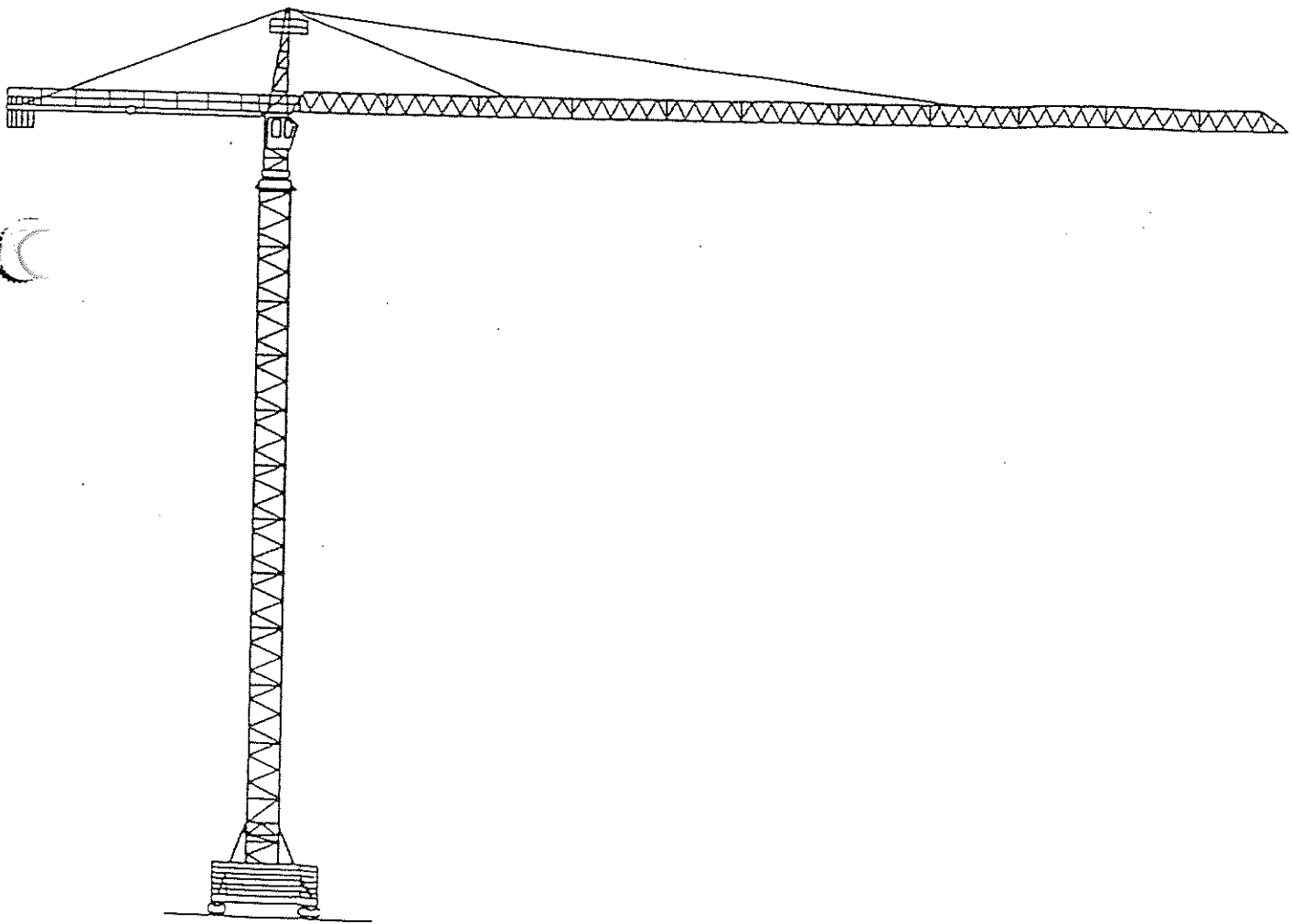




GRUCOMEDIL



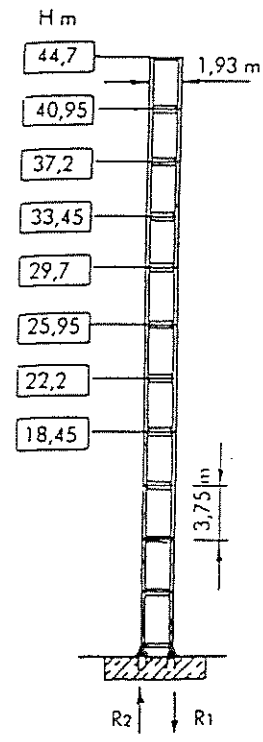
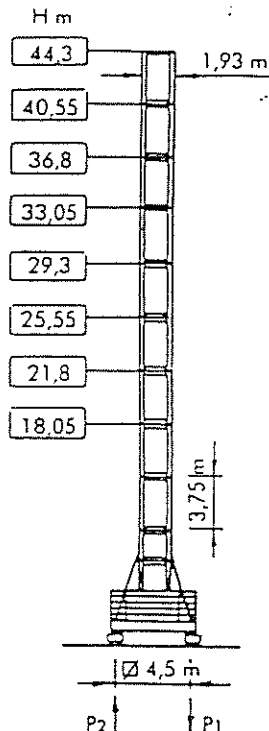
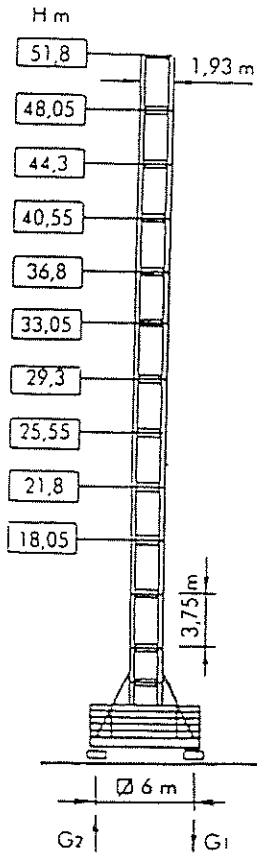
GRU A TORRE
SISTEMA MODULARE
GIUNZIONE A SPINE

TOWER CRANE
MODULAR SYSTEM
PIN CONNECTION

CT 651



CT 651 S 20



G 1	83,3 t *	88 t *
G 2		4 t *
	62,8 t	

P 1	89,7 t *	85,7 t *
P 2		6,2 t *
	58,3 t	

R 1	131,9 t *	132,5 t *
R 2	92,2 t *	91,2 t *
	51,2 t	

H > H max consultateci
H > H max consult us

Peso gru senza zavorra
max H max sbraccio

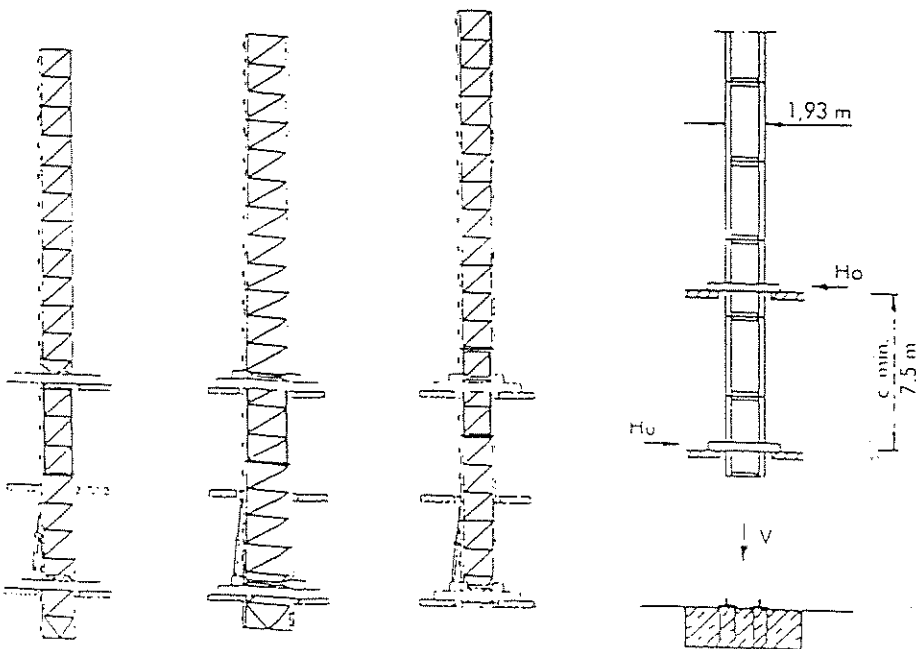
Weight without ballast
max height max jib length

* In servizio
* Fuori servizio

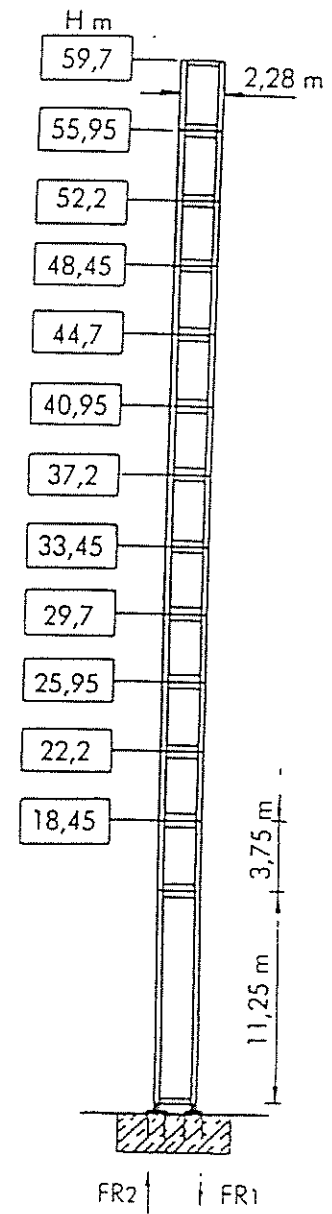
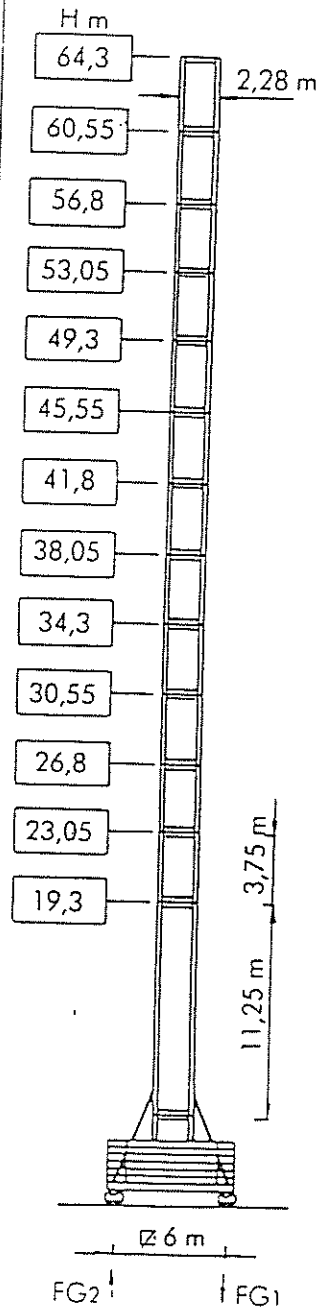
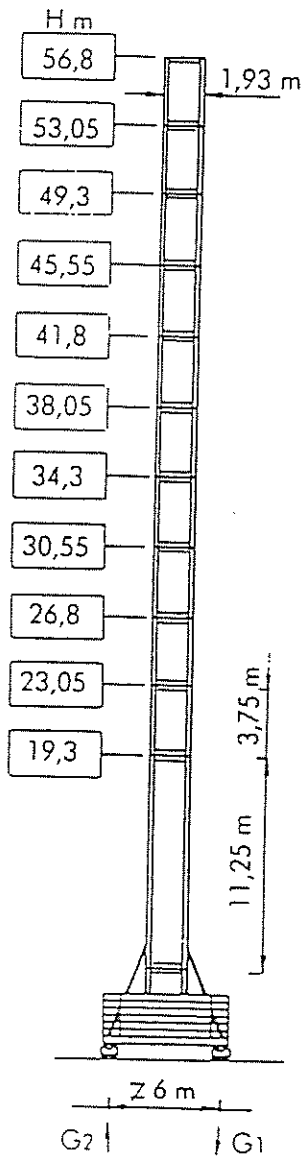
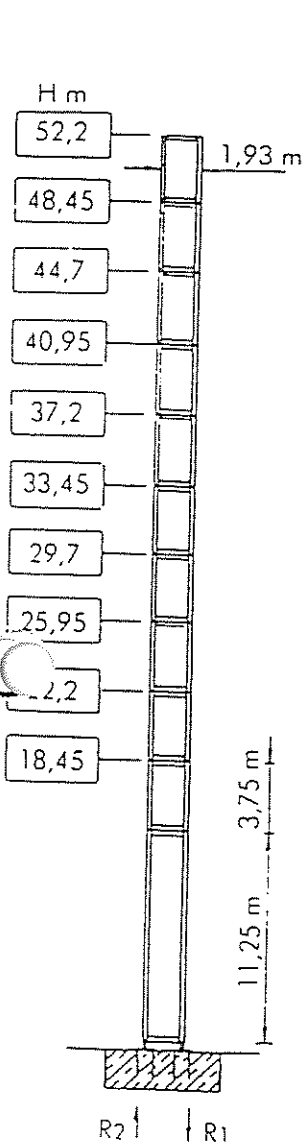
* In service
* Out of service

Ho	32,7 t *	28 t *
Hu	30,7 t *	17,3 t *
V	73 t	

Per ulteriori informazioni vedi scheda tecnico



CT 051 S 20 TL



R 1	155 t	185 t
R 2	111,3 t	145 t
	54,8 t	

G 1	90,4 t	107 t
G 2		14 t
	66,3 t	

FG 1	95 t	122 t
FG 2		27 t
	70,8 t	

FR 1	129 t	191 t
FR 2	83 t	150 t
	59,8 t	

Peso gru senza zavorra
max H max sbraccio










Weight without ballast
max height max jib length




• In servizio
• Fuori servizio

• In service
• Out of service

CT 051 S 23

POTENZA TOTALE RICHIESTA NECESSARY POWER SUPPLY	ARGANI WINCHES	CORRENTE TRIFASE THREE-PHASE CURRENT
53 Kw	SL 40	380 V - 50 Hz
56 Kw	AWLR 505	380 V - 50 Hz
56 Kw	AWLR 506	380 V - 50 Hz
71 Kw	AWLR 706	380 V - 50 Hz

ARGANI - WINCHES		m/min.	t.	HP	KW					
SL 40		7,5	5	40	30	220 m max				
		30	5							
		60	2,5							
		3,8	10							
		15	10							
		30	5							
AWLR 505		0 → 40	5	50	37	350 m max				
		0 → 50	4							
		0 → 66	3							
		0 → 100	2							
		0 → 20	10							
		0 → 25	8							
		0 → 33	6							
		0 → 50	4							
		0 → 33	6							
AWLR 506		0 → 44	4,6	50	37	350 m max				
		0 → 57	3,5							
		0 → 84	2,4							
		0 → 16,5	12							
		0 → 22	9,2							
		0 → 28,5	7							
		0 → 42	4,8							
		0 → 47	6							
		0 → 61	4,6							
AWLR 706		0 → 80	3,5	70	52	350 m max				
		0 → 116	2,4							
		0 → 23,5	12							
		0 → 30,5	9,2							
		0 → 40	7							
		0 → 58	4,8							
		<i>> 350 m consultare consult us</i>								

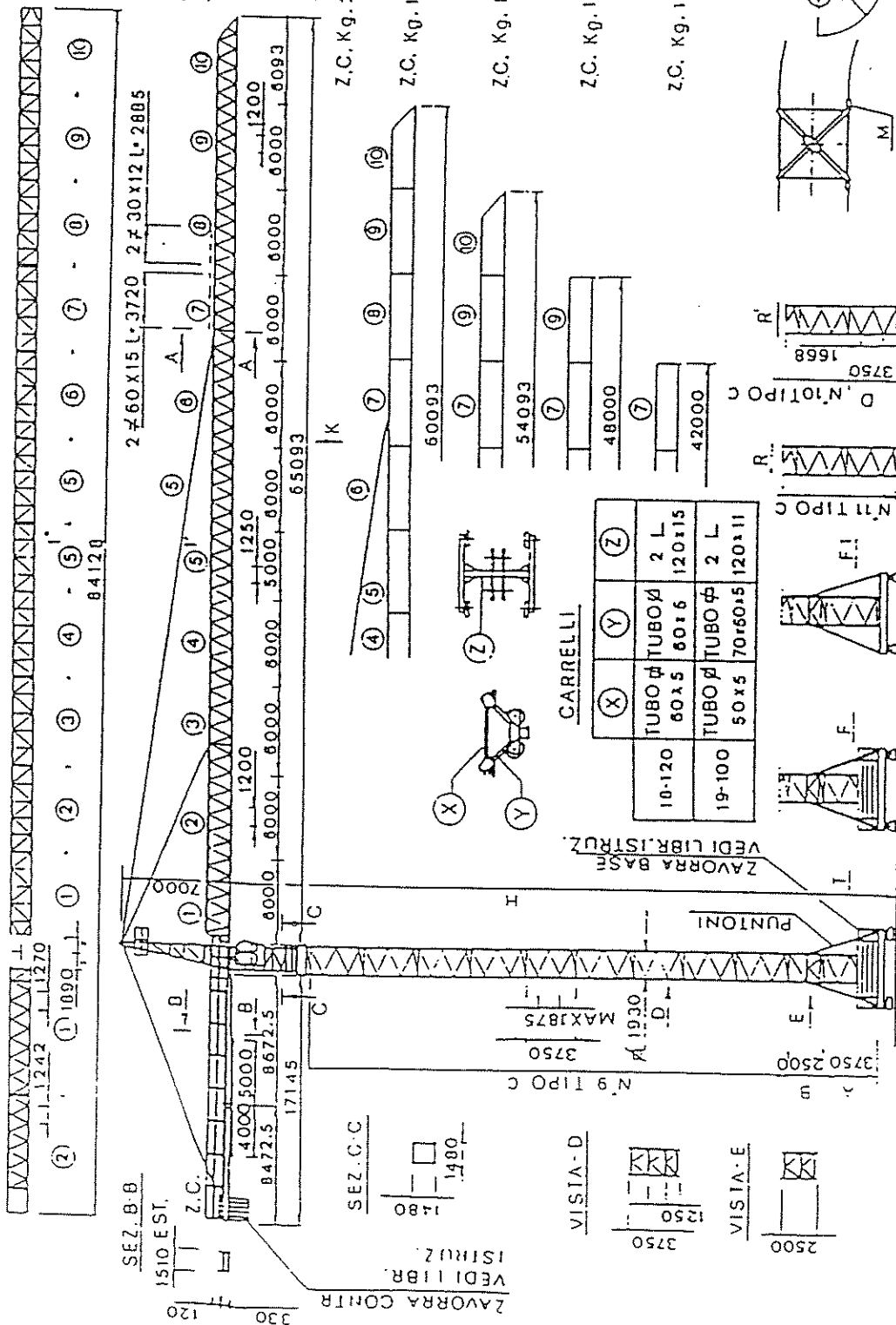
CARRELLI - TROLLEY		C3V	0-10-30-65 m/min	6/5 Kgm	6 Kw
ROTAZIONE - SLEWING		GVP	0 - 0,8 n/min	2 x 7,5 HP	2 x 5,5 Kw
TRASLAZIONE - TRAVELLING		TR - TC	0-12-24 m/min	2 x 3,7 Kgm	2 x 6 Kw

In accordo con le normative CEE 87/405 riguardanti il livello acustico
In accordance with CEE standards 87/405 for the acoustic level

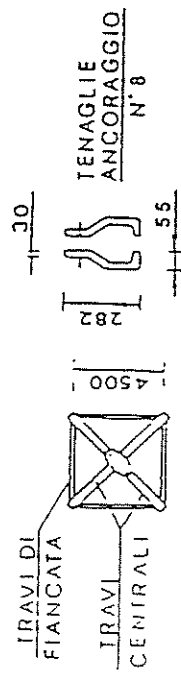
 **GRUCOMEDIL**

AGENTE DEALER

VISTA-K



T	S 20 P	ALTEZZA "H" m.		ALTEZZA LIBERA SOTTO m.
		VENIO ZONA 3	VENIO ZONA 4	
CARRO TRASLANTE		46,3	46,3	44,3
F-F1 CARRO FISSO SU PIASTRE D'APPOGGIO		46,2	46,2	44,2
R	PIASTRE RECUPER.	46,7	42,95	44,7
R'	PIASTRE RECUPER.	46,7	46,7	44,7



WIND ZONE III = 152 Km/hour (DIN)
 WIND ZONE IV = 186 Km/hour (CNR)

- 1. GENERAL PREMISE
- 2. TECHNICAL CHARACTERISTICS
 - . Load diagram
 - . Speed diagram
 - . Load/speed diagram
- 3. CRANE COMPOSITION
- 4. CONTROL GEAR
 - . Hoisting
 - . Jib trolley
 - . Slewing
 - . Travelling
- 5. STRESSES ON THE STRUCTURE
- 6. INSTALLATION AT THE JOB SITE
 - . Line voltage and earthing
 - . Base ballast
 - . Counterjib ballast
 - . Base platform
 - . Runways
- 7. ASSEMBLY
 - . Chassis assembly
 - . Tower assembly
 - . Tower head assembly
 - . Counterjib assembly
- 8. JIB ERECTION
 - . Erection by mobile crane
 - . Erection by crane's own winch
- 9. LADDERS - PLATFORMS - CATWALKS
- 10. SAFETY AND CONTROL SYSTEMS
- 11. LUBRICATION
- 12. MAINTENANCE

13. ADJUSTMENTS

- . Moment limiting device
- . Load limiting device and max. hoisting and
trolley speed cut-out device
- . Hoisting limit switch
- . Double decelerator belts
- . Trolley
- . Hoisting
- . Slewing
- . Travelling

14. INSTRUCTIONS TO USE THE CRANE

- . Setting at work
- . Work station
- . Trolley coupling and release

15. RAISING (TELESCOPIC CAGE)

16. SPARE PARTS

AS REGARDS THE WIRING DIAGRAM, PLEASE REFER TO THE BROCHURE WHICH IS IN THE MAIN CONTROL BOX.



SECTION

1

GENERAL PREMISE



While delivering this operation and maintenance handbook regarding GRUCOMEDIL S.r.l. tower crane CT 651 type and its derived versions, the manufacturer declines any responsibility, either civil or penal one, for accidents that may occur due to non-observance of the specifications there stated.

The crane user is fully responsible for the works made at the job-site. It is upon him, then, the verification of the soil consistency and the feasibility of the installation solutions suggested, which are not binding on GRUCOMEDIL S.r.l.

The crane we are considering can be operated once provided its safety devices have been properly set by the attached personnel. To this purpose, it is up to the Client to make ready some weights on the job-site where the machine is going to be installed. These weights should have the following characteristics:

- . reinforced concrete blocks or, at least, sure weights, arranged for being hitched to the hook chain
- . one weight equal to the max. capacity at jib end of the crane (+/- 3%)
- . one weight equal to the max. capacity of the crane (+/- 3%)
- . one weight equal to 10% of the capacity at jib end of the crane, to set the maximum capacity at jib end (weight at jib end + 10%)
- . one weight equal to 10% of the capacity at jib end for dynamic tests (load at jib end + 10% + 10%)
- . one weight equal to 13% of the capacity at jib end for static tests (load at jib end + 10% + 10% + 13%)
- . one weight equal to 10% of the crane max. capacity for setting of max. load limiting device
- . one weight equal to 10% of the crane max. capacity for dynamic tests (max. load + 10% + 10%)
- . one weight equal to 13% of the crane max. capacity for static tests (max. load + 10% + 10% + 13%)

Jib end capacity and maximum capacity values to be read on the crane capacity diagram.

GRUCOMEDIL S.r.l. declines all responsibilities for accidents or lack of issue of the test certificates from the competent authorities, in case machine settings are carried out with loads different from the given ones.

GRUCOMEDIL S.r.l., the manufacturer, declines any responsibility either civil or penal one, for inconveniences, failures or damages to persons and things at the job-site that may occur due to:

- . non-use of factory spares
- . use of spare parts not suitable to that specific crane
- . modifications or repairs not authorized by GRUCOMEDIL S.r.l.
- . crane erection or use not strictly in conformity with the directions given by the operation and maintenance handbook
- . operation non in conformity with the safety rules foreseen by the specific domestic legislation
- . improper use and improper control of the crane by its operator

The crane operator must strictly attain to the operating and maintenance instructions. He has also to respect the directions given to make any further erection and dismantling after the first one carried out by GRUCOMEDIL's skilled technical staff.

It is advisable to put the crane out of service in case of wind blowing at a speed higher than 72 Km. per hour. An anemometer should be placed on the higher part of the job site to determine the feasibility of the operations. Even in case of wind blowing at a speed just lower than 72 Km. per hour, but lifting loads having a considerable surface exposed to it, consult GRUCOMEDIL to verify the possibility of keeping on working.

Non-authorized personnel is interdicted from modifying somehow any structural part of the crane, electric/oleodynamic or mechanical equipments.

Personnel not in possession of the necessary ascertained experience is also interdicted from using the crane.

Hereinafter is a summary of the Italian rules which regulate the crane use and the operator's proper behaviour.

1. Only authorized personnel is allowed to manoeuvre and use the crane.
2. Before the first shift begins, make sure there is nobody standing on the crane runways and test the limit switch and braking devices. In case of any deficiency, apply to whom it may concern.
3. Never lift a load exceeding the maximum crane capacity allowed or which is badly slinged.
As for the crane capacities, please refer to the data plate fixed on it.
4. Never start any manoeuvre without having received the special signal.
5. Forewarn the start of the manoeuvres by the proper signal.
6. Don't let the crane set out or stop roughly. Avoid also to hit against the stops placed at the end of the crane runway.
7. Don't let the load swing in order to lower it out of the vertical fall. Avoid oblique falls and towing.
8. Avoid hoisting and handling any load over working or transit areas. If not, the start of the manoeuvre or the transit of the load shall have to be properly signalled.
9. Before leaving the control place disconnect the crane main switch, set to zero the control gears and do not let any load hung.
10. Do not leave any material or tools along the service catwalks. Keep the control cabin clean and in order, avoiding possible deposits of inflammable material.
11. In case of crane out of service due to repair or maintenance, its main switch must be disconnected.
12. For tower cranes, gantry cranes or similar cranes working outdoors, when stopping the work, secure the crane with clamps or adequate devices.
13. For cranes using a flexible cable on the ground, be sure that while manoeuvring, it cannot be damaged.

1. Only the persons entrusted to, are allowed to sling the loads and to order the execution of the manoeuvres.
2. If more workers are assigned to the load sling, only one person (the foreman or the senior worker) must be entrusted to control the operations and motions.
3. Orders for manoeuvring must be given according to the code in force at the factory.
4. The slinger has to:
 - use only ropes, chains and special equipments available and get rid of damaged tools;
 - make sure of the right load to be lifted
 - choose the ropes and chains according to the load to be lifted and considering the actual inclination of the load bearing sections (use some equalizers should the angle formed by the rope or chain sections exceed 120°);
 - arrange the ropes or chains as to avoid any possible withdrawings, mainly when lifting more than one piece at a time;
 - insert between ropes or chains and the material to be lifted some wooden thicknesses or protection profiles, mostly when the slings are resting on corners;
 - check the load slinged is properly balanced by stretching slowly the ropes before starting hoisting;
 - be careful the load is lifted at a right height as to avoid eventual obstacles which may be found along the run;
 - if possible, when travelling, go ahead the load as to advice any worker which might stand there;
 - be careful the load is lowered gradually and lays on plane and resistant surfaces to avoid a too quick slackening of the sling and a possible fall of the load itself;
 - be sure that while working with unloaded crane, ropes or suspended chains do not bump against eventual obstacles;
 - lay ropes and chains in order in the special racks.

5. The slinger must not:

- stay, or allow any other worker to stay, near the suspended loads;
- manually move any load: the operator is only allowed to use special tools and carry out only traction efforts;
- carry out either obliquial fall or tearing manouvres of the standing or constrained loads;
- move any wagon or any other means of transportation by using the crane;
- use the crane to lift and transport cylinders without special tanks.

INSTALLATION

After any operation pause and anyway at the beginning of any working day, it is necessary to:

- . reset the electrical input
- . unlock the anchoring tongs in case the crane is a travelling one
- . control brakes and handling efficiency
- . check the reliability of the safety devices
- . verify the control devices efficiency

SERVICE RECOMMENDATIONS

All the working manoeuvres and particularly the lifting one, have to be started gently, i.e. the operation of the lever control must be gradual: do not pull it straight full scale, this to avoid first inertial overloadings that could create dangerous situations to the load itself and to the working area too.

IT IS ALSO FORBIDDEN TO STOP THE CRANE MOVEMENTS BY PUSHING THE "STOP" BUTTON, UNLESS IN CASE OF REAL EMERGENCY. THIS OPERATION, IN FACT, DOES NOT PERMIT A GRADUAL STOP OF THE MOVEMENTS. FURTHERMORE, IF SISTEMATICALLY REPEATED, THIS MANOEUVRE IMPLIES A BIG REDUCTION OF THE CRANE WORKING CYCLES THAT, ACCORDING TO UNI, CNR AND DIN STANDARDS ARE AROUND 600.000 TECHNICAL LIFE CYCLES.

SLEWING BRAKE RELEASE

Before leaving the crane, the rotating unit has to be let free to follow the direction of the wind (weathercock). This is achieved by releasing the slewing motors brake as indicated in the "electric system" paragraph.



SECTION

2

TECHNICAL CHARACTERISTICS

-LOAD DIAGRAM

-LOAD / SPEED DIAGRAM

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100

100

100

100

100

100

100

100

100

100

100

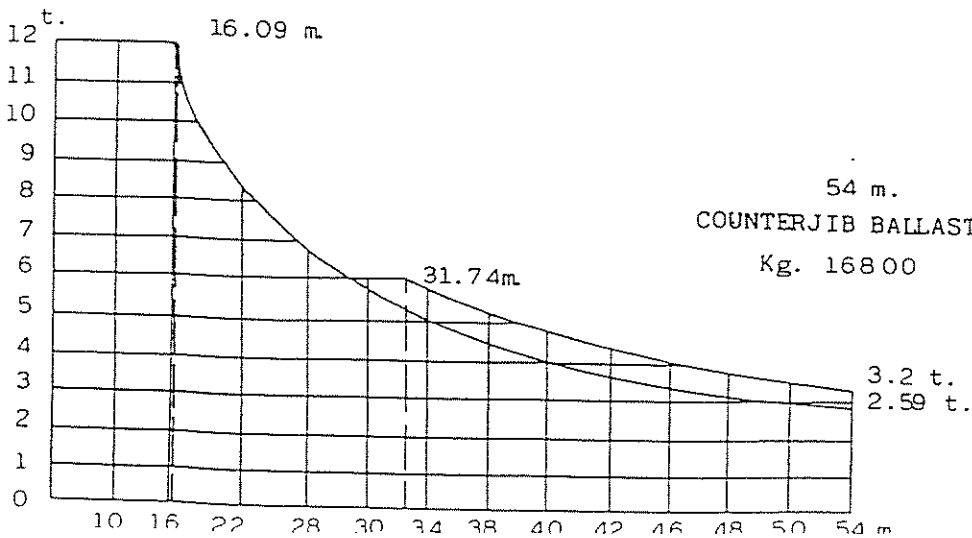
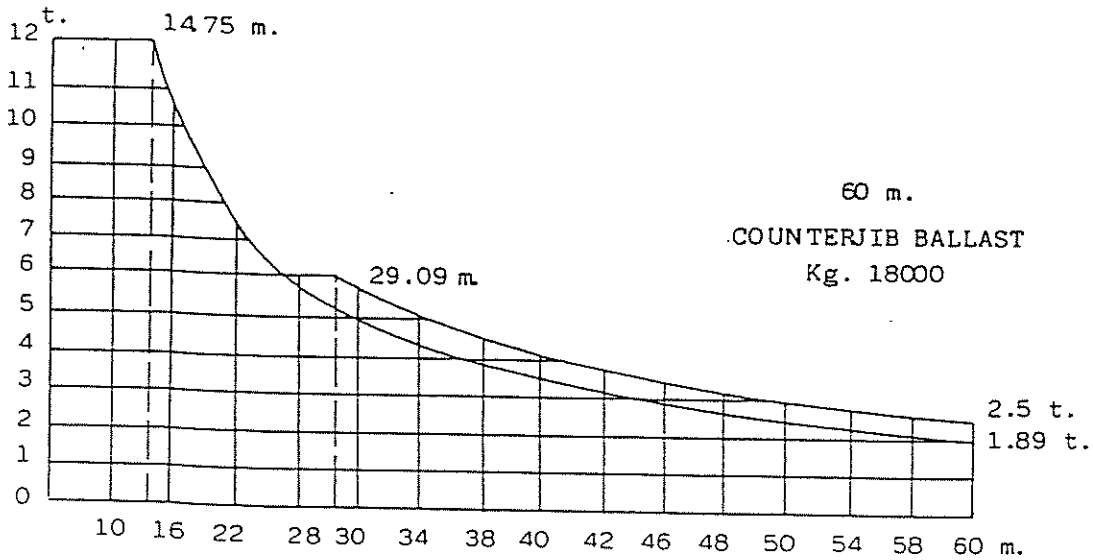
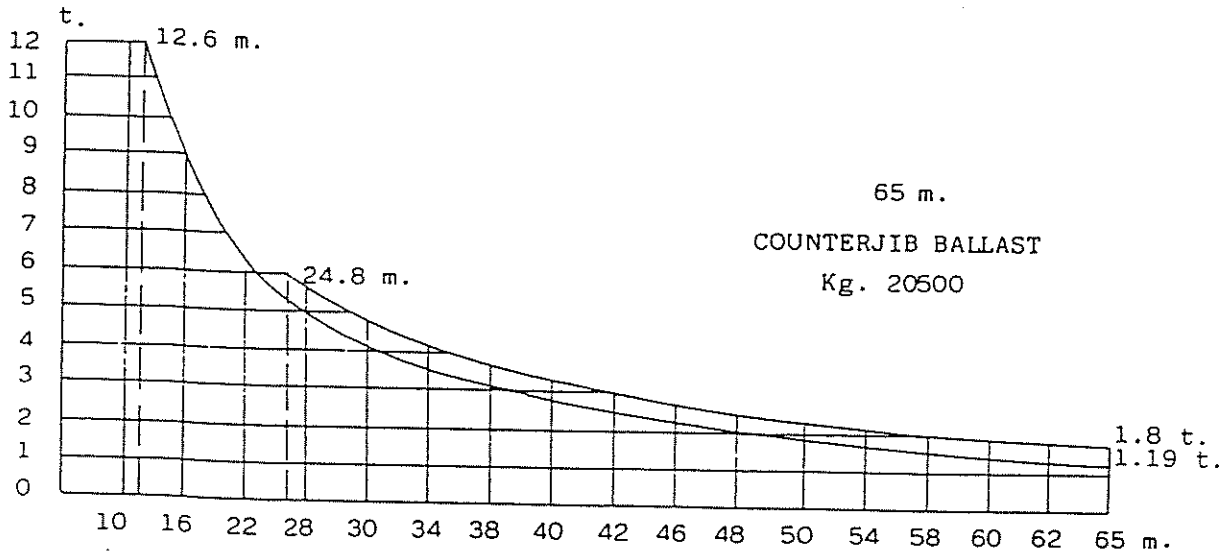
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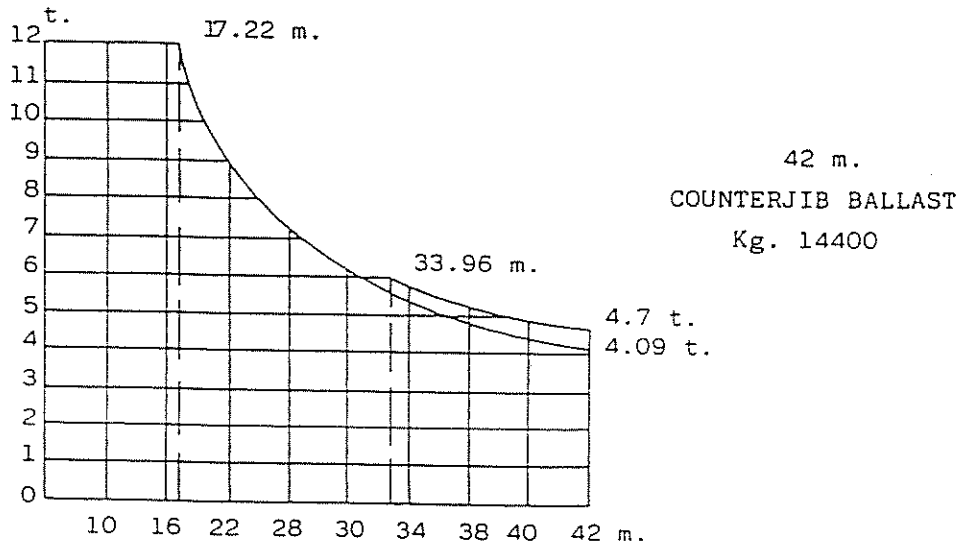
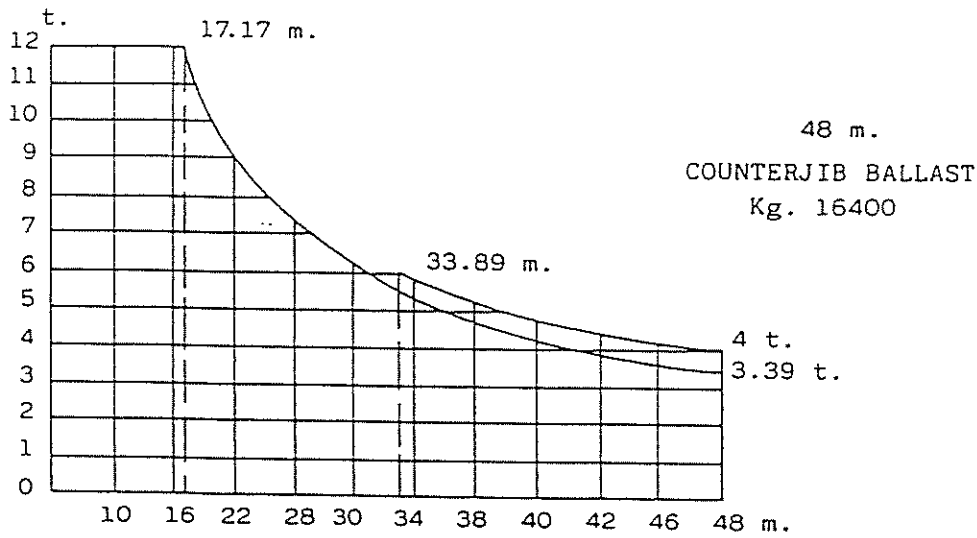
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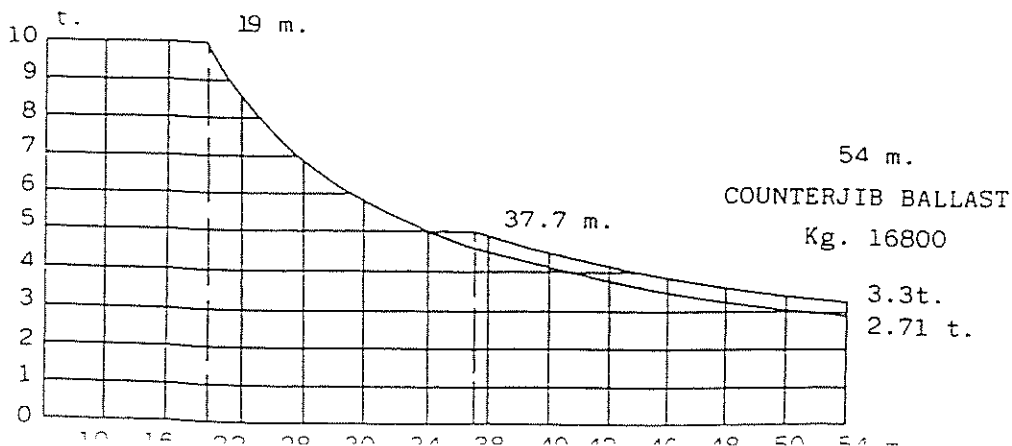
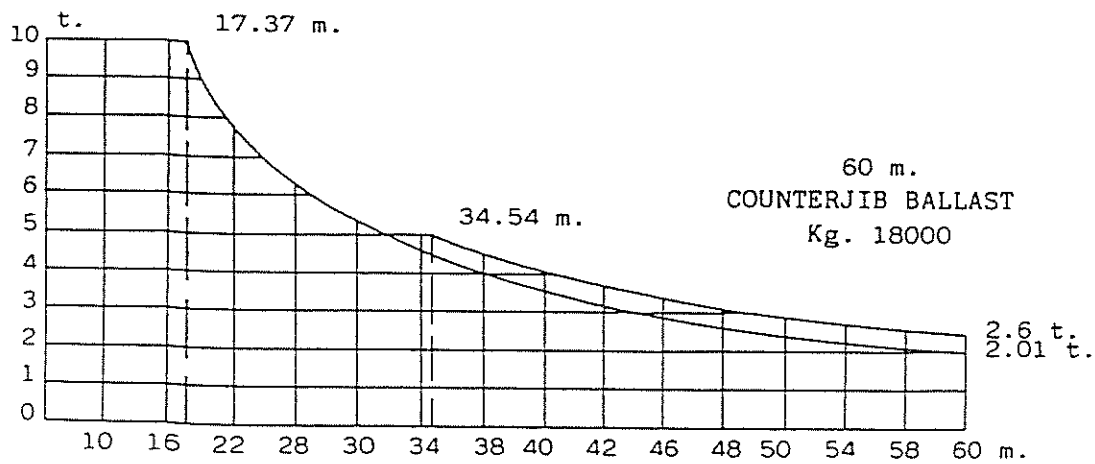
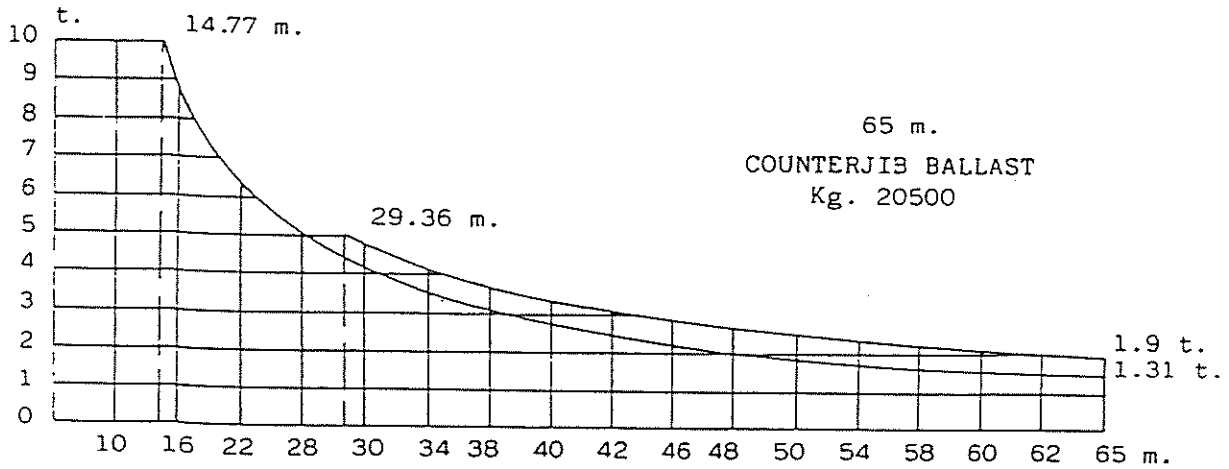
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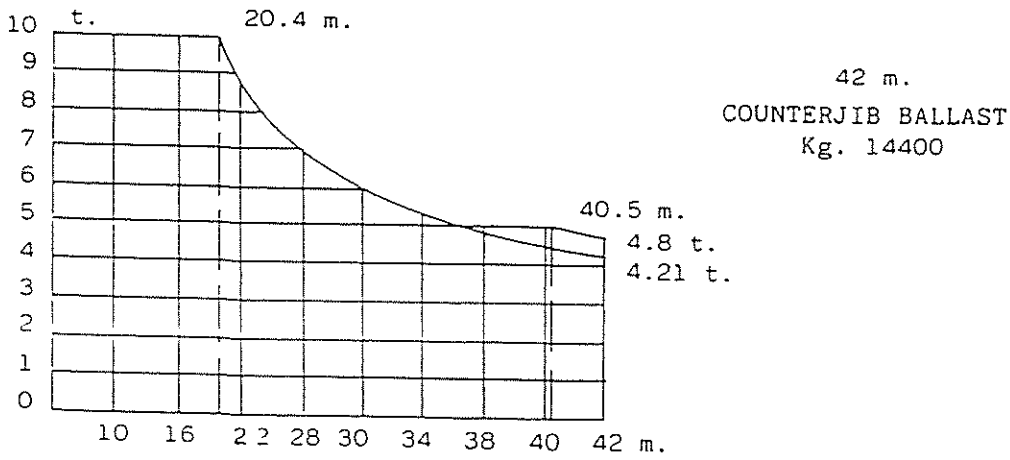
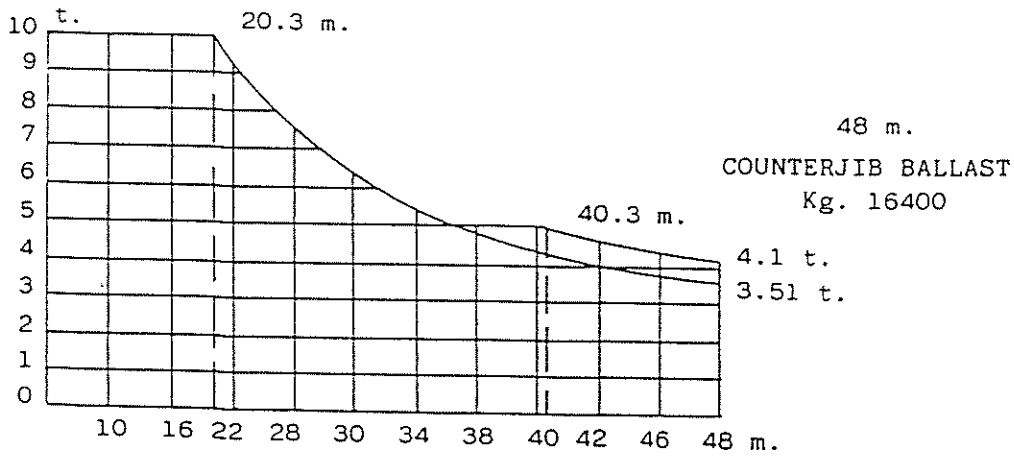
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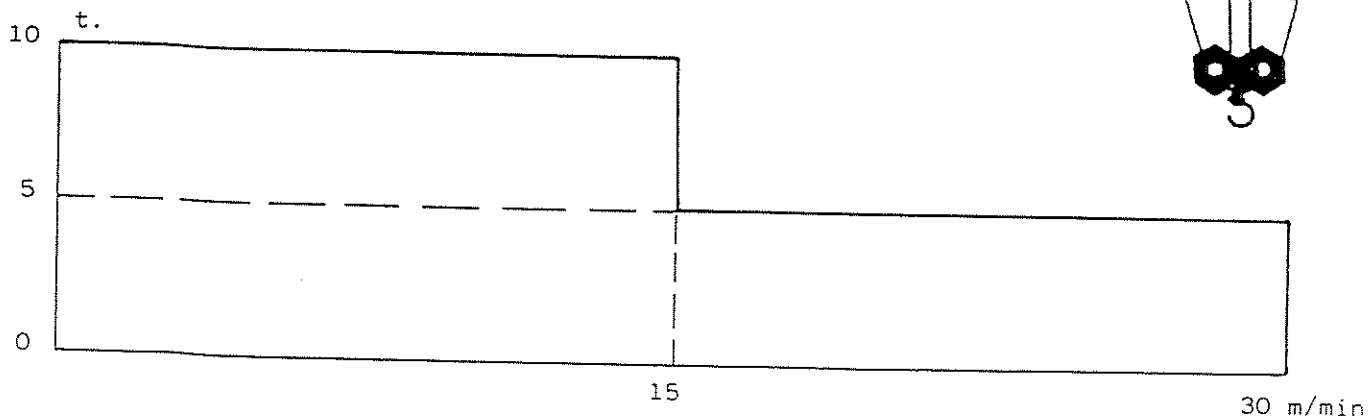
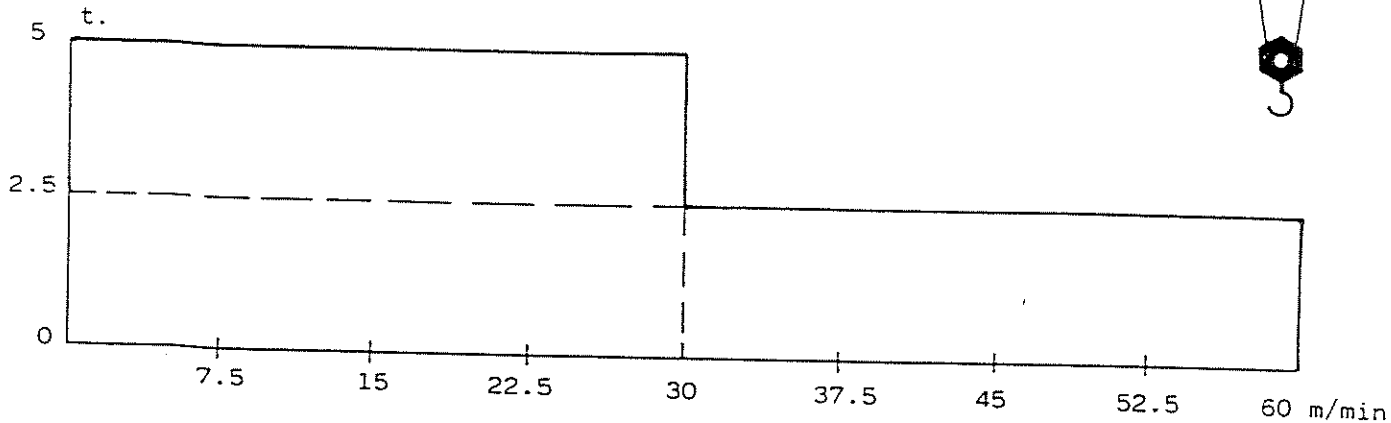




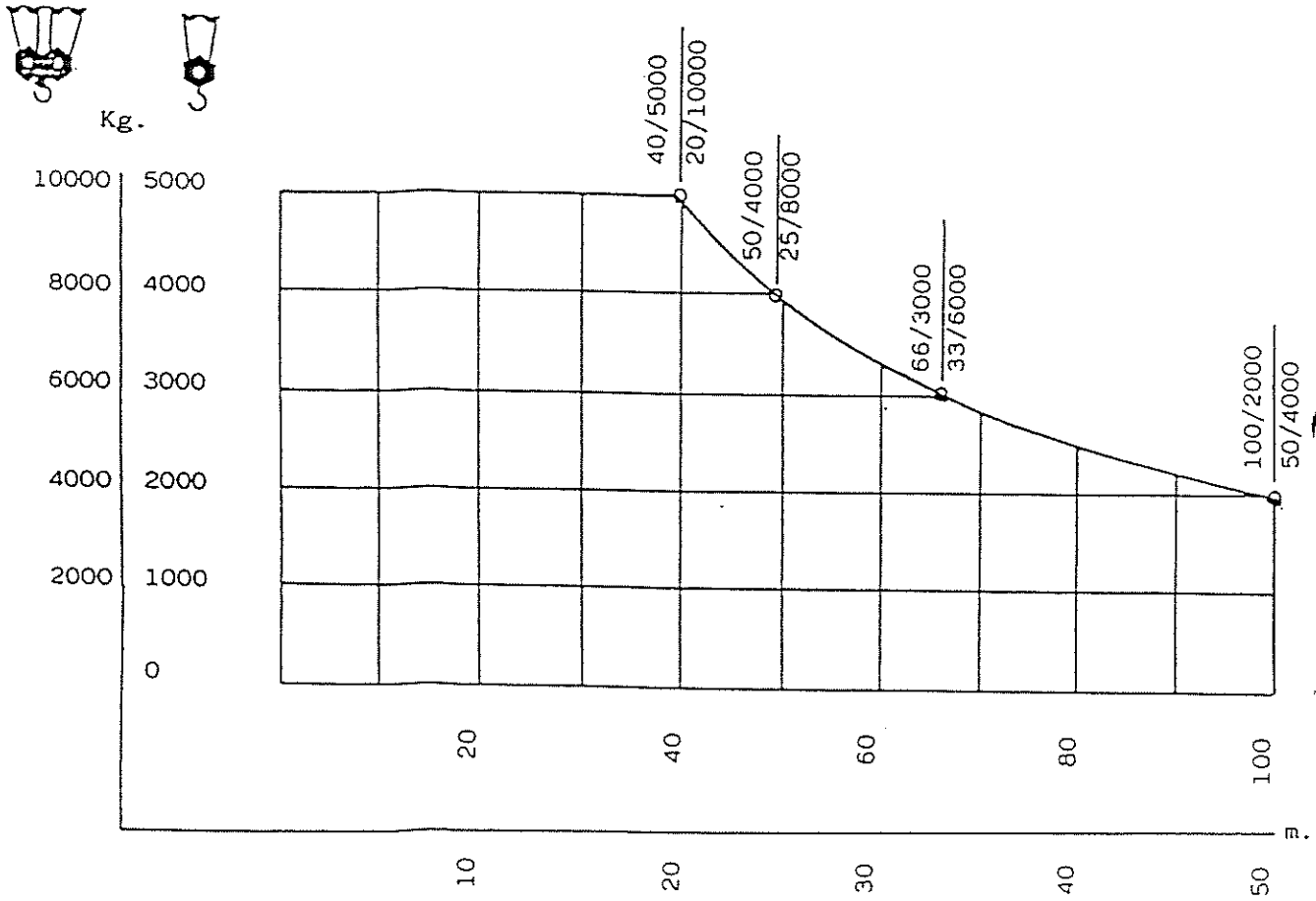




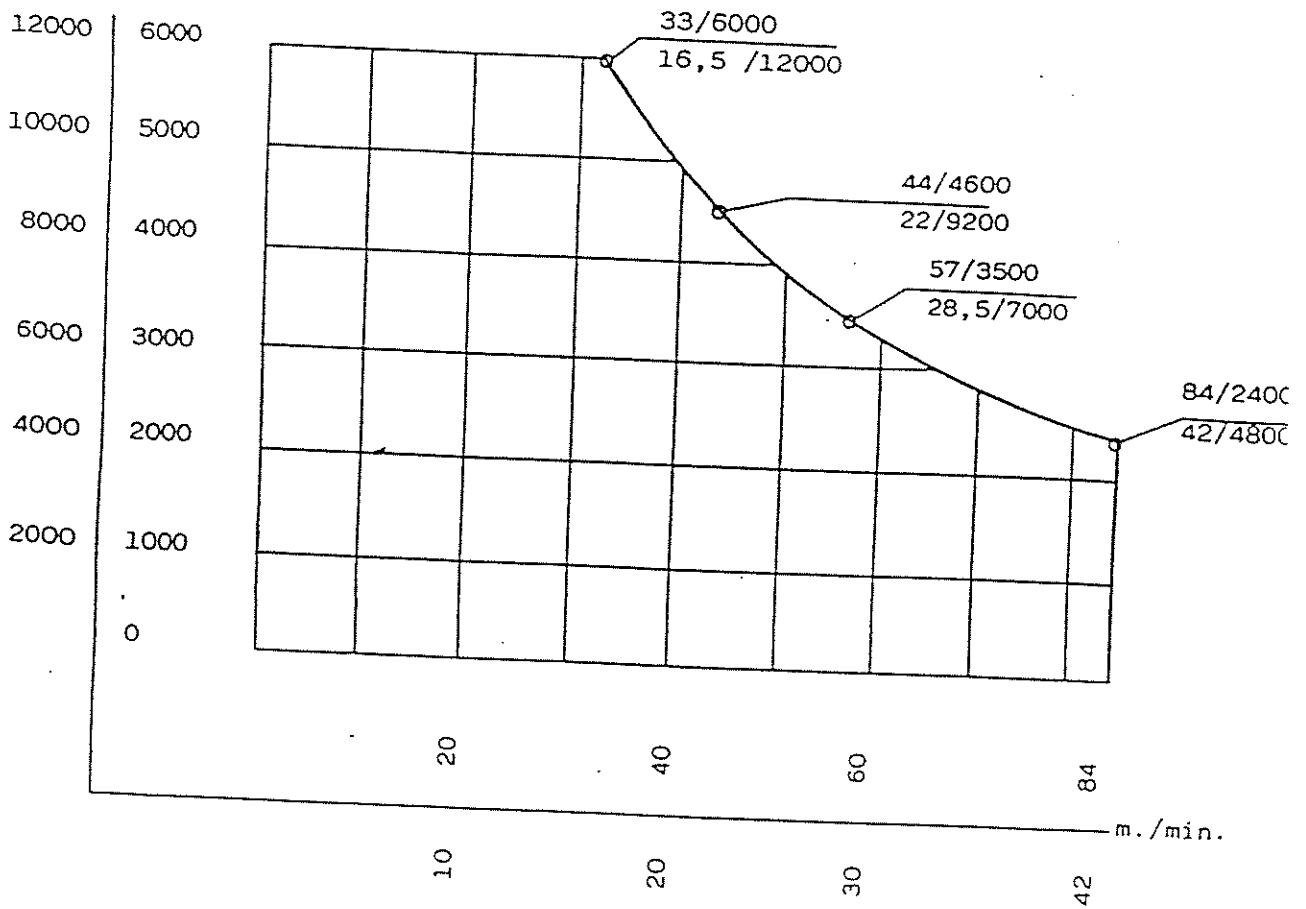
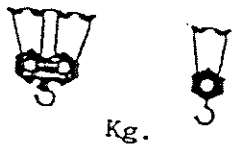
40 AL 50



CAPACITIES/SPEEDS DIAGRAM - WINCH TYPE WARD LEONARD MODEL ALWR 505 -
(50 HP/37 Kw)



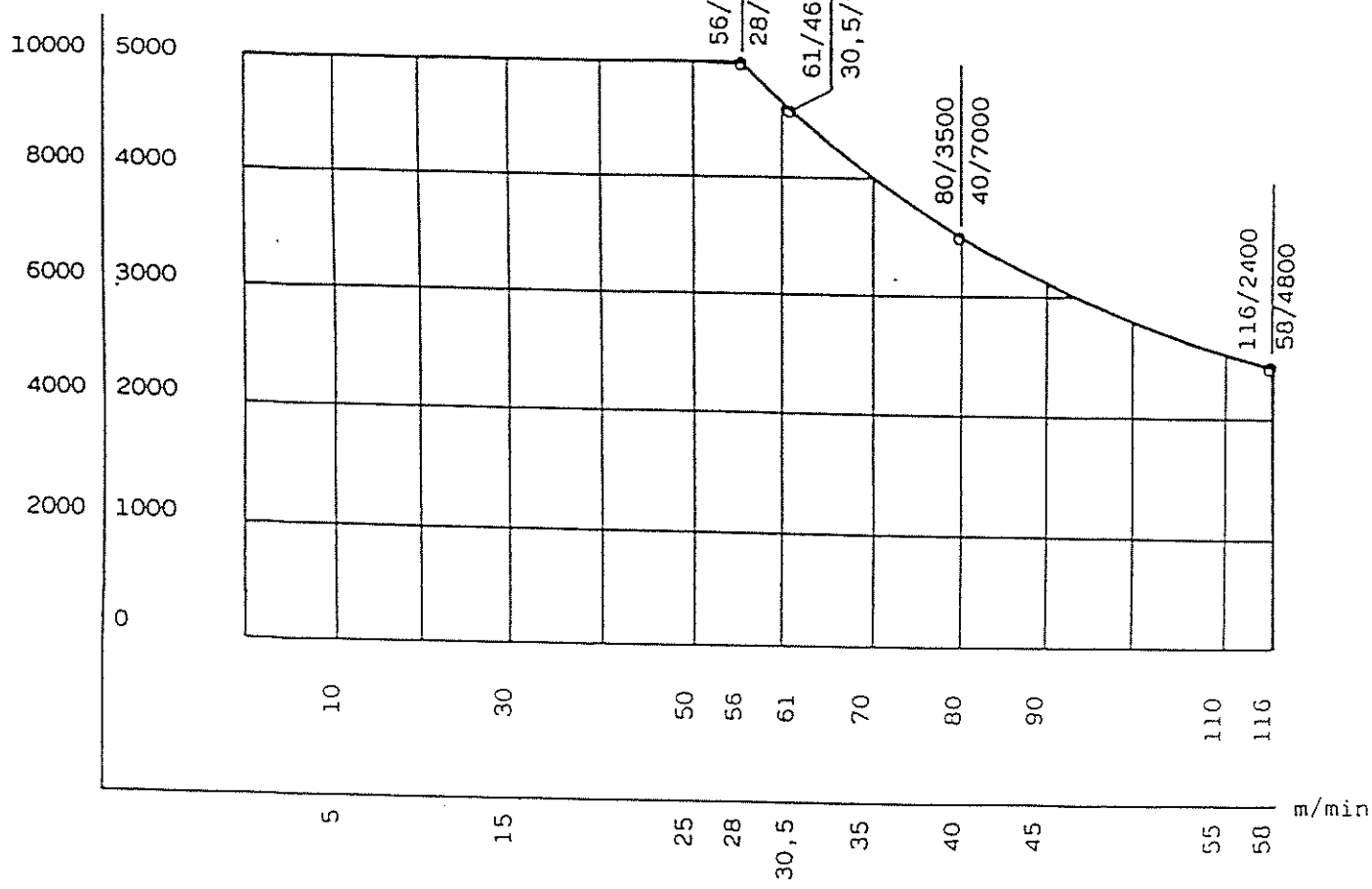
CAPACITIES/SPEEDS DIAGRAM - WINCH TYPE WARD LEONARD MODEL ALWR 506
(50 HP/37 Kw)



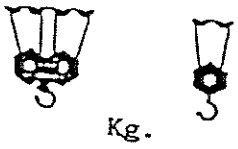
CAPACITIES/SPEEDS DIAGRAM - WINCH TYPE WARD LEONARD MODEL 705 -
(70 HP/52 Kw)



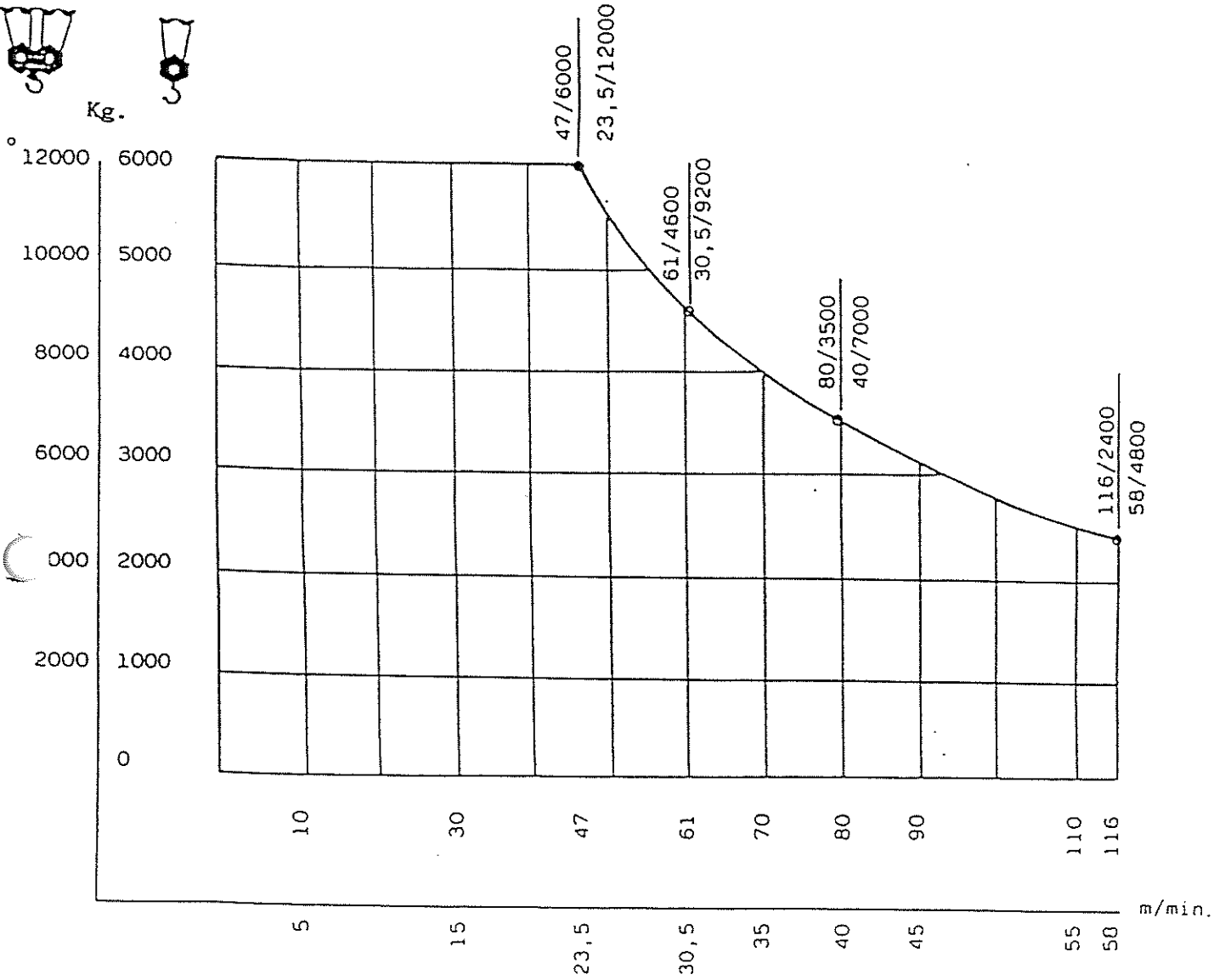
Kg.



CAPACITIES/SPEEDS DIAGRAM - WINCH TYPE WARD LEONARD MODEL 706 -
(70 HP/52 Kw)



Kg.





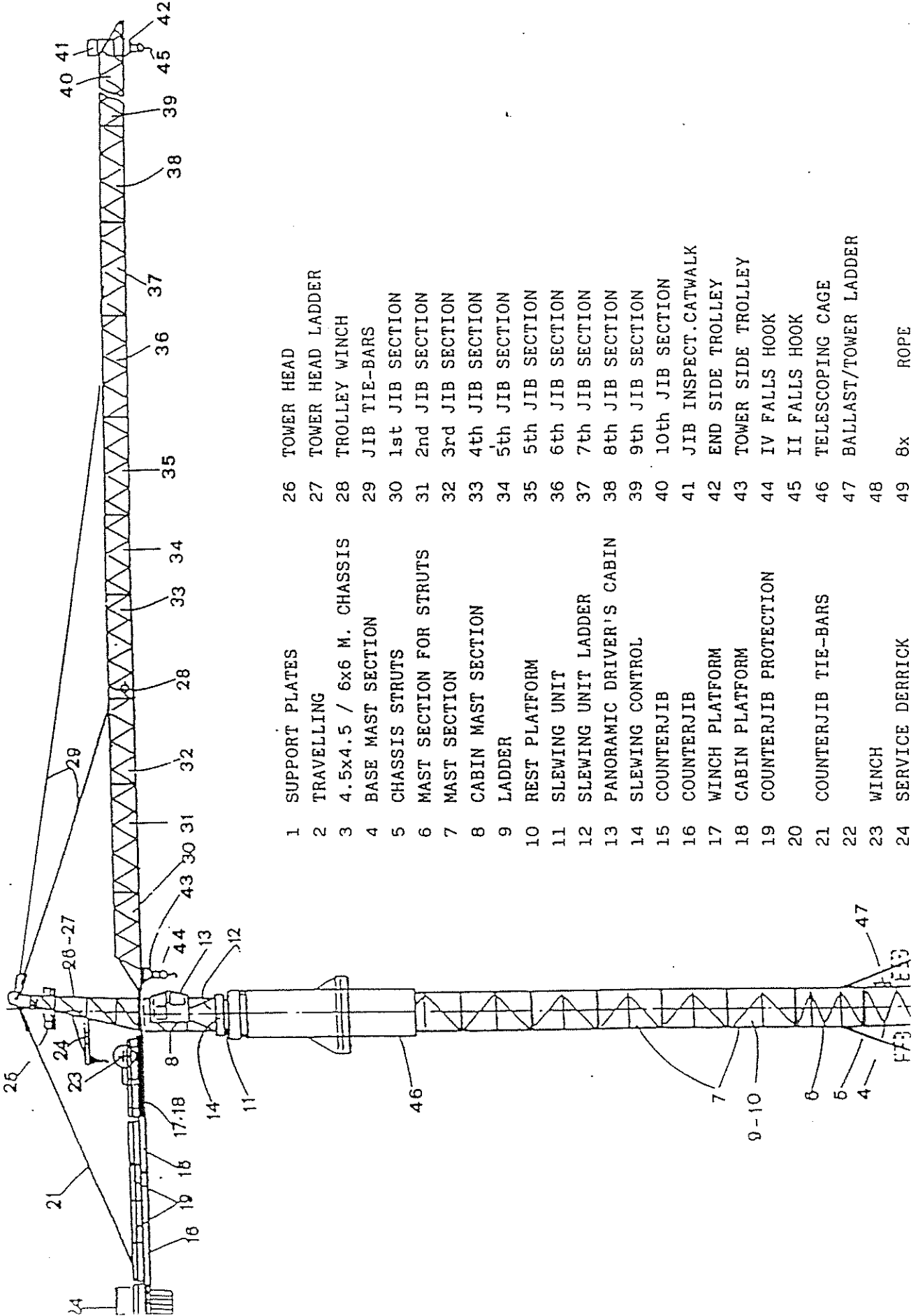
SECTION

3

CRANE COMPOSITION

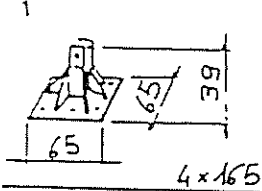
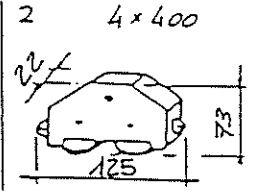
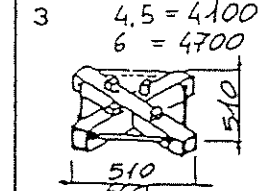
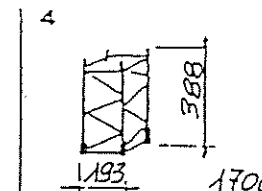
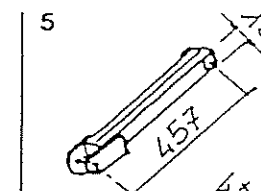
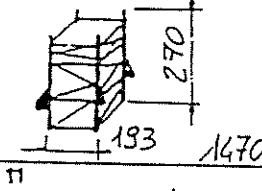
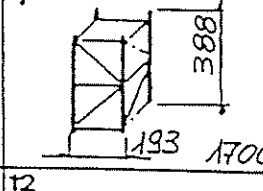
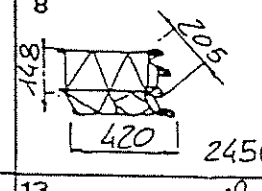
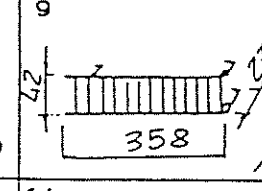
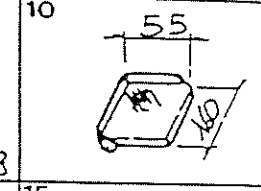
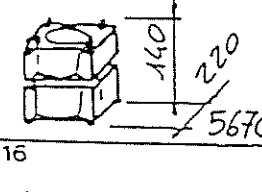
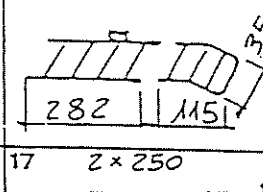
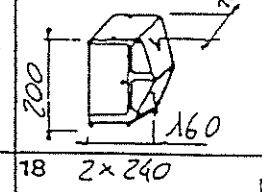
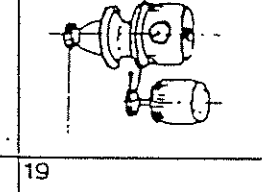
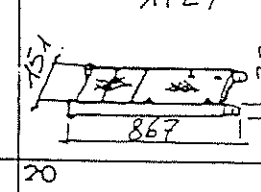
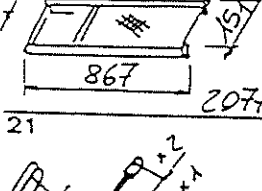
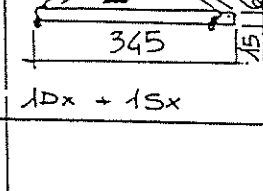
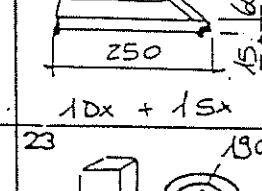
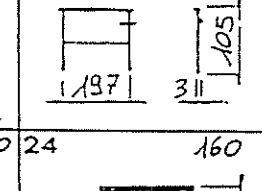
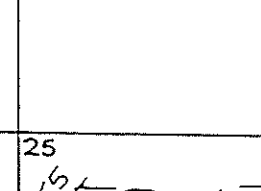
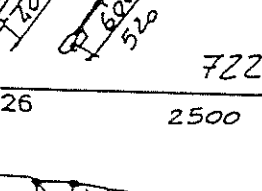
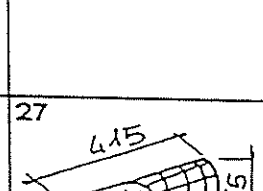
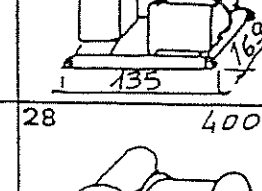
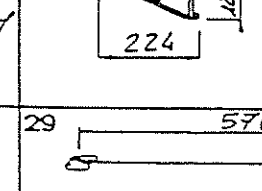
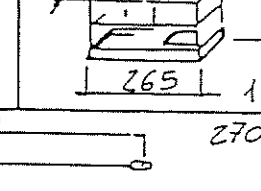
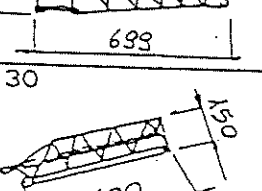
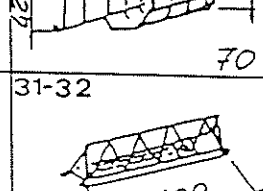
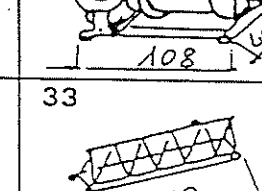
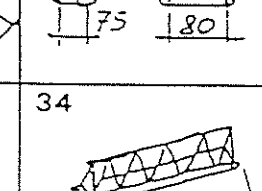
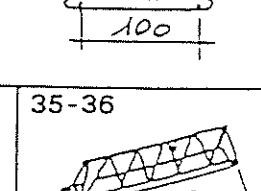
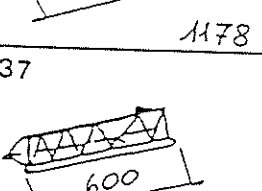
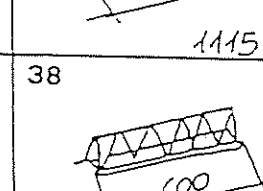
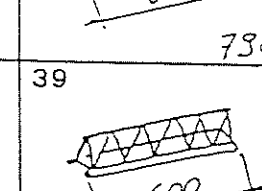
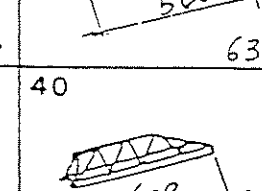
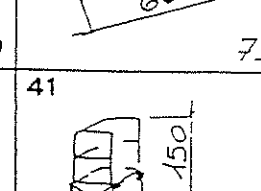
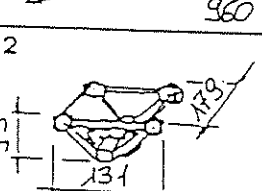
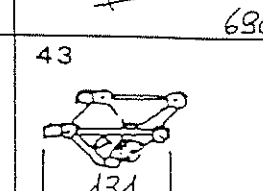
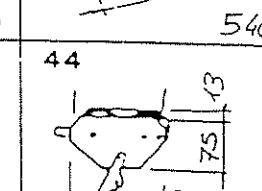
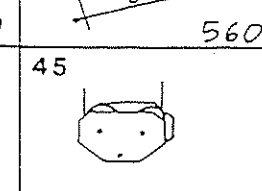
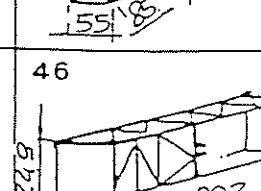
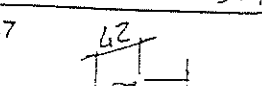



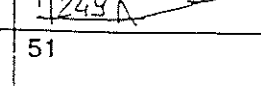





- COMPONENTS WEIGHTS AND DIMENSIONS





- | | | | |
|----|--------------------------|----|----------------------|
| 1 | SUPPORT PLATES | 26 | TOWER HEAD |
| 2 | TRAVELLING | 27 | TOWER HEAD LADDER |
| 3 | 4.5x4.5 / 6x6 M. CHASSIS | 28 | TROLLEY WINCH |
| 4 | BASE MAST SECTION | 29 | JIB TIE-BARS |
| 5 | CHASSIS STRUTS | 30 | 1st JIB SECTION |
| 6 | MAST SECTION FOR STRUTS | 31 | 2nd JIB SECTION |
| 7 | MAST SECTION | 32 | 3rd JIB SECTION |
| 8 | CABIN MAST SECTION | 33 | 4th JIB SECTION |
| 9 | LADDER | 34 | 5th JIB SECTION |
| 10 | REST PLATFORM | 35 | 5th JIB SECTION |
| 11 | SLEWING UNIT | 36 | 6th JIB SECTION |
| 12 | SLEWING UNIT LADDER | 37 | 7th JIB SECTION |
| 13 | PANORAMIC DRIVER'S CABIN | 38 | 8th JIB SECTION |
| 14 | SLEWING CONTROL | 39 | 9th JIB SECTION |
| 15 | COUNTERJIB | 40 | 10th JIB SECTION |
| 16 | COUNTERJIB | 41 | JIB INSPECT.CATWALK |
| 17 | WINCH PLATFORM | 42 | END SIDE TROLLEY |
| 18 | CABIN PLATFORM | 43 | TOWER SIDE TROLLEY |
| 19 | COUNTERJIB PROTECTION | 44 | IV FALLS HOOK |
| 20 | | 45 | II FALLS HOOK |
| 21 | COUNTERJIB TIE-BARS | 46 | TELESCOPING CAGE |
| 22 | | 47 | BALLAST/TOWER LADDER |
| 23 | WINCH | 48 | |
| 24 | SERVICE DERRICK | 49 | 8x ROPE |

WEIGHTS CHART FOR ASSEMBLY AND TRANSPORT

1 	2 4x400 	3 4,5 = 4100 6 = 4700 	4 	5 
6 	7 	8 	9 	10 
11 	12 	13 	14 	15 1727 
16 	17 2x250 	18 2x240 	19 	20 
21 	22 	23 1900 	24 160 	25 
26 2500 	27 415 	28 400 	29 570 	2701 
30 	31-32 	33 	34 	35-36 
37 	38 	39 	40 	41 
42 	43 	44 	45 	46 
47 	48 	49 	50 	51 

BASE CHASSIS

It is included in solution "T", "F" and "F1". It supports the tower so that some of its stresses are absorbed by the struts. It's composed of squared welded beams. Its bearing surface measures 4,5 x 4,5 and 6 x 6 m. It can be mounted in travelling or static position.

BASE BALLAST

It is composed of self-bearing blocks made of reinforced concrete of various dimensions to distribute uniformly its load on the chassis frame and therefore on the bearings. These are vertically fixed to avoid any gauge in case of bump.

TOWER

It is composed of sections 3,75 m. long uniformed for position "A" and "C". THE STANDARD CRANE includes, besides the chassis, the base supports and sections which allow to reach different heights under hook. For considerable heights, the first mast sections are made of profiles of bigger dimensions. On the contrary a 11,25 m. section is available for the maximum height. As far as solution "D" (climbing) is concerned, first and third sections are special ones since they have been arranged for the telescoping phases. Second section and sections among the fourth to the seventh included, are uniformed. In case in the job-site there is the necessity to place the climbing collars in a different position than the one among 7,5 and 11.75 m., even the fourth extension must be of reinforced type.

COUNTERJIB

It is composed of section bars in 'IPE' of 330 mm. The hoisting winches, the electrical equipment and the slewing ballast are placed on it. It is protected by safety guards.

SLEWING UNIT

It is composed of two elements; between them there is the turntable. It is mounted at the top of a minimum of 3 mast sections (standard crane). Jib and counterjib are hinged on it, while the tower head is fixed.

Even the slewing unit is provided with safety guards which permit to reach the control cabin, to inspect the slewing control units, and to reach the jib and the counterjib.

As regards its maintenance operations, please refer to "IMPORTANT ADVICE" page 12.1.

TOWER HEAD

Made of box-type angle bars and round-rods, it forms a triangle which supports the jib and counterjib with tie-bars connected by pins on the top of it.

By an outside ladder one can reach the service guard placed on the upper part of the structure.

JIB

It is made of 11 triangular-section elements (standard crane with 65 m. jib) composed of box-type angle bars and round-rod diagonals. Inside it, there are the support pulleys of the trolley rope. As far as the third jib section is concerned, it is also provided with a catwalk for the trolley winch maintenance.

COUNTERJIB BALLAST

For the total weight of the 5 blocks see page 6.12. They are made of reinforced concrete, self-bearing, positioned in the rear part of the counterjib.

TIE-BARS

The elements which support the jib and the counterjib are composed of round and flat bars hinged to the jib and counterjib themselves and to the tower head. These elements, different in length, are jointed by special steel pins.

Some supports are arranged along the upper angle bar of the jib; tie-bars are laid on these supports after having been connected by pins to the jib, ready to be connected to the tower head (erection with crane truck or other means).



SECTION

4

CONTROL GEAR

-HOISTING

-JIB TROLLEY

-SLEWING

-TRAVELLING



The mechanical control gears of CT 651. crane are positioned as shown in the following picture.

The electric system is composed of two control boxes:

- . the first one, which is located at the crane base, includes the current main socket, the travelling controls and the main switch gear;
- . the second, which is located on the counterjib, includes all other motions controls and the control systems.

Different solutions for hoist winches are available: from a minimum power rating of 29.4 Kw with 3 speeds, to a maximum power rating of 52 Kw, with progressive speed winches.

EXAMPLE FOR CT 651 18.120

A. PROGRESSIVE SPEED WINCH (29.4 Kw) 40 Hp

MOTOR

Feeding: Direct Current
 Type: COMEDIL
 Rate: 29.4 Kw
 Cooling: forced ventilation by independent feeding fan
 with thermic control devices

REDUCTION GEAR

Type: AG40 COMEDIL (orthogonal) 2.I.
 Max. output torque: 1383 daN.m
 Reduction: 1:56
 Lubrication: in oil bath

DRUM

Winding diameter: 0,720 m.
 Edges ext. dia.: 0,920 m.
 Width: 0,730 m.
 Rope housing: helical left
 Length of wound rope 310 m.

ROPES

Diameter: 16 m.
Unitary wire dia.: 0,90 mm.
Type: 19 x 7 non-rotational
Breaking load: 23.500 daN
Spiral: right
Length: standard 220 m.(other lengths on request)

SERVICE BRAKE

Type: EMB MSDD 200
Feeding: Direct Current 40 Volt
Resistant torque: 50 daNm

Different solutions for hoist winches are available: from a minimum power rating of 24.3 Kw with 3 speeds, to a maximum power rating of 88 Kw, with progressive speed winches.

EXAMPLE FOR CT 651 18.120

A. PROGRESSIVE SPEED WINCH - (52 Kw) 70 Hp

MOTOR

Feeding: direct current
Type: COMEDIL
Rate: 37 Kw
Cooling: forced ventilation by independent feeding
heater fan with thermic control devices

REDUCTION GEAR

Type: SL70 A COMEDIL (orthogonal)
Max. output torque: 1600 daN.m
Reduction: 1:31
Lubrication: in oil bath

DRUM

Winding diameter: 0,720 m.
Edges ext. dia.: 0,920 m.
Width: 0,73 m.
Rope housing: helical left

.../.

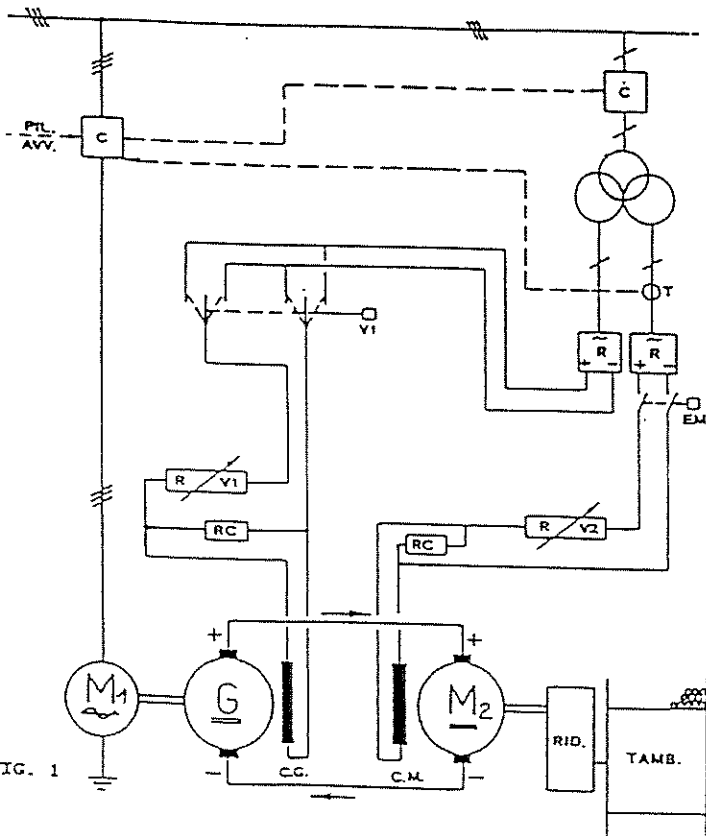
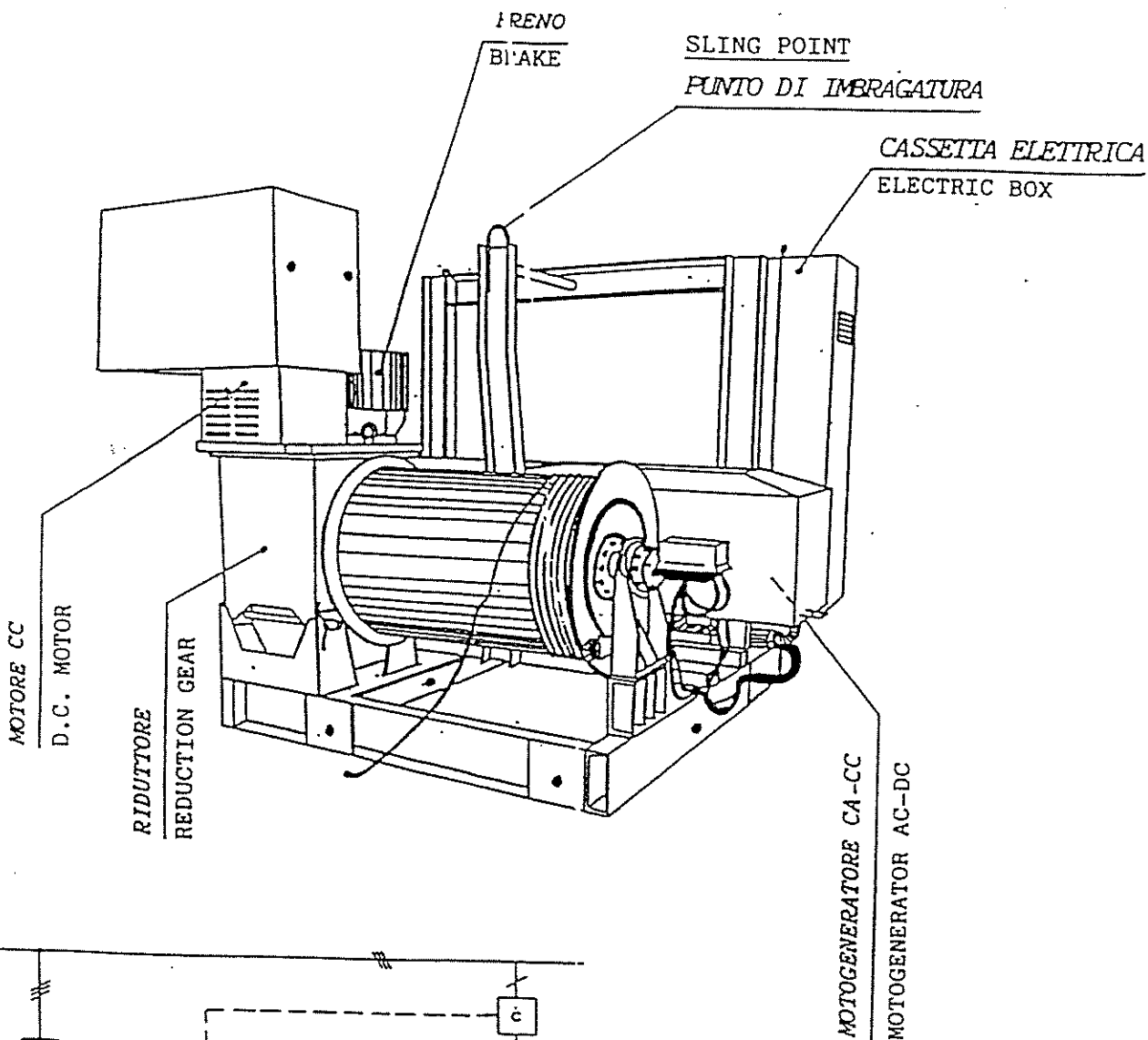
ROPES

Diameter: 16 mm.
Unitary wire dia.: 0,90 mm.
Type: 19 x 7 non-rotational "A4 ALC"
Breaking load: 23.500 daN
Spiral: right
Length: standard 350 m.(other lengths on request)

SERVICE BRAKE

Type: COMEDIL FMPR single disc
Feeding: direct current 40 V
Resistant torque: 60 daNm

(See following pages for general information).



AWL PRINCIPLE SCHEME

- M1 = alternate current traction motor
- G = direct current (D.C.) generator
- M2 = D.C. current hoisting motor
- C = starting contactors block / general gear
- CG = generator field
- CM = motor field
- T = lack excitation survey-device
- R = excitation bridges
- V1 = direction choice contacts (left/right)
- EM = motor exciting contactor
- RV1 = speed variation control
- RV2 = motor exciting adjusting system
- RC = load circuit for emergency brakes

FIG. 1

AWL COMEDIL WINCHES

WARD LEONARD system operates, as shown in picture 1, by feeding motor "M" through a generator "G", and exciting both of them by an independent rectifier.

While the motor is practically fed by a constant excitation any excitation variation of this generator causes an armature voltage change that fed the motor and, consequently, a variation of its speed that therefore can be modified with continuity, with large range.

To invert the motor rotating direction, the generator exciting circuit is equipped with a pole reverser, which reverses the polarity of the armature current.

The motor doesn't need any starting device still maintainig its power request limited, since the voltage that feeds this motor is gradually raised, manoeuvring with low power the generator exciting circuit.

WARD LEONARD unit gives the advantage that the generator produces just the energy necessary to feed the motor at various speeds, without any waste and ,anyway, with progressive increase starting from zero. This system doesn't give any starting voltage peaks, as usually happens with the standard systems with squirrel cage motors or with slip-ring motors with external resistances, even when having maximum loads.

There is also the possibility to stop (more or less rapidly and in a progressive way) the motor, thus weakening the generator exciting circuit. In this case the generator produces an electromotive force (e.m.f.) lower than the motor one, so that this motor operates as a generator, giving back energy to the real generator, and receiving a braking effect more or less energetic (it depends on the speed used to weaken the generator excitation).

The generator mechanical feeding is operated by an A.C. standard motor with a squirrel cage motor, with star-triangle starting system (bi-tension) with reduced take-off current to 70 HP.

For higher capacities there is a system having a starting motor (CA) with small power.

To operate and control this type of winches, Gru Comedil Srl proposes two solutions:

AWL-R where "R" stands for generator exciting control through voltage variations by inserting small resistances in the circuit;

AWL-E where "E" stands for generator exciting control through voltage variations by an electronic card.

Both solutions offer similar load/speed characteristics, considered on the external parts (i.e. maximum speed with maximum load), but differ in the intermediate points of these characteristics.

AWL-R solution - completely electromechanical type - doesn't permit intermediate speed points besides 20 steps, pre-determined during designing phase as follows:

- 5 joy-stick positions for hoist or descent
- 4 speed ranges selector positions

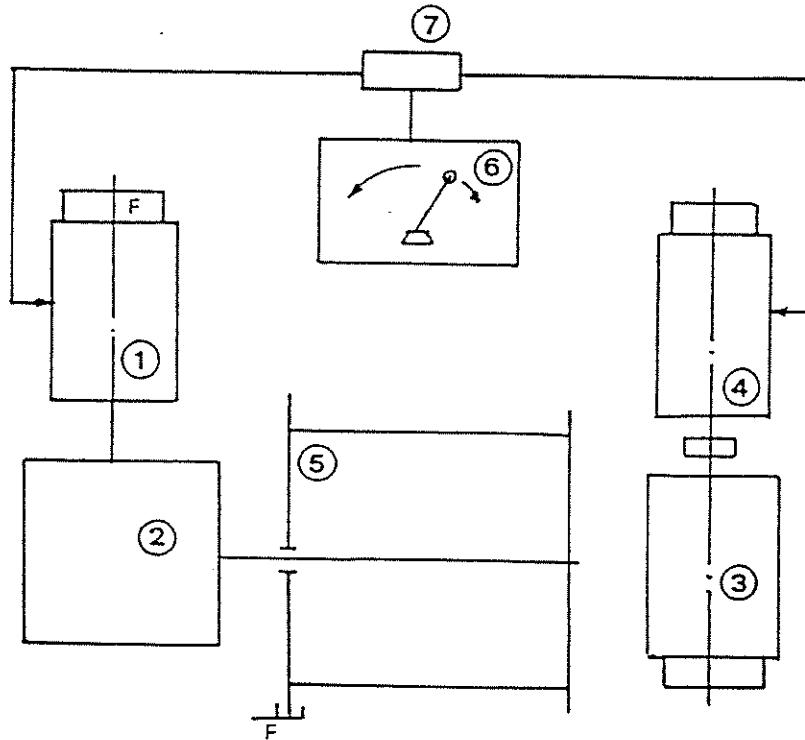
TOTAL: 5 positions x 4 ranges = 20 steps (hoist/descent)

AWL-E solution permits, through a small electronic card operated by a potentiometric joy-stick, an infinite range of speeds in the intermediate diagram points.

If from a technological point of view AWL-E solution could be considered more valid, from a practical point of view the advantages given by AWL-R solution (performances close to AWL-E ones) are higher talking about maintenance simplicity and lastingness.

For both solutions the maximum speed achievable and the maximum hoisting load are anyway constantly controlled by a dynamometric survey device - Comedil electromechanical type - to insert/disconnect such loads/speed independently from the crane operator intervention.

This control device intervenes in a negative way on the pilot system, so that when having dynamometric anomalies, the crane is not allowed to reach the maximum speeds and the hoisting rotor is trimmed in conditions of maximum torque/minimum r.p.m. (maximum load/minimum speed).



- 1. ELECTRIC MOTOR WITH BRAKE
- 2. ORTHOGONAL REDUCTION UNIT
- 3. ELECTRIC MOTOR

- 4. GENERATOR
- 5. DRUM
- 6. CONTROLS
- 7. MOTOR CONTROL
- F= BRAKE

The jib trolley is composed of two independent elements sliding on special rollers along the jib lower angle bars.

The two parts join automatically when working with IV falls rope drive. Always automatically, they separate to reset the II falls rope drive.

The trolleys coupling and releasing operations are described in the "how to use" chapter.

The whole is operated by a motodecelerator, which allows a speed from 0 to 70 m./min. with progressive starts and decelerations.

MOTOR

Feeding: alternate current 380 V 50 Hz
Type: Comedil
Rate: 60/50 daN.m
R.p.m.: 1450/2850

MOTODECELERATOR

Feeding: direct current 20 V
Type: Comedil eddy currents

REDUCTION GEAR

Helical reduction gear
Type: Comedil VC 125/30
Max. output torque: 125 daNm
Reduction: 1/30
Lubrication: oil

DRUM

Winding diameter: 0,238 m.
Edges external dia.: 0,280 m.
Width: 0,775m.
Rope housing: helical left
Wound rope length: 70 m. approx.

ROPE

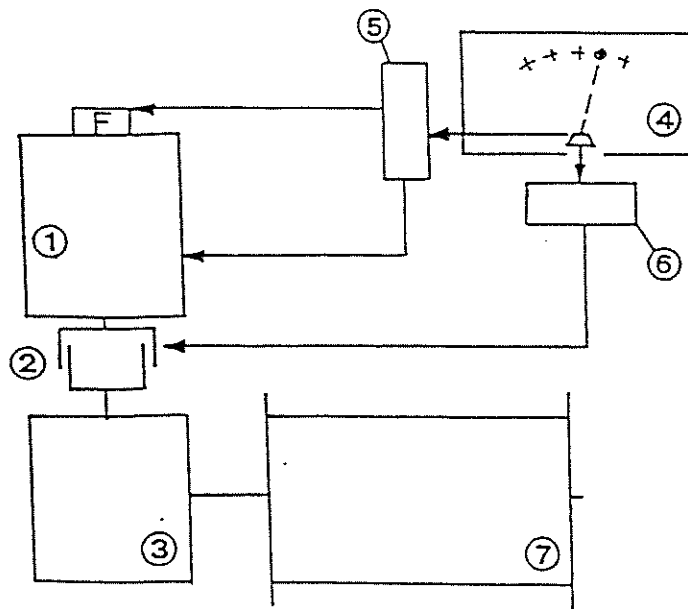
Diameter: 8 mm.
Unitary wire dia.: 0.64 mm.
Type: 114 + FC non rotational wires
Breaking load: 3920 daNm
Spiral: right
Width: 1 x 130 m. + 1 x 86 m.

SERVICE BRAKE

Type: electromagnetic in line
110 SD COMEDIL
Feeding: alternate current 380 V 50 Hz
Dynamic resistant torque: 5 daNm
Static resistant torque: 8 daNm

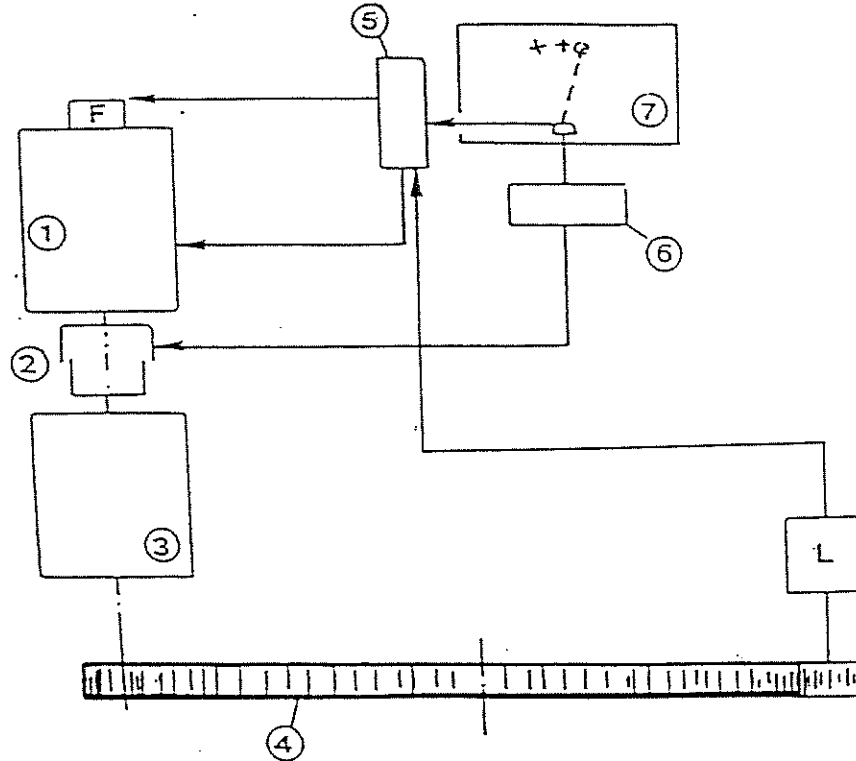
EMERGENCY BRAKE (OPTIONAL)

A stop device is placed on the jib trolley, in case of rope break.

T R O L L E Y

1. ELECTRIC MOTOR
2. DECELERATOR
3. WORM SCREW REDUCTION UNIT
4. CONTROL
5. MOTOR FEEDING
6. DECELERATOR FEEDING
7. DRUM

CONTROL BY MOTO-DECELERATORS



1. ELECTRIC MOTOR
 2. DECELERATOR
 3. EPICYCLOIDAL REDUCTION GEAR
 4. SLEWING TURNTABLE
 5. MOTOR FEEDING
 6. DECELERATOR FEEDING
 7. CONTROL
- F. PARKING BRAKE / EMERGENCY
L. SLEWING LIMIT SWITCH

The slewing is controlled by two units, each having 5 Kw rate, controlled by alternate current motors. The slewing speed varies from 0 to 0.8 r.p.m.

A motodecelerator permits to have gradual speeds or decreasing ones in the best way, so to avoid any eventual load oscillation. The unit is supplied with a limit switch, which prevents the slewing unit from turning more than 1.5 times in the same direction. Then, the manoeuvre has to be reversed to avoid damaging the feeding wires, which, along the tower through the slewing unit reaches the electrical equipment (placed on the counterjib).

The unit is supplied also with a special instrument which prohibits the reverse operations until the structure is completely standstill, so structural inertias are reduced to zero (page 13.12).

MOTOR

Feeding: alternate current 380 V 50 Hz
Type: COMEDIL
Rate: 5 Kw - no. 2 (65 daN.m)
R.p.m.: 1450
Cooling: forced ventilation by in-line heater fan with thermic control device

REDUCTION GEAR

Epicycloidal reducer in line with motodecelerator
Type: EPR COMEDIL
Max. output torque: 800 daNm
Reduction: 1/181
Lubrication: oil/grease
Pinion: 10 teeth - module 12

TURNTABLE

Type: I.2.175
Number of teeth: 120
Module: 12
Fixing screws: 40 x 2 M24 special COMEDIL screws

Both 4.5 x 4.5 m. and 6 x 6 m. base chassis can be equipped to travel, also to curve as an option. Because of the crane structure and type of job to be carried out in the job-site, different travelling systems can be adopted.

The wheels will have different diameters, according to the crane composition, that is: when crane height is lower than 40.5 m. wheel diameter will be 305 mm. In this case the crane will be equipped with 2 motors. Cranes of bigger dimensions used for hard works will mount wheels diameter 455 mm. In this case 4 motors are needed for crane motion.

Travelling speed is anyway 24 m/min.

The travelling group is equipped with a hydraulic joint between motor and reduction unit so to allow gradual starting.

Delayed-action of brakage is foreseen so that the brake can act only when the crane is standstill.

EXAMPLE FOR CRANE WITH 4.5x4.5 m. BASE CHASSIS - HUH 44.3 m.

BOGIE

Wheels: 2 wheels for each bogie
 Diameter: 305 mm.

MOTOR

Feeding: alternate current 380 V 50 Hz
 Type: B5
 Rate: 2 x 4 Kw

REDUCTION GEAR

Type: EM 1045/110, SPECIAL COMEDIL
 Max. output torque: 700 daN.m
 Reduction: 1:51.7
 Lubrication: (see page 11.3)

SERVICE BRAKE

Type: TLC 145 COMEDIL
Feeding: direct current 40 V
Braking torque: 48 N. x 2

HYDRAULIC JOINT

Type: 190 L.M.U.
Max. torque 6 Kw at 1450 rpm.

EXAMPLE FOR CRANE WITH 6 X 6 m. BASE CHASSIS - HUH 51.8 m.BOGIE

Wheels: 2 wheels for each bogie
Diameter: 455 mm.

MOTOR

Feeding: alternate current 380 V 50 Hz
Type: B5
Rate: 4 x 3 Kw

REDUCTION GEAR

Type: EM 1045/110, SPECIAL COMEDIL
Max. output torque: 700 daN.m
Reduction: 1: 80
Lubrication: (see page 11.3)

SERVICE BRAKE

Type: TLC 145 COMEDIL
Feeding: direct current 40 V
Braking torque: (48 Nm) N° 4

HYDRAULIC JOINT

Type: 190 L.M.U.
Max. torque: 6 Kw at 1450 rpm.

EXAMPLE FOR CRANE WITH 4.5X4.5-m. BASE CHASSIS - HUH 44.3 m.

BOGIE

Wheels: 2 wheels for each bogie
 Diameter: 305 mm.

MOTOR

Feeding: alternate current 380 V 50 Hz
 Type: B5
 Rate: 2 x 4 Kw

REDUCTION GEAR

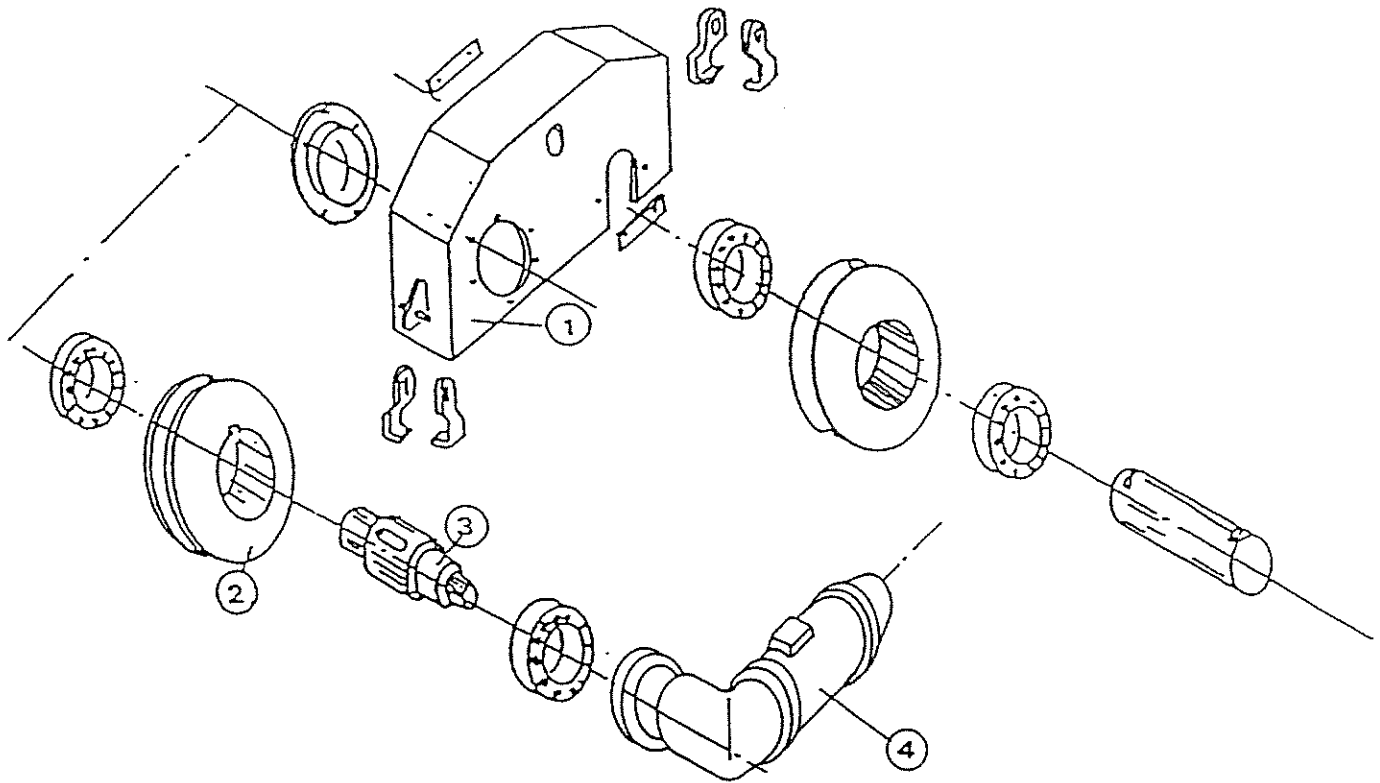
Type: EM 1045/110, SPECIAL COMEDIL
 Max. output
 torque: 700 daN.m
 Reduction: 1: 51.7
 Lubrication: (see page 11.3)

SERVICE BRAKE

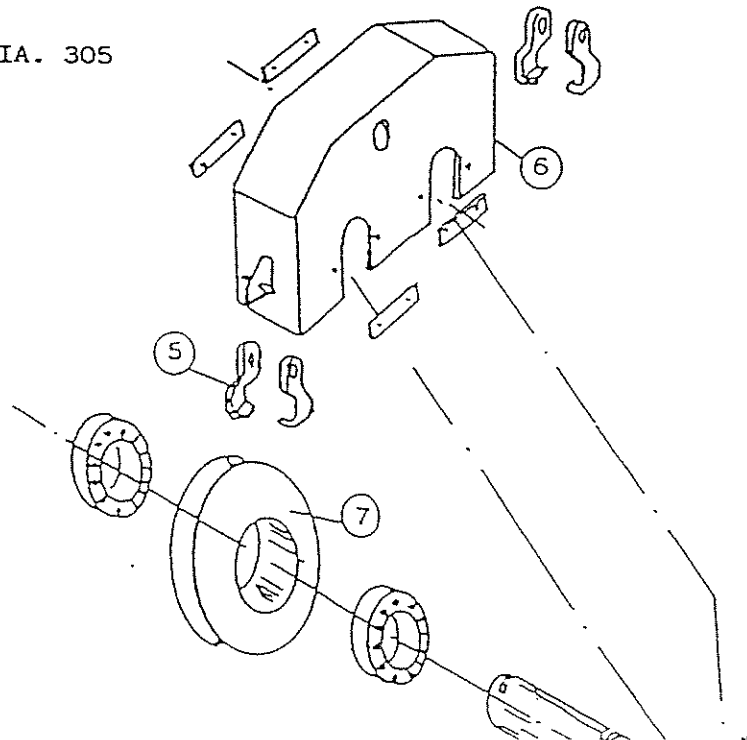
Type: TLC 145 COMEDIL
 Feeding: direct current 40 V
 Braking torque: (48 Nm) N° 2

HYDRAULIC JOINT

Type: 190 L.M.U.
 Max. torque 6 Kw at 1450 rpm.



1. DRIVE BOGIE
2. DRIVE WHEEL DIA. 305
3. PIN WITH ACCESSORIES
4. MOTOR UNIT
5. ANCHORING TONGS
6. IDLE BOGIE
7. IDLE WHEEL DIA. 305



SECTION

5

STRESSES ON THE STRUCTURE

STRESSES ON THE STRUCTURES

The weights of the crane, according to the various solutions, are indicated in the first pages of this manual.

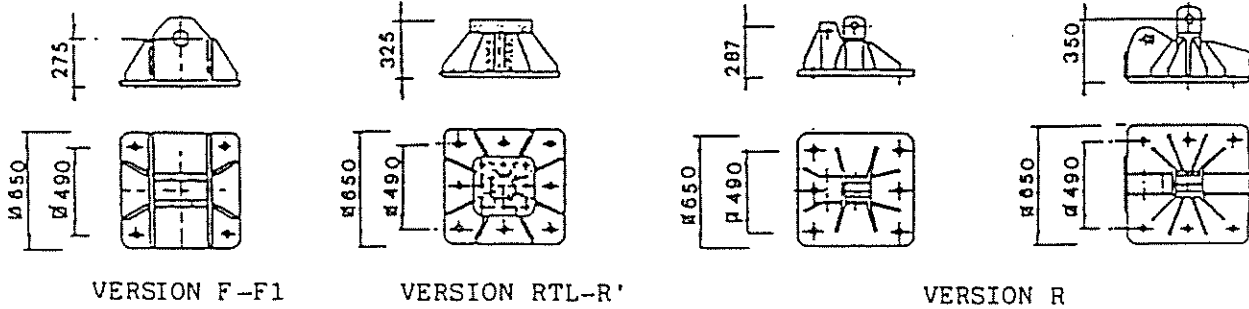
In the following pages report all the data concerning the stresses to the crane base referred to different heights, with regards the possible different combinations.

For the "climbing" version you can have, on request, the stresses regarding the initial phase and the consequent raising operations.

Following values have been taken under working conditions with max. wind "in service" blowing at 72 Km./h. and maximum wind blowing at 152 Km./h. at a height of 100 m. from the ground, with "out of service" crane.

Note : OPERATION LIMIT FOR CRANE IN SERVICE IS 72 km/h.

SUPPORT PLATES FOR STATIC CRANE



TIE - DOWN BOLTS

VERSION "F" : SEE PAGE 12-13

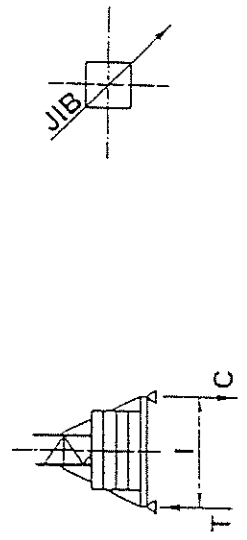
VERSION "F1" : 4 TIE - DOWN BOLTS
FOR EACH SUPPORT PLATE

	VERSION	FREE HEIGHT UNDER HOOK m.	TIE-DOWN BOLTS FOR EACH PLATE
S 20 P S 20 G S 20 UP S 20 UG	R - R'	≤ 29,7	4
S 20 TL	RTL	≤ 44,7	6
		≤ 52,2	8
		≤ 29,7	4
S 23	R	≤ 37,2	4
		≤ 48,45	6
S 23 TL	RTL	≤ 37,2	4
		≤ 52,2	6
		≤ 59,7	8

TIE - DOWN BOLTS ∅ 45 M42

WIND III ZONE

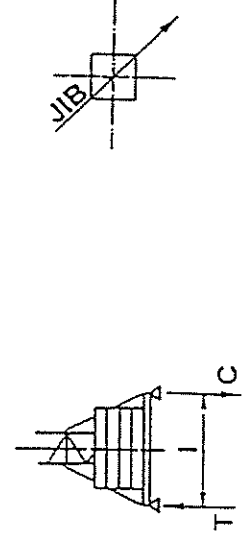
CRANE CT 651 S20 P		STATIC AND TRAVELLING WITH CHASSIS AND BALLAST BLOCKS - "F" AND "T" VERSION										I = 4,5m x 4,5m	
HEIGHT UNDER HOOK (m)	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE				BASE BALLAST			MAX. LOAD "IN SERVICE" ON 1 BEARING [I] COMPRESSION "C"	MAX. LOAD "OUT OF SERVICE" ON 1 BEARING [I] COMPRESSION "C"	TRACTION "T"		
		A	B	C	D	UNDER THE TRACK [I]	ON THE CHASSIS [I]	Q. TY OF BLOCKS					
							Rp	Sp	K				
18,05	FB	1	1	2			12	16		72,49	38,29		
21,80	FB	1	1	3			12	18	2	76,29	44,76		
25,55	FB	1	1	4			12	18	2	78,12	49,80		
29,30	FB	1	1	5			12	18	2	80,10	55,37		
33,05	FB	1	1	6			12	18	2	82,10	61,45		
36,80	FB	1	1	7			12	22	2	86,45	70,15		
40,55	FB	1	1	8			12	22	2	88,69	77,33		
44,30	FB	1	1	9			12	28		93,30	87,30		



FB = TELESCOPIC CAGE LOW
I = CHASSIS INTERAXE

WIND III ZONE

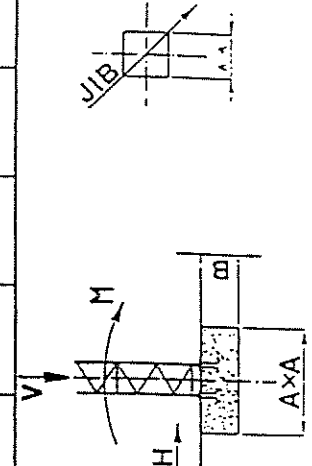
CRANE CT 651 S20 G		STATIC AND TRAVELLING WITH CHASSIS AND BALLAST BLOCKS - "F" AND "T" VERSION										I = 6,0m x 6,0m	
HEIGHT UNDER HOOK (m)	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE				BASE BALLAST			MAX. LOAD "IN SERVICE" ON 1 BEARING (t)		MAX. LOAD "OUT OF SERVICE" ON 1 BEARING (t)		
		A	B	C	D	UNDER THE TRACK (t)	ON THE CHASSIS (t)	Rg	Sg	K	COMPRESSION °C	TRACTION °C	
18,05	FB	1	1	2			50,80	8	4	4	35,20		
21,80	FB	1	1	3			50,80	8	4	4	38,84		
25,55	FB	1	1	4			50,80	8	4	4	42,89		
29,30	FB	1	1	5			61,80	8	8	2	50,11		
33,05	FB	1	1	6			61,80	8	8	2	55,00		
36,80	FB	1	1	7			61,80	8	8	2	60,35		
40,55	FB	1	1	8			80,00	12	8	4	70,68		
44,30	FB	1	1	9			80,00	12	8	4	76,96		
48,05	FB	1	1	10			80,00	12	8	4	83,73		
51,80	FB	1	1	11			80,00	12	8	4	91,03		



FB = TELESCOPIC CAGE LOW
I = CHASSIS INTERAXE

WIND III ZONE

CRANE TYPE CT 651 S20		STATIC WITHOUT CHASSIS - "R" VERSION													
HEIGHT UNDER HOOK (m)	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE				WIND "IN SERVICE" (S)			WIND "OUT OF SERVICE" (FS)			PRESSURE MAX. [kg/cm ²]		PLINTH DIMENSIONS A x B (m)	•
		A	B	C	D	V (t)	H (t)	M (tm)	V (t)	H (t)	M (tm)	S	FS		
18,45	FB			4		68,24	2,06	225,00	65,62	7,89	27,38	1,45		5,7 x 1,3	4,8
22,20	FB			5		70,14	2,22	231,70	67,38	8,63	54,98	1,47		5,7 x 1,3	
25,95	FB			6		72,04	2,39	239,10	69,14	9,39	95,97	1,47		5,8 x 1,3	
29,70	FB			7		73,94	2,56	247,20	70,90	10,10	120,50	1,48		5,8 x 1,3	
33,45	FB			8		75,84	2,73	255,80	72,66	10,90	158,70	1,44		6,0 x 1,3	5
37,20	FB			9		77,74	2,89	265,10	74,42	11,70	200,70	1,45		6,0 x 1,3	
40,95	FB			10		79,65	3,06	275,00	76,18	12,50	246,50	1,42		6,2 x 1,3	
44,70	FB			11		81,65	3,23	285,60	78,04	13,40	296,50	1,49		6,2 x 1,3	5,3



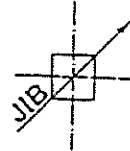
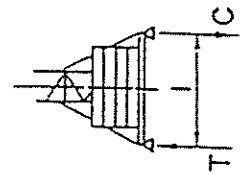
FB = TELESCOPIC CAGE LOW

• Minimum plinth side (PRESSURE TO BE VERIFIED)
 •• External side 1,93 m
 Axis 1,8 m

WIND III ZONE

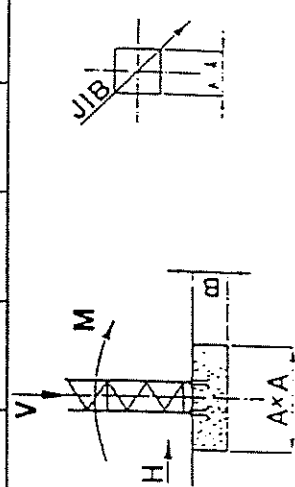
CRANE CT 651 S20 TL		STATIC AND TRAVELLING WITH CHASSIS AND BALLAST BLOCKS - "F" AND "T" VERSION										l = 6,0m x 6,0m		
HEIGHT UNDER HOOK (m)	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE				UNDER THE TRACK (t)	BASE BALLAST ON THE CHASSIS (t)			Q.TY OF BLOCKS			MAX. LOAD "IN SERVICE" ON 1 BEARING (t)	MAX. LOAD "OUT OF SERVICE" ON 1 BEARING (t)
		A	B	C	D		Rg	Sg	K	COMPRESSION °C	TRACTION °C			
19,30	FB	1	1				50,80	8	4	4		61,30	36,80	
23,05	FB	1	1		1		50,80	8	4	4		62,70	40,60	
26,80	FB	1	1		2		61,80	8	8	2		67,20	47,50	
30,55	FB	1	1		3		61,80	8	8	2		68,90	52,10	
34,30	FB	1	1		4		61,80	8	8	2		70,60	57,20	
38,50	FB	1	1		5		72,80	12	8			75,30	65,40	
41,80	FB	1	1		6		80,00	12	8	4		79,20	73,10	
45,55	FB	1	1		7		80,00	12	8	4		81,10	79,60	
49,30	FB	1	1		8		80,00	12	8	4		83,20	86,50	
53,05	FB	1	1	1	8		94,60	12	14			89,20	97,60	
56,8	FB	1	1	2	8		94,60	12	14			91,30	105,60	

FB = TELESCOPIC CAGE LOW
l = CHASSIS INTERAXE



WIND III ZONE

CRANE TYPE CT 651 S20 TL		STATIC WITHOUT CHASSIS - "RTL" VERSION													
HEIGHT UNDER HOOK [m]	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE			WIND "IN SERVICE" (S)			WIND "OUT OF SERVICE" (FS)			PRESSURE MAX. [kg/cm ²]		PLINTH DIMENSIONS A x B [m]	•	
		B	C	D	E	V [t]	H [l]	M [tm]	V [t]	H [l]	M [tm]	S			FS
18,45	FB			1	1	68,05	2,06	225,00	65,44	7,89	27,38	1,45		5,7 x 1,3	4,8
22,20	FB			2	1	69,95	2,22	231,70	67,20	8,63	54,98	1,47		5,7 x 1,3	
25,95	FB			3	1	71,85	2,39	239,10	68,96	9,39	85,97	1,47		5,8 x 1,3	
29,70	FB			4	1	73,75	2,56	247,20	70,72	10,10	120,50	1,48		5,8 x 1,3	5
33,45	FB			5	1	75,65	2,73	255,80	72,48	10,90	158,70	1,44		6,0 x 1,3	
37,20	FB			6	1	77,55	2,89	265,10	74,24	11,70	200,70	1,45		6,0 x 1,3	
40,95	FB			7	1	79,45	3,06	275,00	76,00	12,50	246,50	1,42		6,2 x 1,3	5,3
44,70	FB			8	1	81,35	3,23	285,60	77,76	13,40	296,50		1,49	6,2 x 1,3	
48,45	FB			9	1	83,36	3,38	296,70	79,62	14,10	349,90		1,36	6,8 x 1,3	5,8
52,20	FB			1	9	85,37	3,55	308,50	81,48	15,00	408,50		1,49	6,8 x 1,3	



• B = TELESCOPIC CAGE LOW

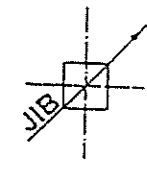
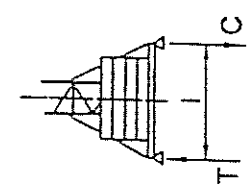
Minimum plinth side (PRESSURE TO BE VERIFIED)

** External side 1,93 m
Axis 1,8 m

WIND III ZONE

CRANE CT 651 S23 STATIC AND TRAVELLING WITH CHASSIS TYPE "B" AND BALLAST BLOCKS - "F" AND "T" VERSION I = 6,0m x 6,0m														
HEIGHT UNDER HOOK (m)	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE				UNDER THE TRACK		BASE BALLAST ON THE CHASSIS			MAX. LOAD "IN SERVICE" ON 1 BEARING (I)		MAX. LOAD "OUT OF SERVICE" ON 1 BEARING (I)	
		A	B	C	D	(I)	(II)	Rg	Sg	K	COMPRESSION °C	TRACTION °T	COMPRESSION °C	TRACTION °T
23,05	FB	1	1	3			50,80	8	4	4	64,50	41,90		
26,80	FB	1	1	4			50,80	8	4	4	66,10	46,30		
30,55	FB	1	1	5			61,80	8	8	2	70,55	53,30		
34,30	FB	1	1	6			61,80	8	8	2	72,32	58,80		
38,05	FB	1	1	7			61,80	8	8	2	74,17	64,50		
41,80	FB	1	1	8			80,00	12	8	4	81,30	75,45		
45,55	FB	1	1	9			80,00	12	8	4	83,30	82,10		
49,30	FB	1	1	10			94,60	12	14		89,40	92,90		
53,05	FB	1	1	11			94,60	12	14		91,6	100,6		
56,80	FB	1	1	12			116,48	12	20		99,8	114,3		

FB = TELESCOPIC CAGE LOW
I = CHASSIS INTERAXE

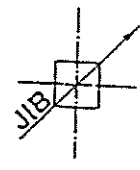
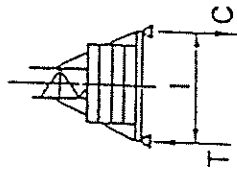


WIND III ZONE

CRANE CT 651 S23 TL STATIC AND TRAVELLING WITH CHASSIS TYPE "B" AND BALLAST BLOCKS - "F" AND "T" VERSION I = 6,0m x 6,0m

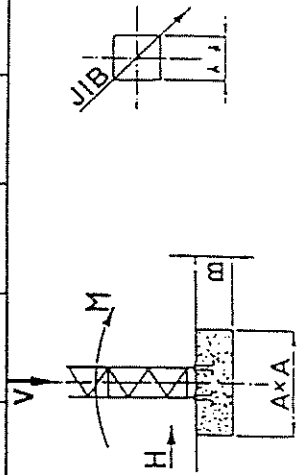
HEIGHT UNDER HOOK (m)	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE				UNDER THE TRACK		BASE BALLAST ON THE CHASSIS			MAX. LOAD "IN SERVICE" ON 1 BEARING (I)		MAX. LOAD "OUT OF SERVICE" ON 1 BEARING (I)	
		A	B	C	D	[I]	[J]	Q. TY OF BLOCKS			COMPRESSION "C"	TRACTION "T"		
								Rg	Sg	K				
23,05	FB	1	1	1				50,80	8	4	4	64,50	41,90	
26,80	FB	1	1	2				50,80	8	4	4	66,10	46,30	
30,55	FB	1	1	3				61,80	8	8	2	70,55	53,60	
34,30	FB	1	1	4				61,80	8	8	2	72,32	58,80	
38,05	FB	1	1	5				61,80	8	8	2	74,17	64,50	
41,80	FB	1	1	6				80,00	12	8	4	81,30	75,45	
45,55	FB	1	1	7				80,00	12	8	4	83,30	82,10	
49,30	FB	1	1	8				94,60	12	14		89,40	92,90	
53,05	FB	1	1	9				94,60	12	14		91,60	100,60	
56,80	FB	1	1	10				116,48	12	20		99,80	114,30	
60,55	FB	1	1	11			20,00	116,48	12	20		102,20	123,20	
64,3	FB	1	1	12			45,00	116,48	12	20		104,60	132,50	

FB = TELESCOPIC CAGE LOW
I = CHASSIS INTERAXE



WIND III ZONE

CRANE TYPE CT 651 S23 TL		STATIC WITHOUT CHASSIS - "RTL" VERSION															
HEIGHT UNDER HOOK (m)	TELESCOPIC CAGE POSITION	TOWER ELEMENTS QUANTITY AND TYPE				WIND "IN SERVICE" (S)				WIND "OUT OF SERVICE" (FS)				PRESSURE MAX. (kg/cm ²)		PLINTH DIMENSIONS A x B (m)	•
		A	B	C	D	V (t)	H (t)	M (tm)	V (t)	H (t)	M (tm)	S	FS				
25,95	FB			3	1	74,71	2,47	244,00	71,61	9,72	89,55	1,45		5,9 x 1,3			
29,70	FB			4	1	76,71	2,65	252,30	73,46	10,50	125,70	1,46		5,9 x 1,3	5		
33,45	FB			5	1	78,10	2,83	261,30	75,31	11,30	164,70	1,42		6,1 x 1,3			
37,20	FB			6	1	80,70	3,01	270,90	77,16	12,20	208,10	1,43		6,1 x 1,3			
40,95	FB			7	1	82,70	3,18	281,20	79,01	13,00	255,60	1,40		6,3 x 1,3	5,5		
44,70	FB			8	1	84,70	3,36	292,20	80,86	13,90	307,30		1,49	6,3 x 1,3			
48,45	FB			9	1	86,70	3,54	303,80	82,71	14,60	363,40		1,37	6,9 x 1,3	6,2		
52,20	FB			10	1	88,70	3,72	316,10	84,56	15,70	423,80		1,49	6,9 x 1,3			
55,95	FB			11	1	90,69	3,89	329,00	86,41	16,60	488,90		1,37	7,5 x 1,3	6,7		
59,70	FB			12	1	92,69	4,07	342,60	88,26	17,60	558,50		1,48	7,5 x 1,3			



FB = TELESCOPIC CAGE LOW

• Minimum plinth side (PRESSURE TO BE VERIFIED)

• External side 2,28 m
Axis 2,15 m

SECTION

6

INSTALLATION AT THE JOB SITE

- LINE VOLTAGE AND EARTHING
- BASE BALLAST
- COUNTERJIB BALLAST
- RUNWAYS

The user must provide the necessary electrical supply and wiring/connections for the crane to meet its electric energy needs, adhere to the specifications described herein, and conform to standard electrical codes as well as conform to the norms for electrical installations in the place and country where the crane is being installed. For the dimensions of the mains, table 4.28 provides the maximum wire lengths and cross-section diameters of the conductors according to the electrical load applied.

Results depicted in the table use the following requisites as the basis for making the calculations: symmetrical and balanced three-phase system with 380 V voltage, 50 Hz frequency, 0.8 (cos ϕ) power factor and power cable capable of withstanding a continuous working temperature of 60°C.

For exposed cables or cables routed through underground conduits, it is suggested to use NIVVK fire retardant type cable. For other type of installation, such as using a cable reel, it is advisable to select the most suitable type basing on the sectional area, length, weight and bending radius, if any.

The electrical power source must meet the requirements for the particular crane and likewise comply with the established standards.

CEI EN 60204 standards are applicable to the electrical equipments of the crane; therefore, voltage requirements must be within a $\pm 10\%$ maximum tolerance, and the maximum marginal frequency variance for a short period of time is $\pm 2\%$ (cf. CEI EN 60204 § 4.3.1).

The user must ensure that the power source voltage and frequency requirements meet the specifications and standards necessary to operate the crane. Remember that the frequency requirement is particularly important should generating sets be used for feeding the crane.

Comedil's technical department is at customers' disposal for any needed assistance, clarifications, or for providing service for any special need that could arise at the building yard.

Adequate overload protection for the mains must be provided depending on the electrical requirements of the crane. Fuses used for line protection must be "aM" type. If thermal or differential cutout circuit breakers are used to protect the line input, the electrical protection curve of these protection devices must be like that of starting squirrel-cage motors (D curve).

The mains wire ends must be connected to the R S T terminals in the line shunt box (CDL). The earth connection terminal, marked PE, for the earth bonding circuit is also located in the line shunt box near the RST terminals.

The connection of PE terminal to the earth bonding circuit must be completed before the crane is connected to the main power supply.

If the conductor is copper type, its diameter can be calculated by using table 1.2. Where a conductor other than copper is used, its minimum cross-sectional area must be 16 mm² and its electrical resistance, based upon length unit, must not exceed the value allowed for a copper conductor.

Table 1.2

Phase conductor cross-sectional area as per Table 4.19 S [mm ²]	External protective conductor minimum cross-sectional area S _p [mm ²]
S < 16 o S = 16	S _p = S
S > 16 o S < 35 o S = 35	S _p = 16
S > 35	S _p = S/2

The user is responsible for the installation of the protective bonding system and must ensure that the minimum requirements established by the standards are complied with.

The continuous technological development leads to the solution of many building yard problems making, in turn, new materials available to customers such as new earth plates.

Because of ongoing changes to designs and to avoid issuing any obsolete technical information, materials and methods for the installation of protective circuits have been excluded from this manual. Contact Comedil's Technical Department for any inquiries: proper explanations and suggestions will be given.

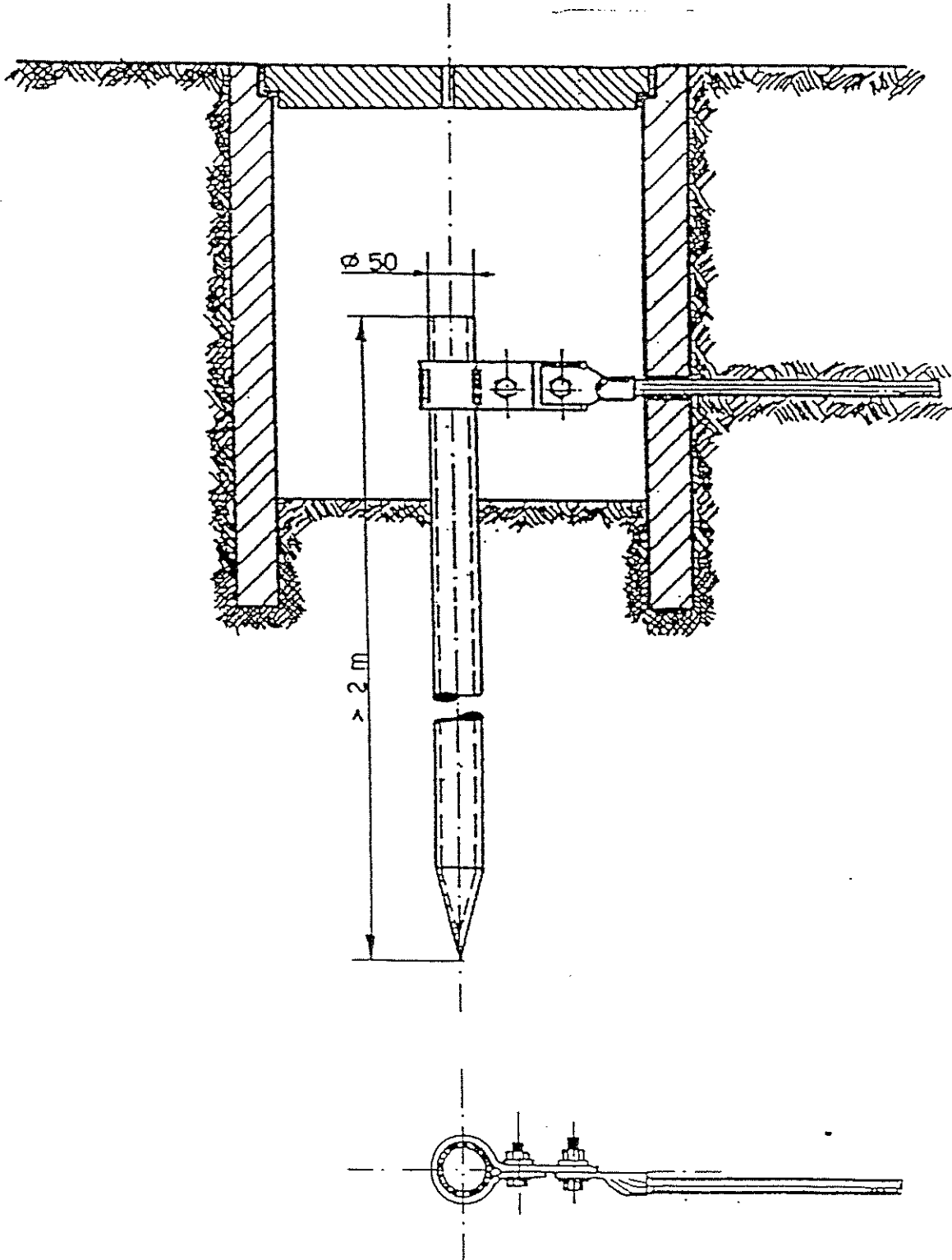
Table 1.1

Maximum recommended length from power source to line shunt box												
[kVA]	12.5	25	37.5	50	62.5	75	87.5	100	112.5	125	137.5	156.25
[CV]	14	27	41	54	68	82	95	109	122	136	150	170
[kW]	10	20	30	40	50	60	70	80	90	100	110	125
Conductor cross-sectional area S [mm ²]	Jib length [m]											
6	85											
10	144	73										
16	226	114	76	57								
25	365	185	123	92	74	62						
35	528	267	178	133	107	89	76	67	59			
50	633	320	213	160	128	107	91	80	71	64	58	
70	896	453	302	226	181	151	129	113	101	91	82	73
95	1218	615	410	308	246	205	176	154	137	123	112	99
120	1484	750	500	375	300	250	214	188	167	150	136	120
150	1759	889	593	444	356	296	254	222	198	178	162	143
185	2065	1043	696	522	417	348	298	261	232	209	190	167
240	2639	1333	889	667	533	444	381	333	296	267	242	214
300	2969	1500	1000	750	600	500	429	375	333	300	273	241
400	3654	1846	1231	923	738	615	527	462	410	369	336	296

Calculation for electric lines with 380 Vac 50 Hz PF 0.8 with maximum conductor temperature 60°C.

0161833008
Bassin 1.2m

1.0112000
Circuit North
2x3"



The stability of the crane, either travelling or static with chassis versions, is assured by some ballast blocks placed on the chassis traverses.

The quantity of base ballast blocks varies according to the height of the crane and is specified in the following page. The crane user must provide for the manufacturing of the blocks according to the drawings of the following pages, and attain to the dimensions, molds and concrete mixing characteristics there stated.

It is very important to comply with the seasoning time recommended.

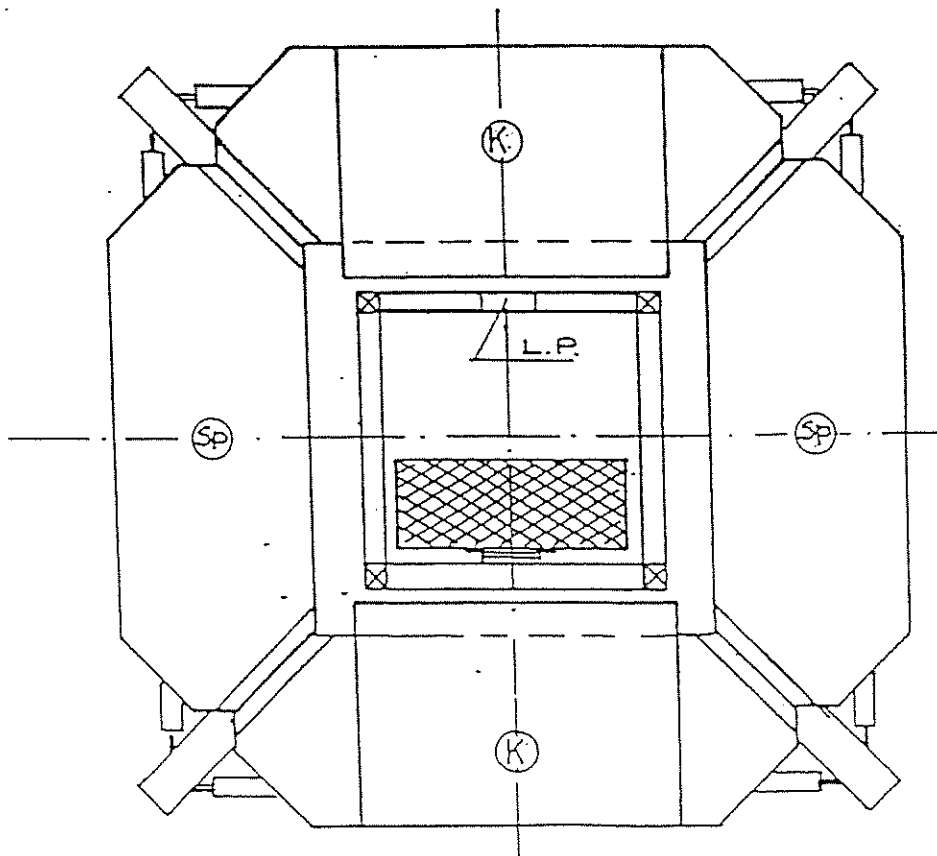
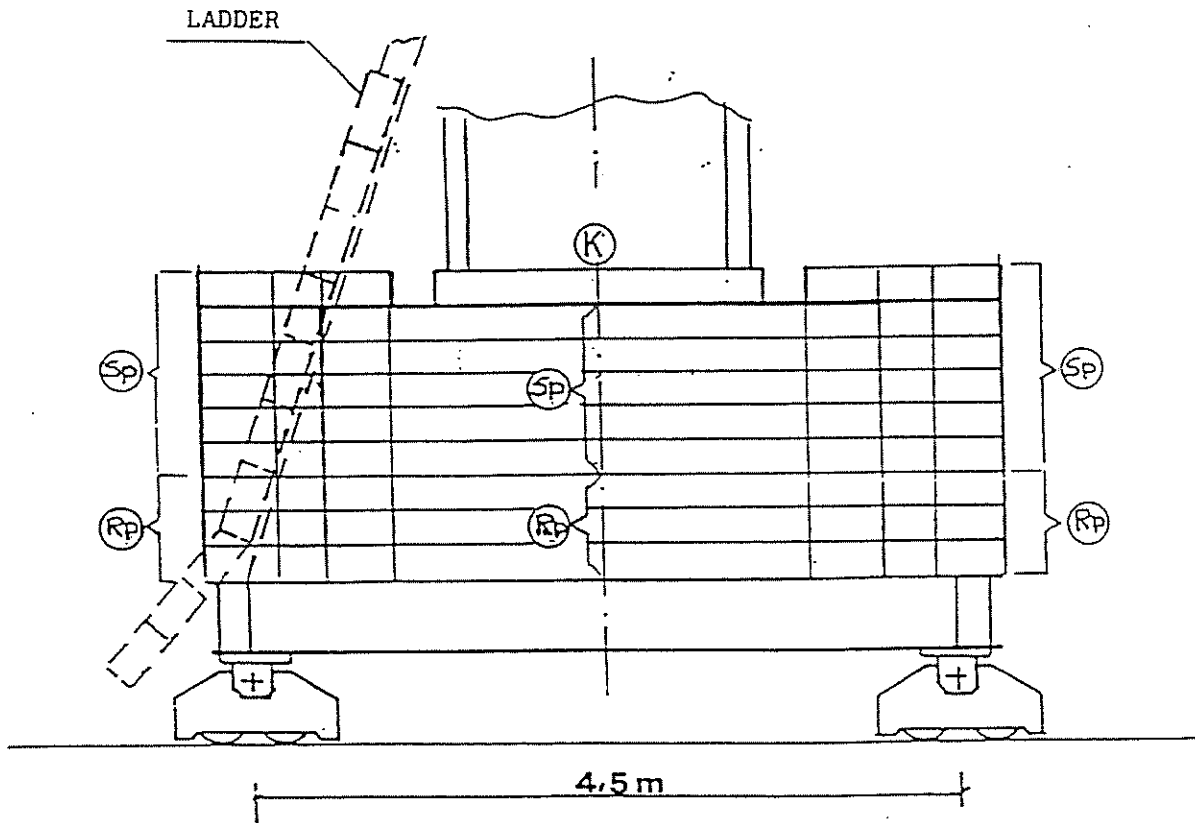
The base ballast has to be positioned after having assembled the first mast section, duly considering the necessary space to insert the struts.

In the following pages you can find the ballast blocks drawings concerning chassis and counterjib. Indicatively, you can also find some types of tracks for travelling cranes.

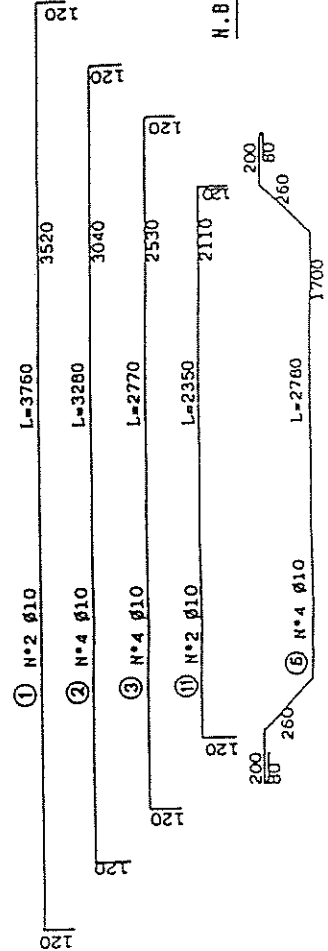
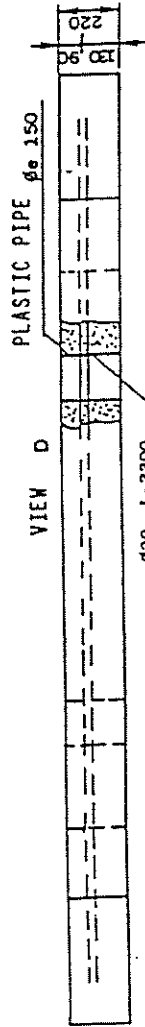
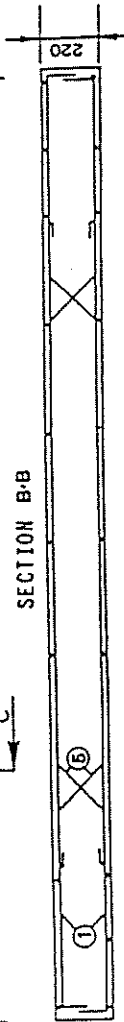
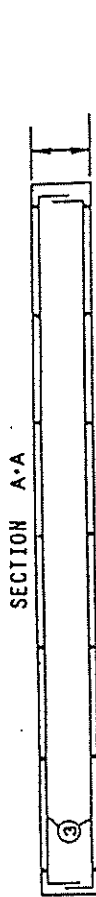
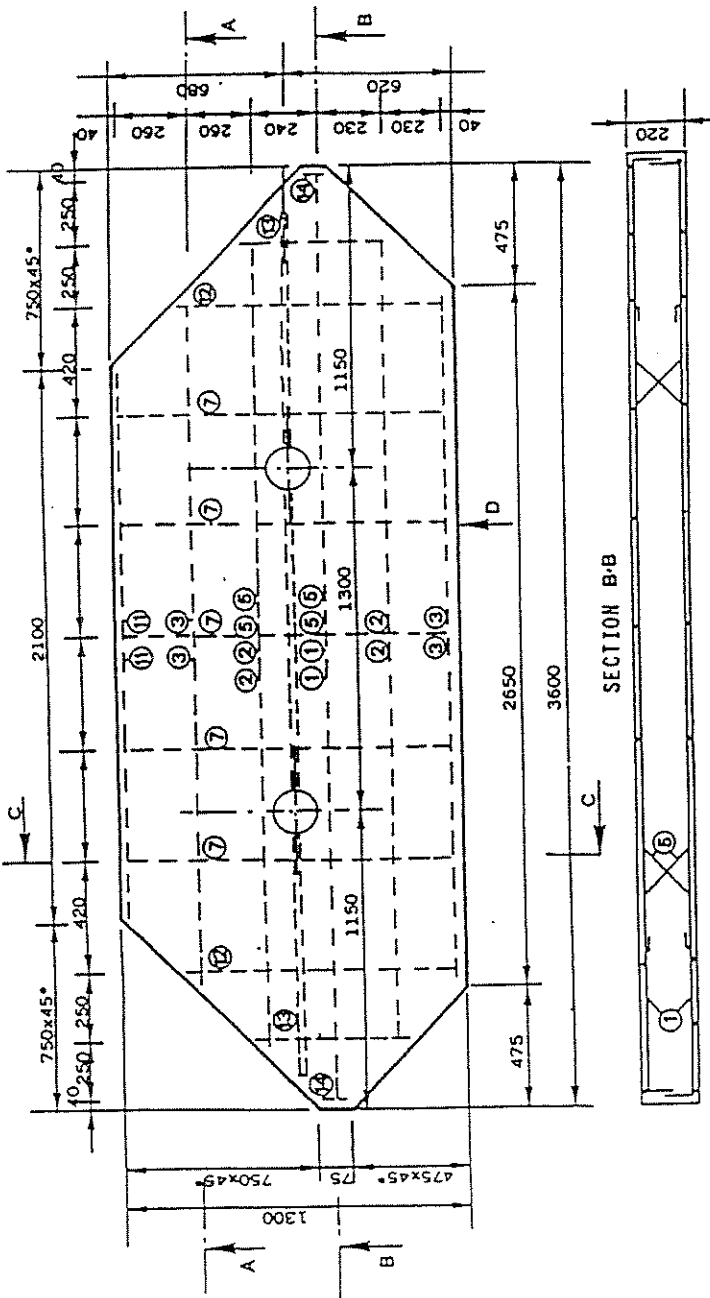
Reinforced concrete blocks, whatever purpose they have, have to be built following the manufacturing drawings paying attention to dimensions and class, both of reinforcement and concrete.

Blocks shall be built at least 10 days before their use, so that they are completely set and dry.

The reinforcement must be Fe B 44 K, while concrete must be class 300.

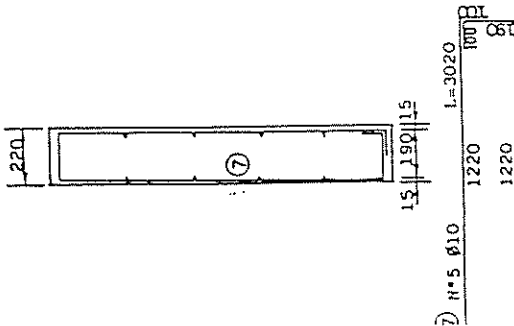


" S p "



H.B.: IRON BARS TO BE BENT AT 45°

SECTION C-C



13 N°2 ø10 L=1740 14 N°2 ø10 L=640

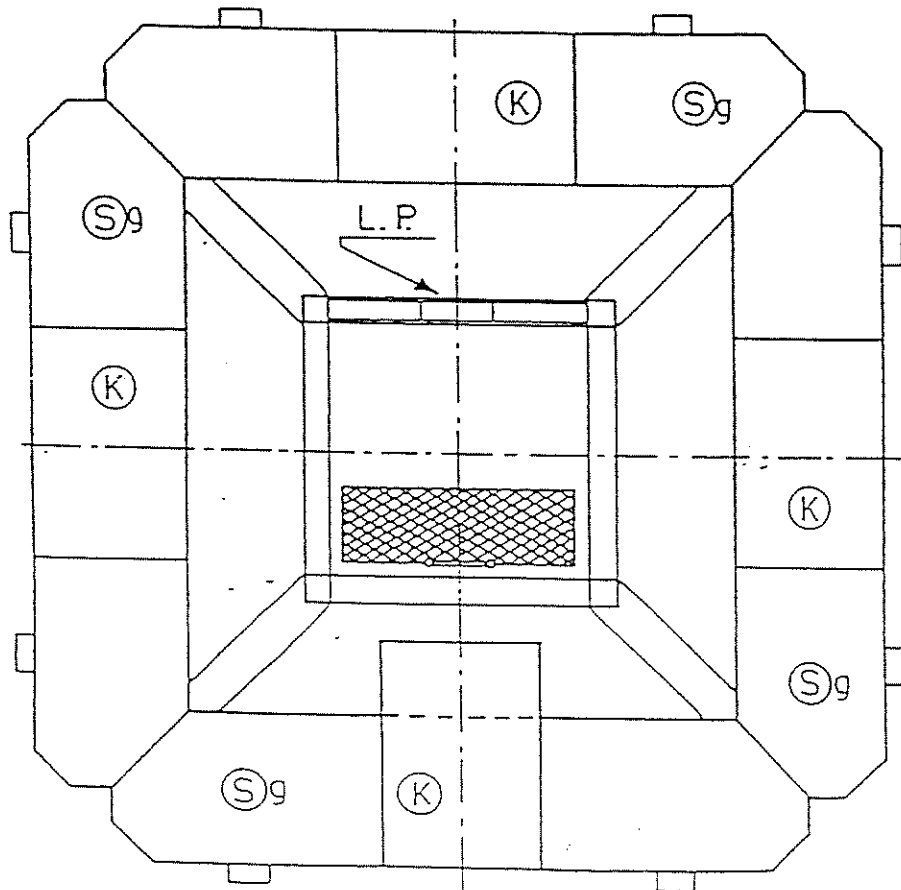
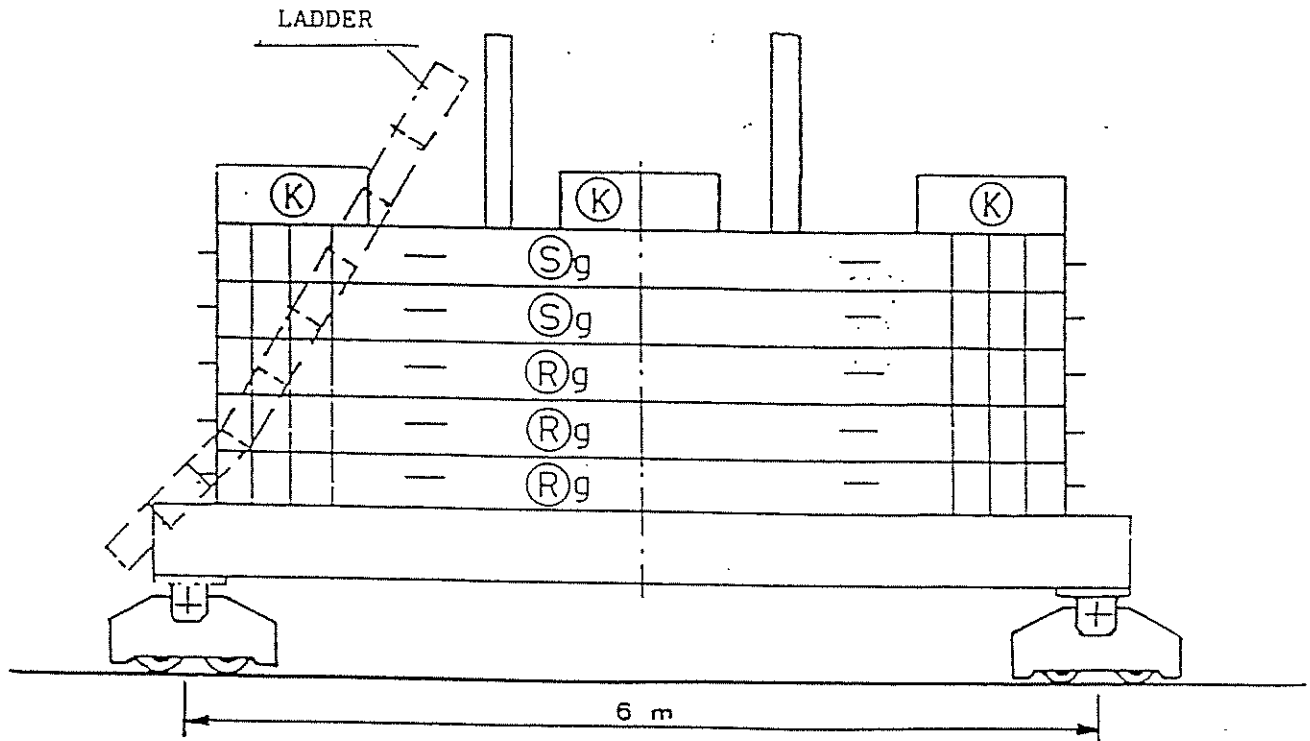
BLOCK TYPE "Sp" WEIGHT 2,080 Kg
 Concrete type 330 0.4 m³ sand
 0.8 m³ gravel
 150 l. water

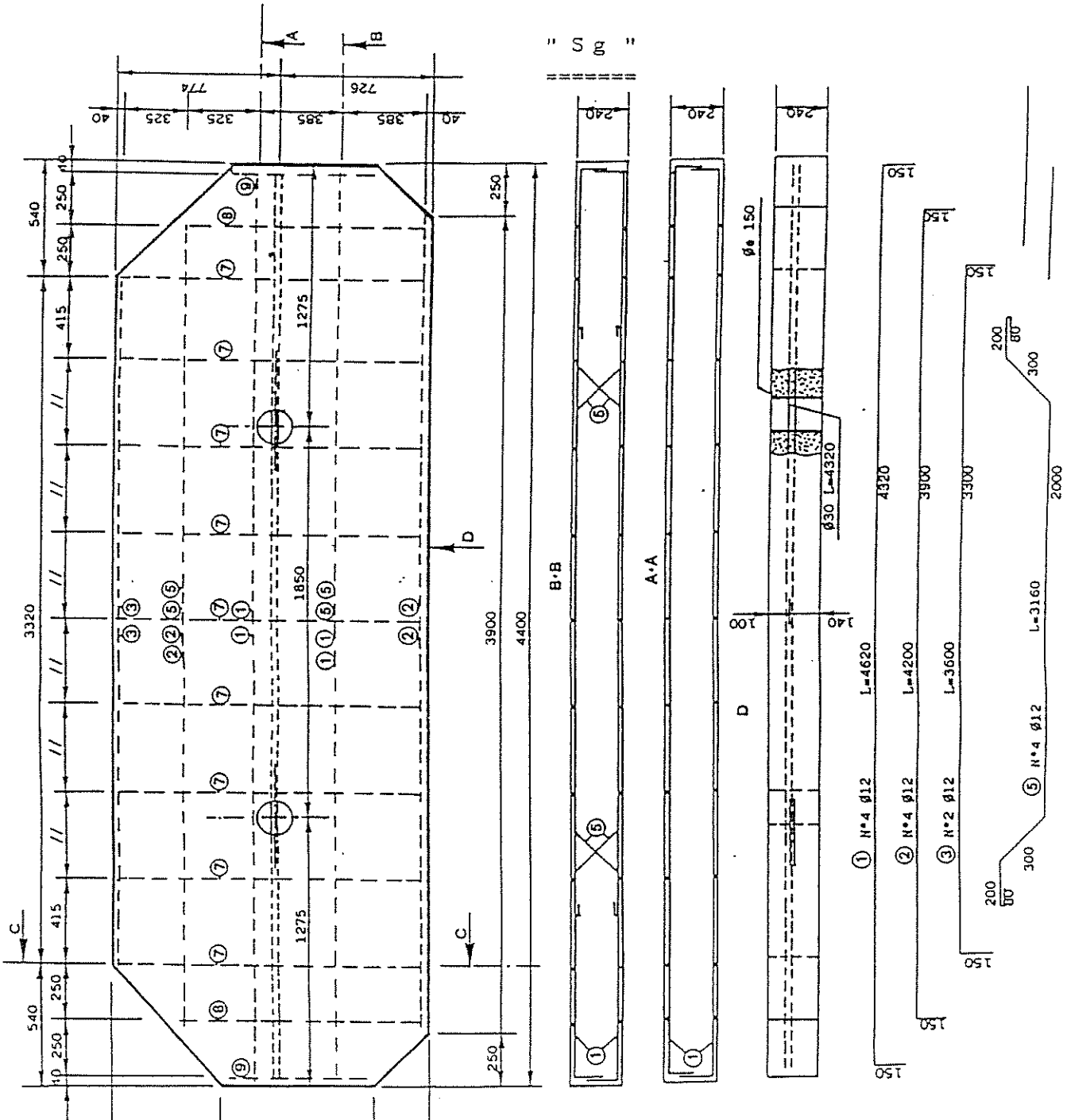
Reinforcement type FeB 44 K

Specific gravity R.C. 2,400 Kg/m³
 Blocks not to be positioned before
 10 days seasoning

MARK ALL THE BLOCKS

"Sp" blocks have to be positioned on "Rp" load bearing type block.



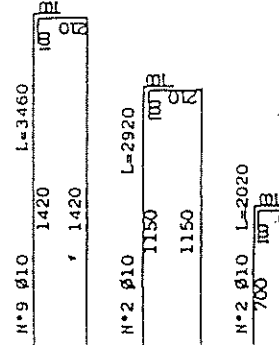


BLOCK TYPE "Sg" - WEIGHT 3,640 Kg
 Concrete type 330 0.4 m³ sand
 0.8 m³ gravel
 150 l. water

Reinforcement type FeB 44 K
 Specific gravity R.C. 2,400 Kg/c
 Blocks not to be positioned before
 10 days seasoning

MARK ALL THE BLOCKS

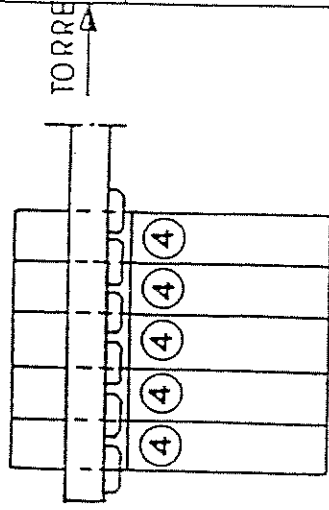
"Sg" blocks to be positioned
 on "Rg" load bearing type



CT 651

CT 65

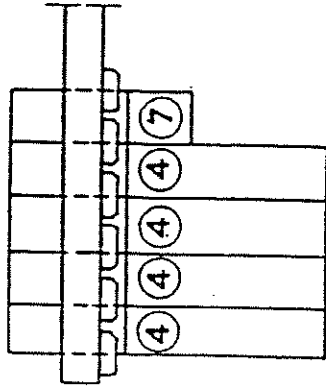
20500 kg



- ④ 4100 kg
- ⑤ 2400 kg
- ⑥ 2100 kg
- ⑦ 1600 kg

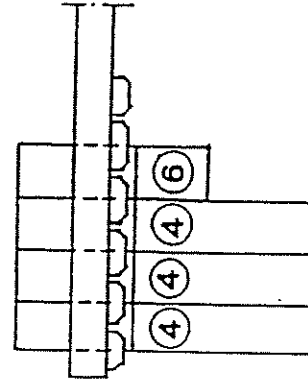
CT 60

18000 kg



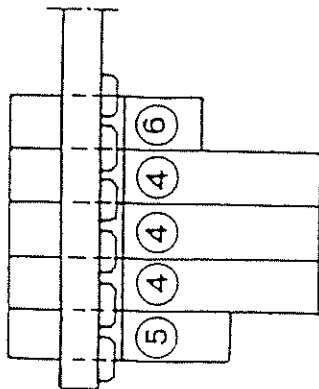
CT 42

14400 kg



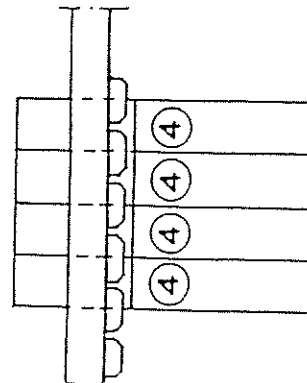
CT 54

16800 kg



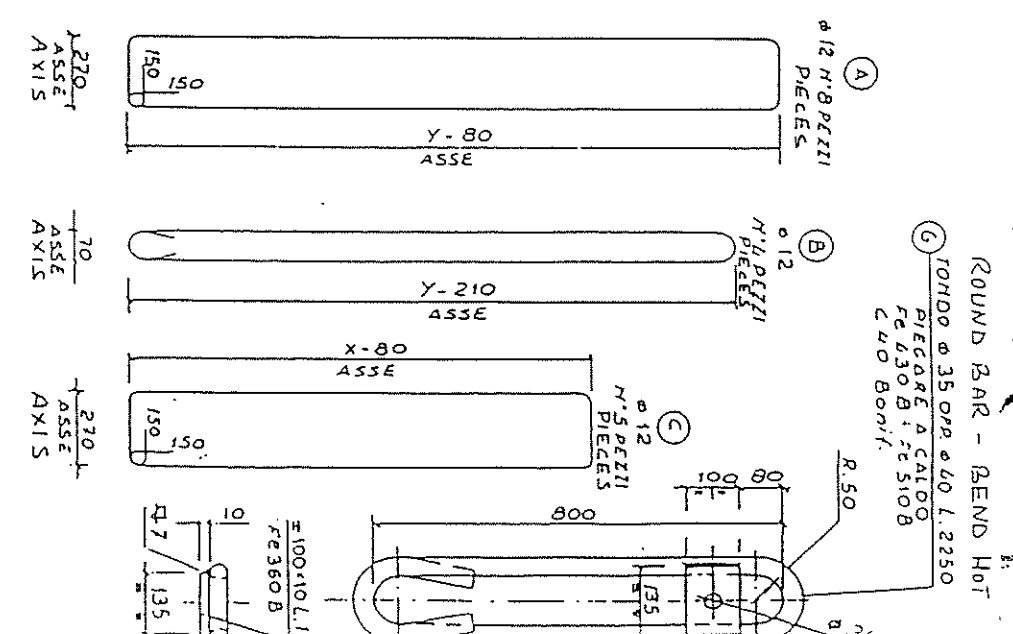
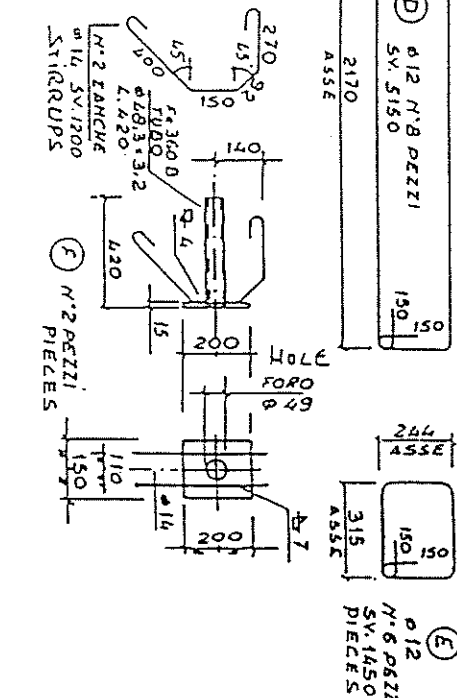
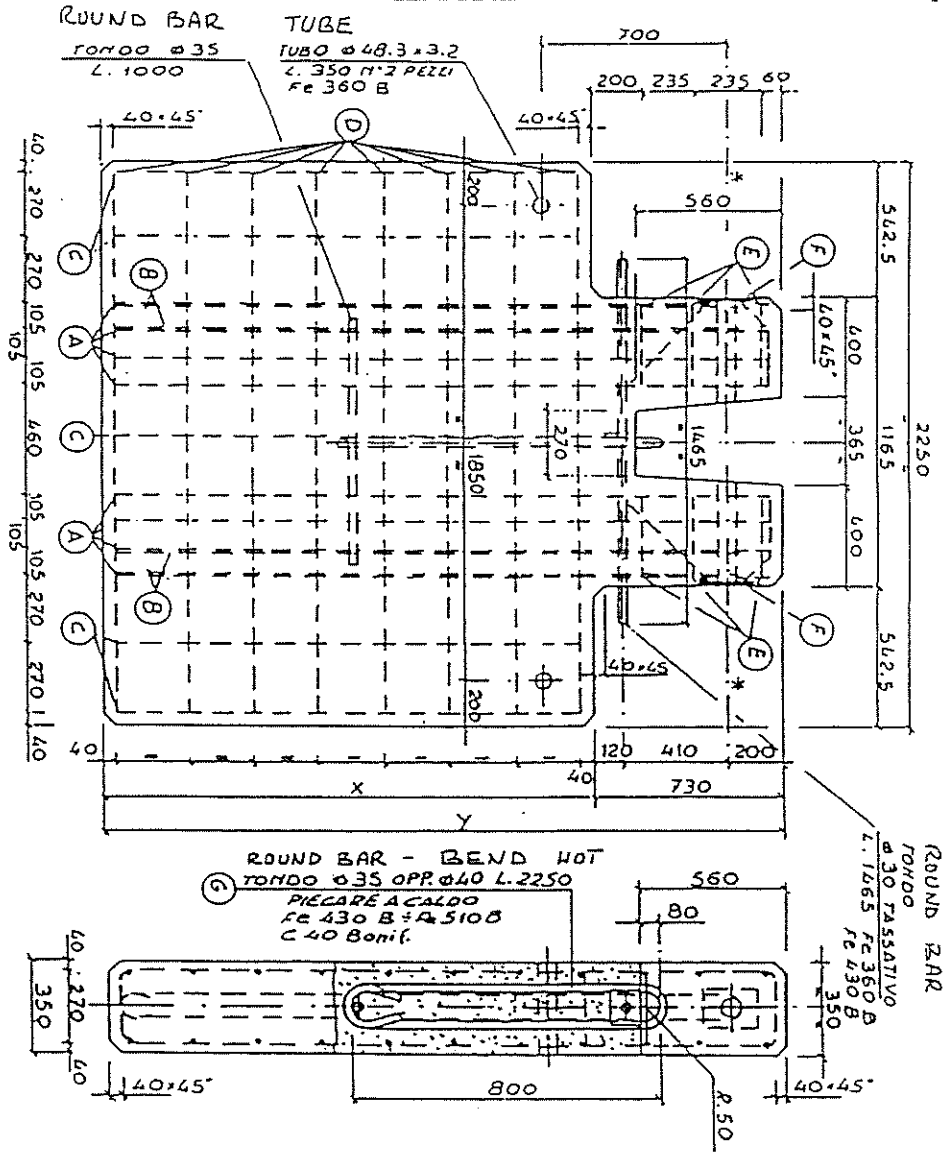
CT 48

16400 kg



BLOCK TYPE 4 - KG. 4100

SPECIFIC WEIGHT	PE50 SPECIFIC GLOBALE.C.A. KG./m ³	X [mm]	Y [mm]
0052	200E	1785	5152
0072	200E	1870	5092
00E2	200E	1965	5692



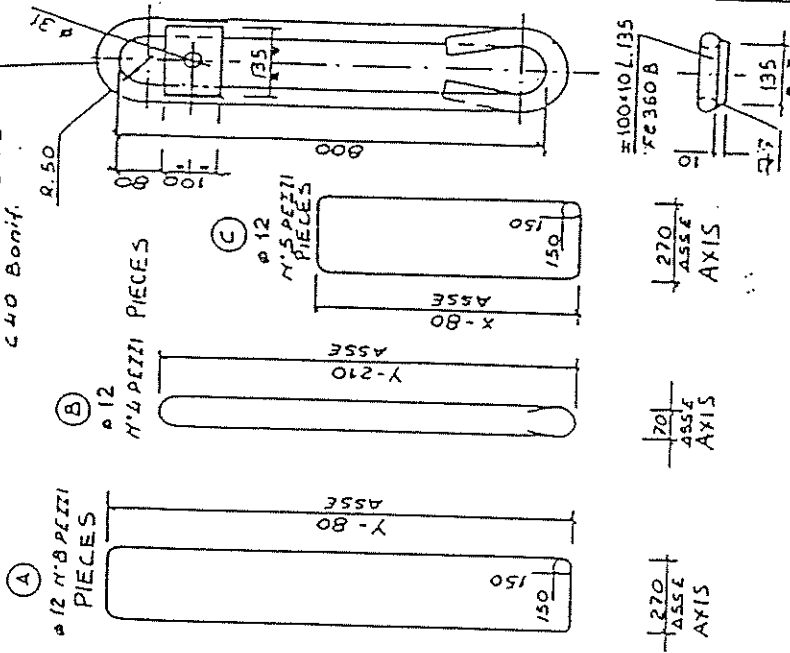
IMPORTANT NOTE:

- Blocks not to be positioned before 10 days seasoning.
- Reinforcement: Fe B 44 K
- Concrete class 300
- Respect holes concentricity
- Check the weight of each block

BLOCK TYPE 5 - KG. 2400

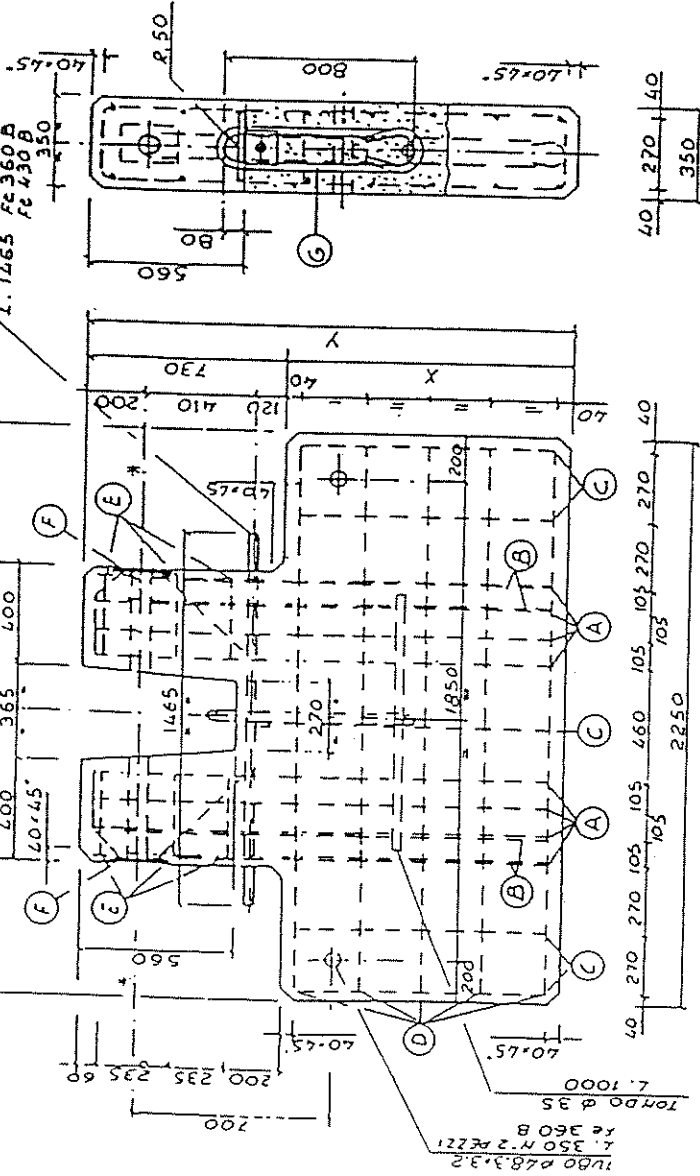
ROUND BAR - HEND H01

① 10000 Ø 35.000 L. 2260
PIECE A CALDO
FE 430 B + FE 510 B
C 40 Bonif.



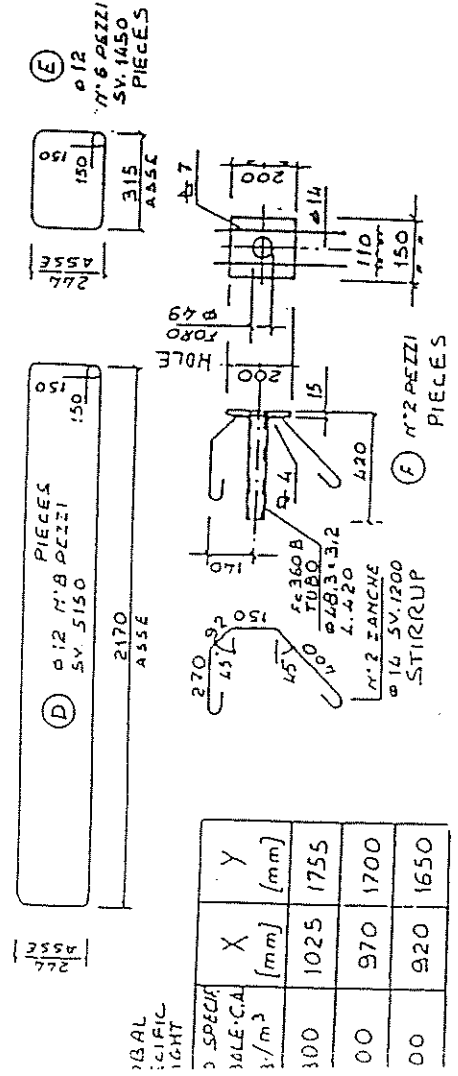
ROUND B

② 10000 Ø 35.000 L. 2260
PIECE A CALDO
FE 430 B + FE 510 B
C 40 Bonif.

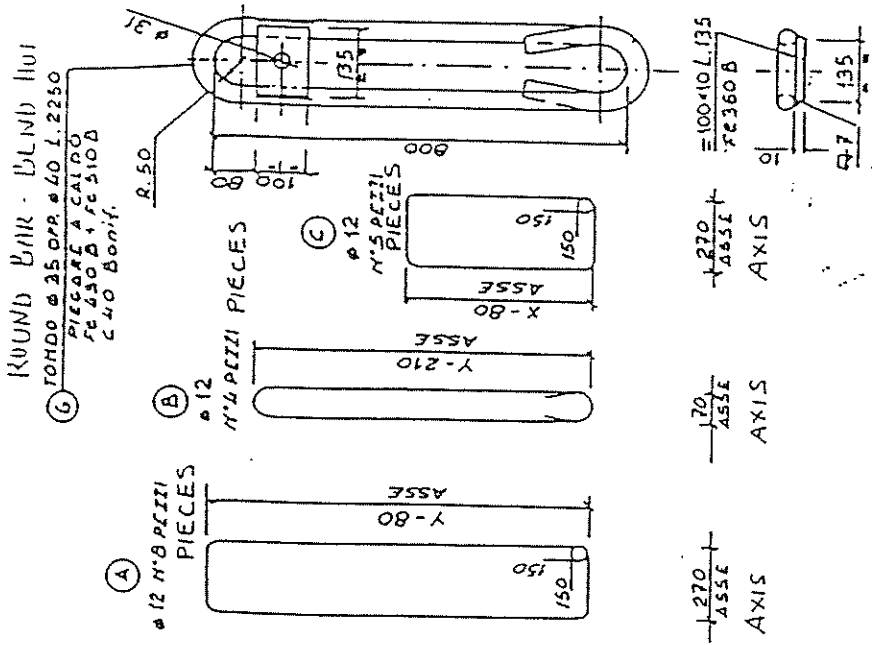


IMPORTANT NOTE:

- Blocks not to be positioned before 10 days seasoning.
- Reinforcement: Fe B 44 K
- Concrete class 300
- Respect holes concentricity
- Check the weight of each block



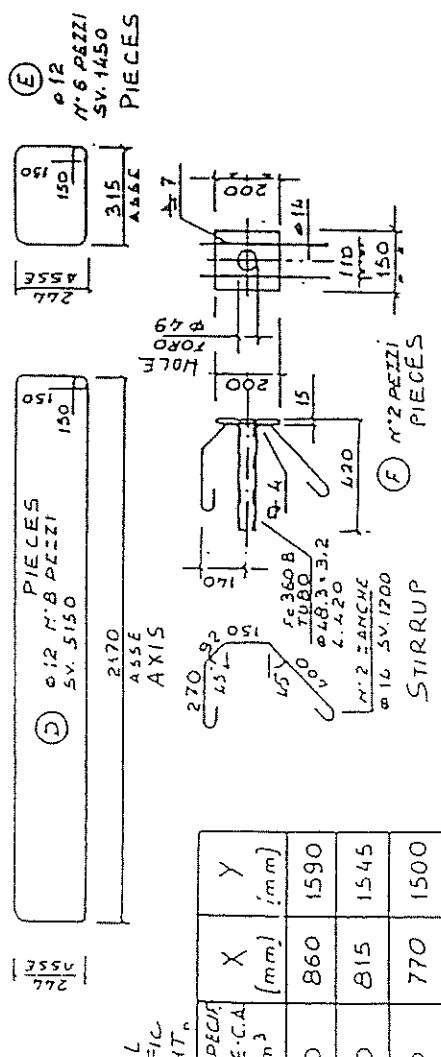
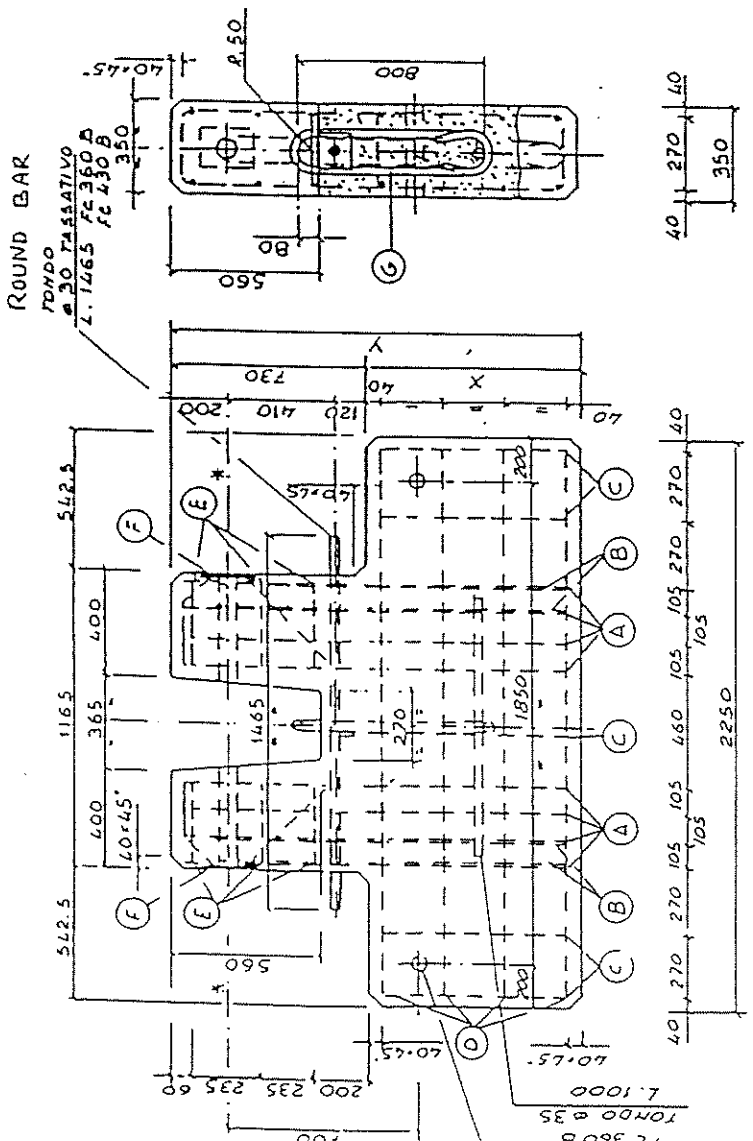
Ø SPECIA	X [mm]	Y [mm]
300	1025	1755
00	970	1700
00	920	1650



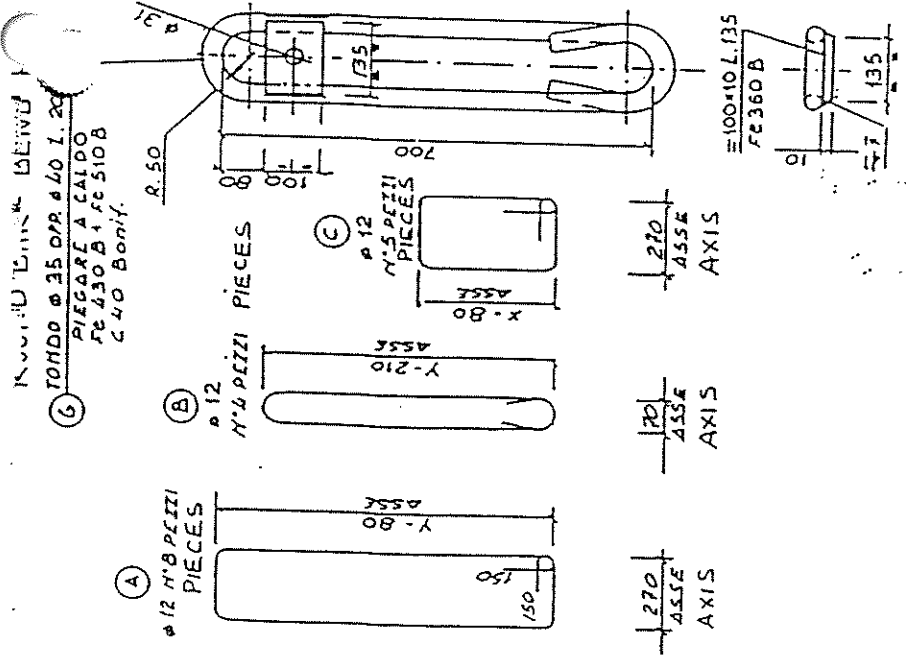
BLOCK TYPE 6 - KG. 2100

IMPORTANT NOTE:

- Blocks not to be positioned before 10 days seasoning.
- Reinforcement: Fe B 44 K
- Concrete class 300
- Respect holes concentricity
- Check the weight of each block



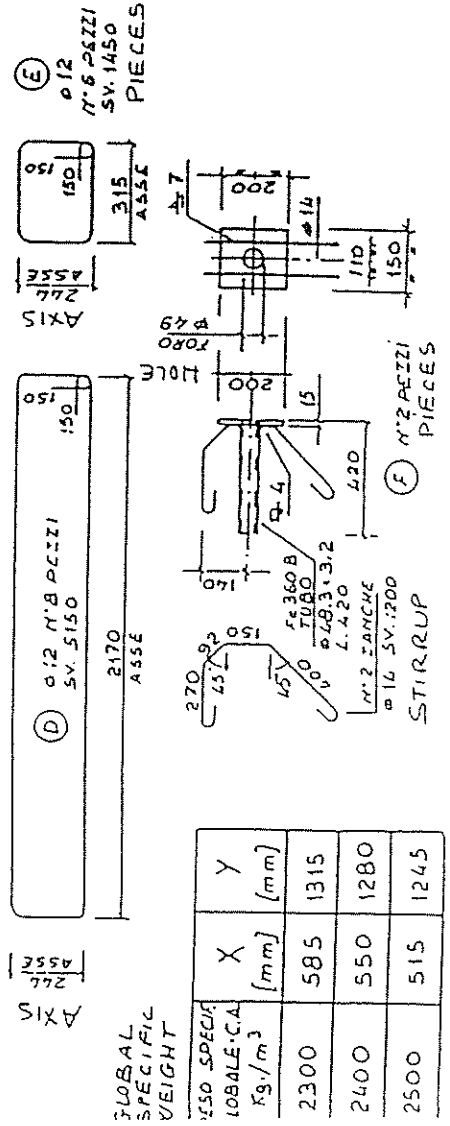
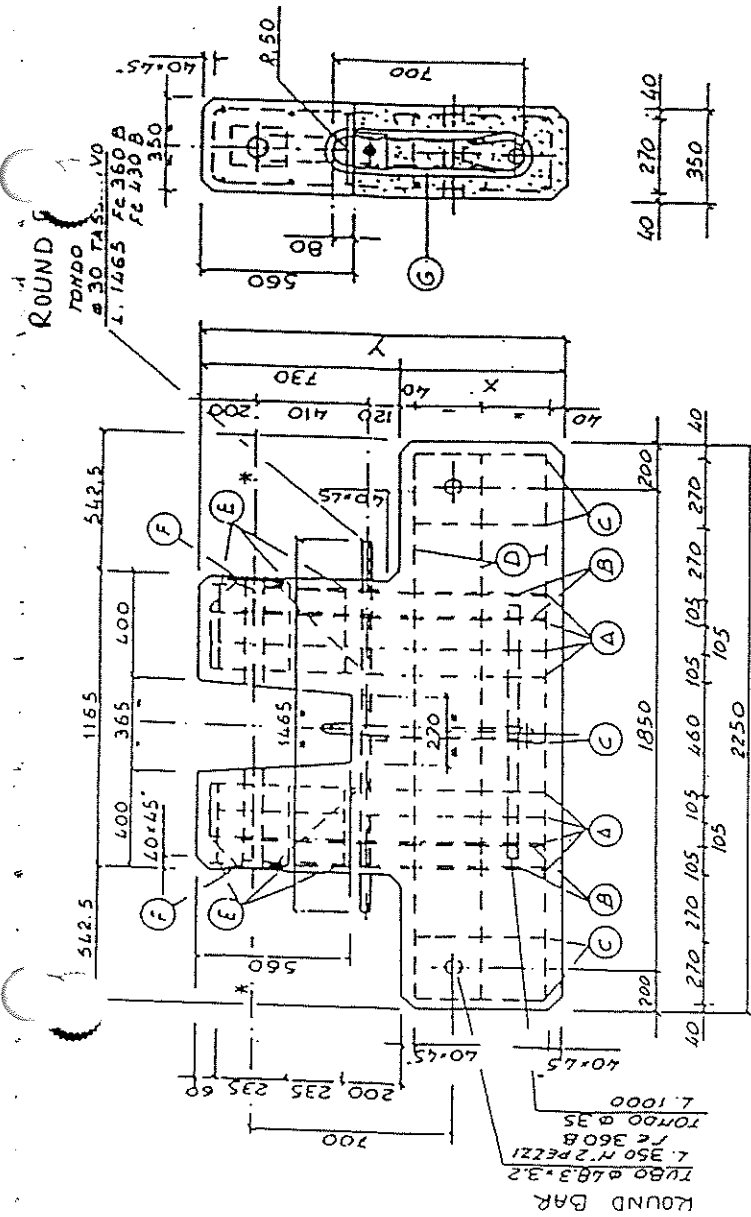
PEZZI	X (mm)	Y (mm)
1	860	1590
2	815	1545
3	770	1500



BLOCK TYPE 7 - KG. 1600

IMPORTANT NOTE:

- Blocks not to be positioned before 10 days seasoning.
- Reinforcement: Fe B 44 K
- Concrete class 300
- Respect holes concentricity
- Check the weight of each block



GLOBAL SPECIFIC WEIGHT

GLOBAL SPECIFIC WEIGHT	Y (mm)	X (mm)
2300	1315	585
2400	1280	550
2500	1245	515

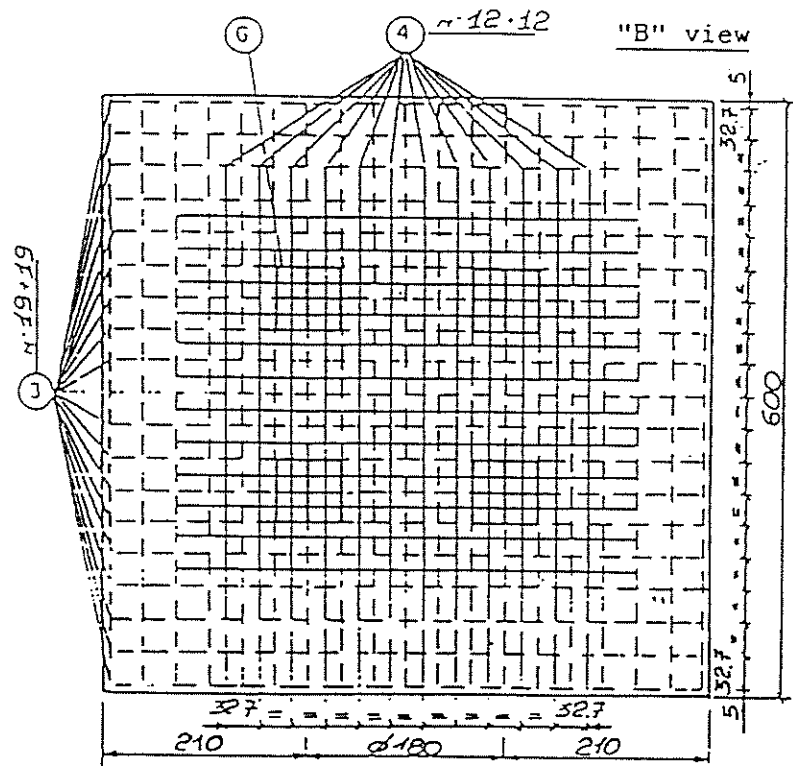
First equipment to be installed at the job-site before the crane arrives are the foundation plinths or the travelling tracks platforms, according to the crane working version chosen. (See pages 5.2 + 5.10).

The preparation of such equipment is subject to the crane own characteristics and to the type of soil on which the foundation rests. In the following chart you can find medium soil " σ_{RT} " resistance data subject to the geological configuration.

TYPE OF SOIL	σ_{RT} RESISTANCE
	daN /cm ²
Loose earth	0.72
Sand	0.90
Loam/gravel	1.26
Gravel	1.43
Rocky	1.65

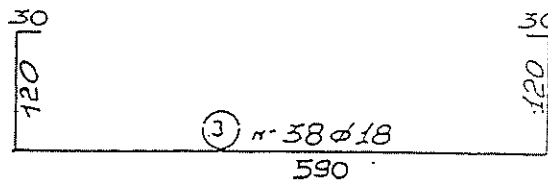
SEE EXAMPLES ON THE FOLLOWING PAGES.

EXAMPLE FOR CT 651 S20 R

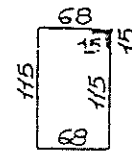
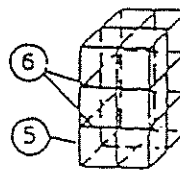
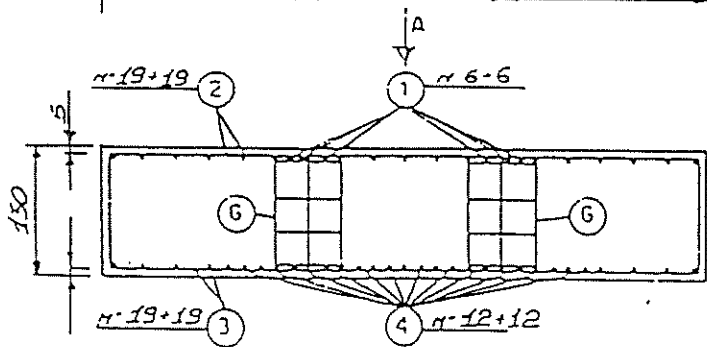


① n. 12 ϕ 16
350

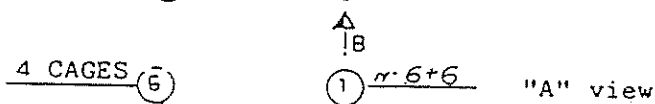
② n. 38 ϕ 18
590



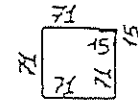
④ n. 24 ϕ 18
460



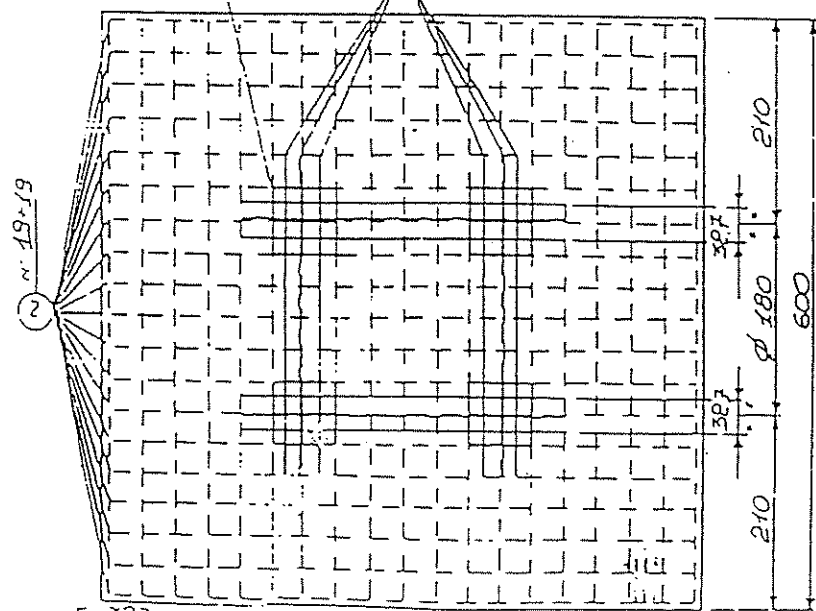
⑤ n. 24 ϕ 14



4 cages to be positioned under the support plates



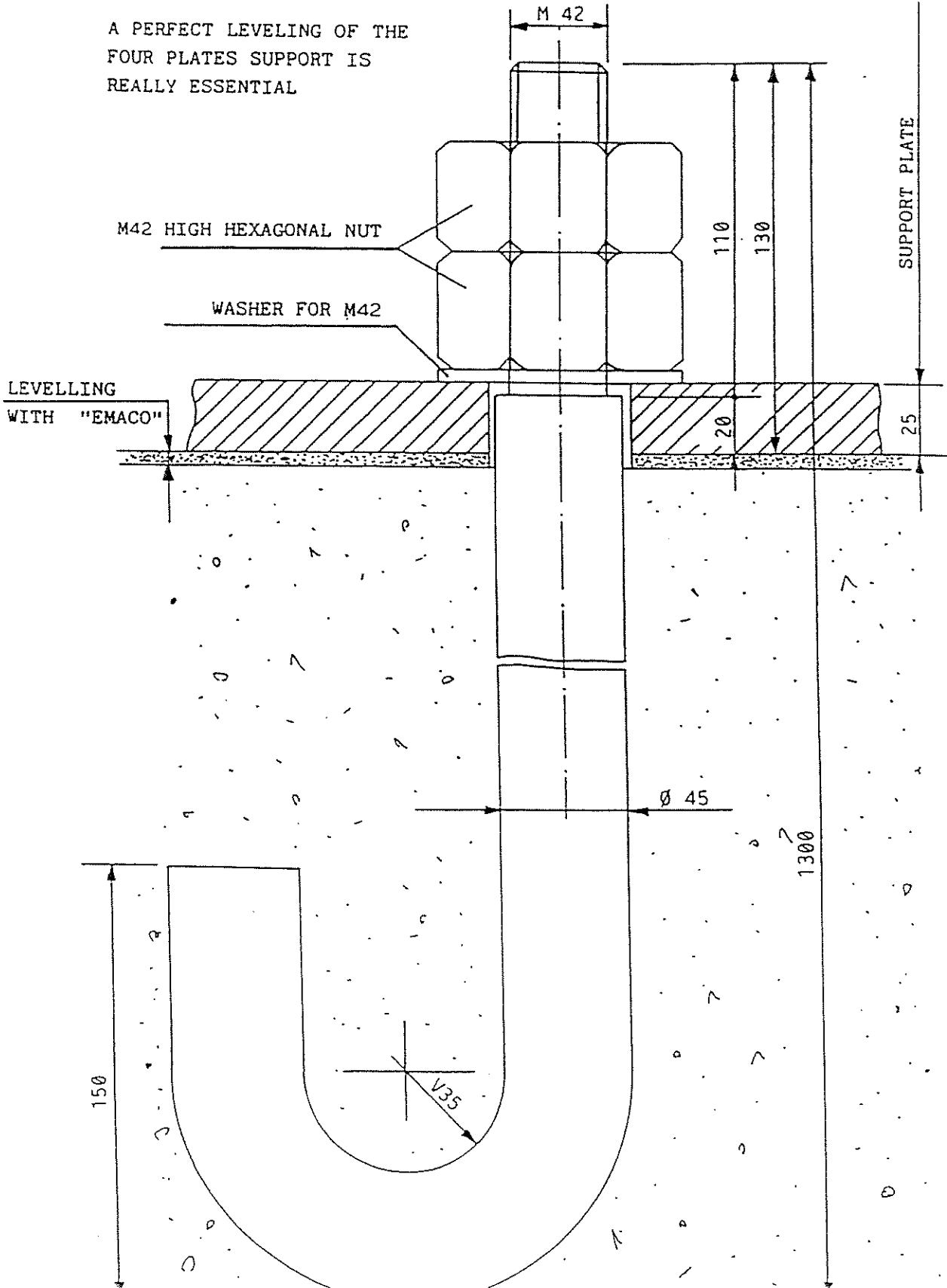
⑥ n. 8 ϕ 14

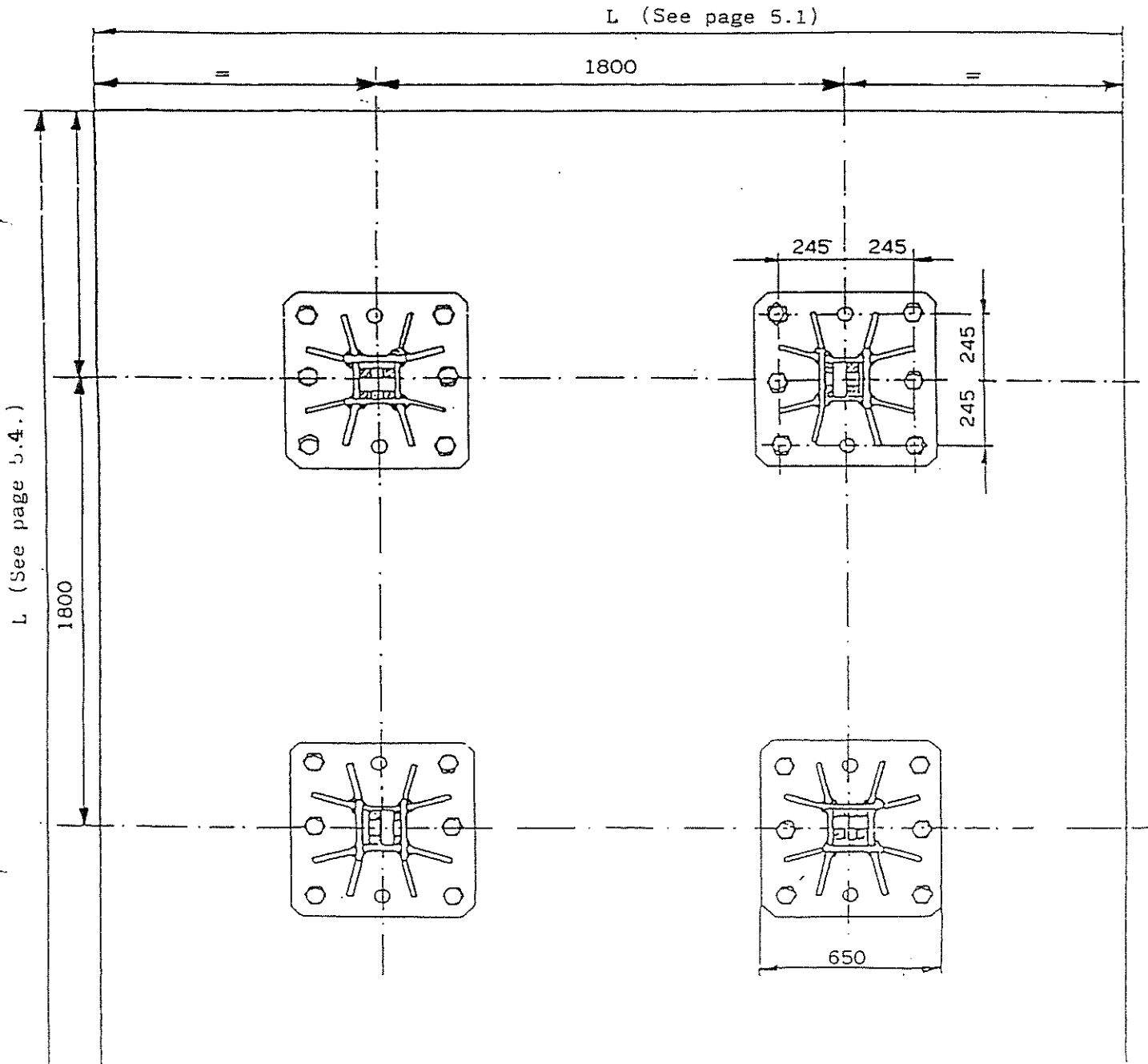
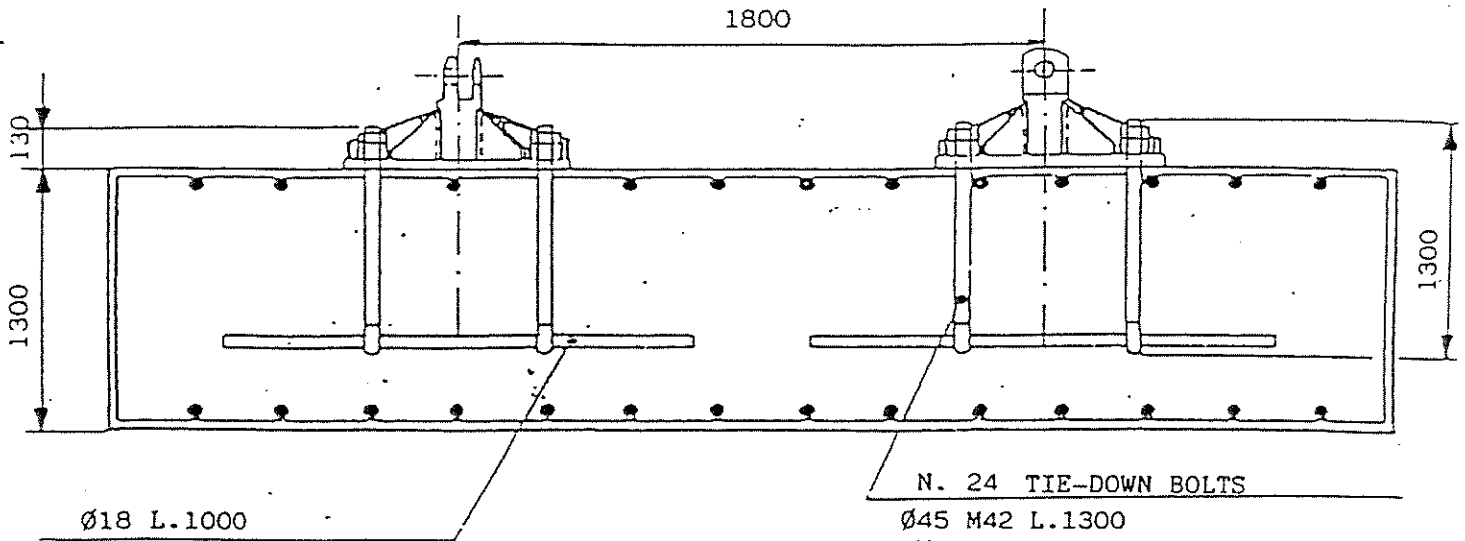


Foundation weight 112,3 t.
Concrete weight 2,4 t./m³

Concrete class 300
Steel type Fe B 38K

A PERFECT LEVELING OF THE
FOUR PLATES SUPPORT IS
REALLY ESSENTIAL





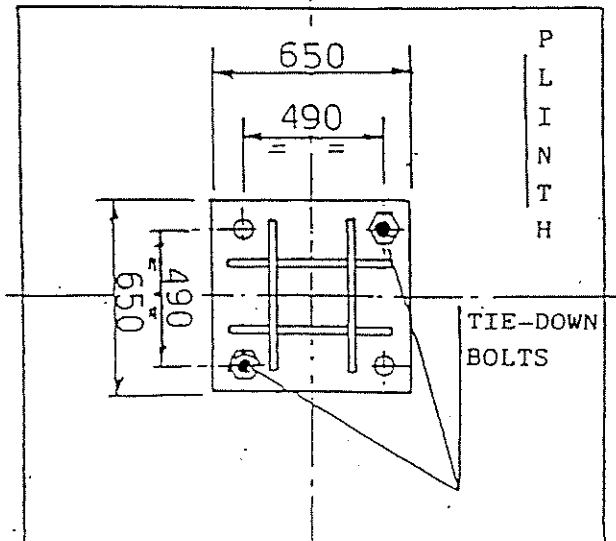
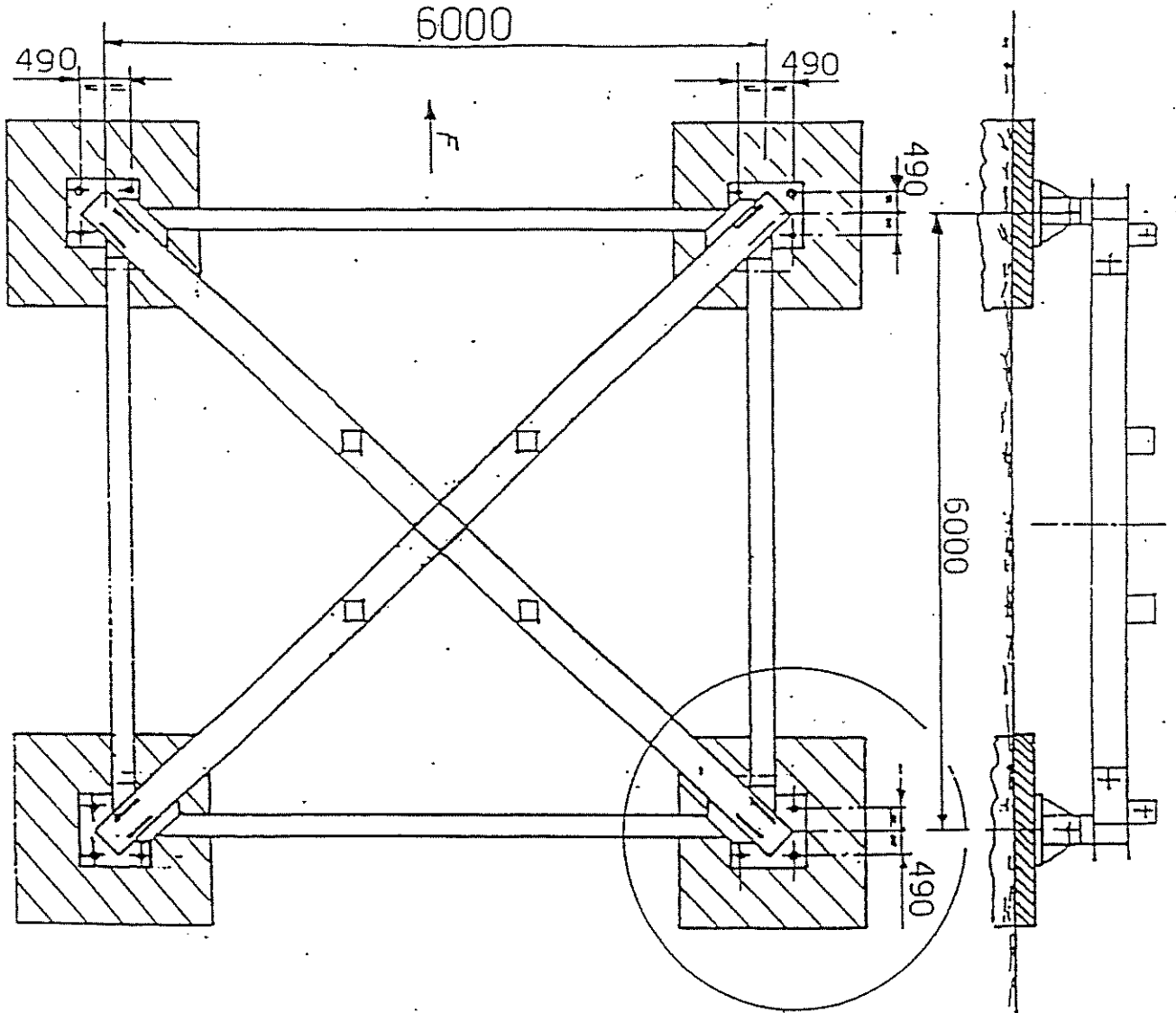
When the crane, also chassis version, is erected at considerable heights (pages 5.5 to 5.9), in the worst "out of service" conditions it is necessary to anchor it to the soil by tie-down bolts (at least two for each support plate).

The small plinth dimensions (see following sketches) depend on the stresses on each support and on the soil resistance.

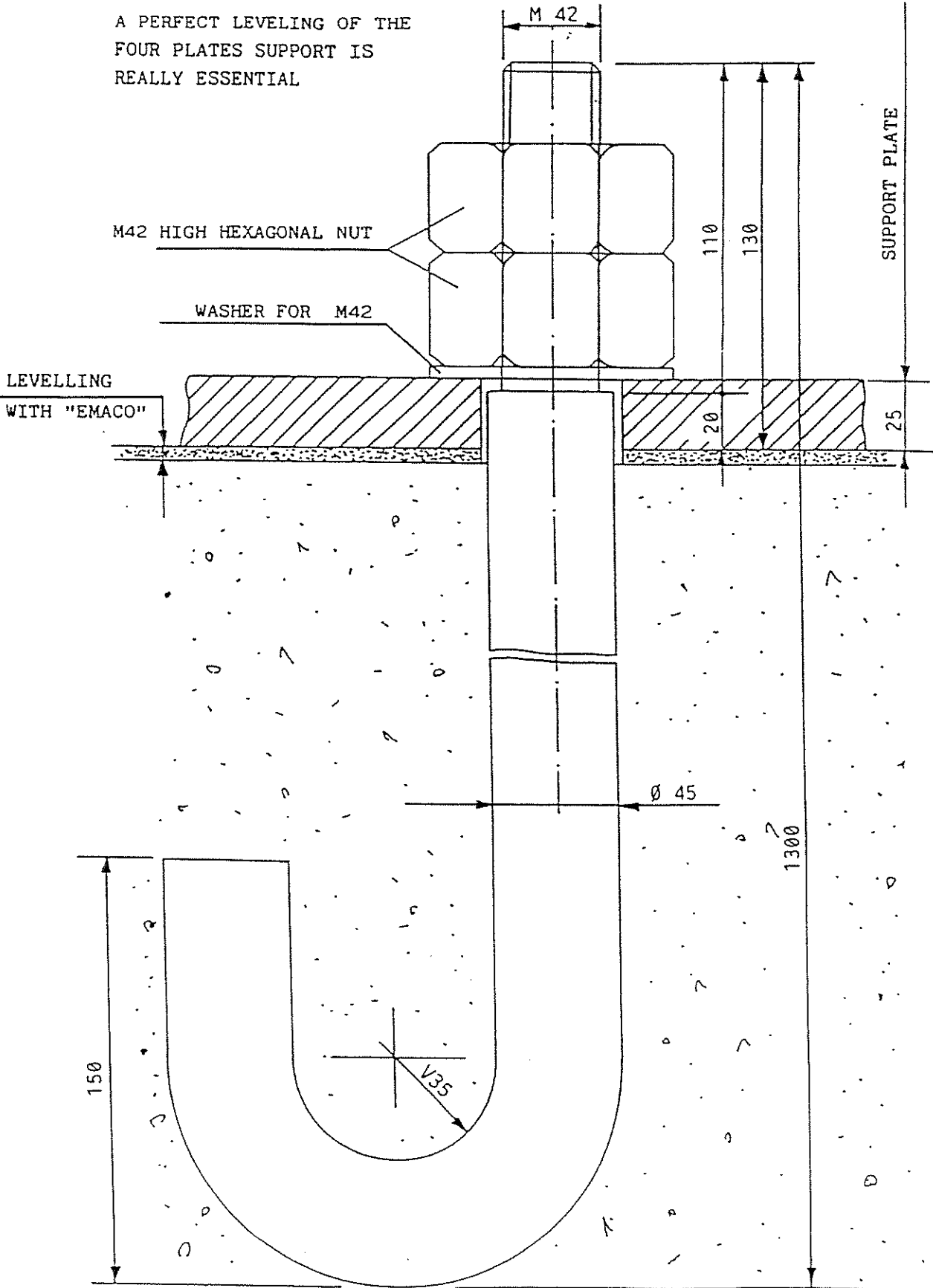
If the side of each small plinth is long enough to be very close to the one of the other support, it is better to set a single concrete bed.

To search the stresses on the soil for each version of crane, please consult the tables from page 5.2 to 5.10.

Also in this case, as well as in the whole installation at the job-site, the study of the reinforcement is up to the user. However, at pages 6.18 to 6.20 we report an example.



A PERFECT LEVELING OF THE
FOUR PLATES SUPPORT IS
REALLY ESSENTIAL



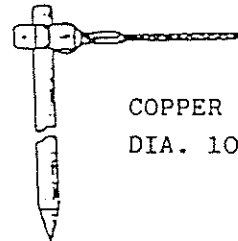
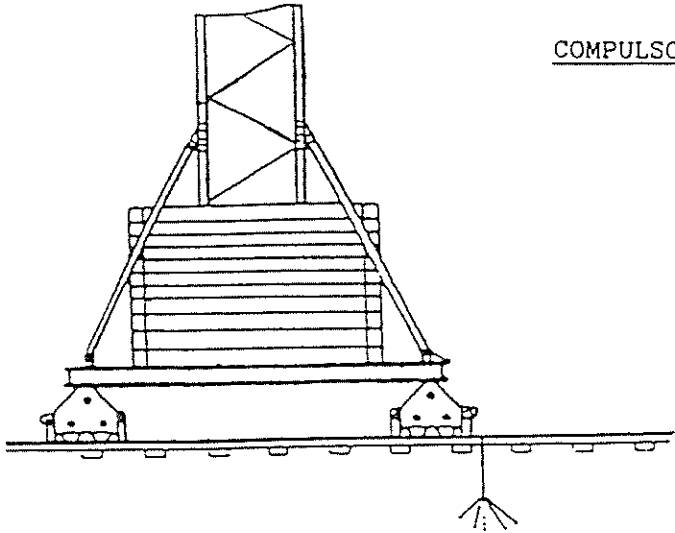
For travelling version cranes the user has to arrange for the runways according to CNR-UNI 10021 standards.

Herebelow we are reporting these main regulations:

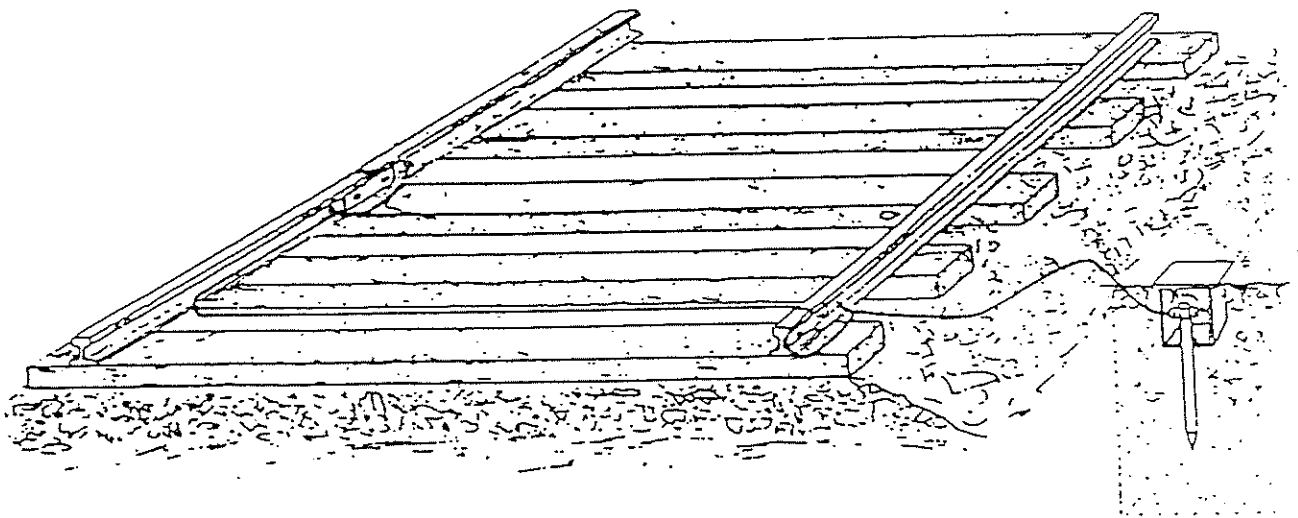
- a) runways must be perfectly horizontal, both longitudinally and crosswise;
- b) the rail gauge must be constant, the tracks straightaway with the same longitudinal profile;
- c) runways must be installed on a solid base according to solution indicated in the following pictures. The dimensions given consider a ground of good consistence supporting a pressure of at least 2 Kg/cm².
The rail must be type 50 UNI 3141 with a nominal head of 70 mm.
Weight per meter must be 50 Kg.

Slightly used rails are recommended for they grant a good bearing surface. The type of rail shown at page 6.31 - item 2, is not recommended (new), whereas the one as per item 3 is (not new).

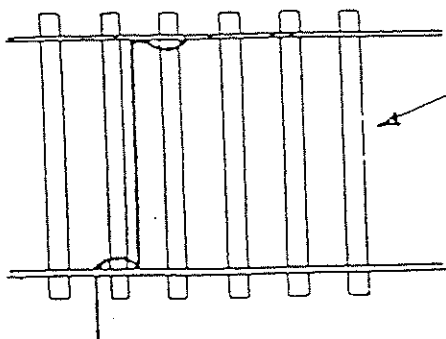
COMPULSORY: EARTHING

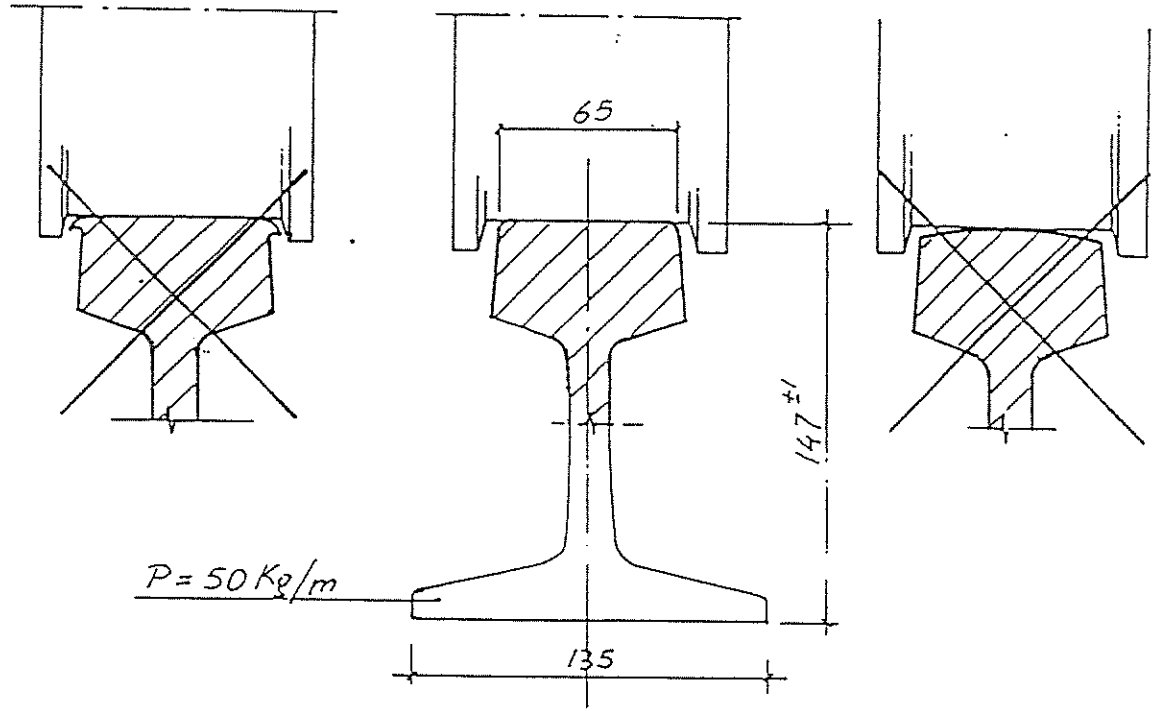


COPPER CABLE
DIA. 10 MM.

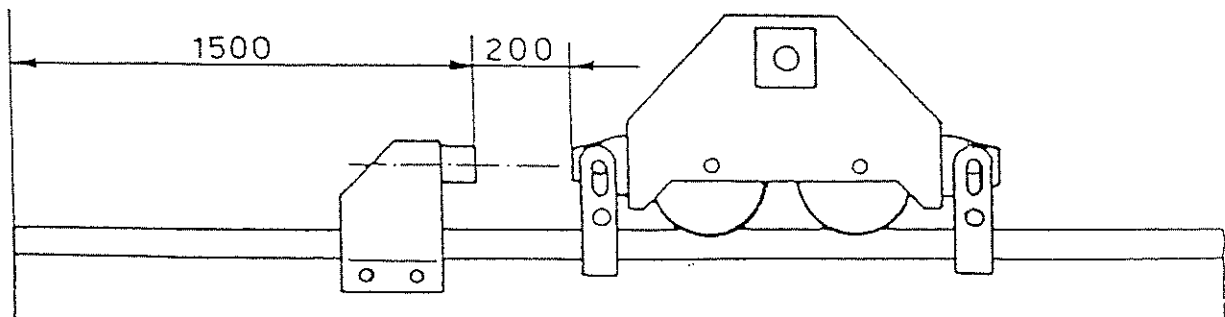
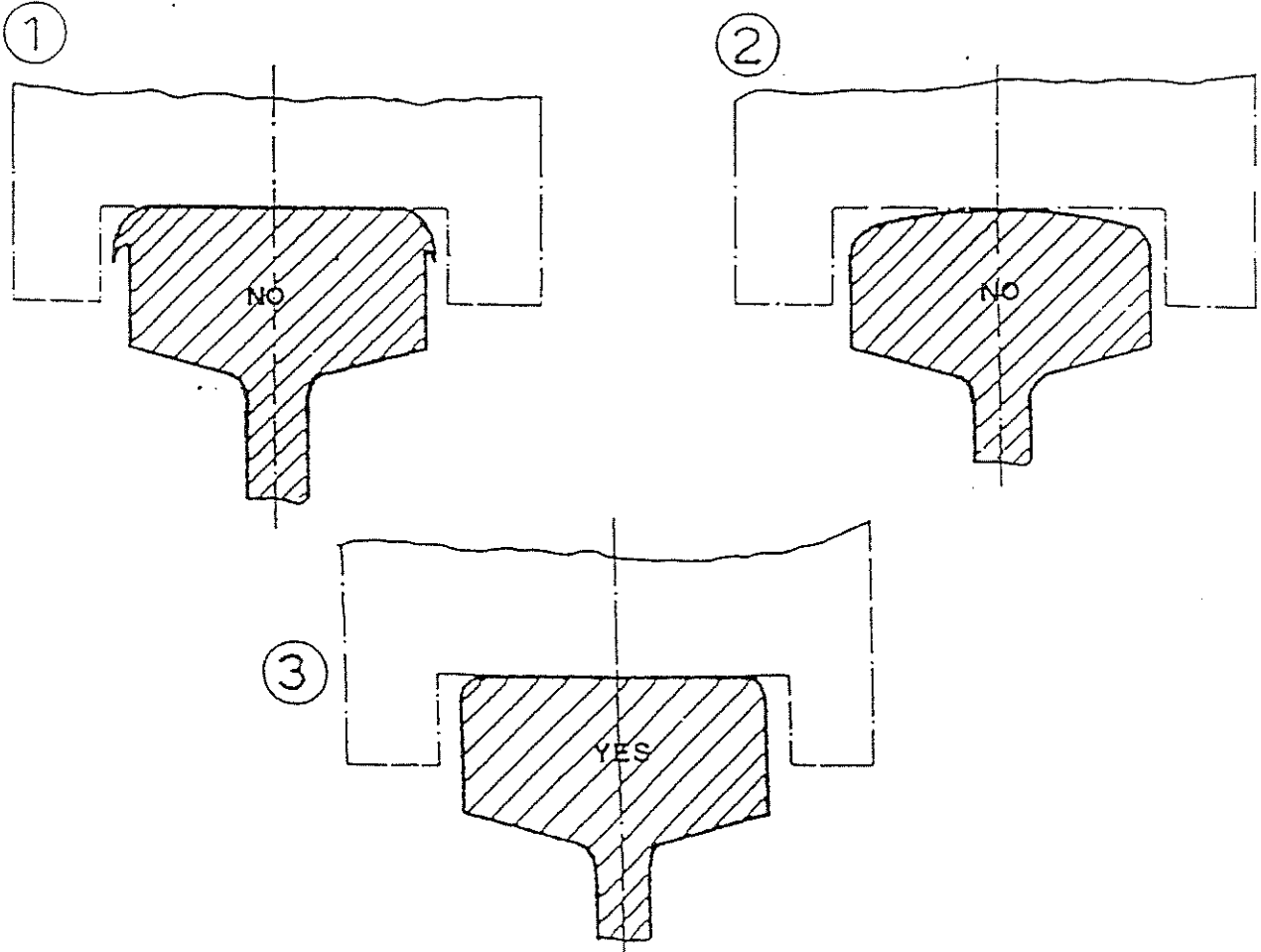


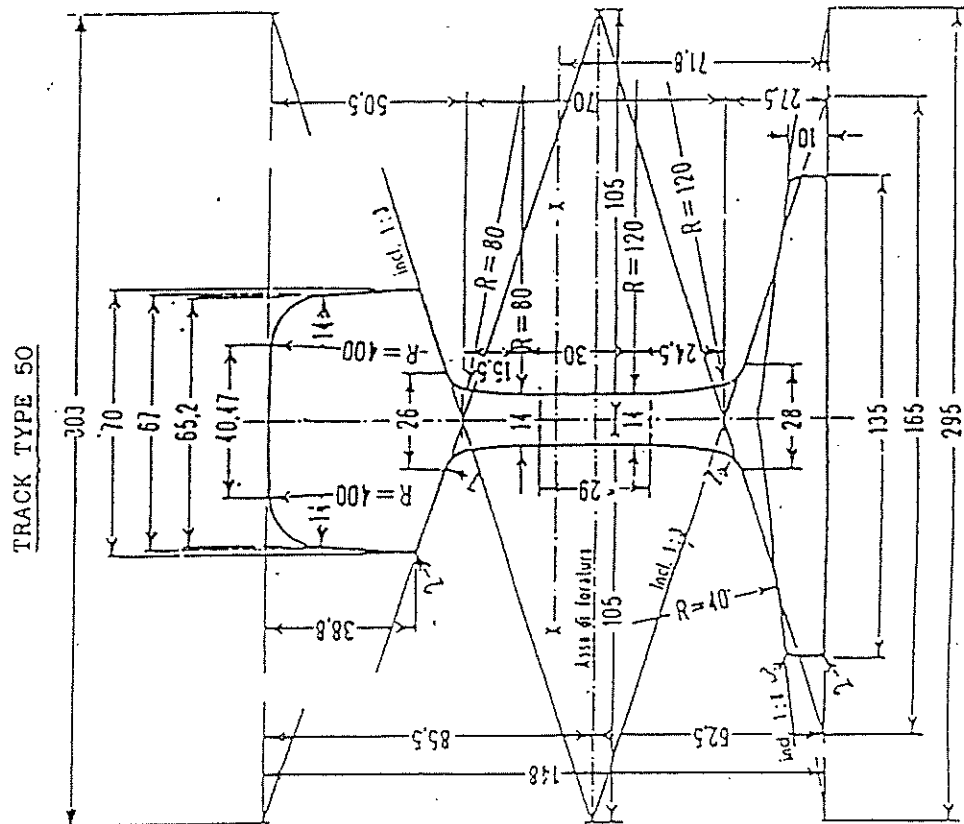
DETAIL OF THE ELECTRIC
CONNECTION OF THE TRACK





FORM TOLERANCE FOR THE TRACKS (mm.)	
Straightness on a horiz. plane of a rail 	$L = 2000$ $r = +/- 1$
Straightness in a vertical plane 	$L = 6000$ $V = 6$
Parallelism of the rails 	$i = 6000$ $P1-P = 10$
Difference in level 	$L = 6000$ $h = < 12$
Eccentricity of the rail compared to the beam 	$S \geq 12$ $\Sigma = 5$
Inclination of the rail compared to the horiz. plane 	$\beta' = 1'$





A. Track installation on concrete kerbs

The dimensions of the kerb are specified with drawing pages 6.34-6.35 and regard concrete class 300 with 2400 Kg./cu.m. specific gravity.

Rods must be chosen according to the load to be borne and to the ground nature. To the purpose, consult the tables for crane maximum loads transmitted when "in service" or "out of service" to each support from pages 5.2 to 5.10.

The joining traverses between the kerbs must be placed at least every 4.5 m. and made according to B-B section drawing 6.33.

The small blocks must be placed considering a centre distance of 600 mm.

*** * ***

A. Track installation on concrete kerbs with tie-down bolts and brackets (drawing 6.34)

Kerbs must be prepared according to the directions given as per previous sketches (see pages 6.34 - 6.35).

The rail must be anchored by M24 FE 360 tie-down bolts 200 mm. long, placed at a distance of 600 mm.

ANCHORAGE FOR "OUT OF SERVICE"

Form and dimensions for layby of crane anchorage when 'out of service' are those shown in picture pages 6.36-6.37. Concrete is class 300 and the iron bars are made of FE 44 Bk.

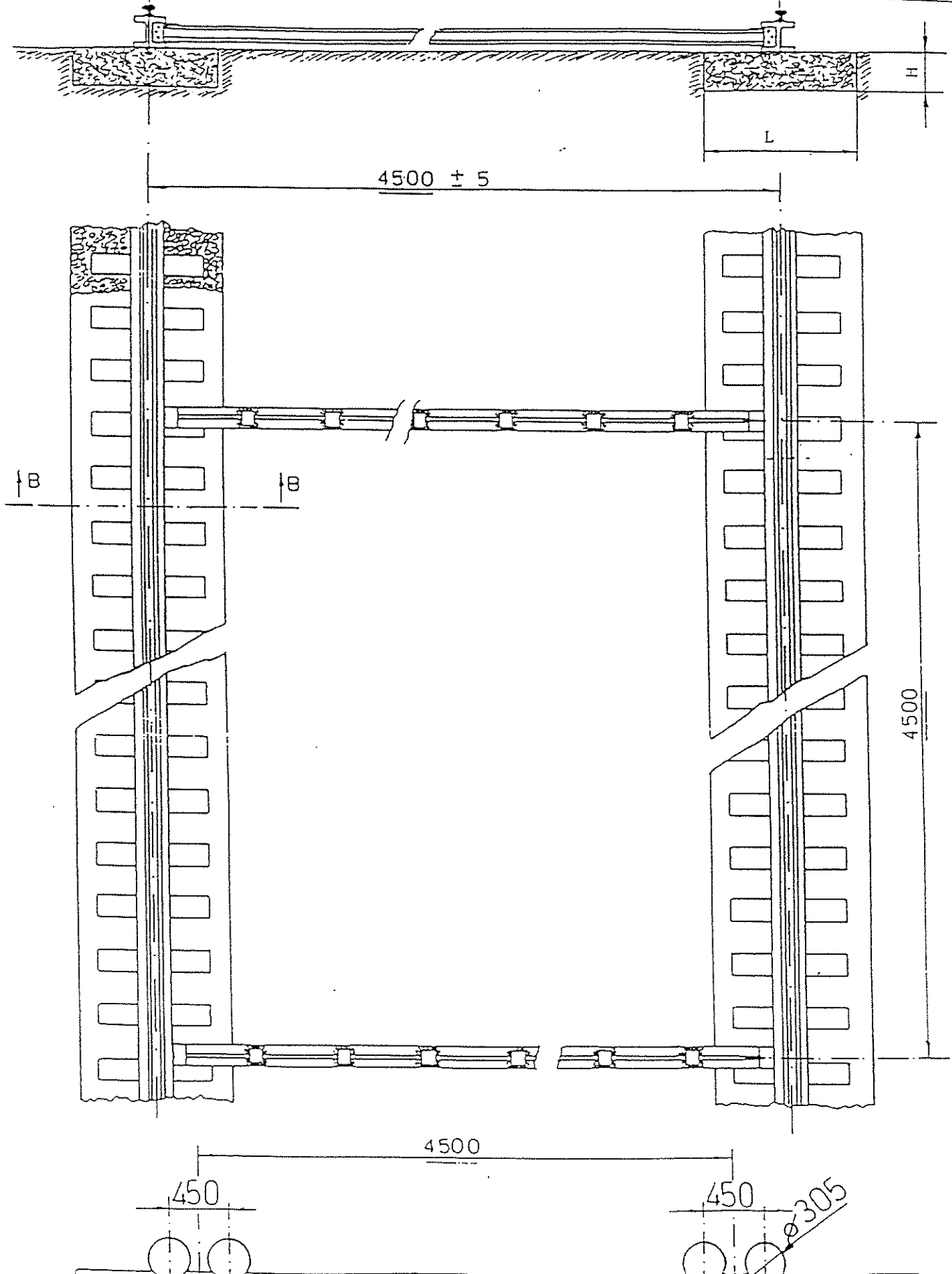
The number of tie-down bolts which join the tracks to the concrete kerbs in this area must be increased (one every 200 mm.).

Both runways ends must be connected to the earth plate.

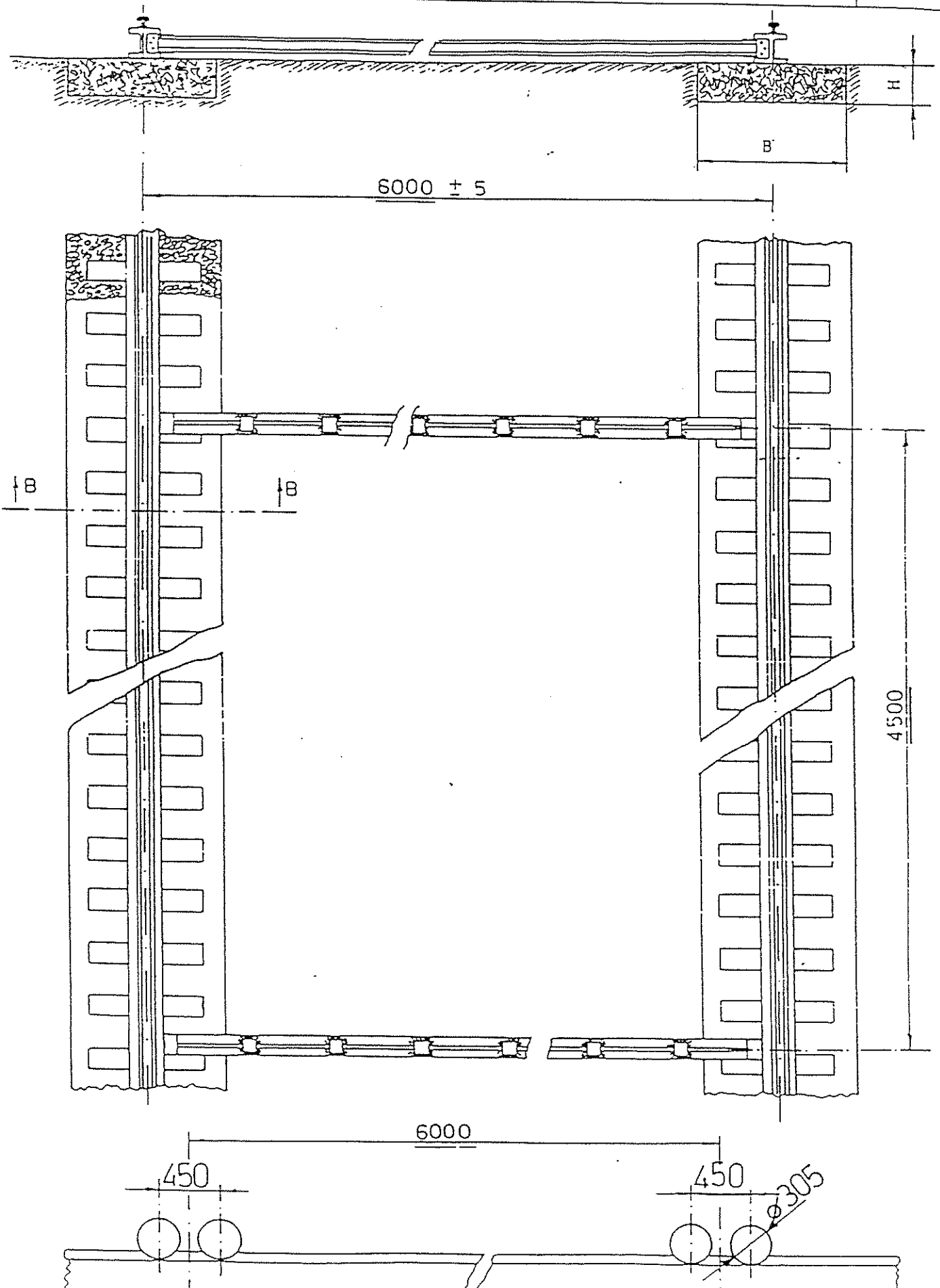
Most attention is recommended to the user when anchoring the crane 'out of service'. A) and B) travelling bogie axis must coincide with the kerb joining traverses axis (picture 6.37). This to allow the crane to stand centered as to the anti-tilting ballast.

The travelling limit buffers must be secured to the rail once taken the crane to the electric limit switch position. Their distance from the travelling bogie head must be of at least 200 mm. (picture 6.27). There must be still a safety margin of 1.5 m. between the buffer and the track end.

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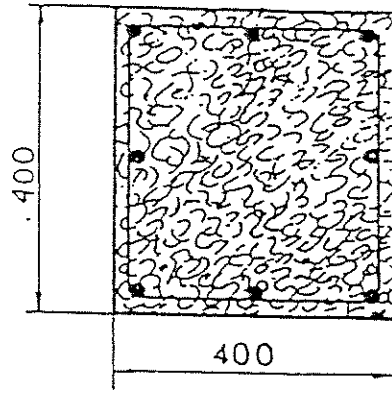


CT 651 S20G - S20TL - S23 - S23TL



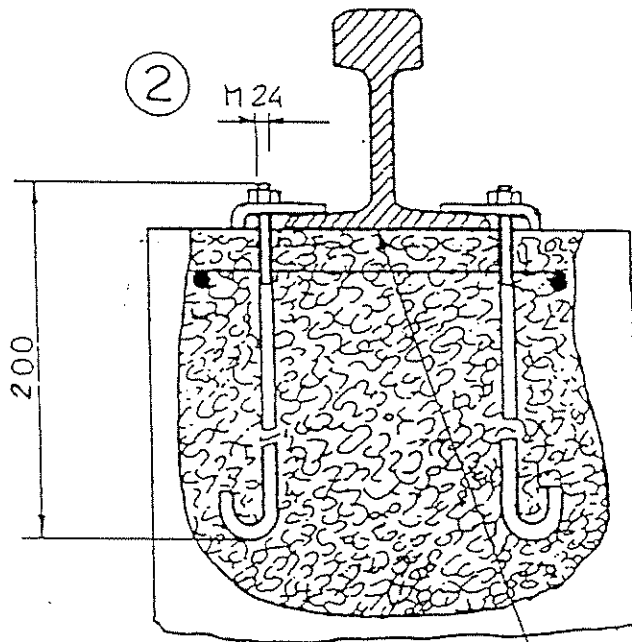
B-B SECTION

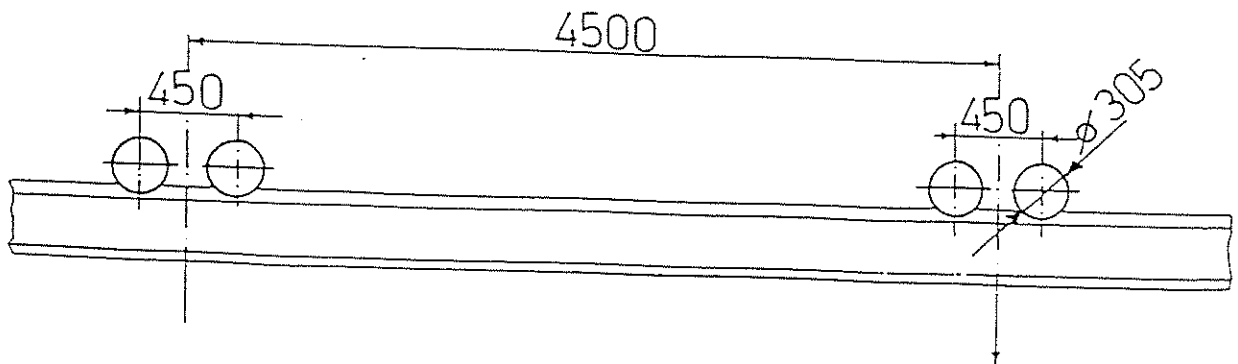
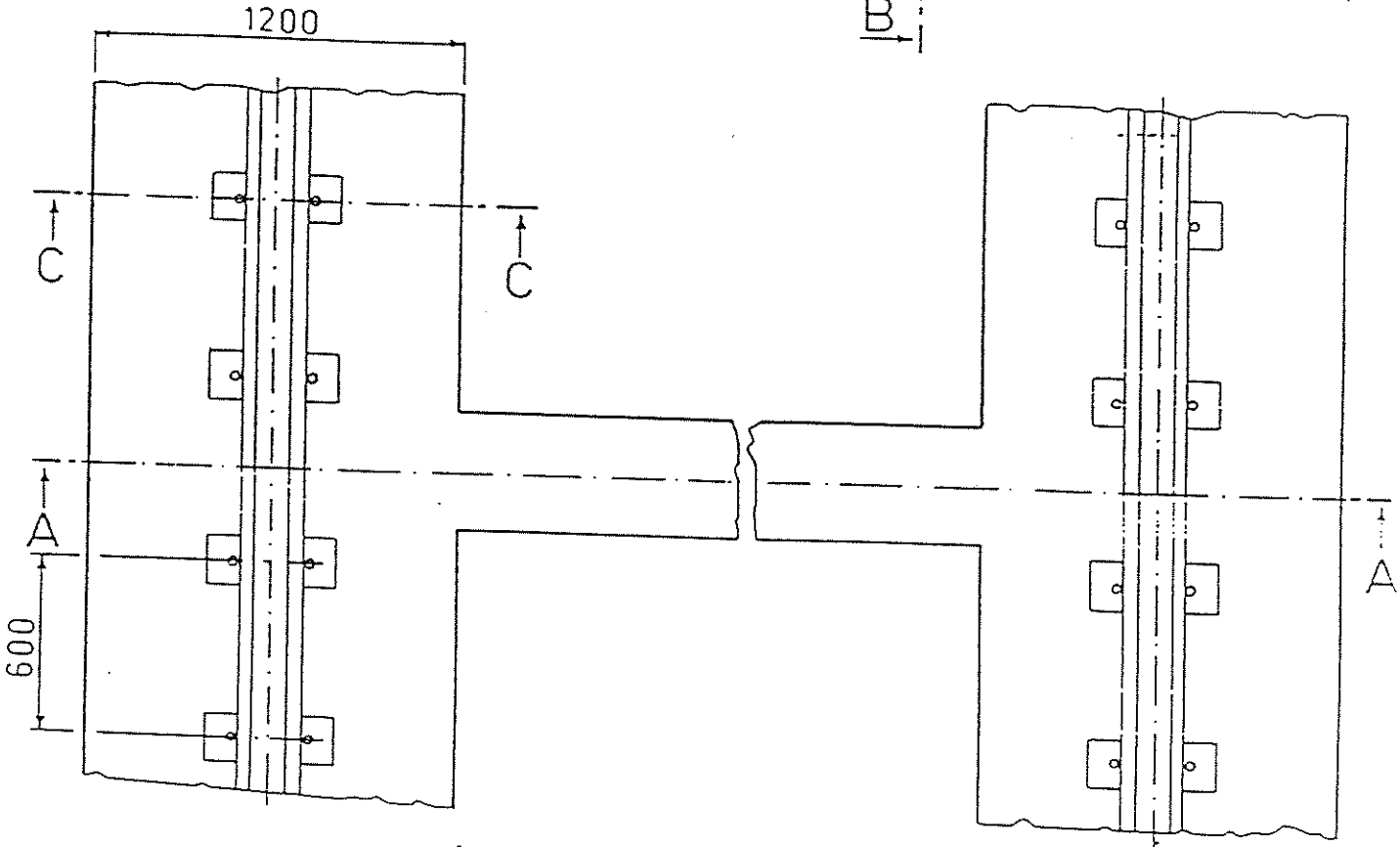
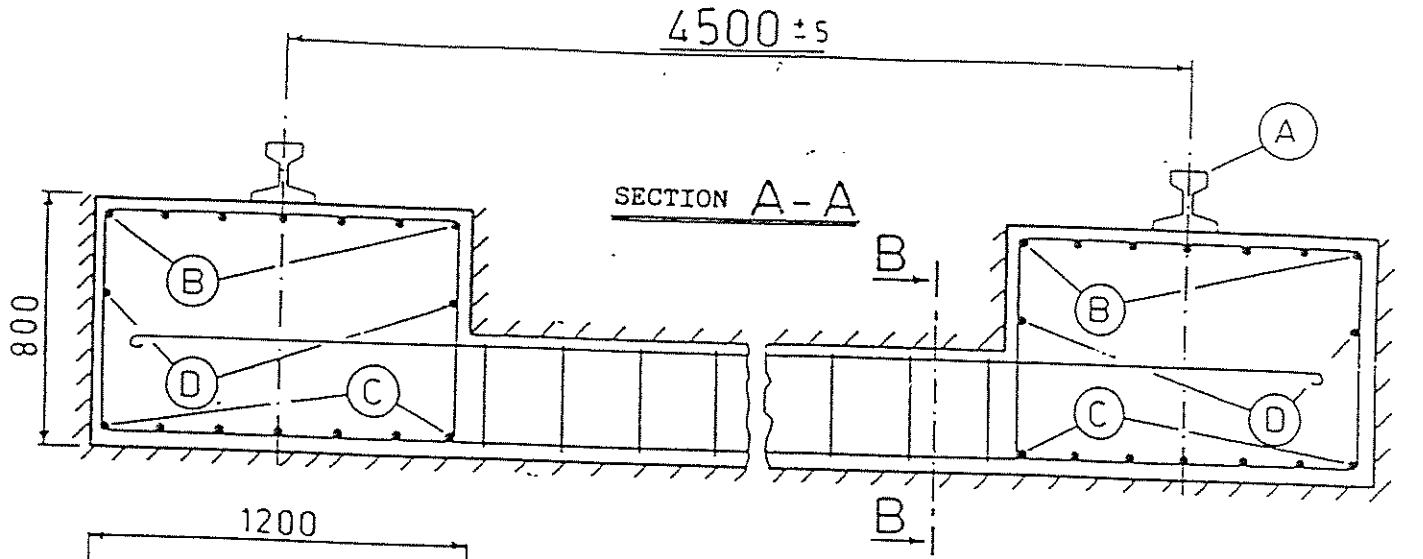
①

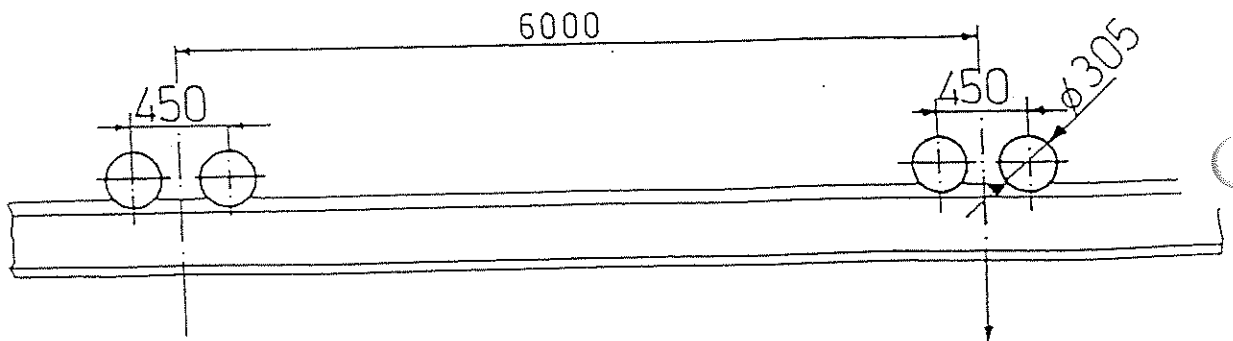
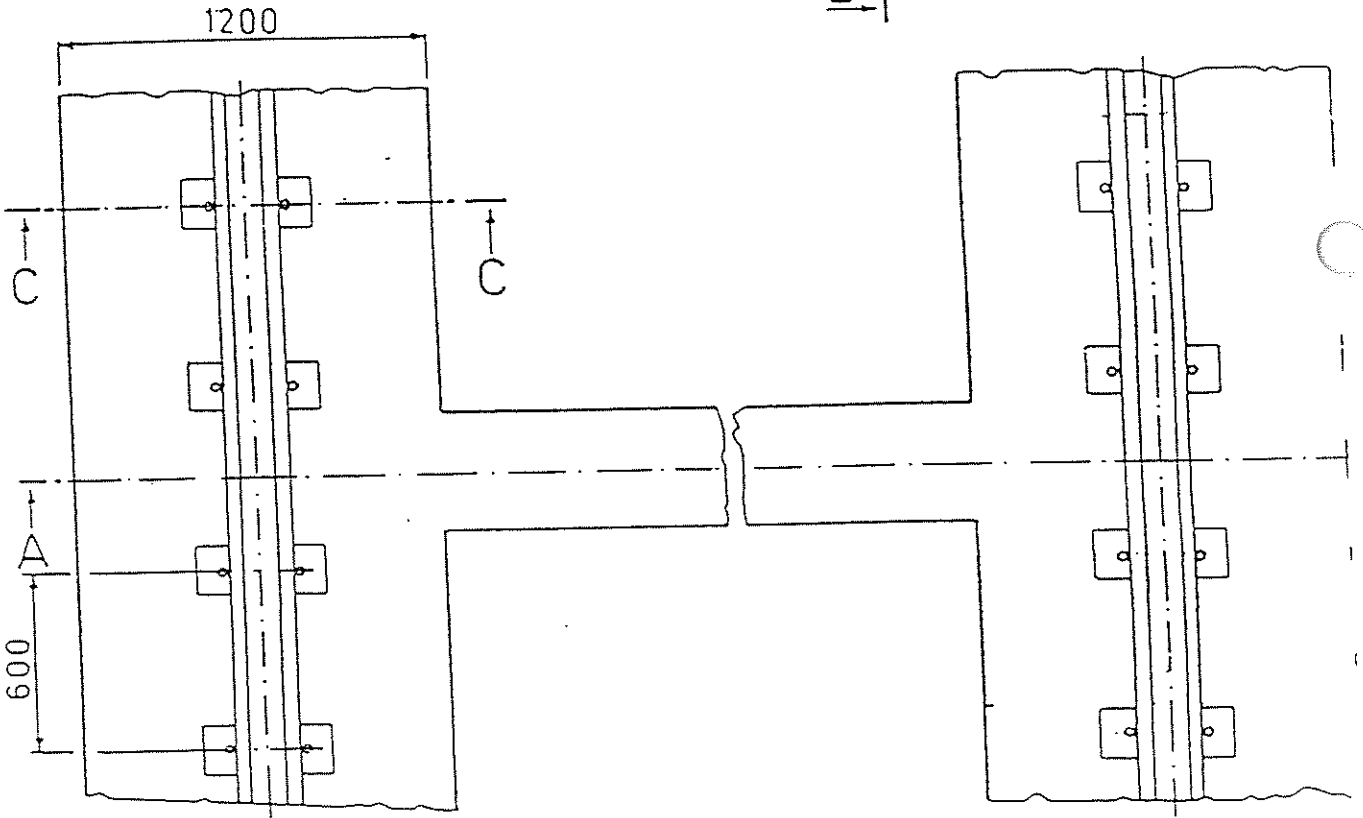
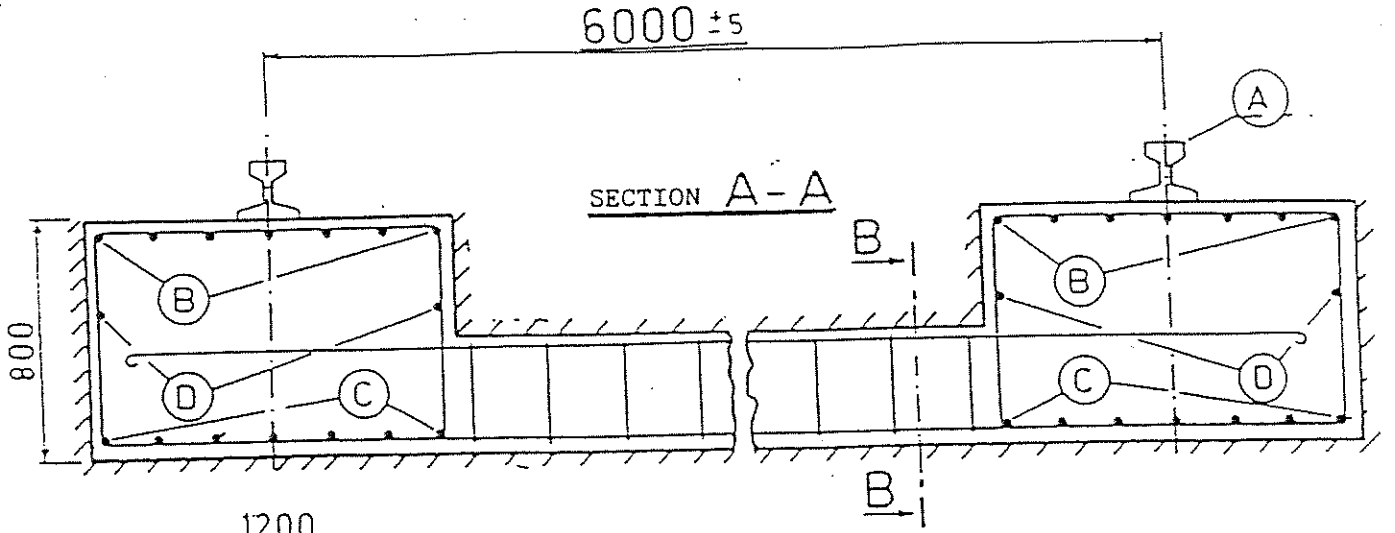


C-C SECTION

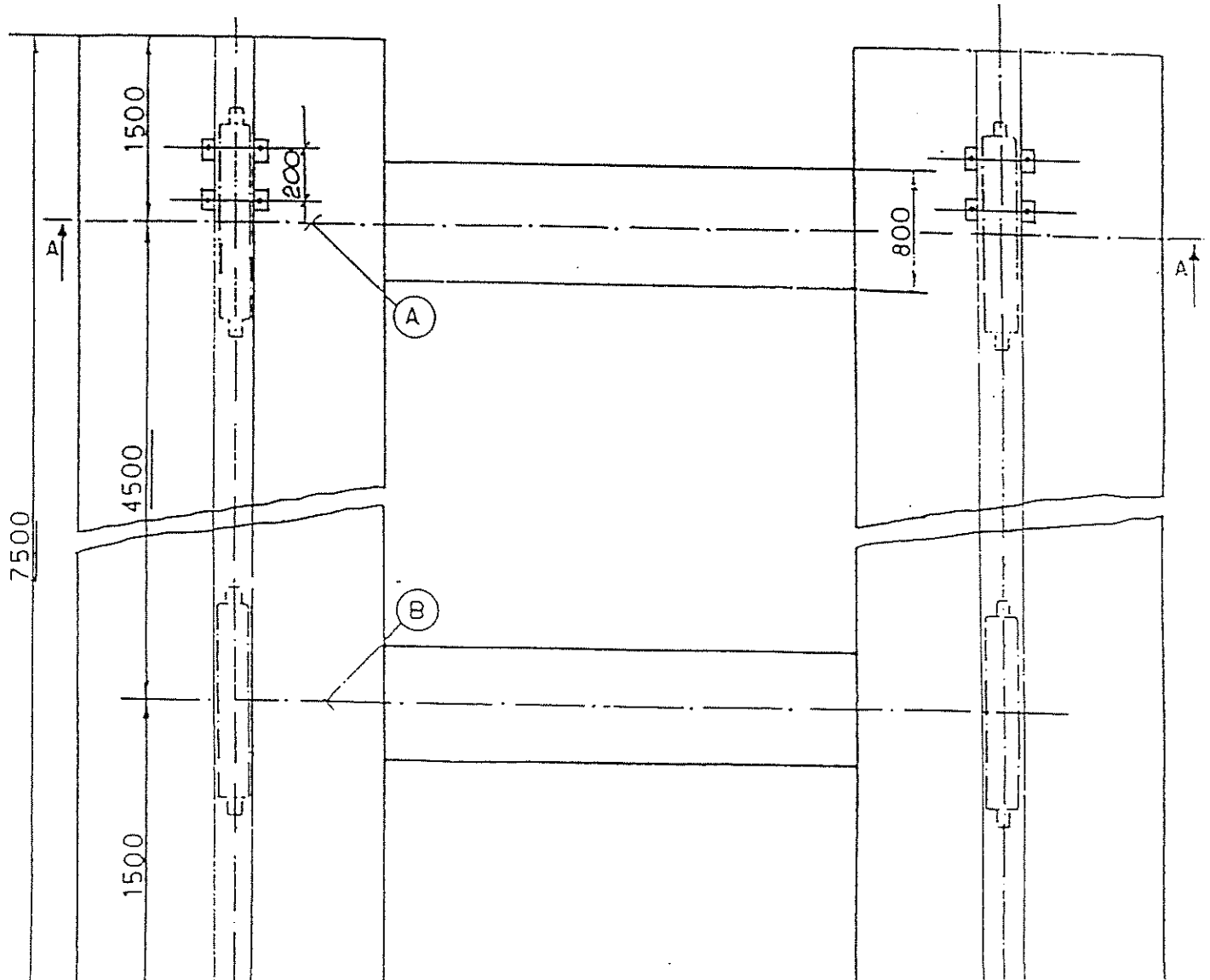
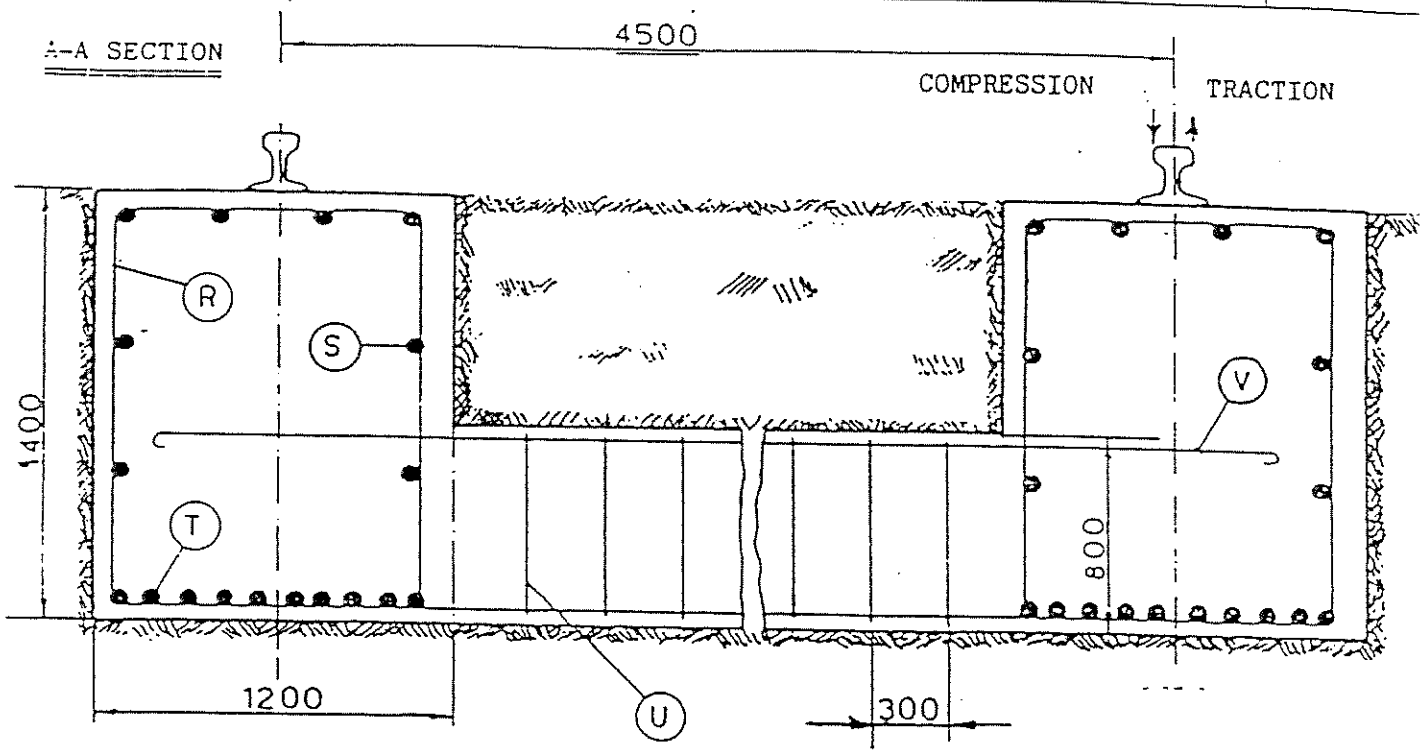
②

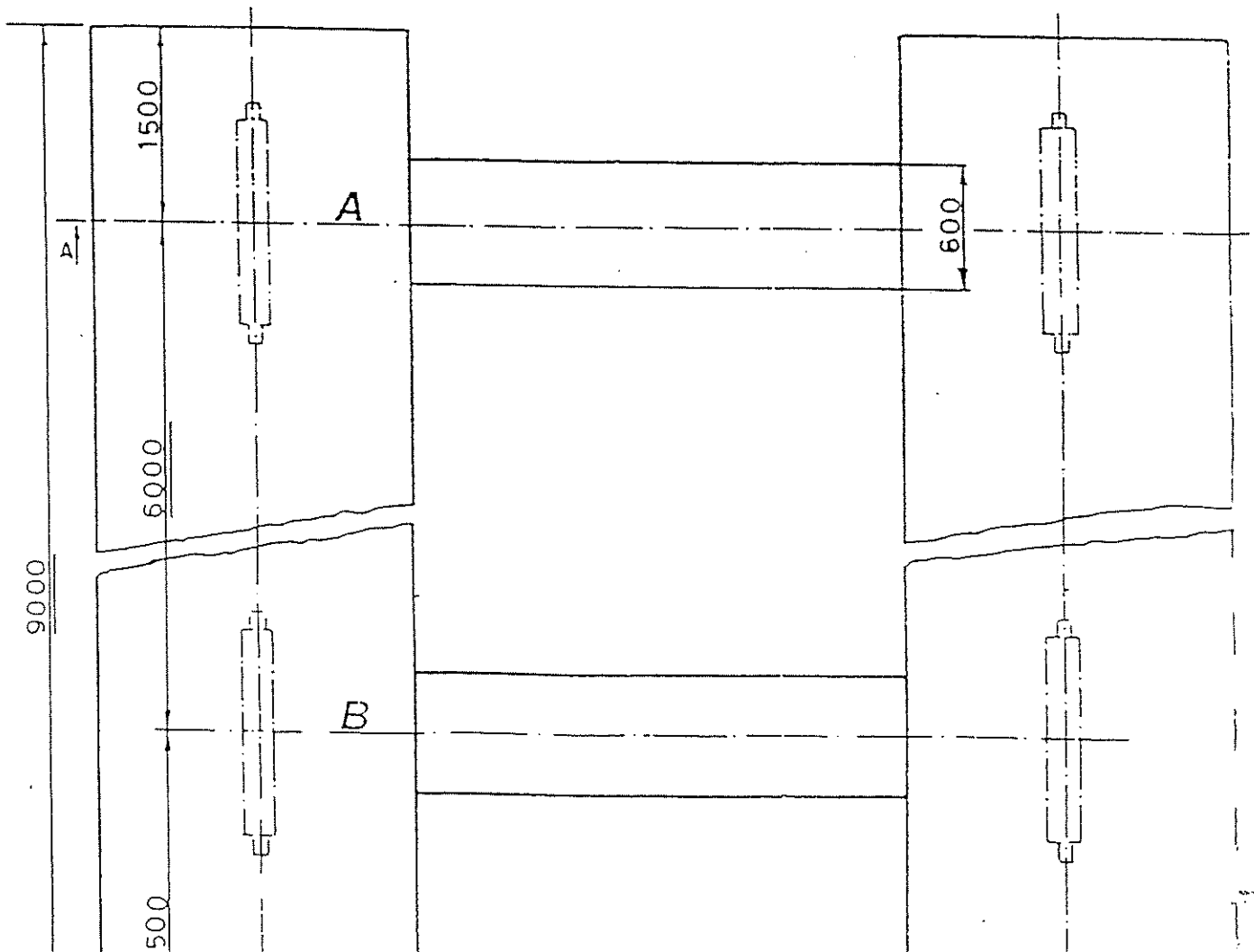
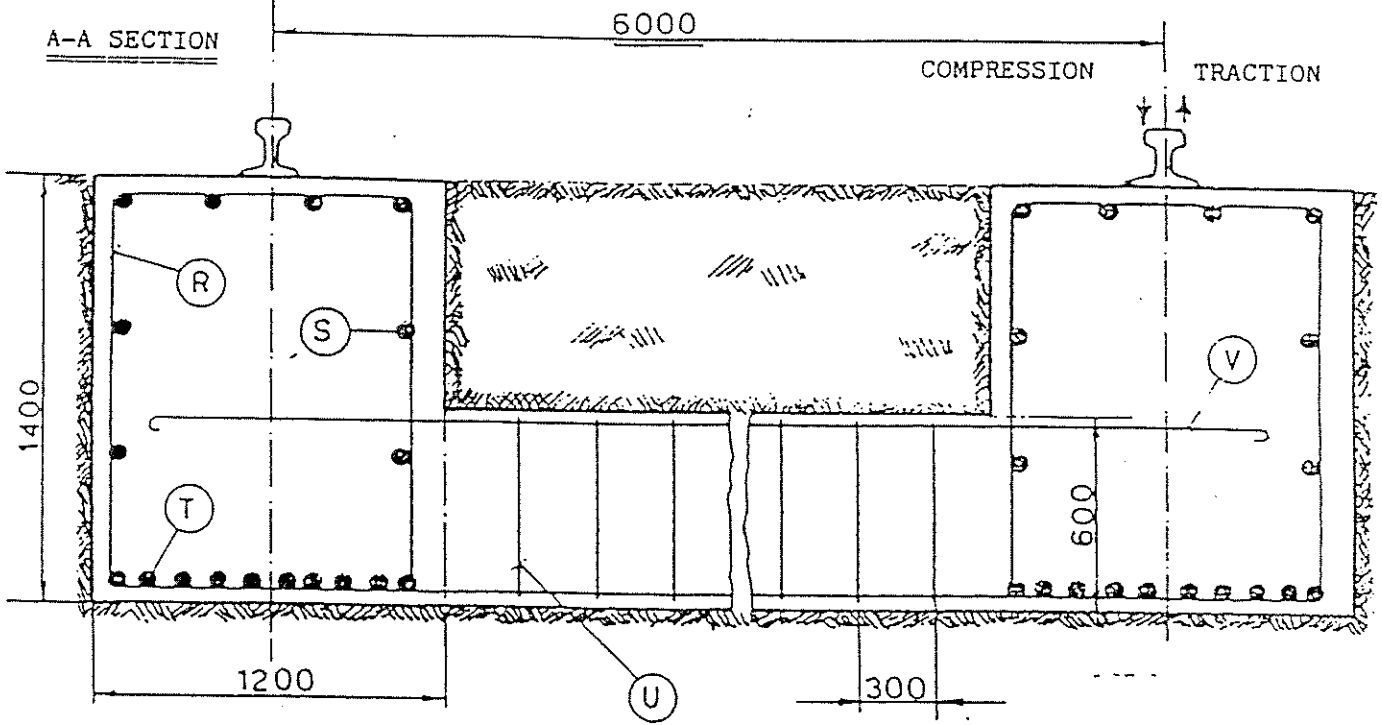


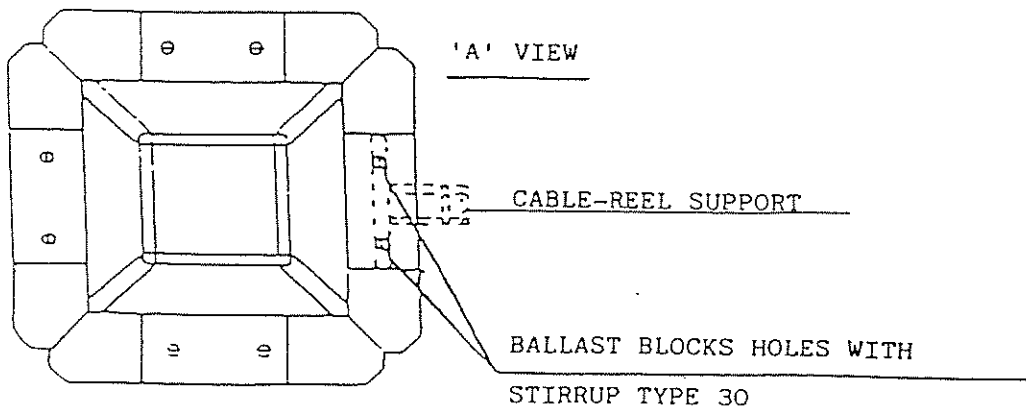
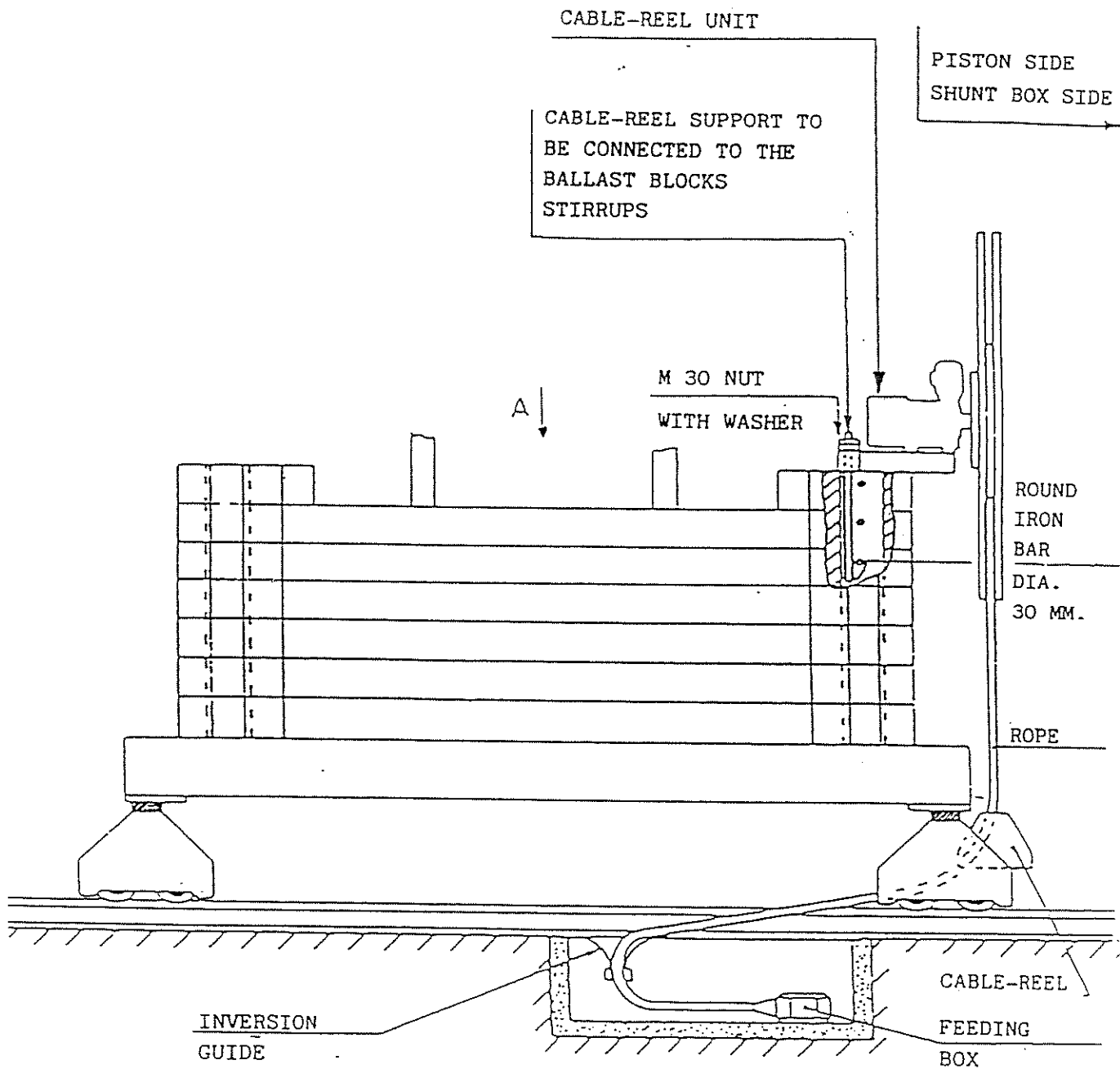


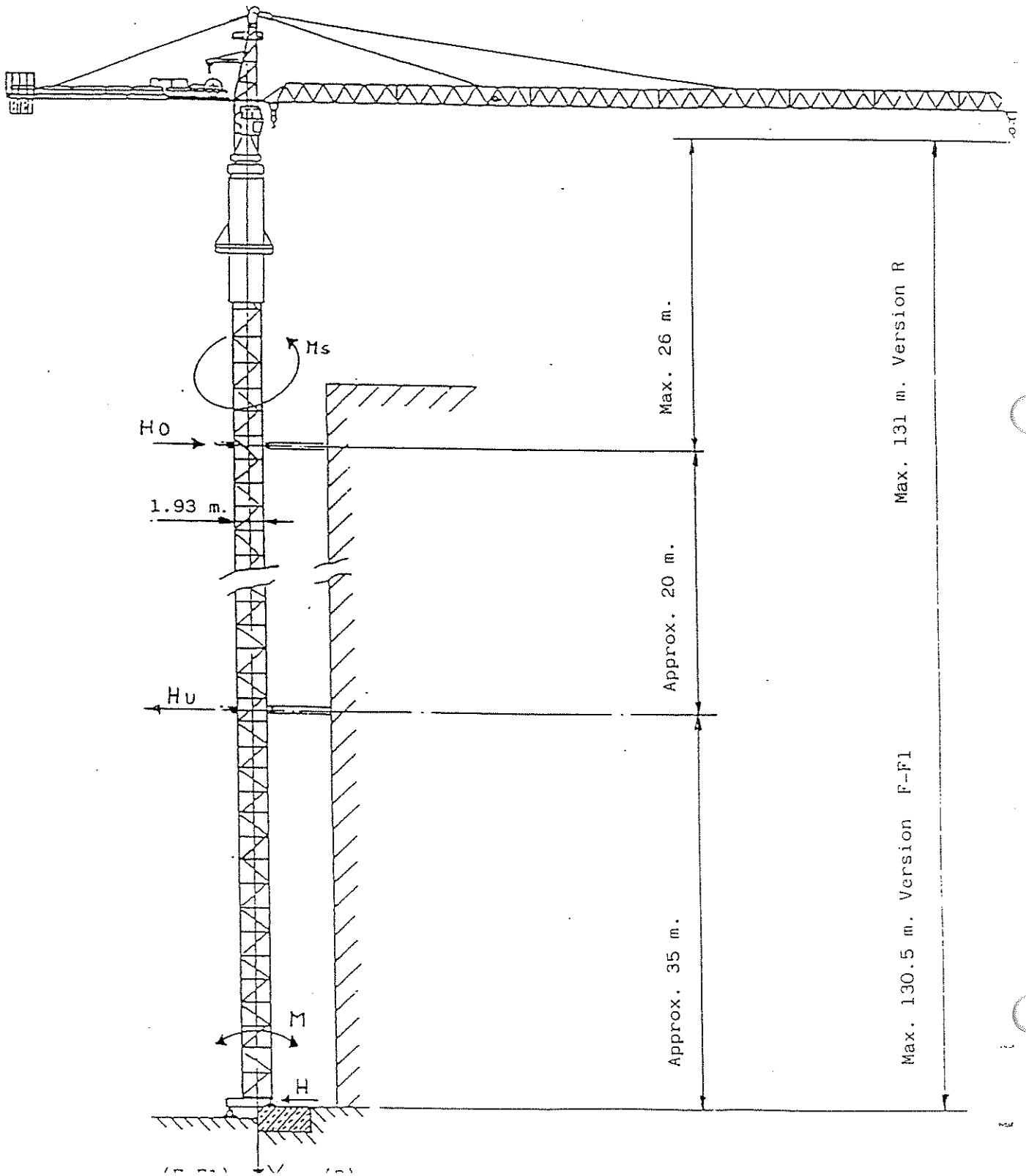


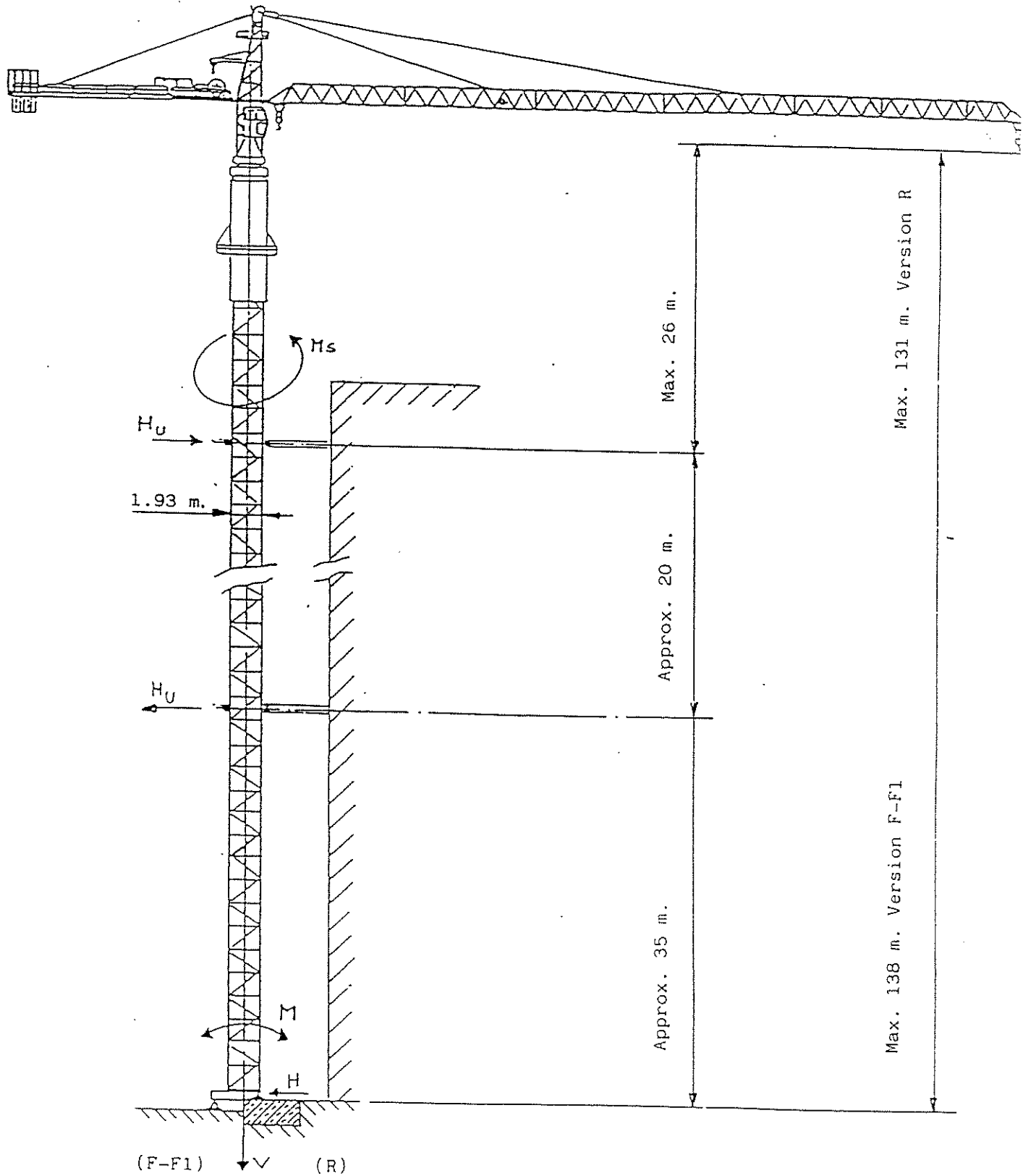
CT 651 S20 P

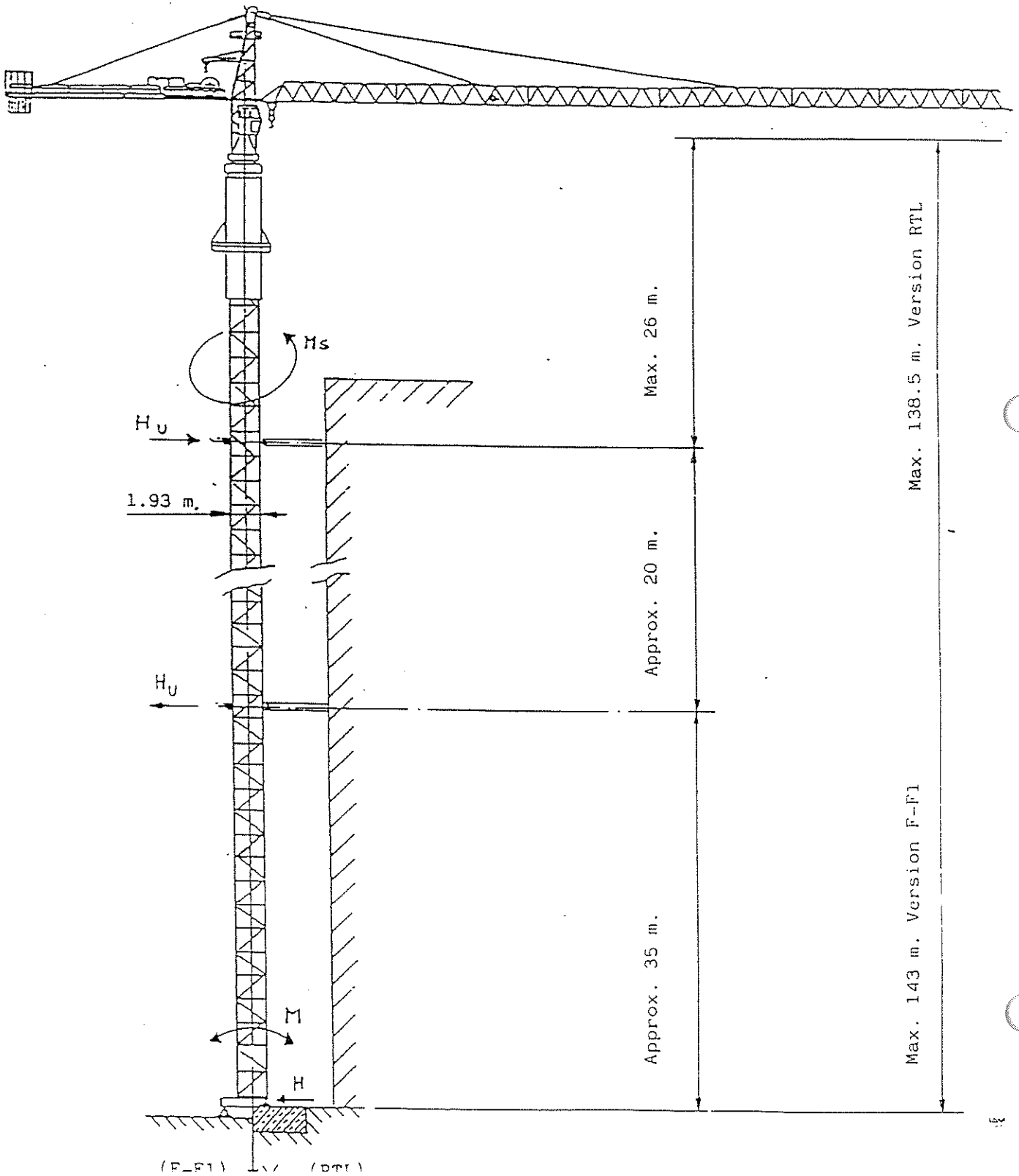


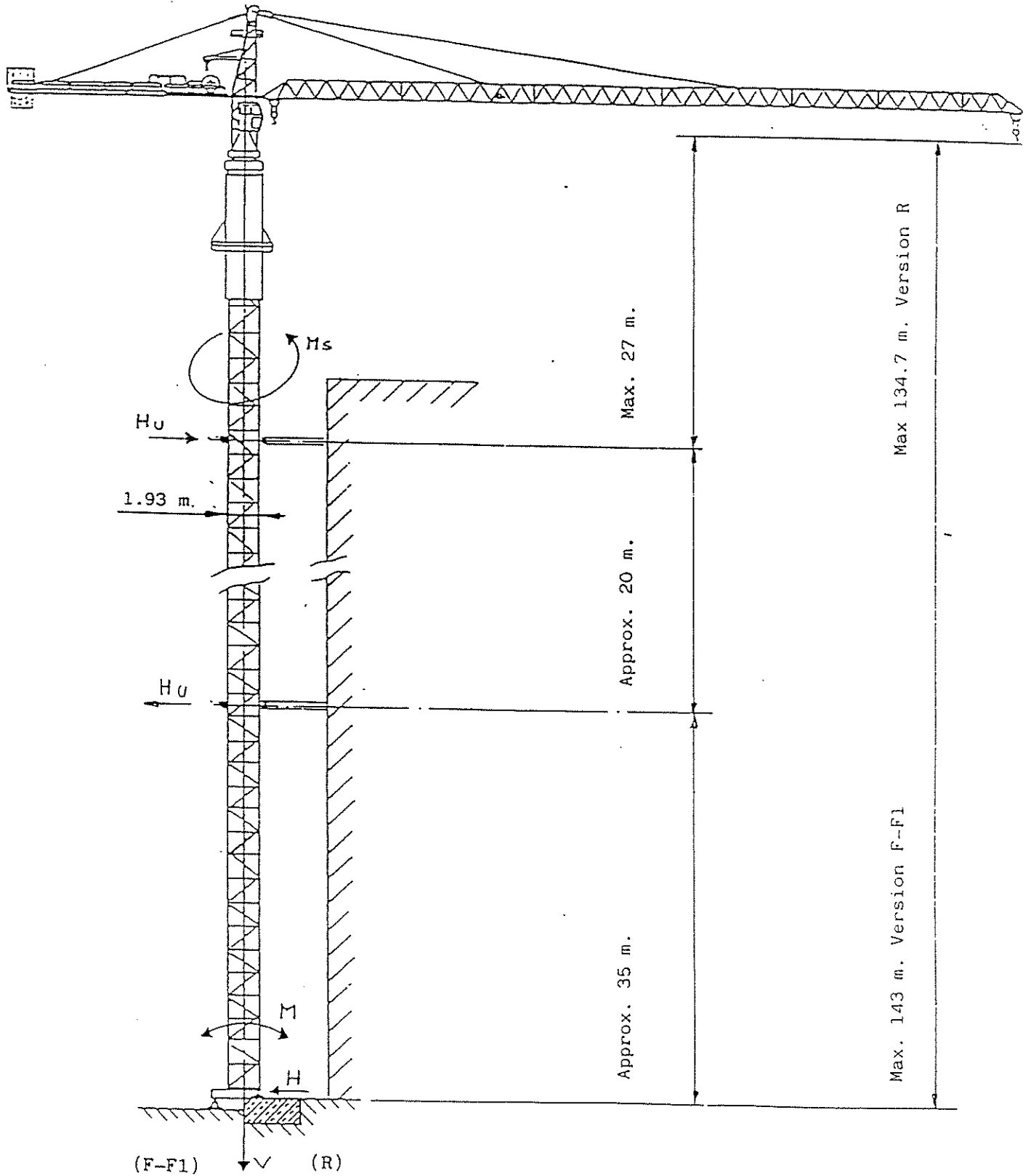


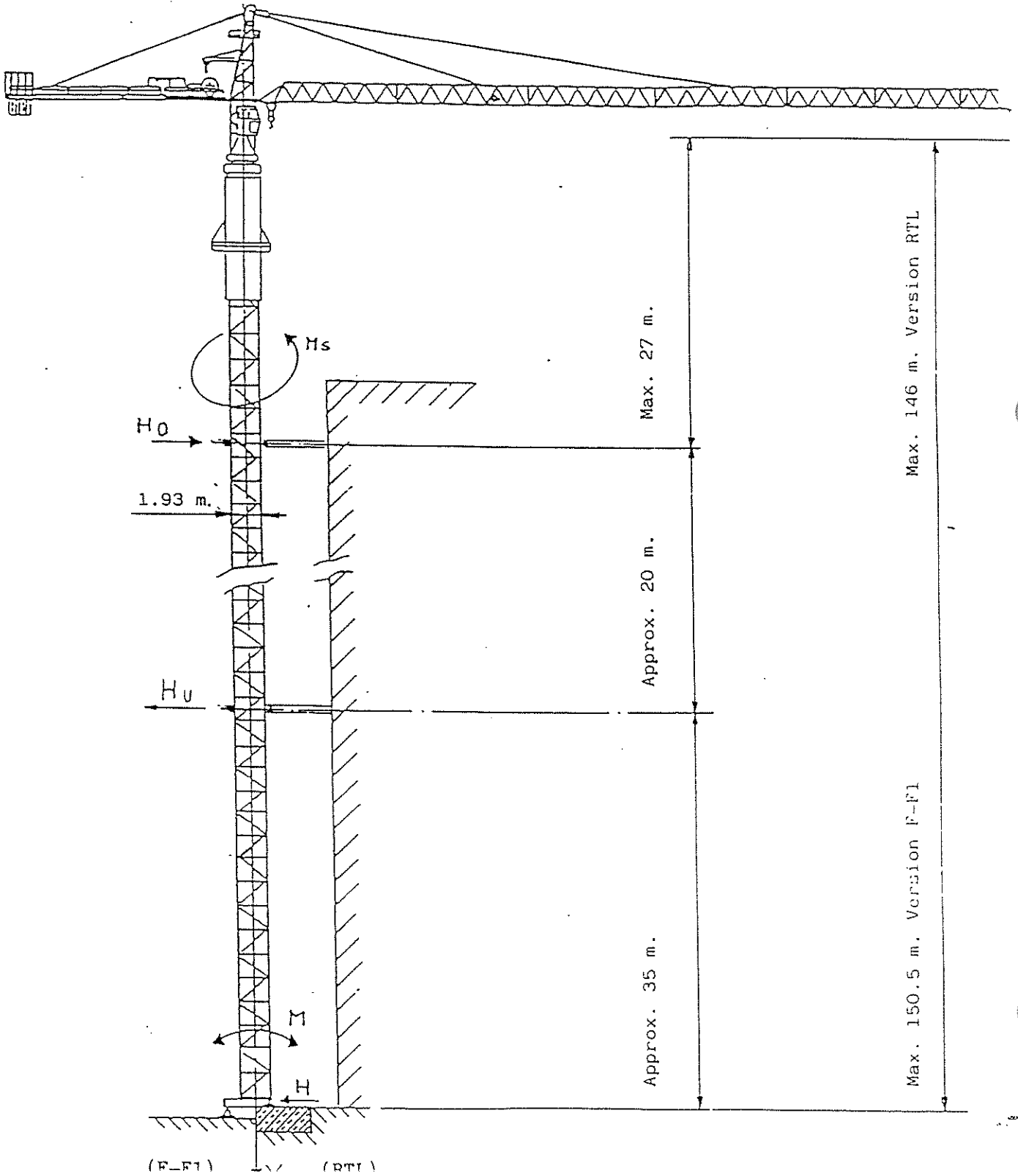


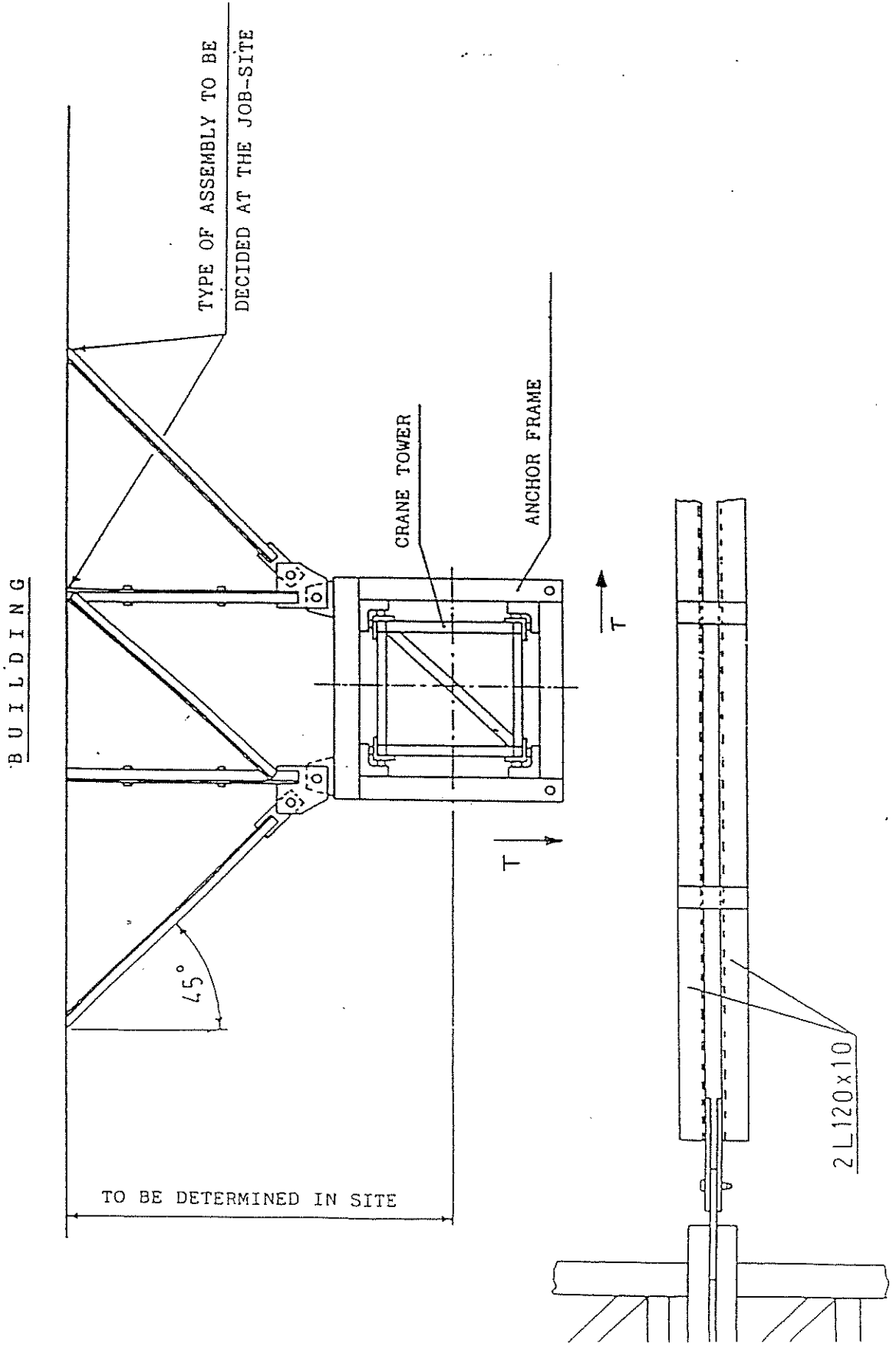


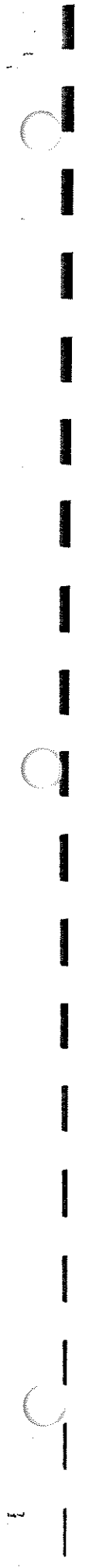












SECTION 7 ASSEMBLY

- CHASSIS ASSEMBLY
- TOWER ASSEMBLY
- TOWER HEAD ASSEMBLY
- COUNTERJIB ASSEMBLY
- JIB ASSEMBLY



CRANE ERECTION AND DISMANTLING INSTRUCTIONS HAVE TO BE GIVEN ONLY TO SKILLED ERECTORS, ONCE ASCERTAINED THEY HAVE ATTENDED A SPECIFIC TRAINING COURSE.

ANYWAY, IT IS ALWAYS SUGGESTED TO CONTACT OUR SERVICE STAFF OR OUR AGENTS TO HAVE SKILLED ERECTORS AVAILABLE.

IN CASE DIFFERENT OPERATORS ARE CONTACTED, WE RECOMMEND YOU TO BE SURE OF THEIR REAL SKILL BEFORE COMMISSIONING THEM THE JOB. AT THIS STAGE, GRUCOMEDIL IS NO MORE RESPONSIBLE FOR ANY EVENTUAL DAMAGE IT MAY OCCUR AS A CONSEQUENCE OF THAT.

AFTER ALL THE JOB SITE OPERATIONS ARE READY, THE CRANE ERECTION CAN START.

THE PERSONNEL IN CHARGE MUST HAVE POSITIONED THE CRANE COMPONENTS ON THE GROUND SO THAT SOME PREASSEMBLING OPERATIONS CAN BE CARRIED OUT, IN ORDER TO MAKE THE ERECTION EASIER AND REDUCE THE NUMBER OF MANOEUVRES FOR WHICH A MOBILE CRANE IS NECESSARY.

FIRST OF ALL IT IS NECESSARY TO HAVE A MOBILE CRANE WHICH CAN LIFT THE ELEMENTS UP TO THOSE HEIGHTS SHOWN IN THE FOLLOWING SCHEME, WHICH CONCERN ERECTION AT THE MINIMUM HEIGHT FOR THE TELESCOPIC CAGE PREARRANGEMENT (PAGE 7.3).

IF SOMEONE WOULD FULLY ASSEMBLE THE CRANE BY A TRUCK CRANE, THIS MUST BE CHOSEN DEPENDING ON THE HEIGHTS THE ELEMENTS MUST BE HOISTED UP TO.

CHASSIS

According to the needs, the crane can be installed as static or travelling version; therefore different solutions for installation are available.

Thanks to the interchangeable chassis elements connected by pins (picture 7.5 and 7.6) an easy and quick passage from static to travelling version and vice versa is allowed.

TOWER

Each section is preassembled on the ground with inside ladders, rest platforms and antitorisional diagonals (pictures 9.2-9.3).

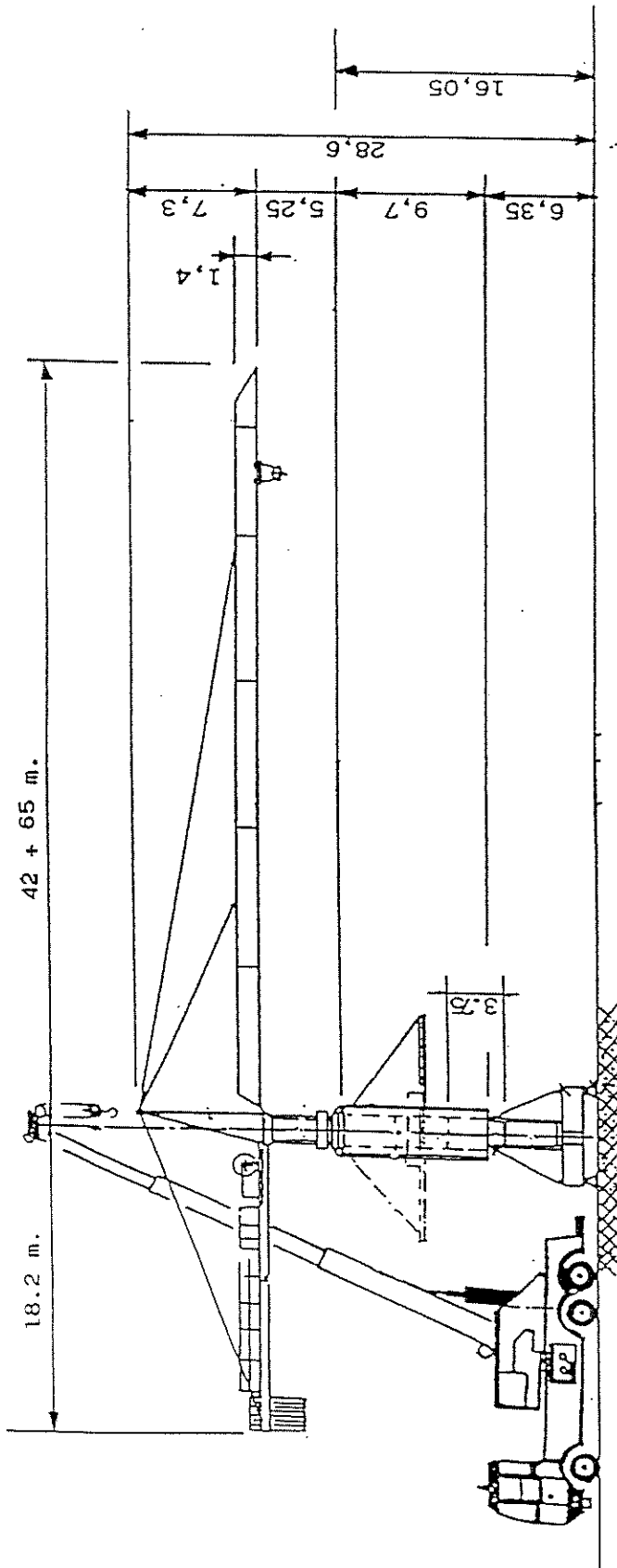
The connection pins must be assembled very carefully; the pin head has to be outside the tower. If not, its conical part might interfere with the rising system, when sticking out of the standard profile (picture 7.10).

Before their assembly, pins must be lubricated with grease and, once inserted, the safety split pin has to be secured.

SLEWING UNIT

The unit is available fully assembled.

Before pin-connecting it to the tower, the cabin and the platforms must be added. The inside ladders are then to be placed and connected with those rising from the tower.



IN CASE THE CRANE IS 'STATIC WITHOUT CHASSIS', 'RTL' VERSION WITH BASE MAST SECTION OF 11,25 M. AND THE TELESCOPIC CAGE ASSEMBLY IS FORESEEN, CALCULATE THE HEIGHT OF THE MOBILE CRANE 2.5 M. HIGHER THAN THE HEIGHT INDICATED IN THIS PICTURE.

TOWER HEAD - TIE BARS CONNECTION

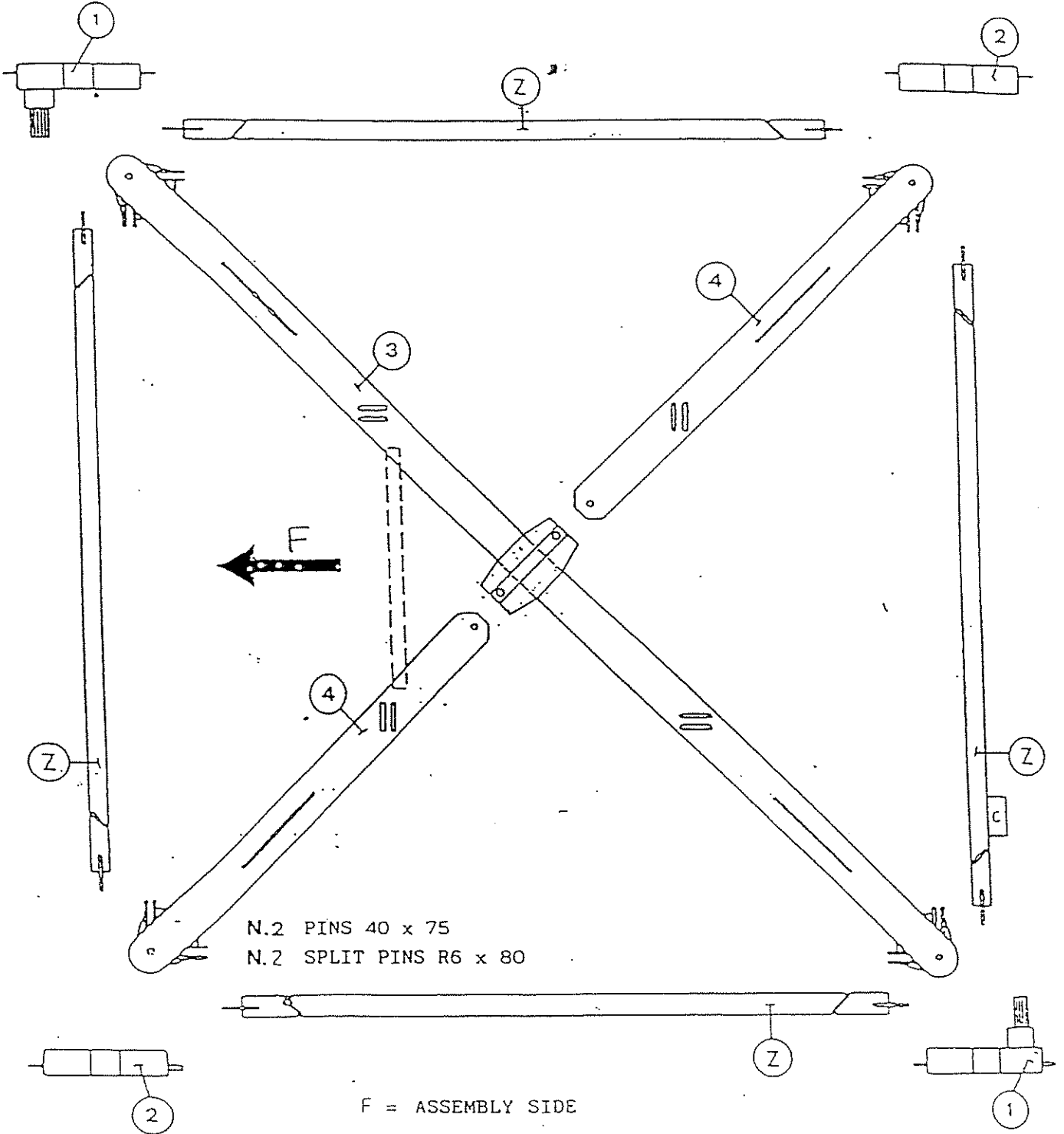
This element, too, has to be completed with the relevant catwalks and ladders before being positioned on the slewing unit. First jib and counterjib tie-bars sections are fixed on the top.

COUNTERJIB

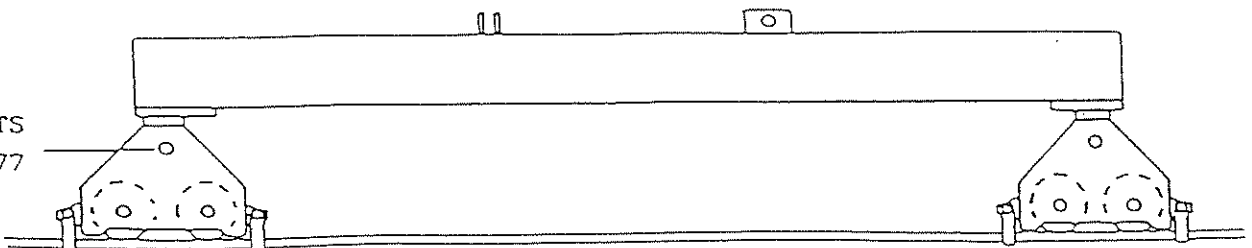
It is available at the job site in two sections. It is equipped with all those devices to be located right there. The inspection platforms and their protections can be assembled on the ground. A proper equipment strong enough to lift it up to the pin-connection position on the slewing unit is requested.

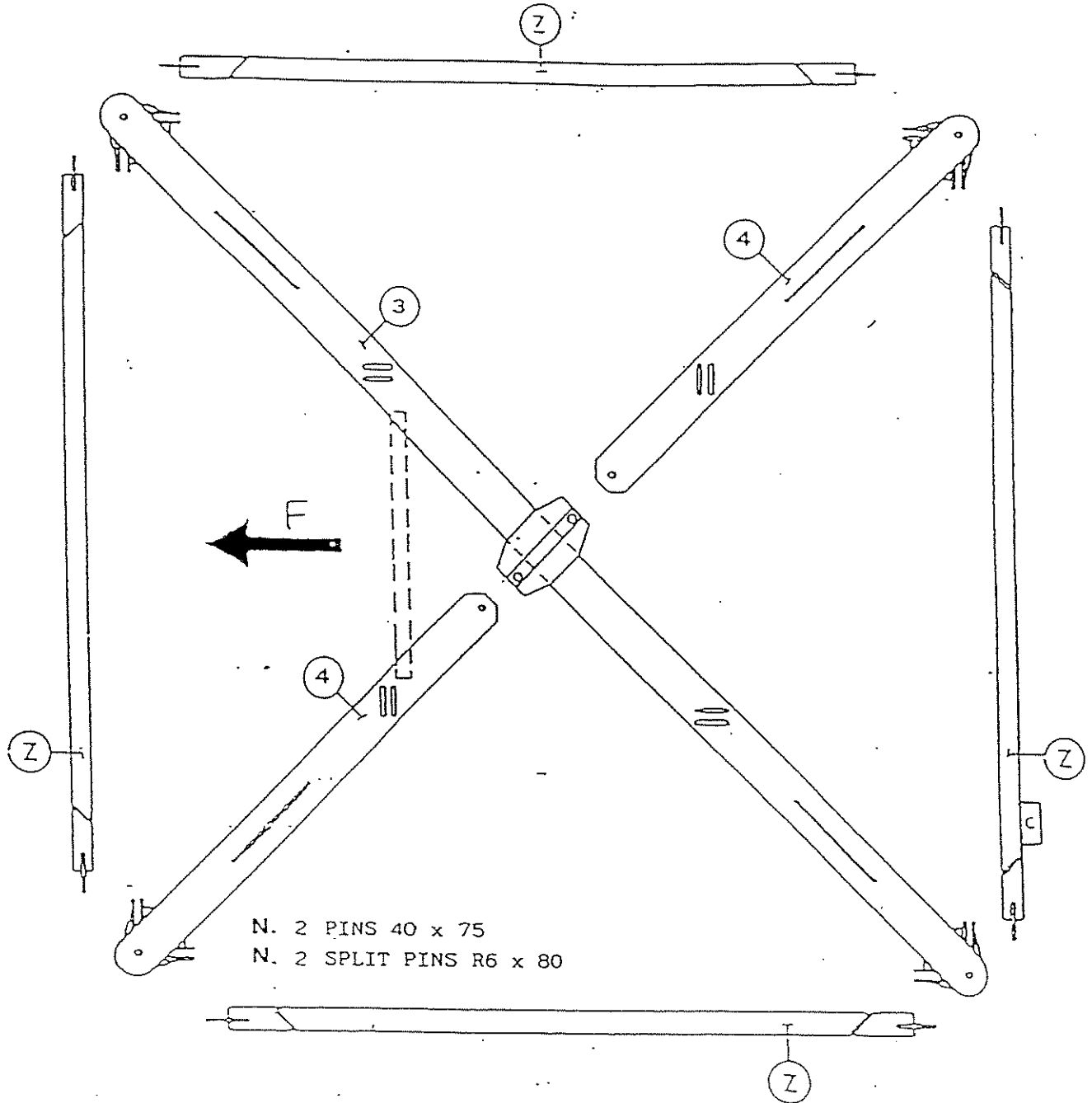
Note:

To assure the crane stability during the jib assembly, one ballast blocks must be positioned in the rear part of the proper housing (picture 8.1).



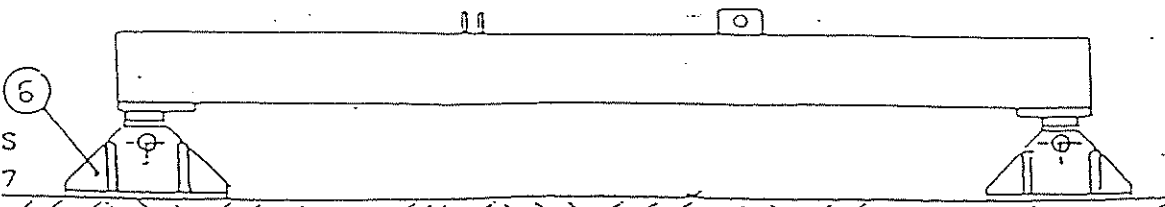
PIN TS
95x277





F = ASSEMBLY SIDE

PIN TS
95x277




As previously indicated, the tower is composed of modular sections 3.75 m. long.


A special 11.25 m. long section is used for heights of 53.8 and 66.3 m. (crane with chassis) and 54.2 and 61.7 m. (static on plinth version).


It is possible to prepare a scheme of the tower for the requested height, with mast sections in the right sequence - from the bottom to the top - according to the requested thicknesses on the masts (See tables from page 5.2 to 5.10).


To this purpose on each mast section there is an identification ladder indicating the following:

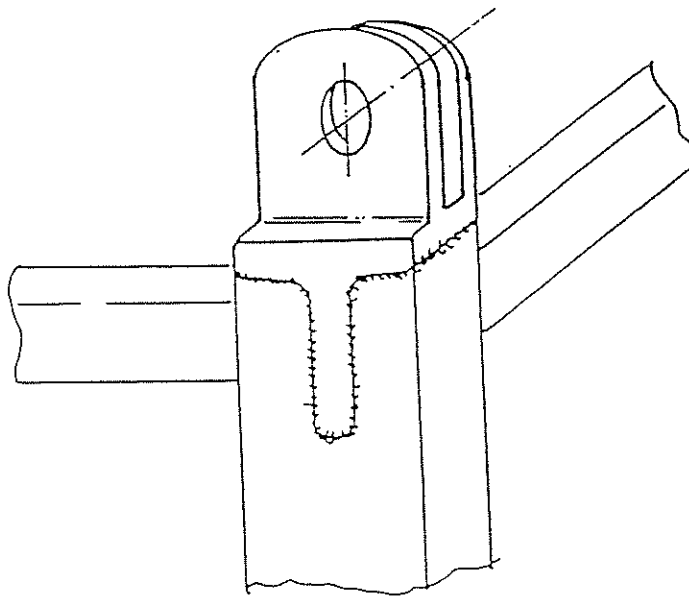
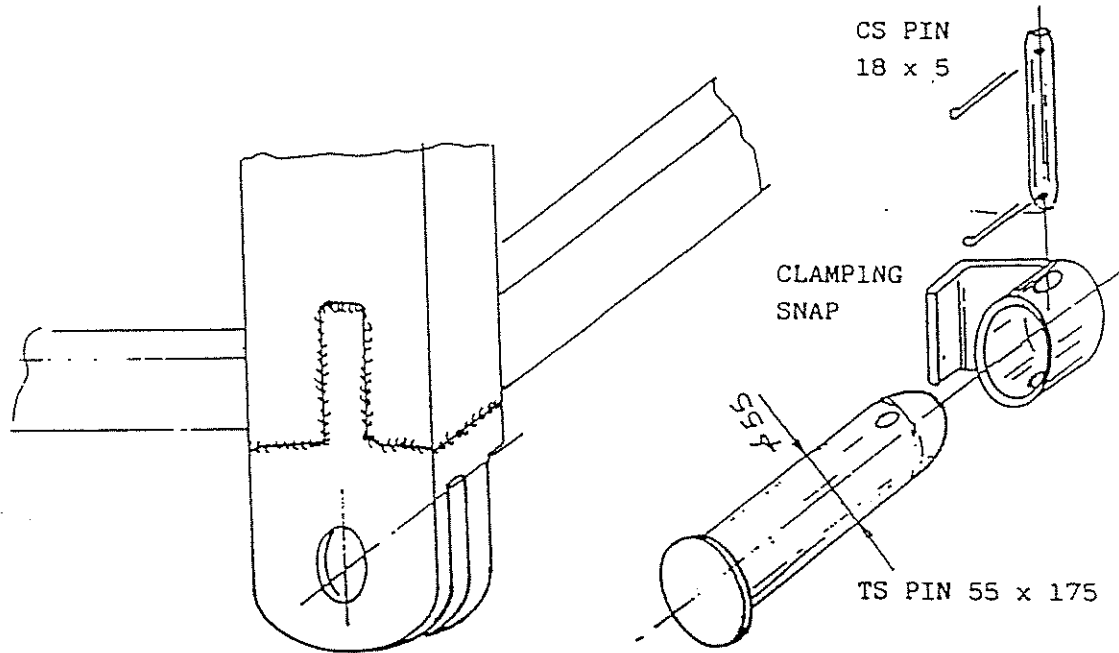
- "mast section type A" for 120 x 15 profiles
- "mast section type B" for 120 x 15 profiles
- "mast section type C" for 120 x 18 profiles

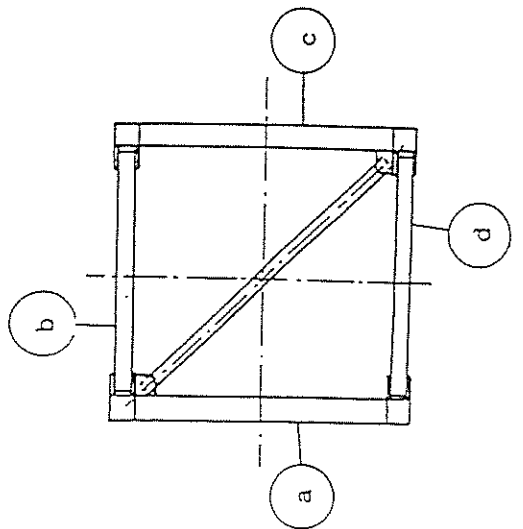
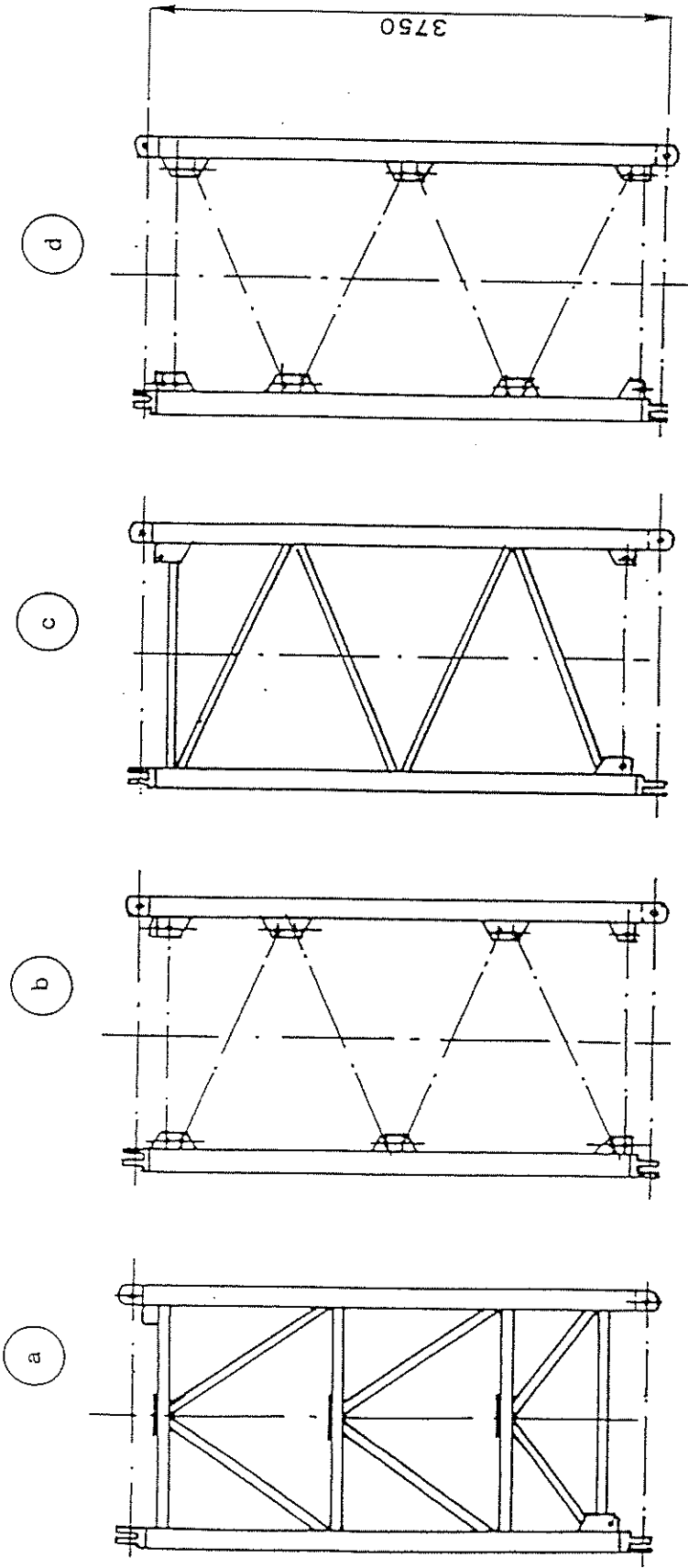
 GRUCOMEDIL
CT 651 S 20U - S20TL
MAST SECTION TYPE "D" 120x18

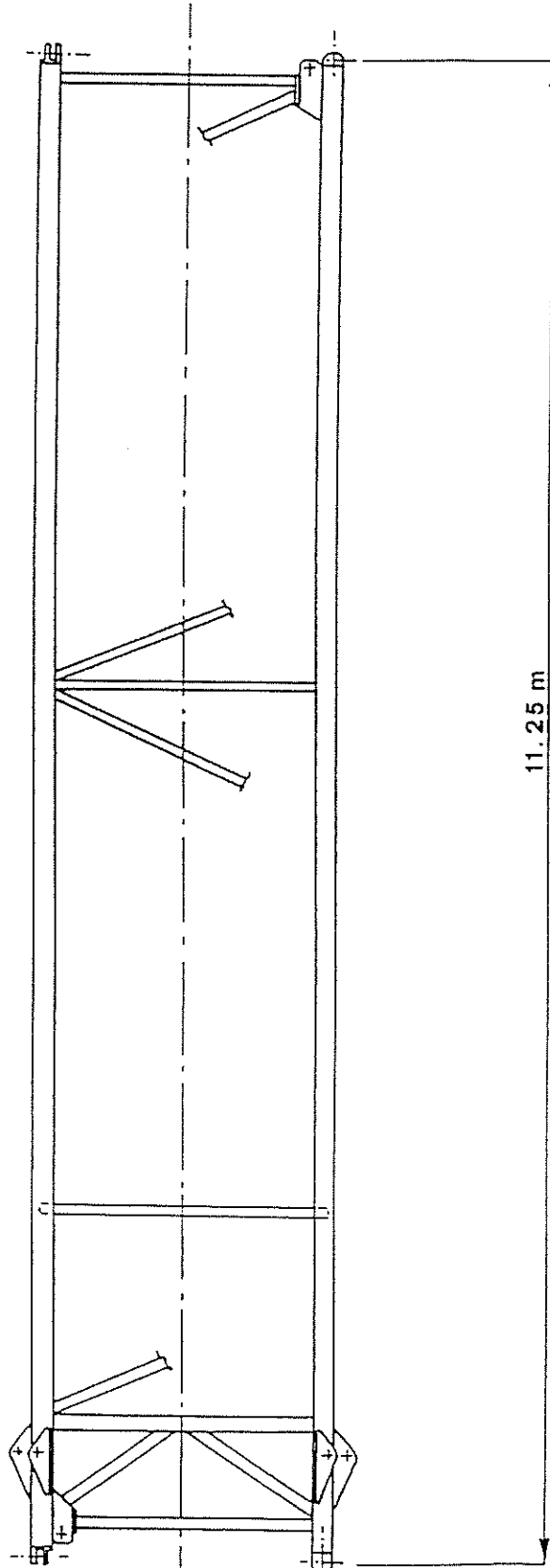
 GRUCOMEDIL
CT 651 S 20 P-G
MAST SECTION TYPE "C" 120x15

 GRUCOMEDIL
CT 651 S 20U P-G
MAST SECTION TYPE "E" 120x18

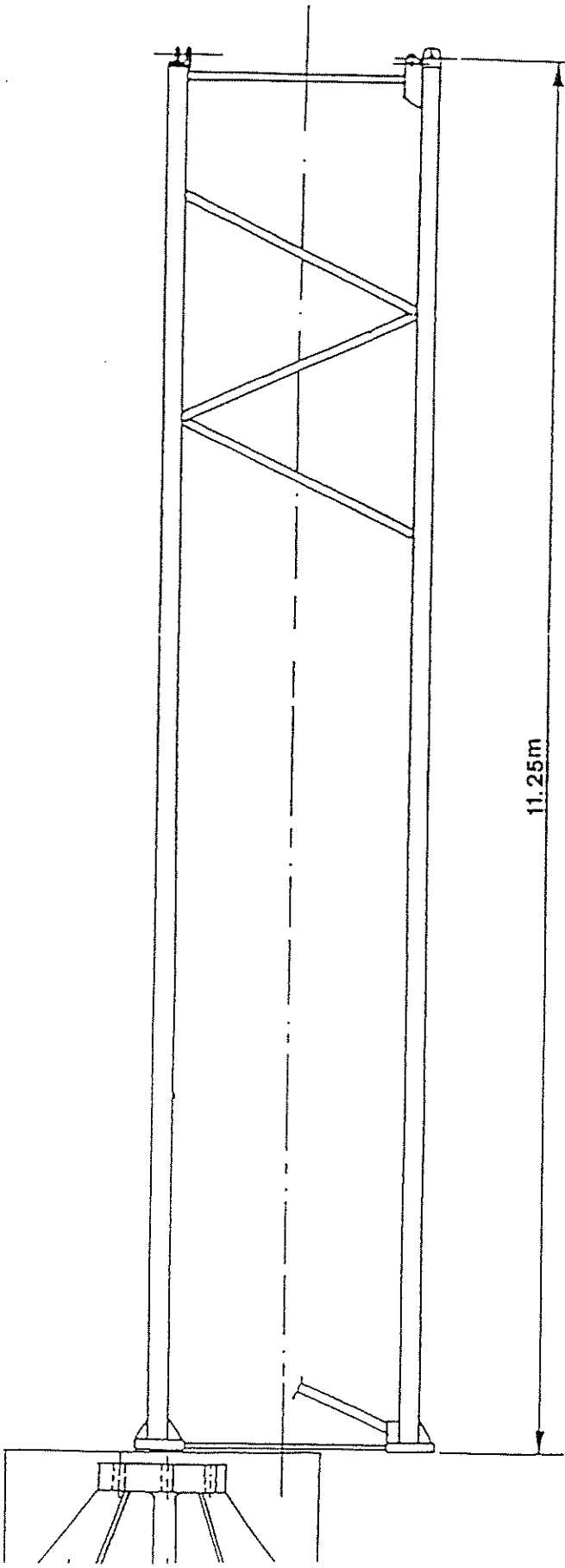
 GRUCOMEDIL
CT 651 S 20 P-G
MAST SECTION TYPE "D" 120x18



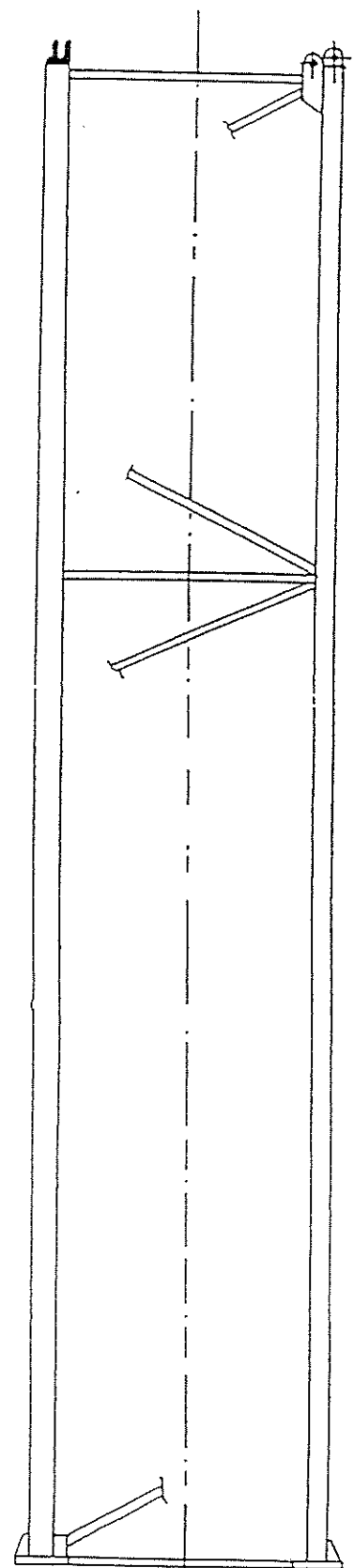




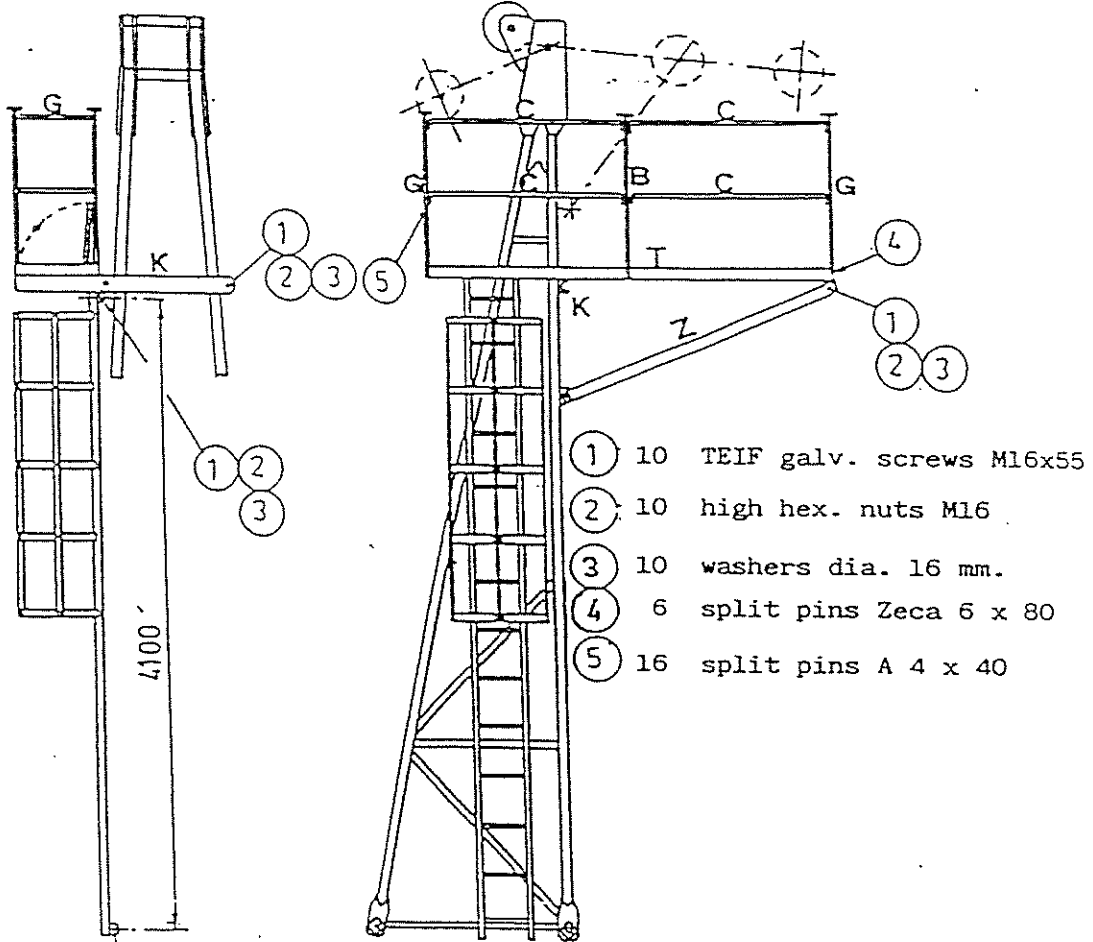
"6TL" VERSION - STRUTS ATTACHMENT SECTION



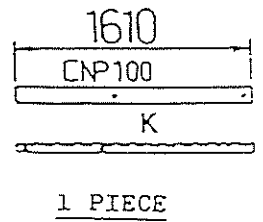
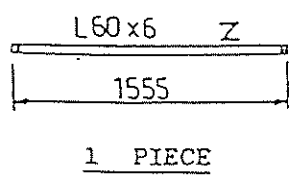
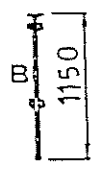
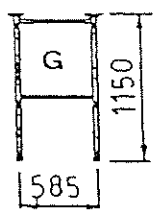
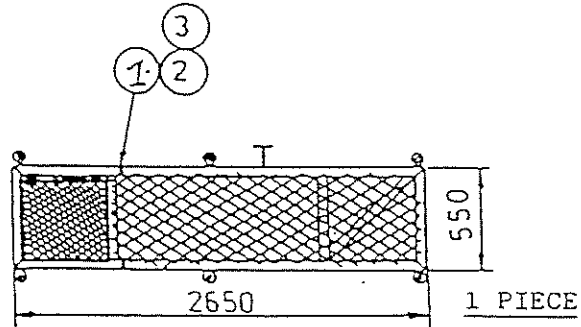
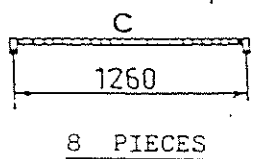
11.25m

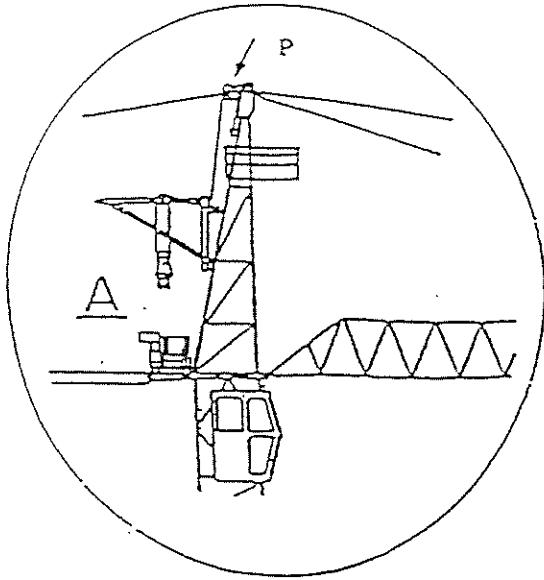


'RTL' VERSION - BASE MAST SECTION

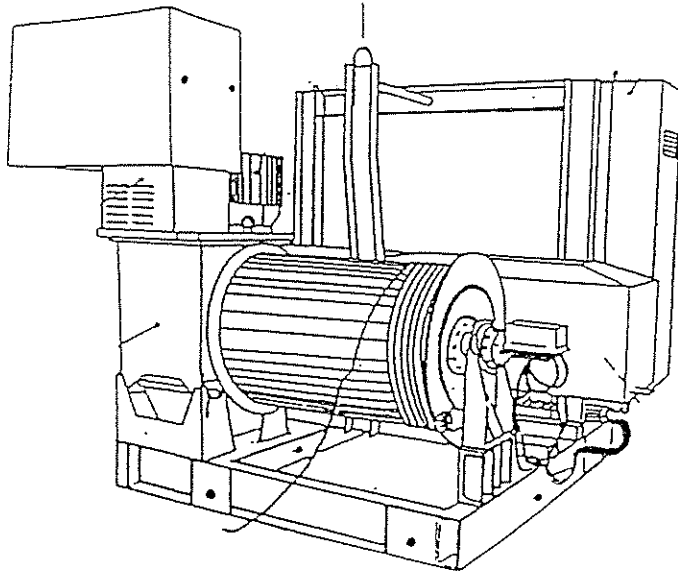
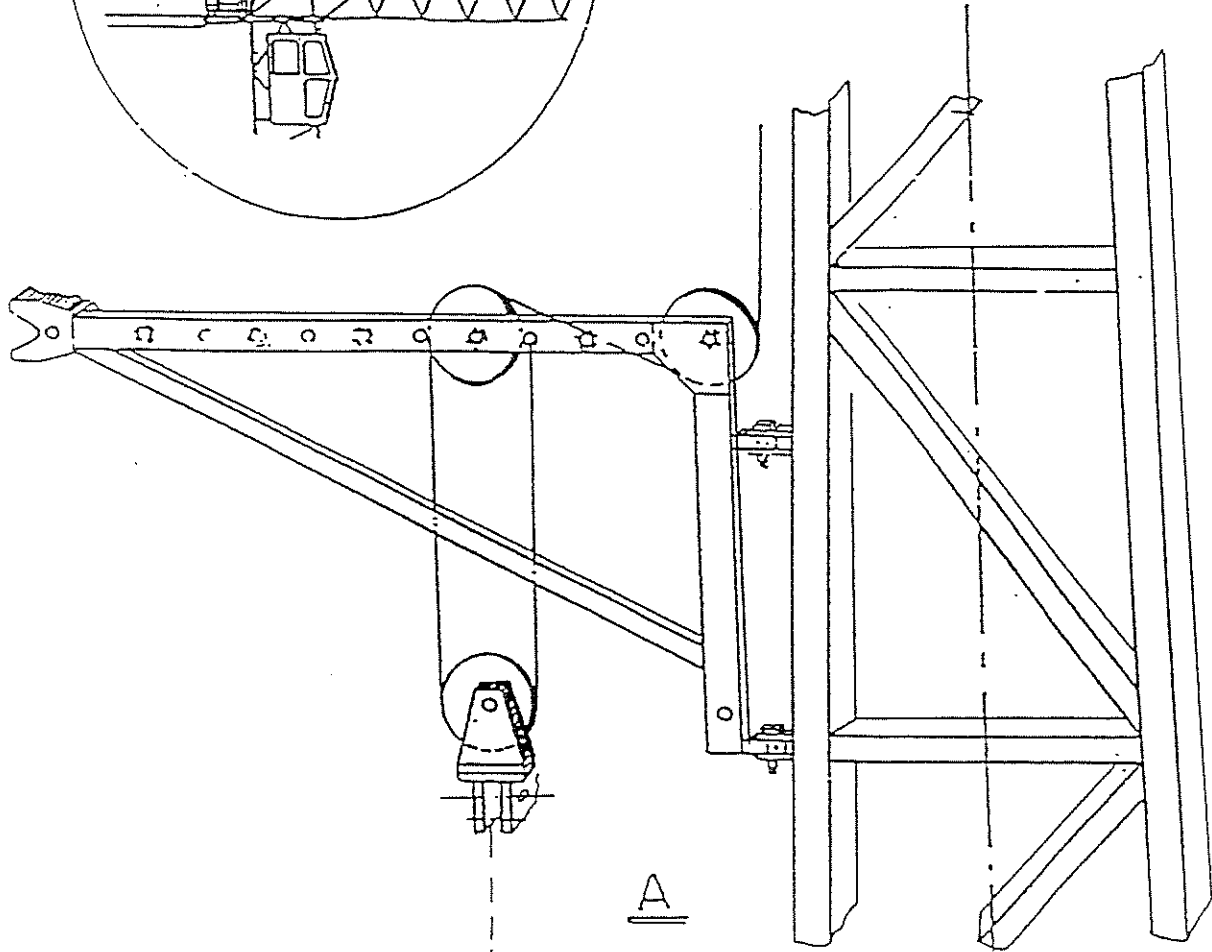


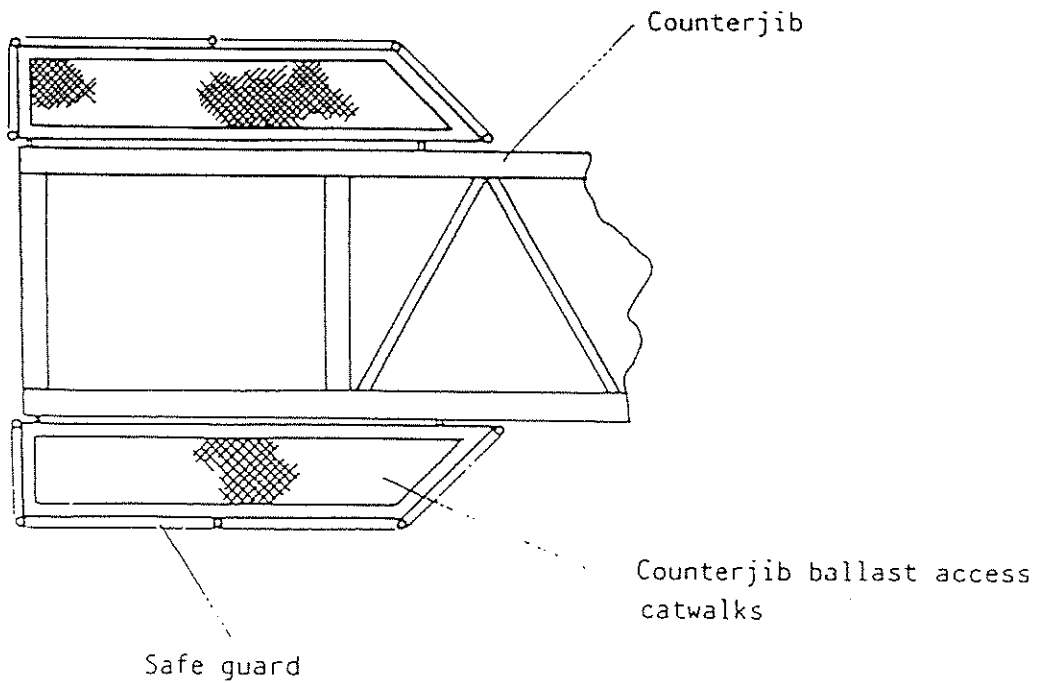
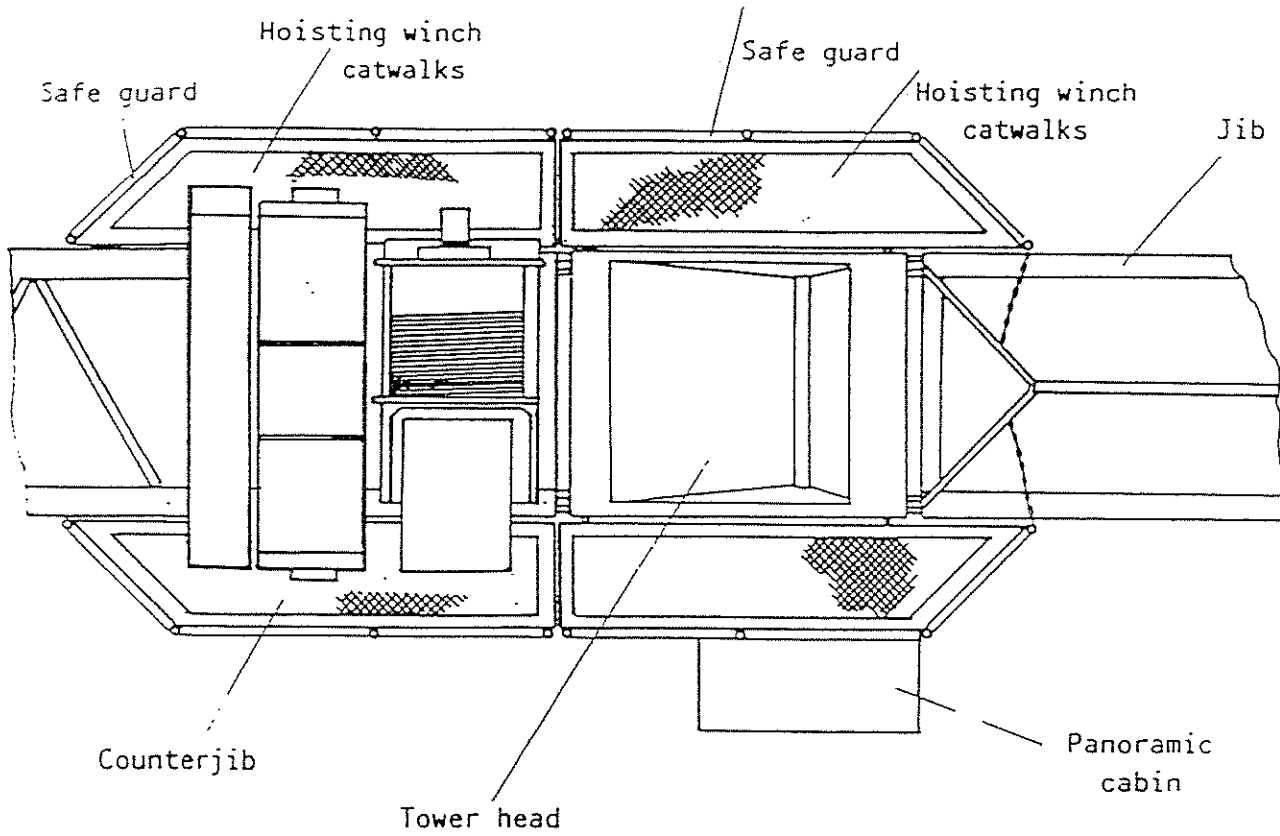
- ① 10 TEIF galv. screws M16x55
- ② 10 high hex. nuts M16
- ③ 10 washers dia. 16 mm.
- ④ 6 split pins Zeca 6 x 80
- ⑤ 16 split pins A 4 x 40

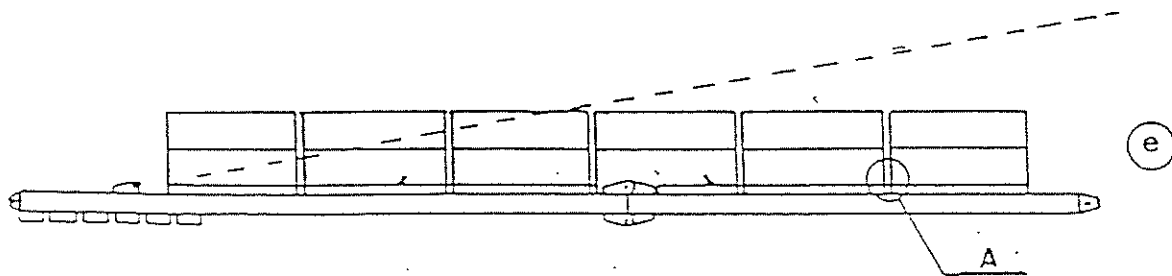
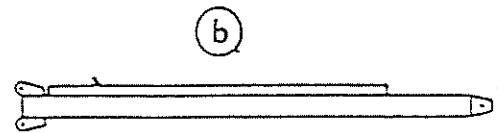
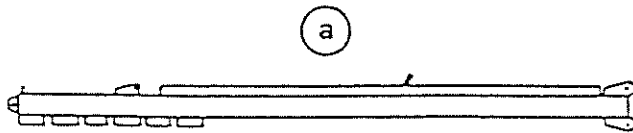
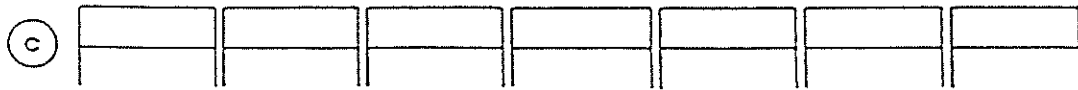
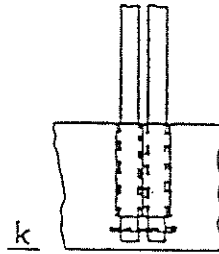




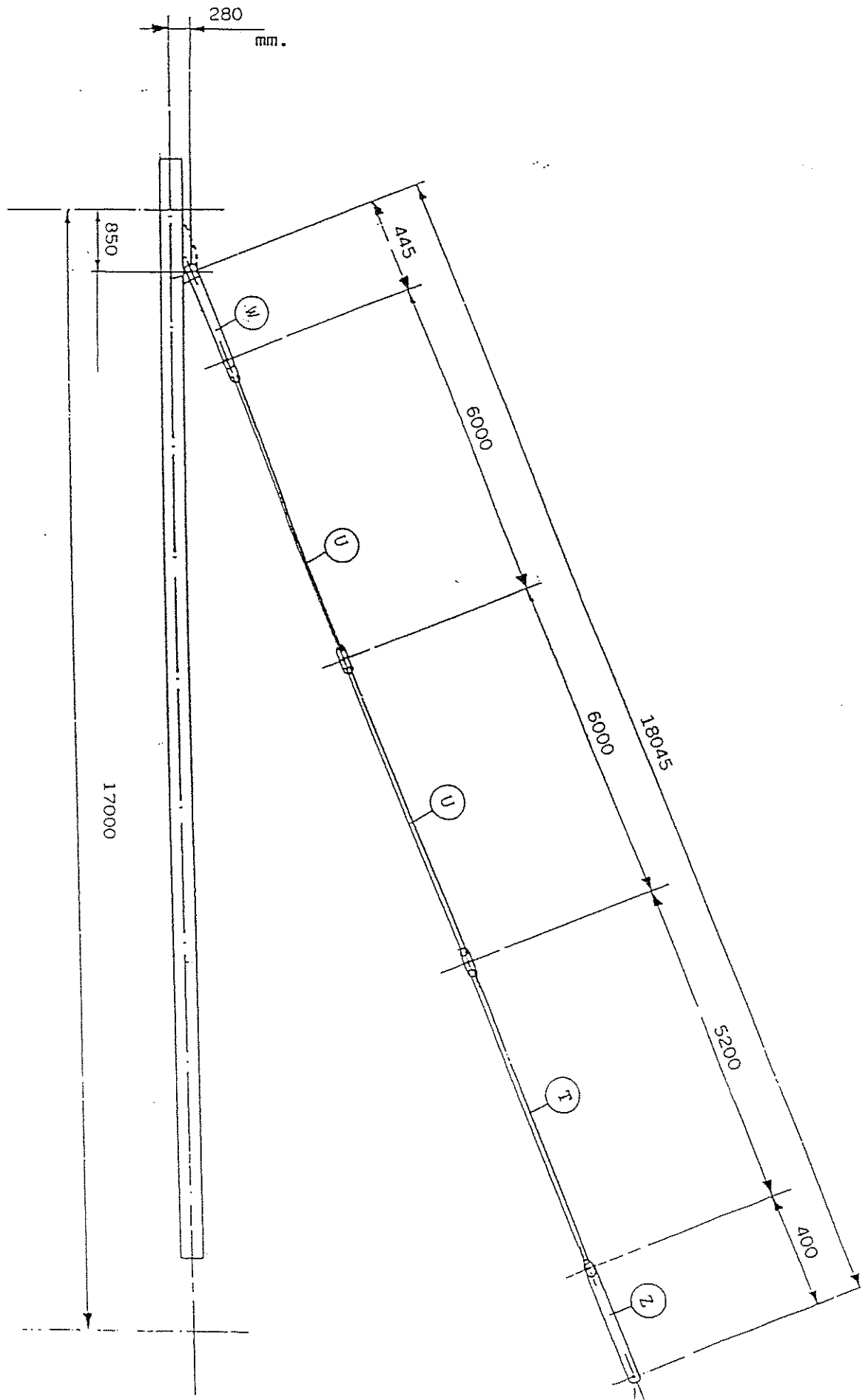
P = PULLEY TO BE ASSEMBLED
TO USE THE DERRICK
(SPECIAL)







- (a) 2nd counterjib section
- (b) 1st counterjib section
- (c) counterjib guards
- (e) counterjib assembly
- (k) scheme of guards fixing



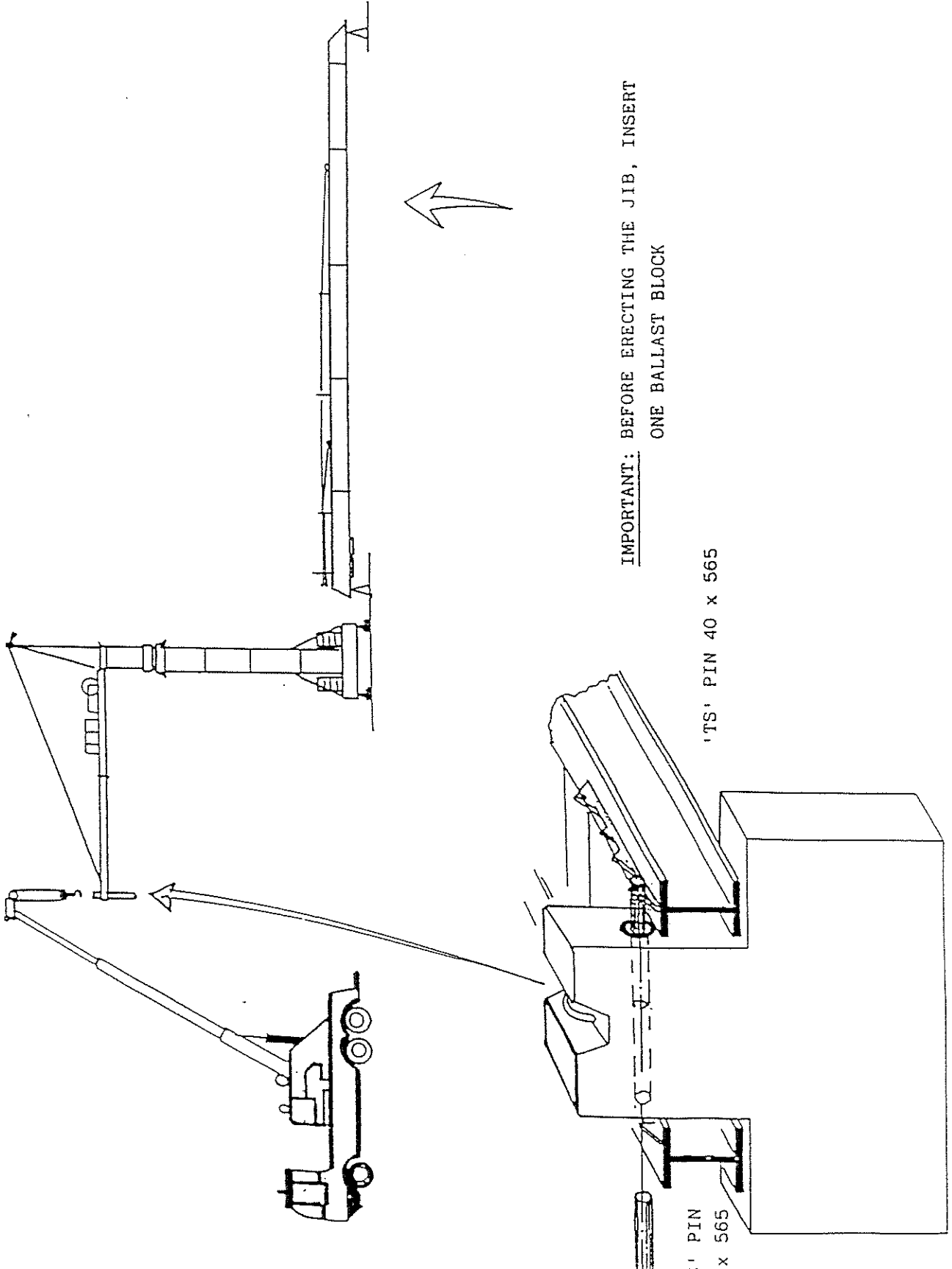
SECTION

8

JIB ERECTION

- ERECTION BY MOBILE CRANE

- ERECTION USING DIFFERENT MEANS



IMPORTANT: BEFORE ERECTING THE JIB, INSERT
ONE BALLAST BLOCK

'TS' PIN 40 x 565

PIN
x 565

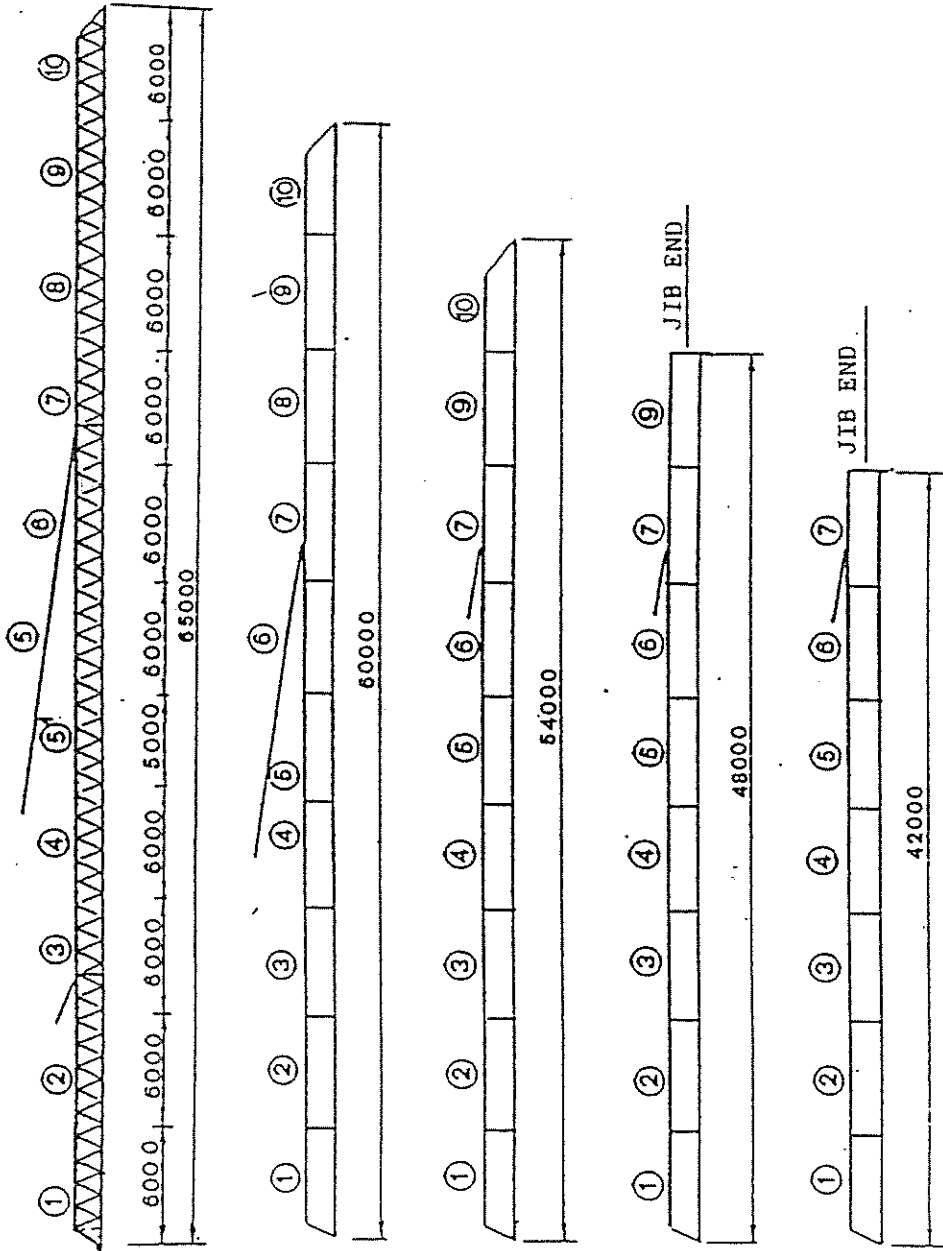
The jib is composed of 11 sections to reach a maximum length of 65 m.

These sections are numbered to avoid any possible mistake during assembling phases and to be easily identified in case some sections should have to be removed to get reduced jib versions. The right composition for the various possible lengths is shown at page 8.3.

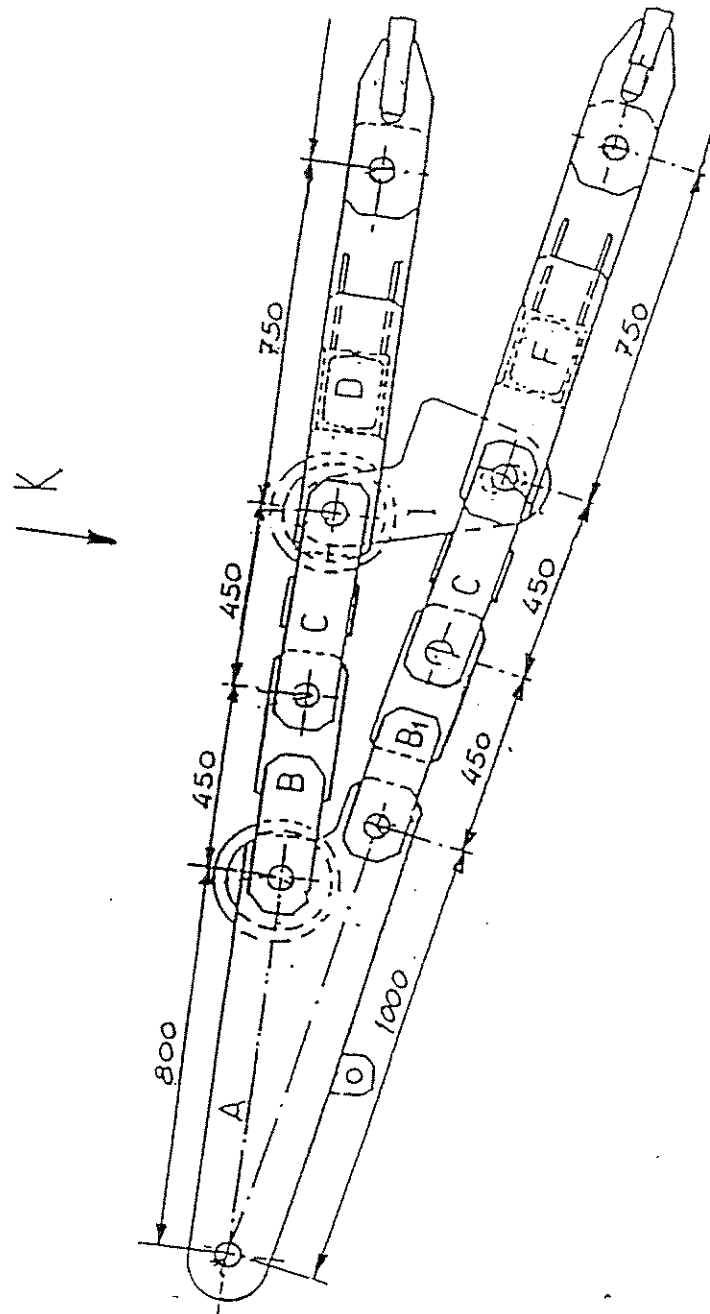
Before the erection phase starts the jib is assembled on the ground and equipped with the trolley control winch and the relevant ropes (Page 8.15).

The jib erection can be carried out according to the following two solutions:

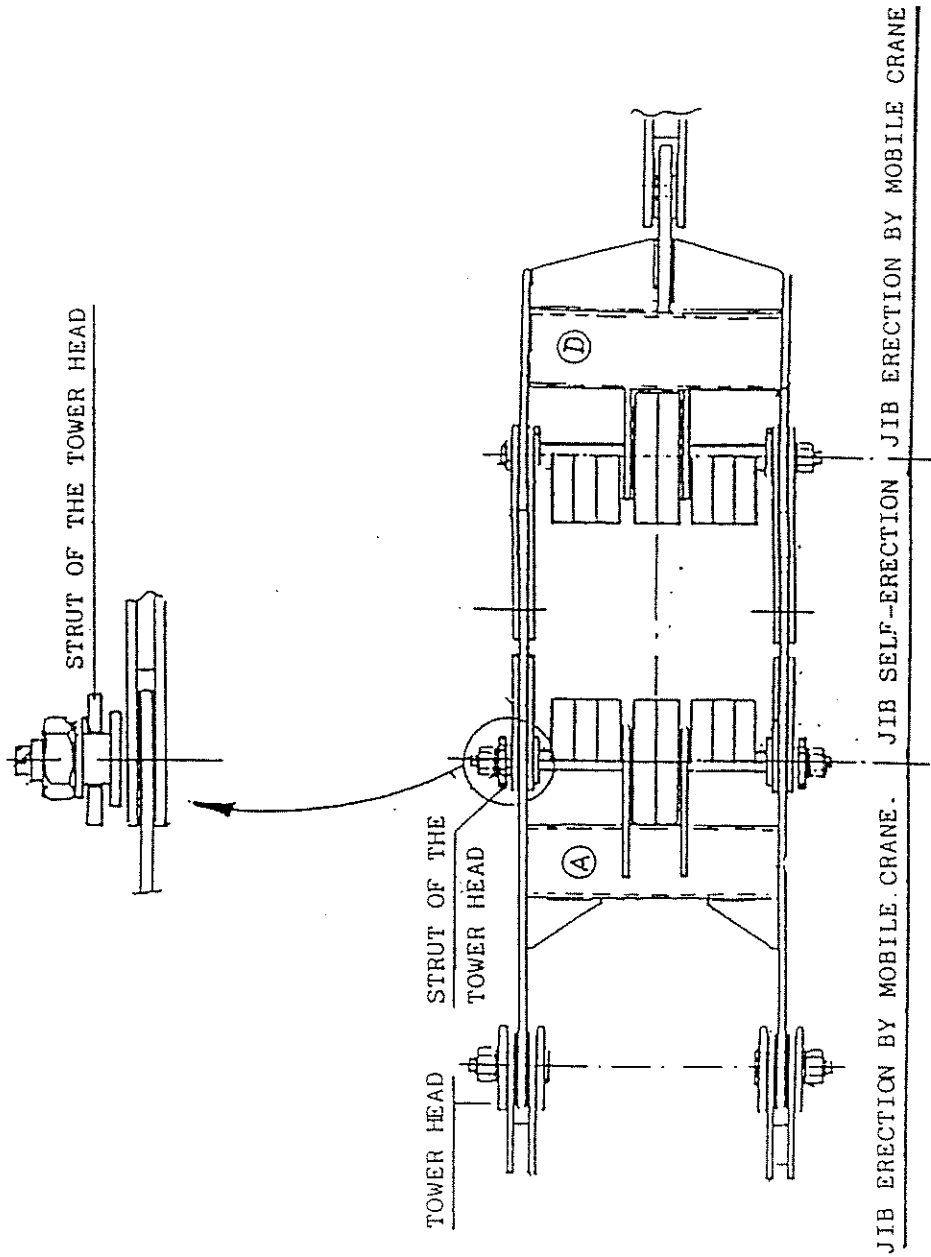
- Jib erection by mobile crane (page 8.10);
- Jib erection by crane's own winch (Page 8.12).

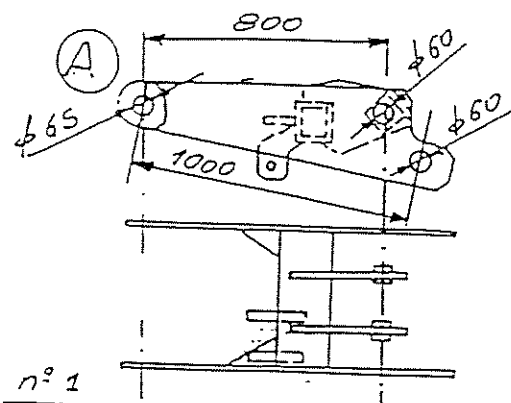


DETAIL "A" (SEE PAGE 8.4 , 8.5)

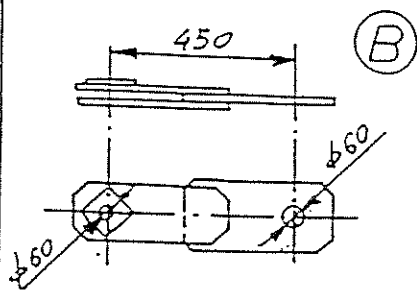


VIEW "K" (SEE PAGE 8.6)

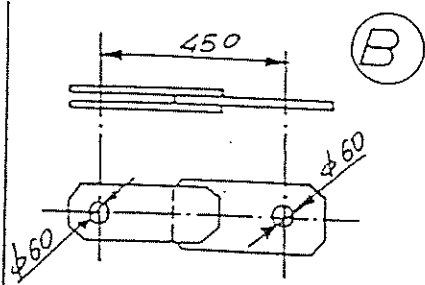




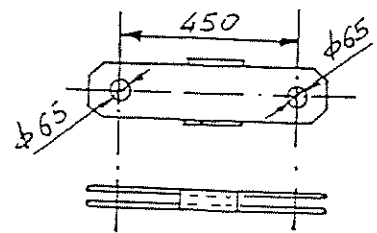
n° 1



n° 2

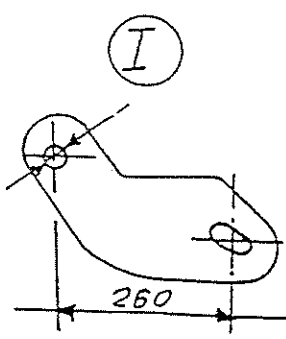


n° 2



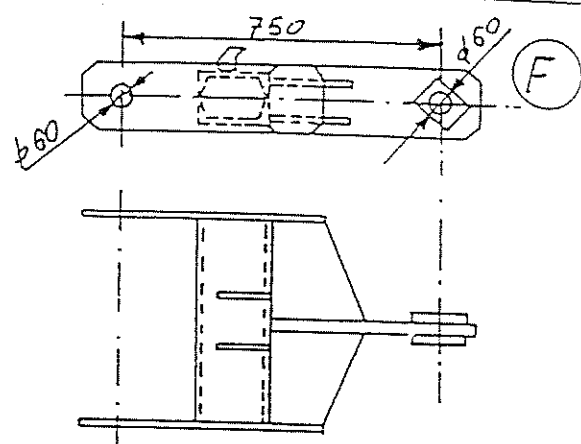
(C)

n° 4



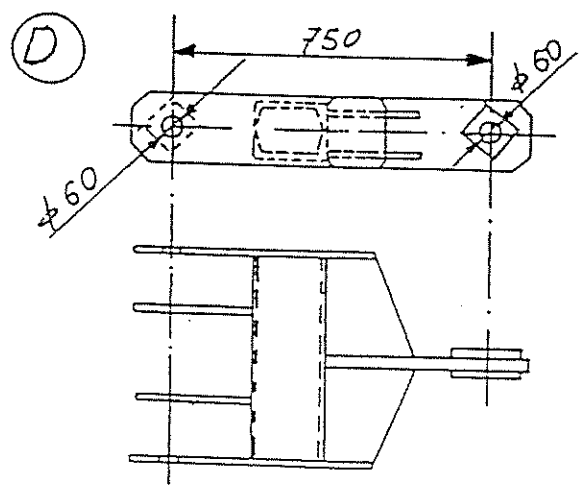
(I)

n° 2



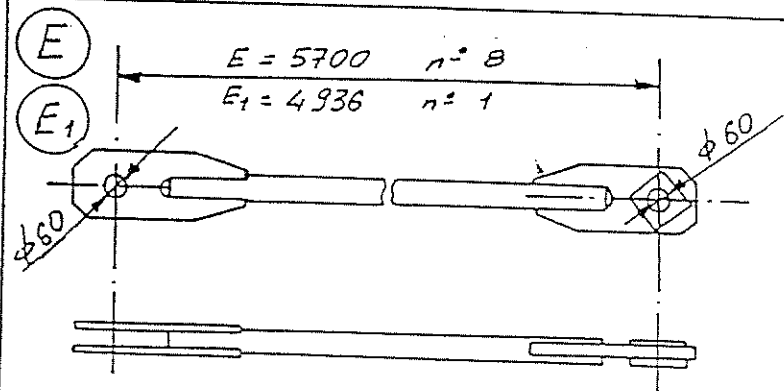
(F)

n° 1



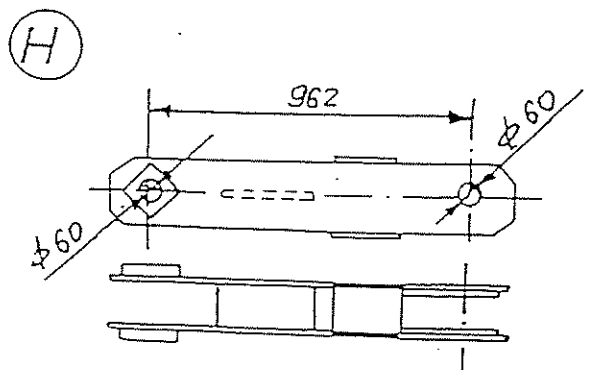
(D)

n° 1



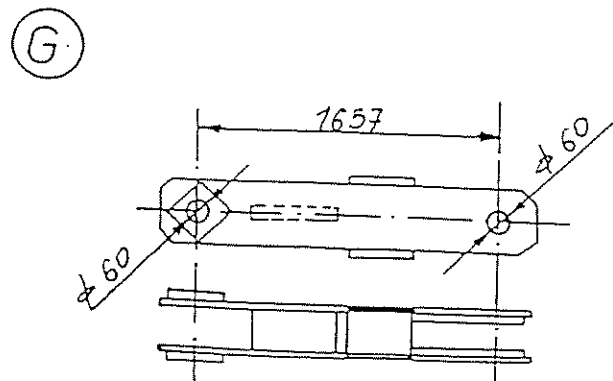
(E)

(E₁)



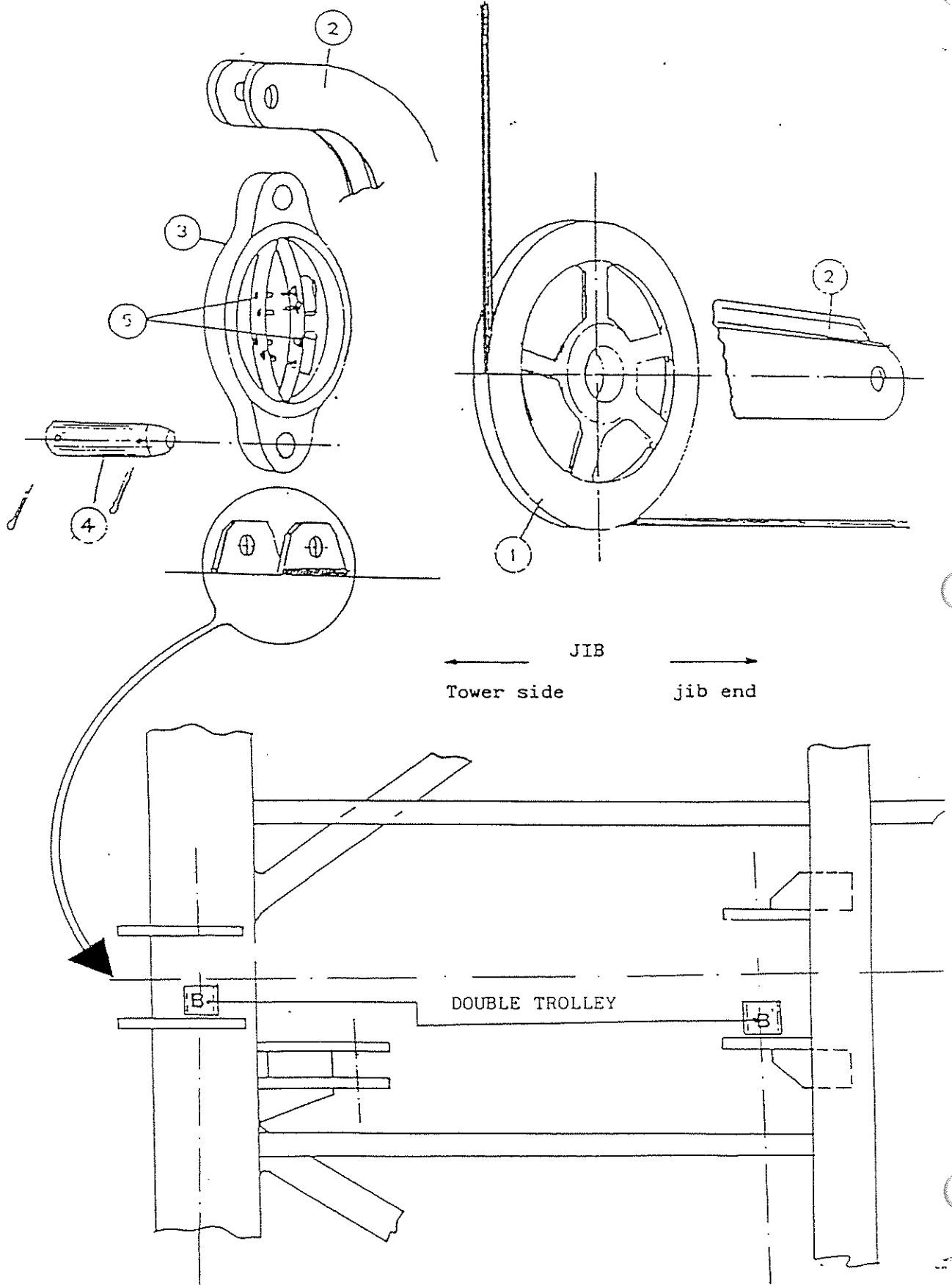
(H)

n° 1



(G)

n° 1



B - B' SPACER FOR DOUBLE TROLLEY

After having lined up on the ground and pin-connected all the jib sections (Page 8.3) put in place "T" tackle so to allow joining of "F" tie bar with "W" attachment on first jib section as well as joining between "D" and "E1" tie-bars. (See detail 2 at page 8.10.1).

Hoist the jib with the mobile crane while checking its correct balancing, then pin-connect position b1 with position b2. (Page 8.11.1).

Now make the hoisting rope slide onto the two pulleys coupled in pairs thus allowing jointing between "R" and "T" tackles (See page 8.11).

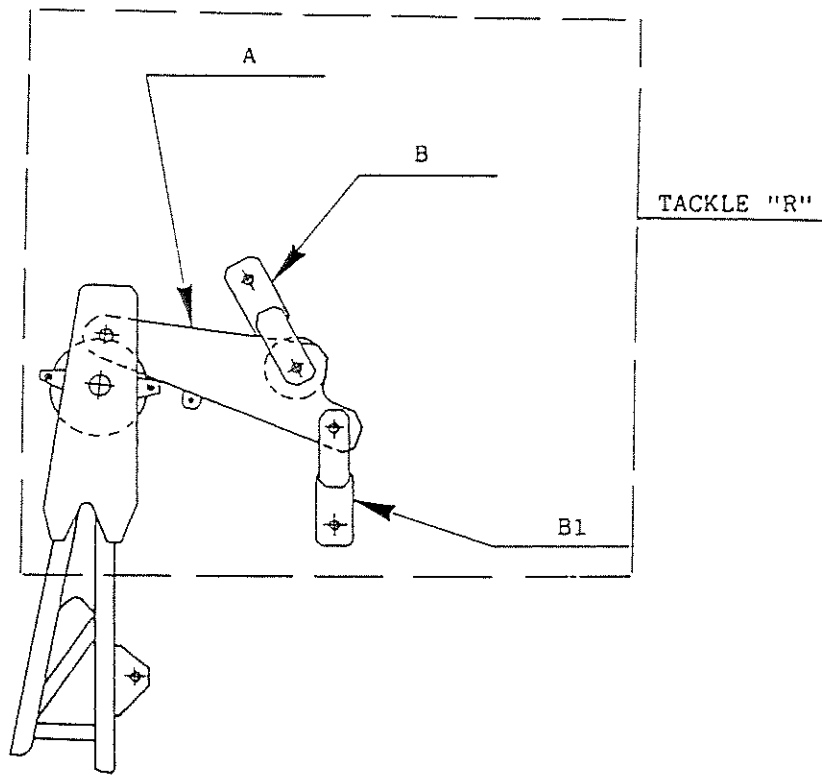
Put in tension the rope, then remove the pin from "W" attachment and pin-connect "F" tie bar to "E" one.

Remove the pin of tie-bars supports, which are along the upper spar, so that they are free to move. (Page 8.11.1). At this point recover the hoisting rope and with the help of the mobile crane make "T" and "R" tackles lock together by respective pins (that is, flat bars "C" of tackle "T" must be pin-connected in turn with flat bars "B" and "B1" of tackle "R").

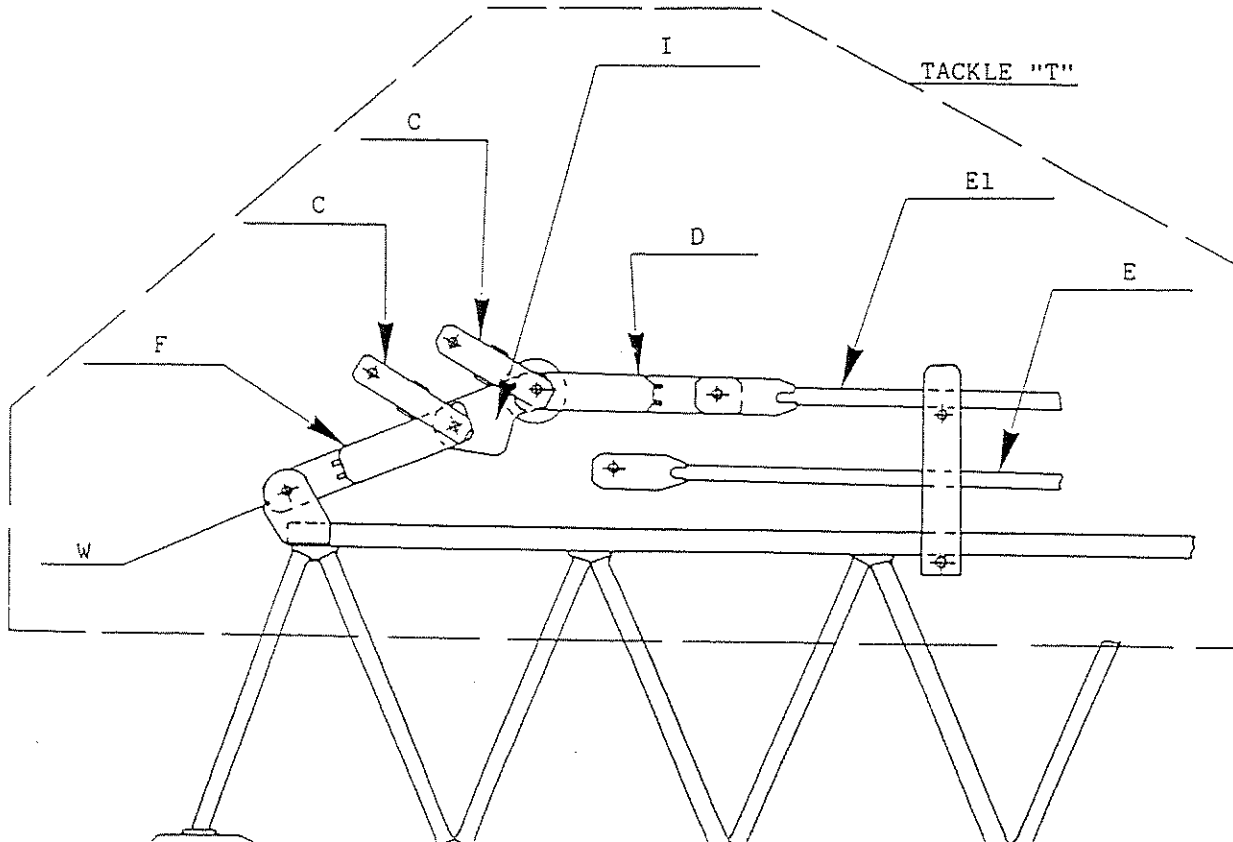
Extract the rope from both "T" and "R" tackles and wind it ready for hoisting (See page 8.16).

Complete positioning of the ballast blocks on counterjib according to crane version (Page 6.12).

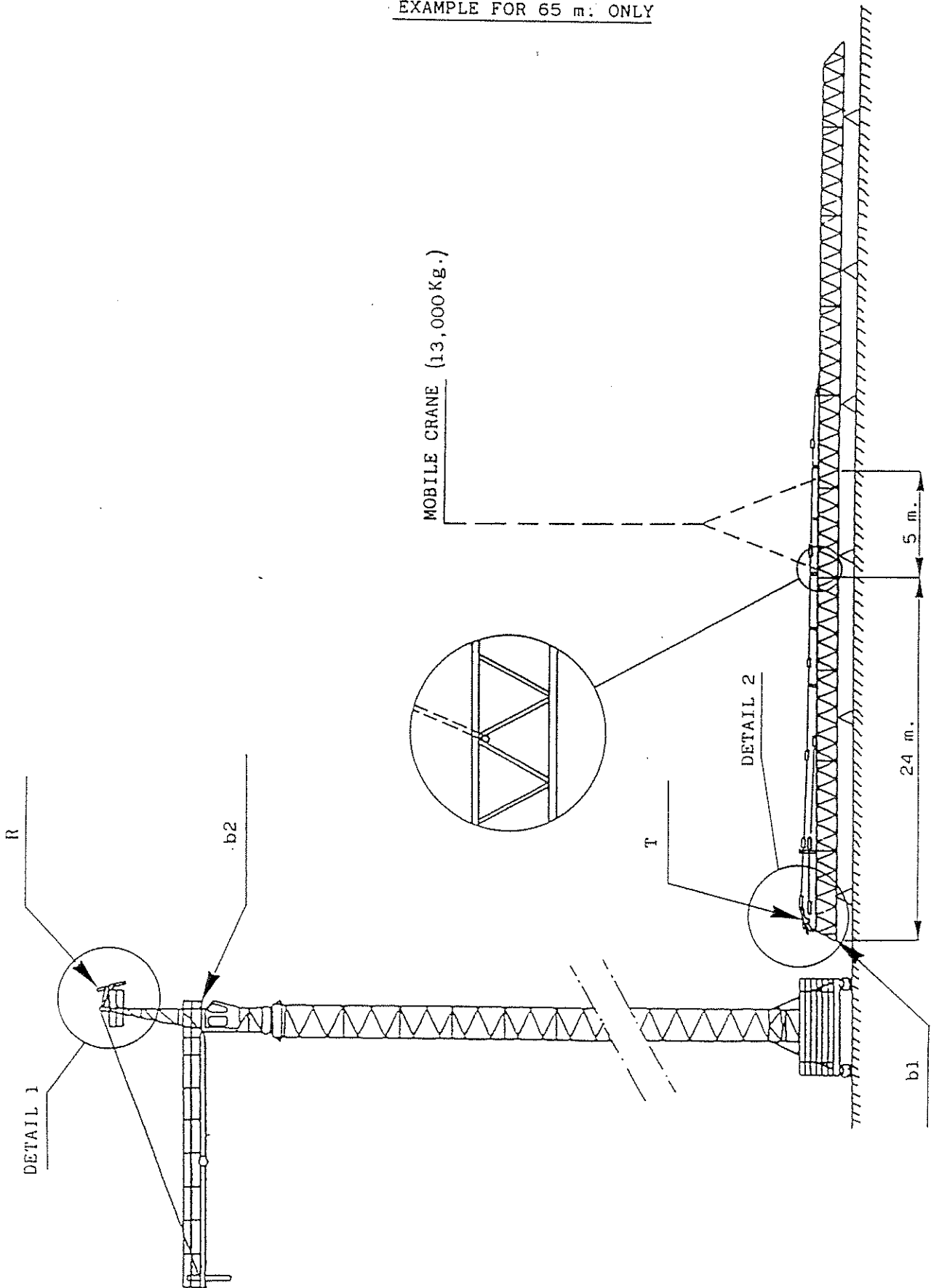
DETAIL 1

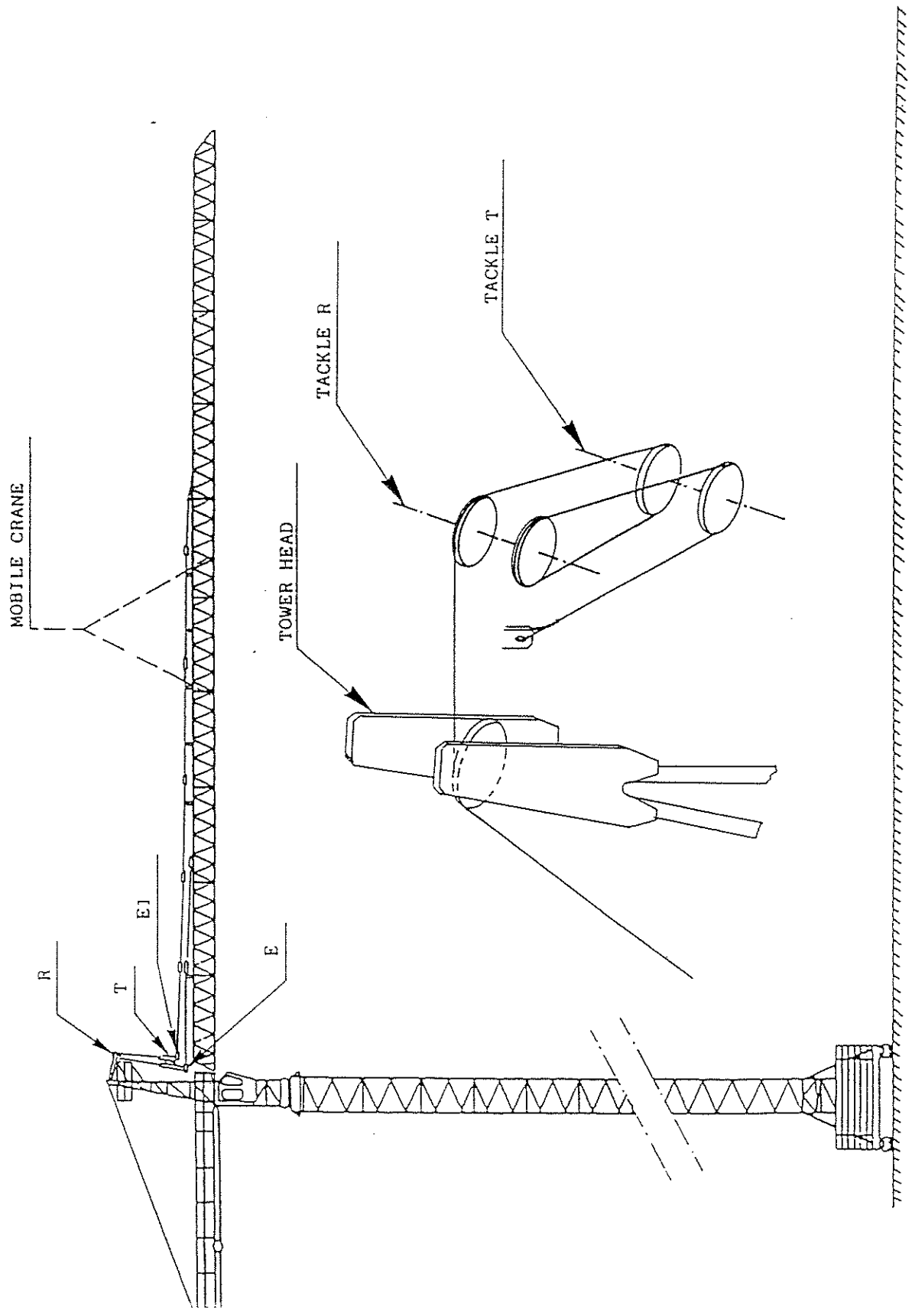


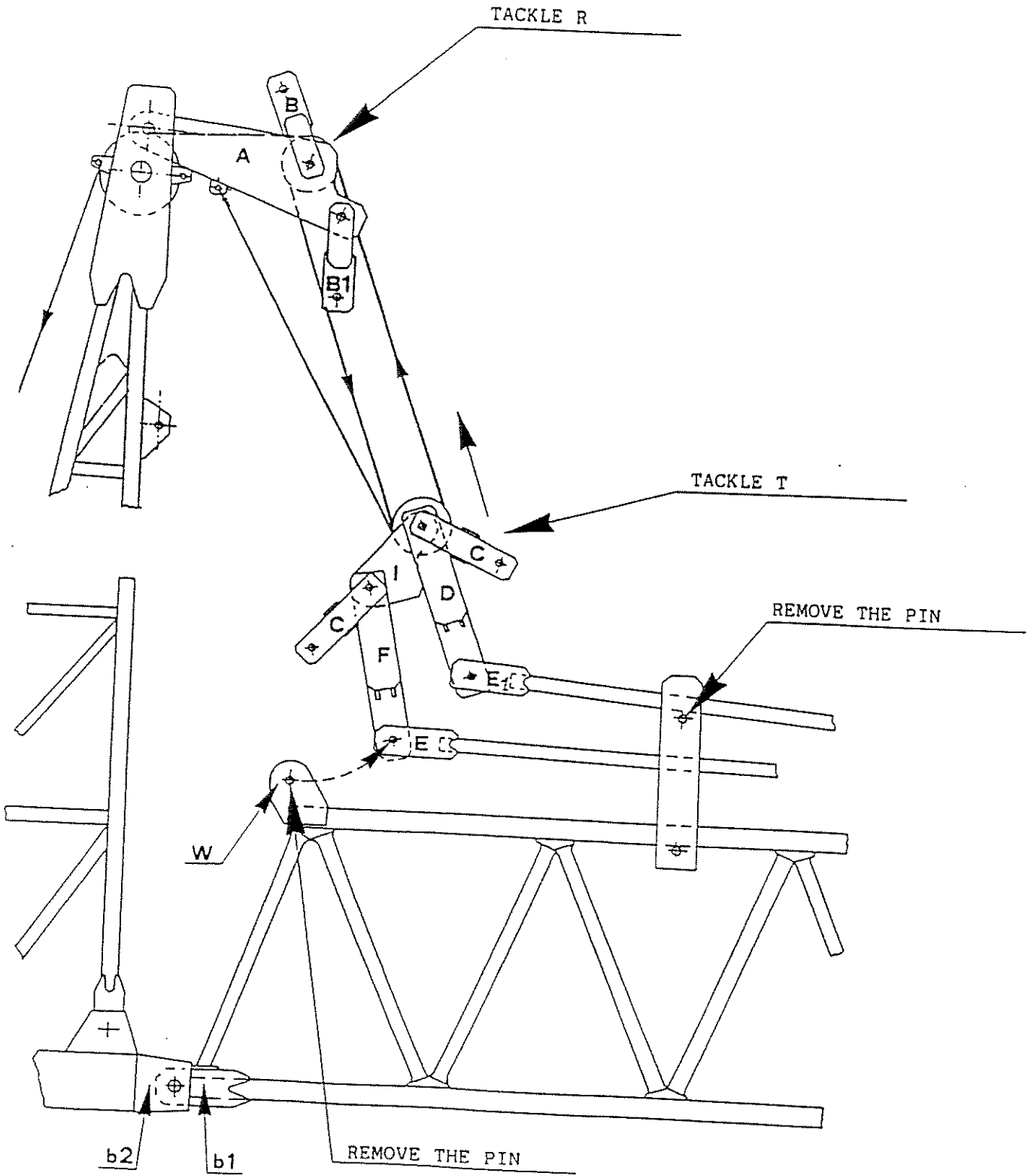
DETAIL 2

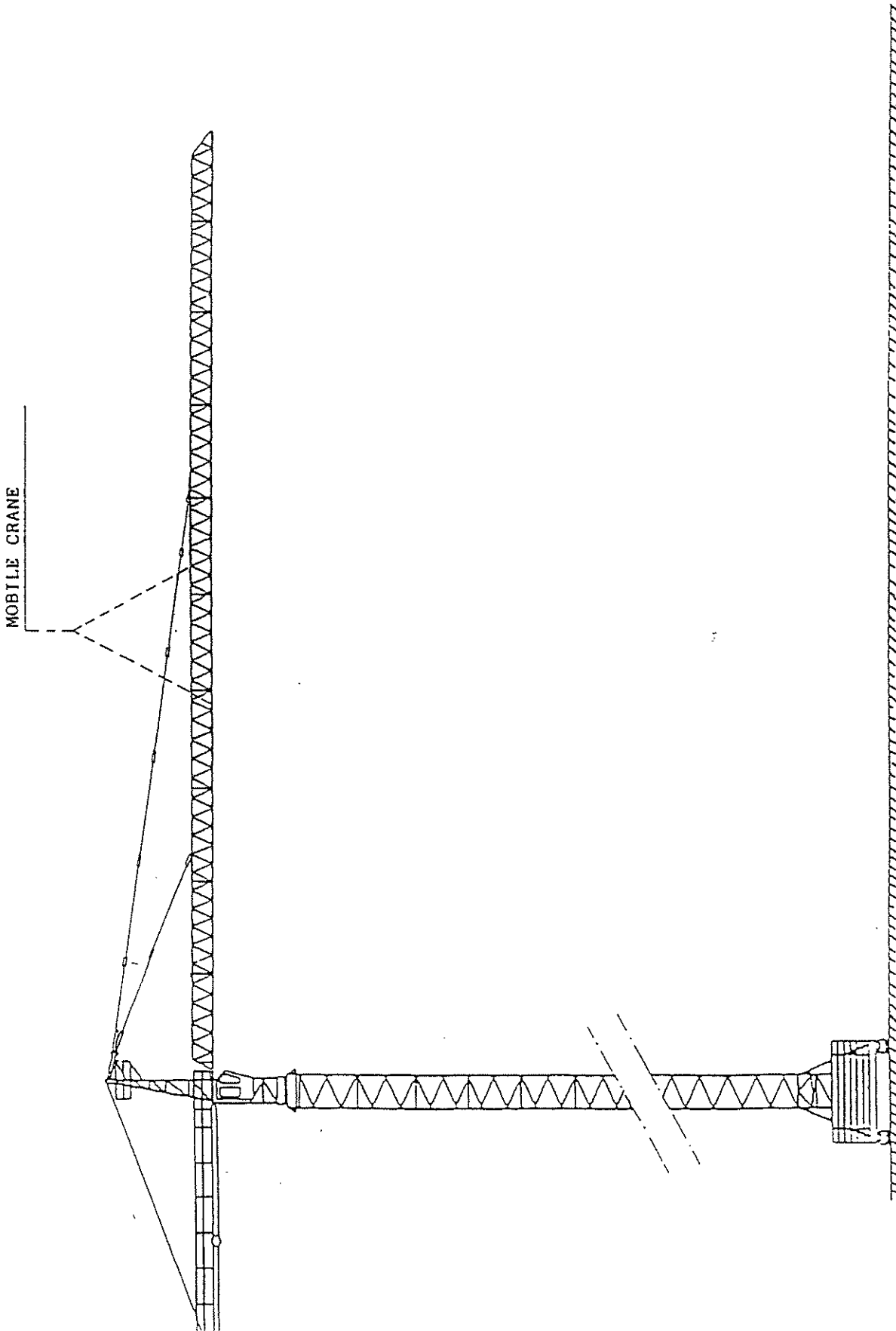


EXAMPLE FOR 65 m. ONLY









Before the self-erection phase starts, "R" tackle (Page 8.13) must be pin-connected on "P" square bar. Also connect with pins "T" tackle with "R" tackle (Page 8.13.1).

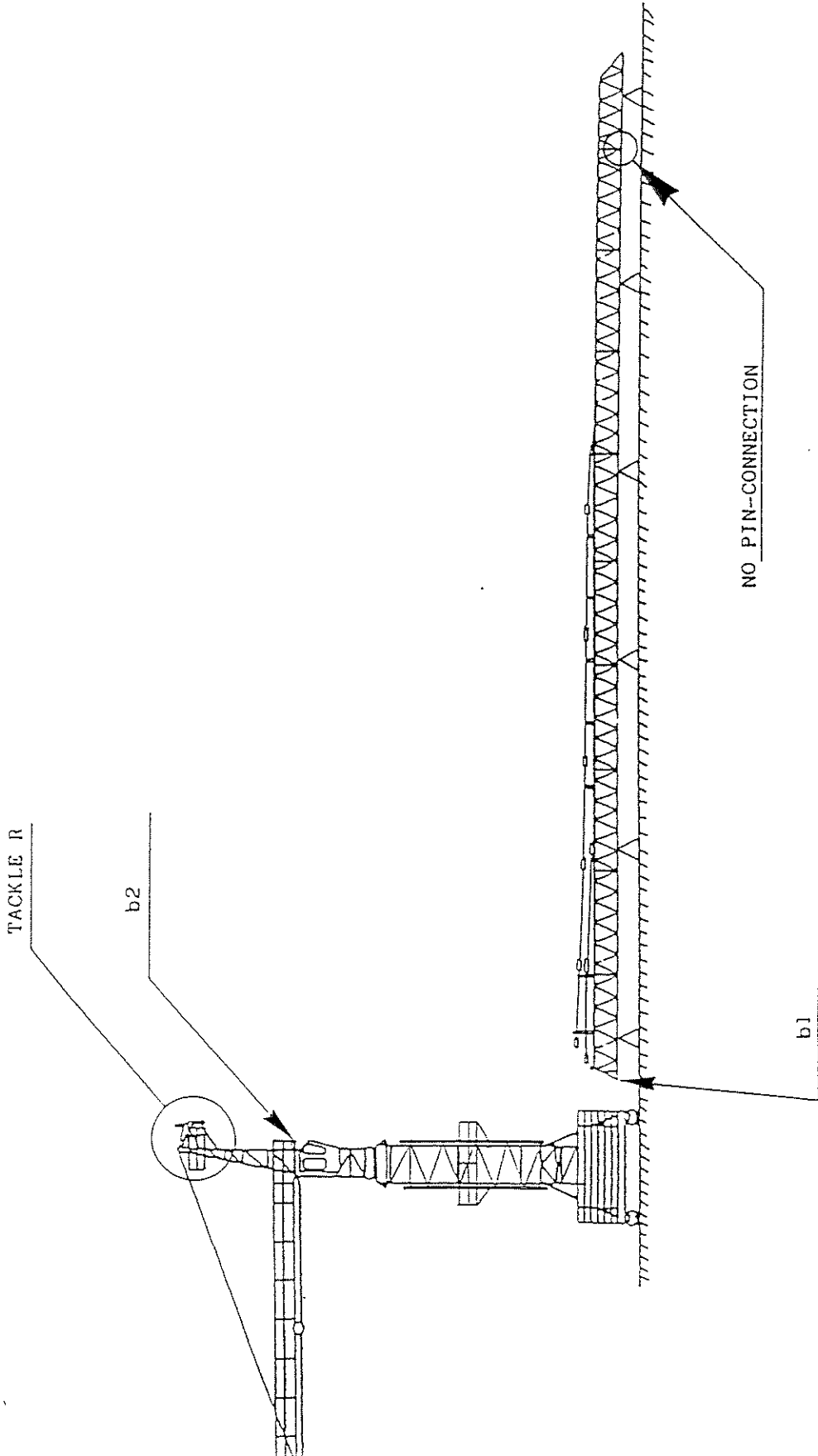
Make the hoisting rope slide onto the 8 pulleys coupled in pairs and attach rope end to "Z" bracket of "A" tie-bar (Page 8.13.1 and 8.13.2). Put in tension the hoisting rope and remove connecting pins between "B1" and "C" tie-bars.

At this point slack the rope and lower "T" tackle so that "F" tie-bar can be pin-connected with suitable "W" housing in correspondance to the first jib section (Page 8.13.3). Now proceed as follows: at first remove the two pins which connect the lower spars of the jib end, then recover the rope and hoist the jib which will pass from position b1 to position b2. Pin-connect the jib when in position b2. (See page 8.13 and 8.13.4).

Slack again the hoisting rope so that "T" tackle can rotate forward and allow pin connection between "D" flat bar and "E1" one. Let "F" flat bar move free from "W" attachment on first jib section and connect it to "E" flat bar (See page 8.13.3 and 8.13.5). Put the rope in tension and remove the pin from tie-bars supports which are along the upper spar so that they are free to move. Recover the rope and the jib will rotate upwards. When the jib end is lined up with the jib itself lock again using the pins which had previously been removed (Page 8.14). After having checked correct position of the jib connect by pins both tackle sets (that is, flat bars "C" of tackle "T" with flat bars "B" and "B1" of tackle "R" (Page 8.13.2).

Extract the rope from both "T" and "R" tackles and wind it ready for hoisting (Page 8.16)

Complete the ballast blocks positioning on counterjib according to crane version (page 6.12).

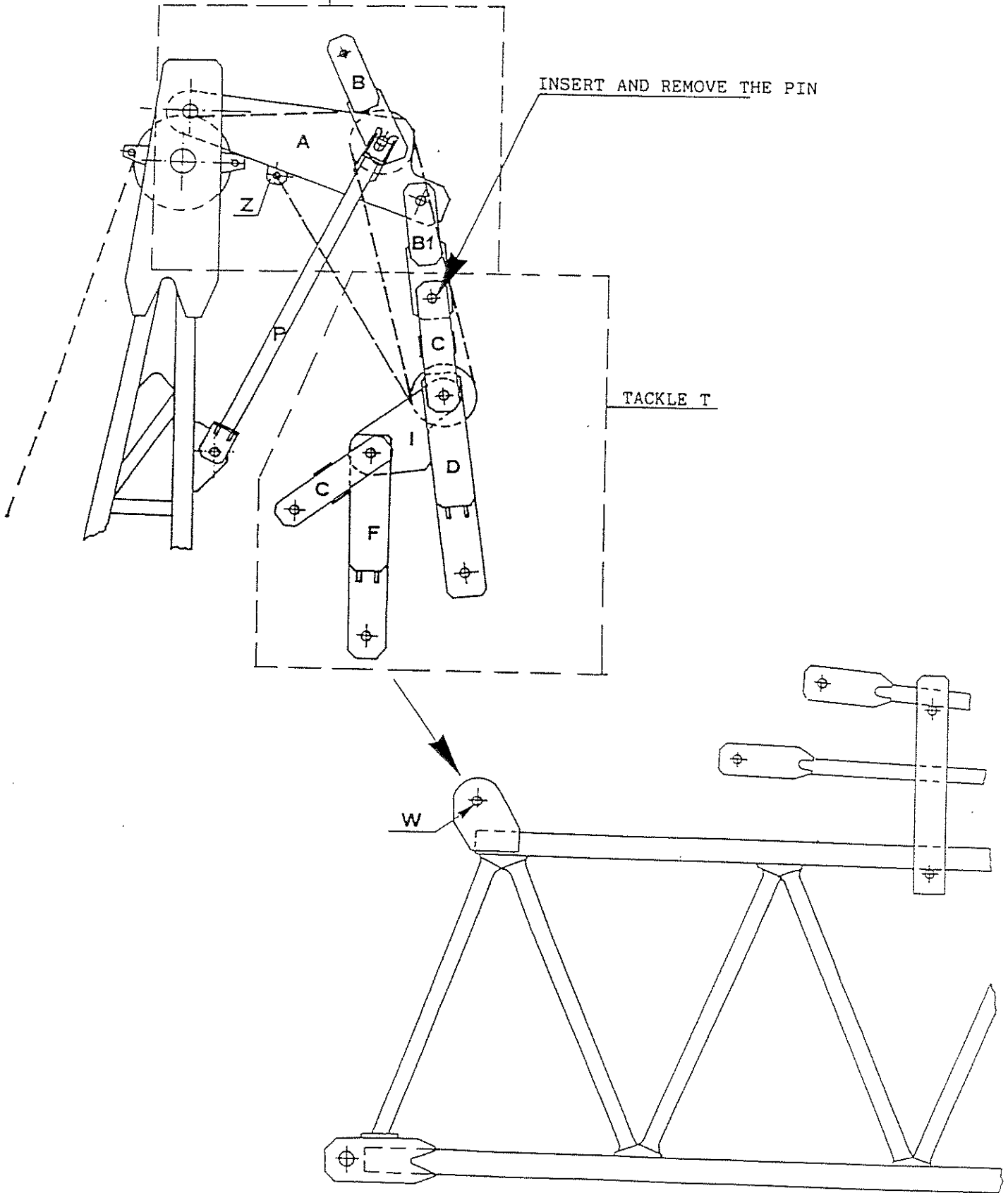


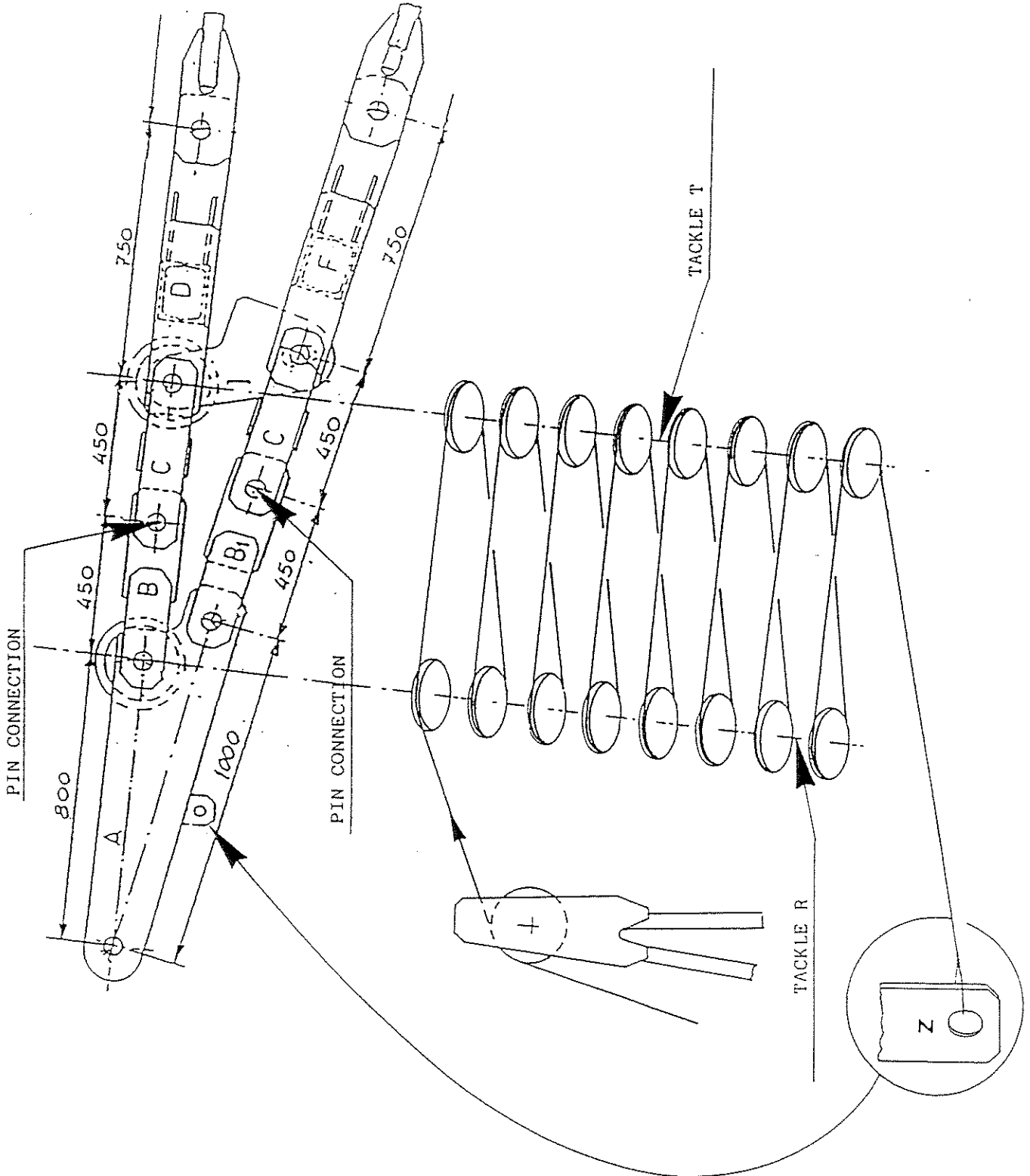
TACKLE R

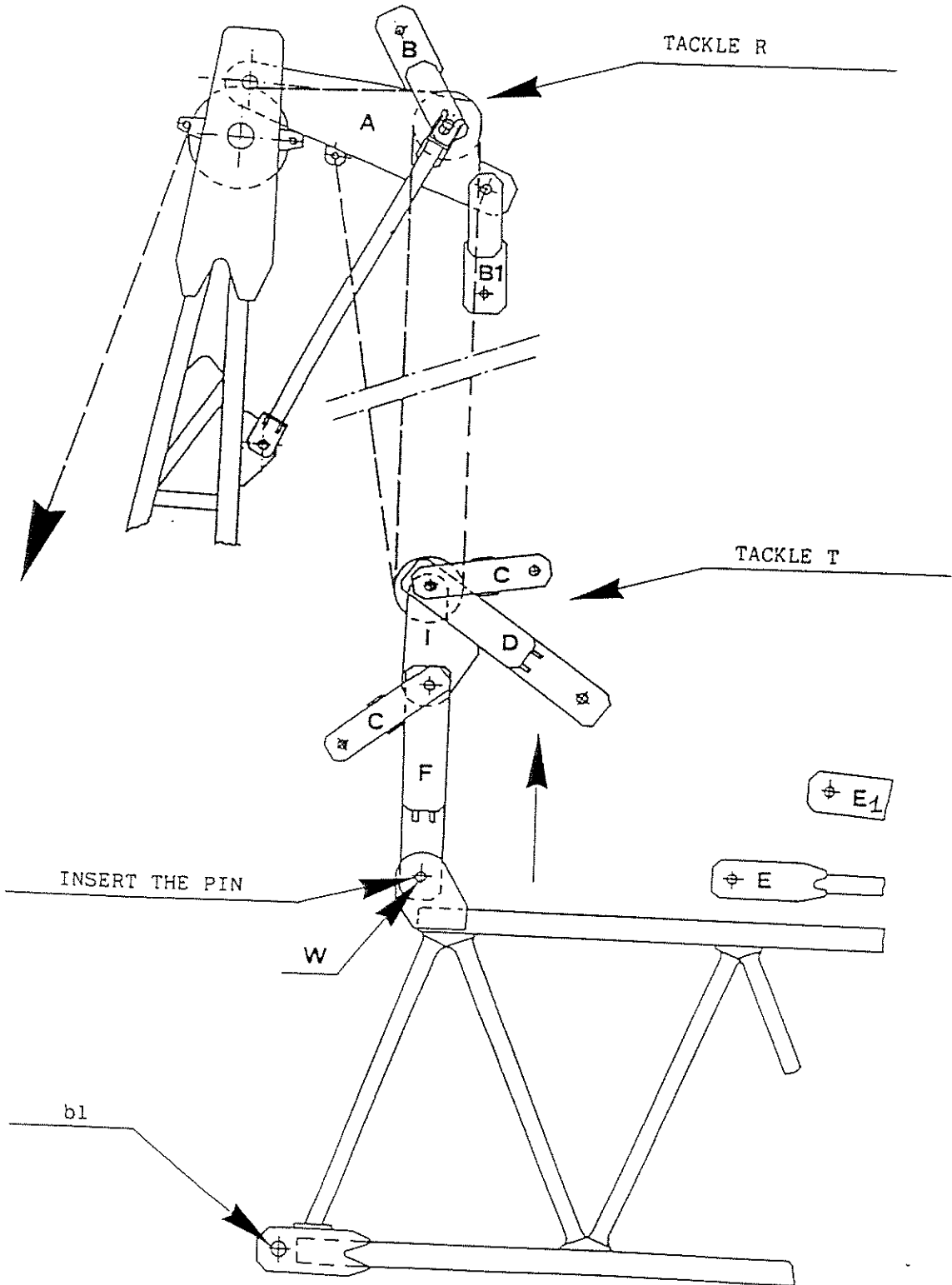
INSERT AND REMOVE THE PIN

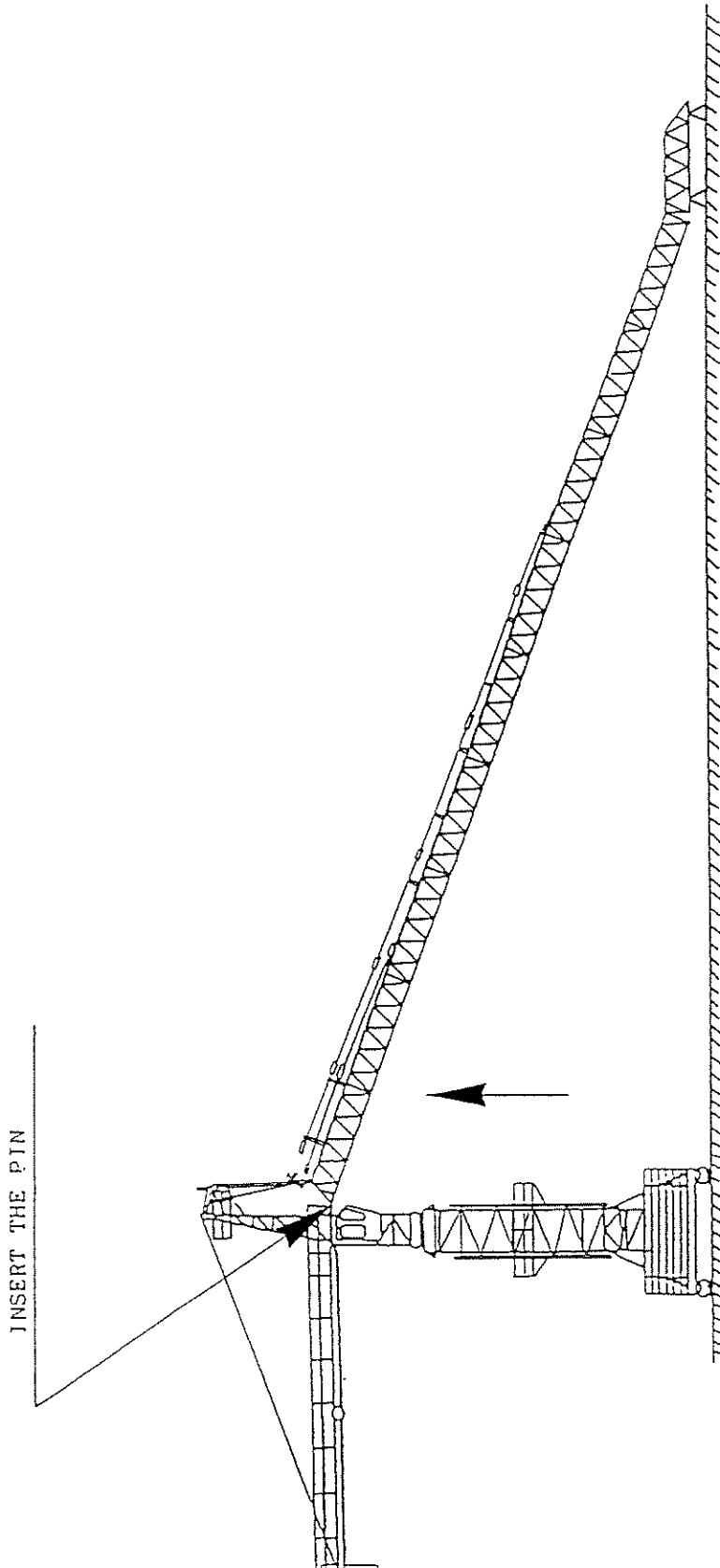
TACKLE T

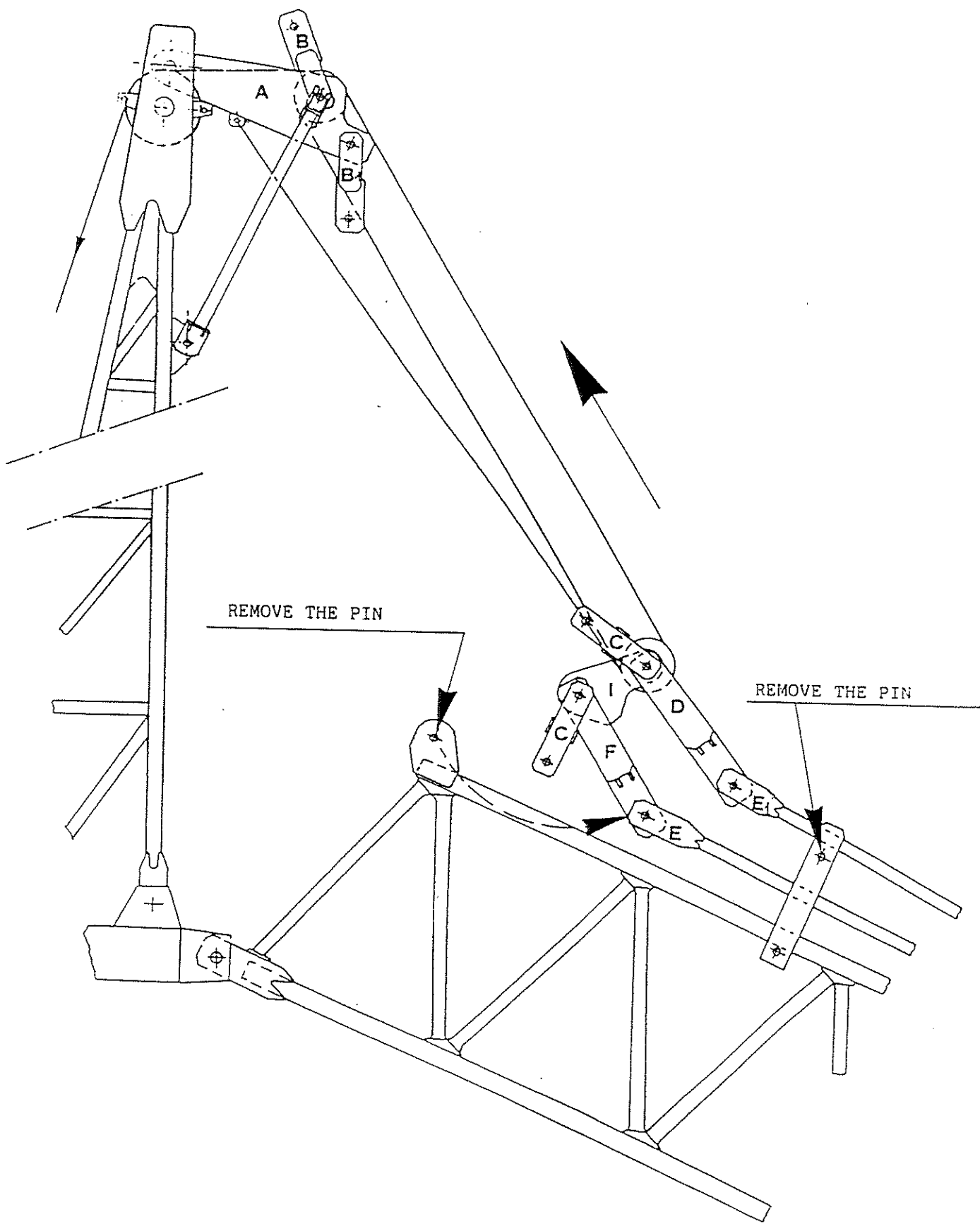
W

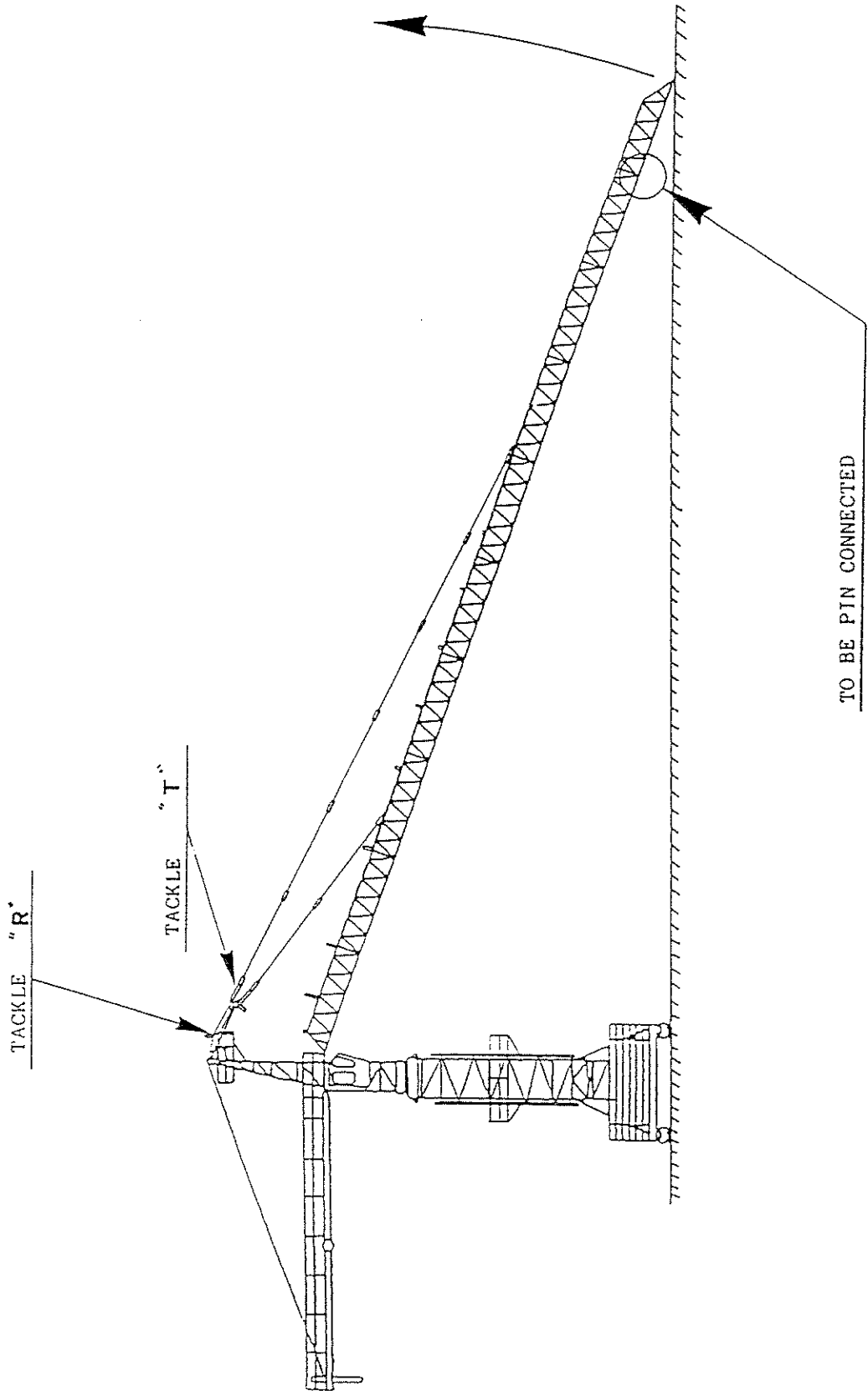


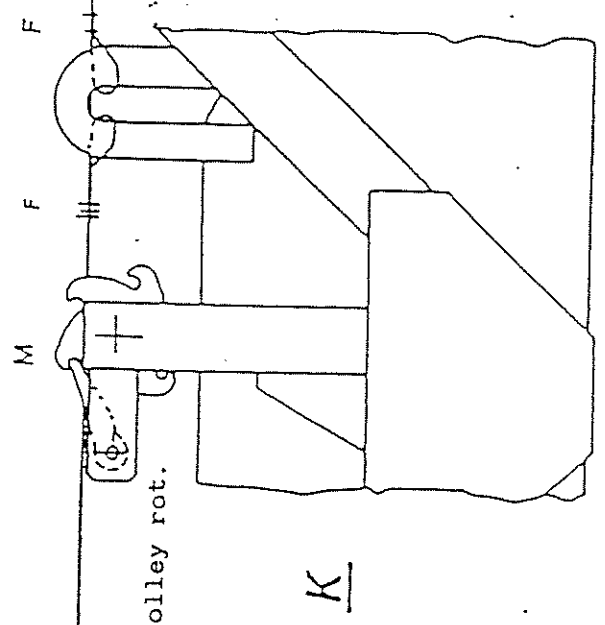
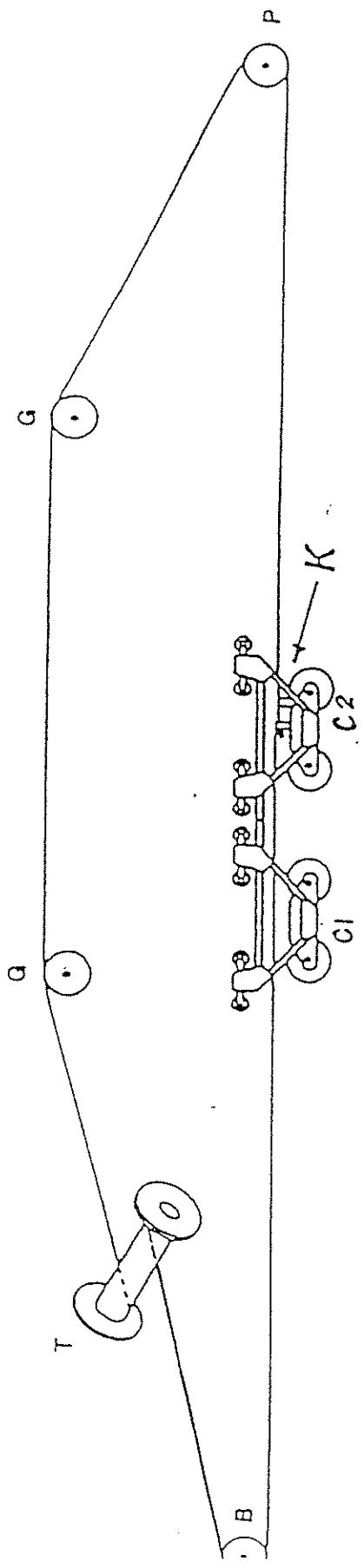




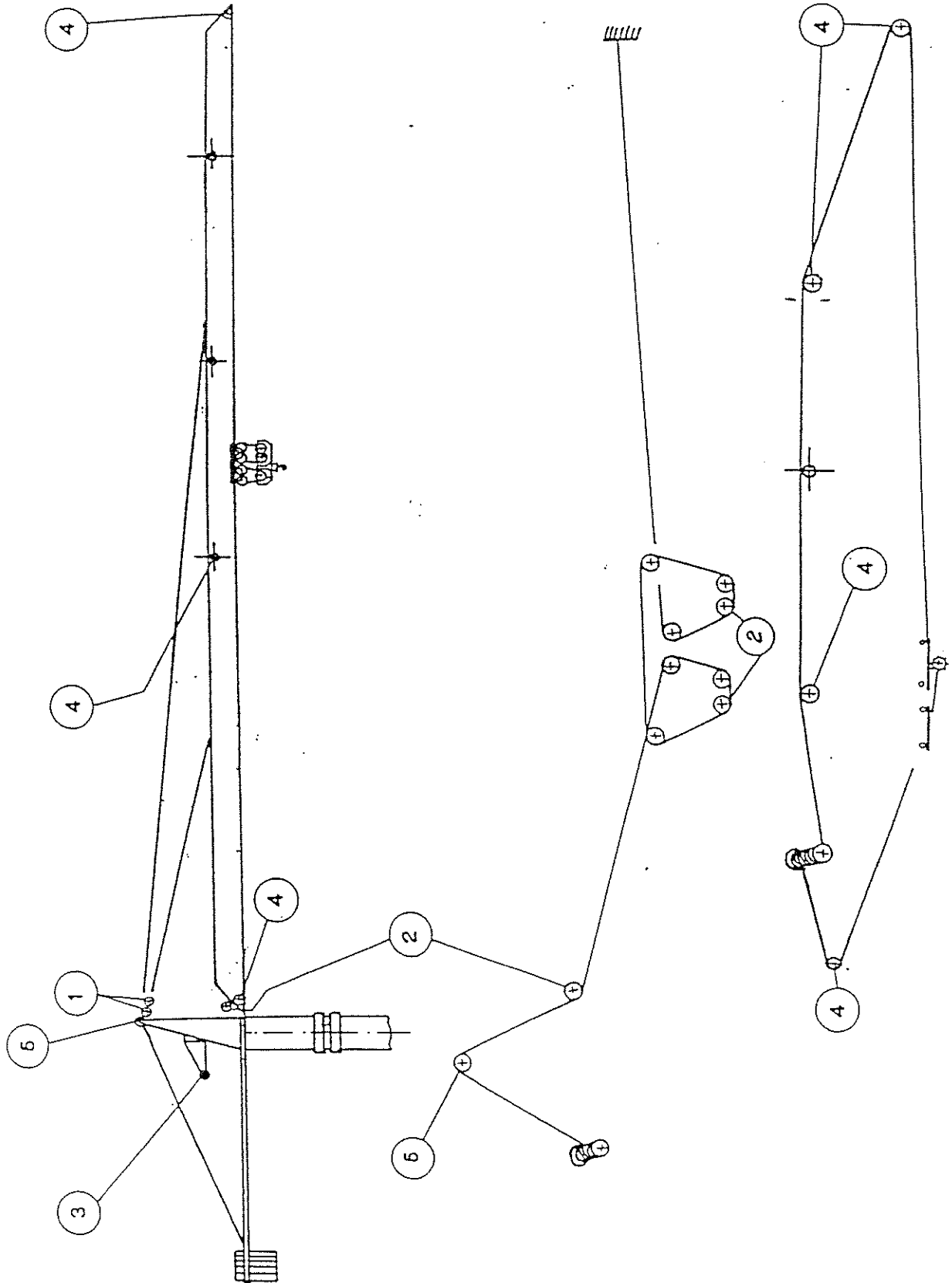








Trolley rope dia. 8 mm.
114 wires with textile core trolley rot.
Kg. 4,000



Trolley clamping device in case the rope breaks or slackens

In case the crane is equipped with this device, it is necessary to check the passage of the rope that transmits the movement to the trolley; in this way the clamping device remains in idle (open) position and the trolley is free to rotate.

The rope has to pass over the lever connected to the clamping pin, that because of its position, cannot interfere with the hoisting rope pulley. (page 10.15).

To avoid dangerous movements of the trolley should the rope breaks, it is equipped with a special mechanism that allows the hoisting pulleys to rotate when the rope is stretched, and to stop when it slackens.

A spring - by inserting a pin in the pulleys' holes - blocks the trolley so that the pulleys cannot rotate anymore (necessary movement for the trolley translation).

It is anyway possible to release the hook since the pulley, being blocked, doesn't rotate when descending.

1
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C

SECTION

9

LADDERS - PLATFORMS - CATWALKS



Each tower section, whichever the crane configuration and height, is prearranged at its top for the installation of a rest platform. Platforms are positioned each two mast sections and fixed to the tower through quick joints with safety pins.

Ladders and platforms are standard ones.

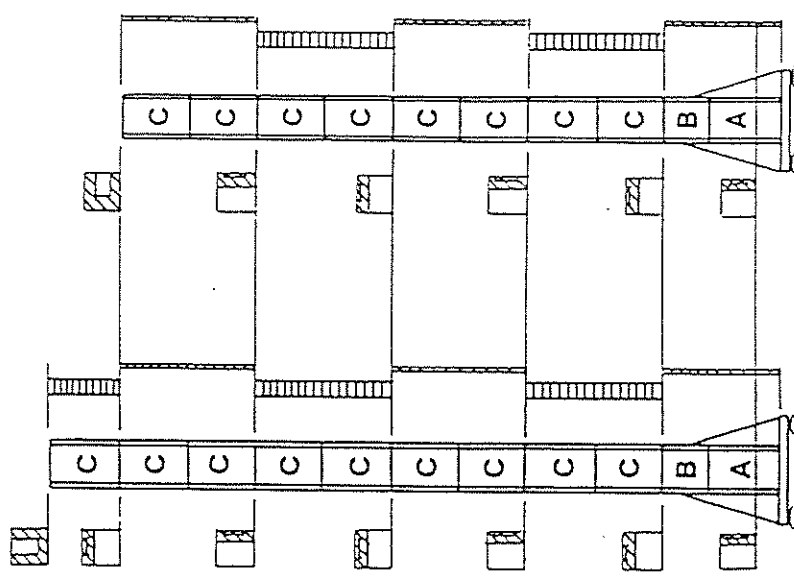
Ladders are complete with circular protection backboards. Being these mobile they can be easily assembled to the mast sections with ladders already assembled.

The following page scheme shows that - between one section and the other - the ladders are staggered of 90°. This has been studied so that the operator who climbs the tower can move on a platform and never have more than 7.5 m. of empty space below him.

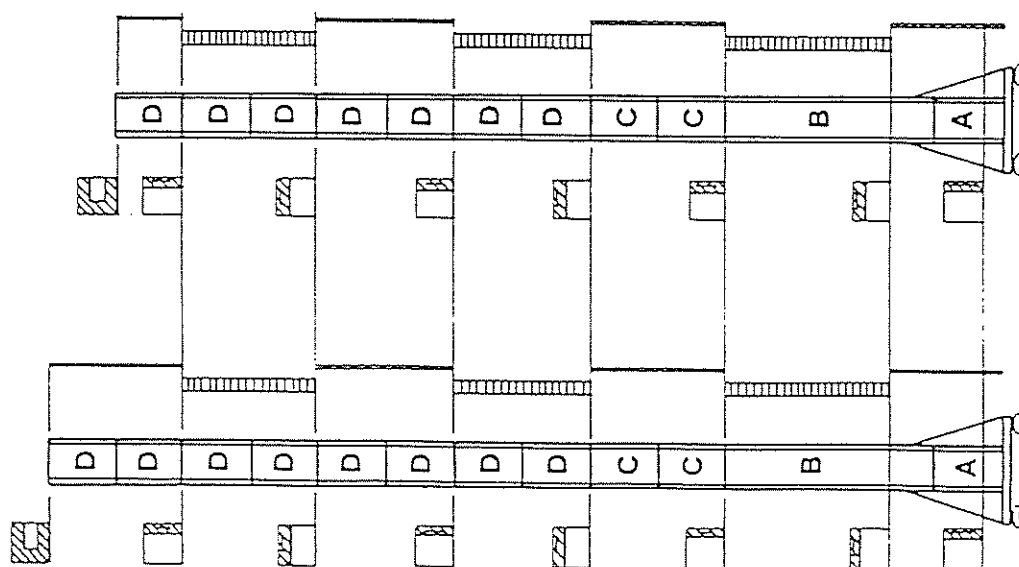
The slewing unit ladder is composed of two parts: the first one is fixed to the upper traverse of the slewing unit; the second is joined to the first by pins.

Following pages show the various ladders and platform components for all the crane versions.

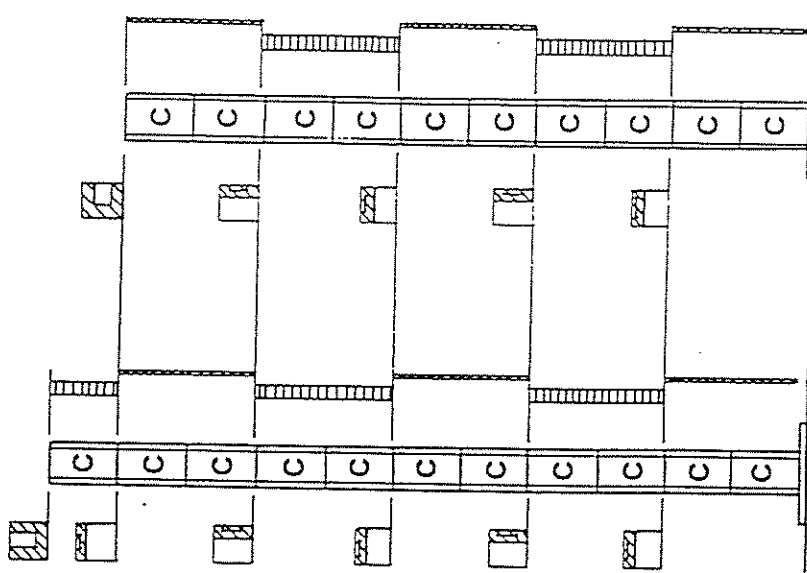
S 20 P



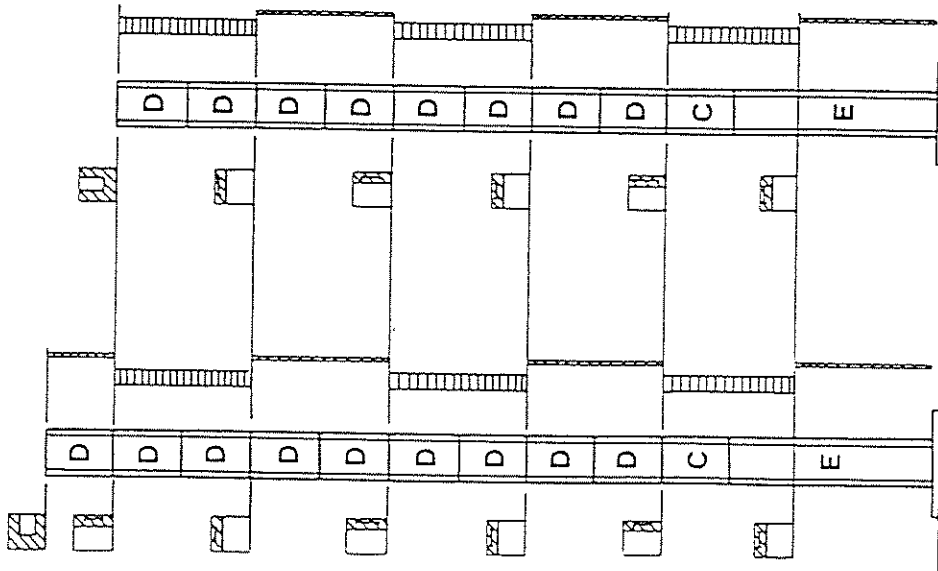
S 20 TL



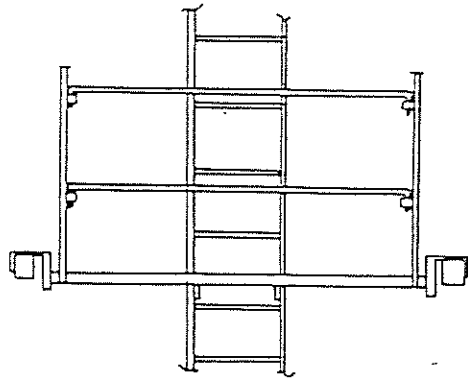
S 20 R



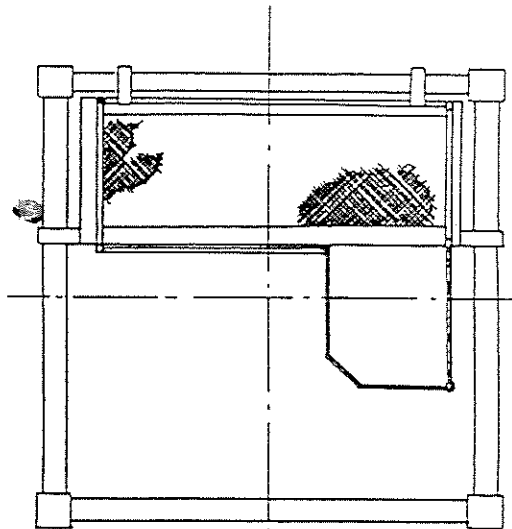
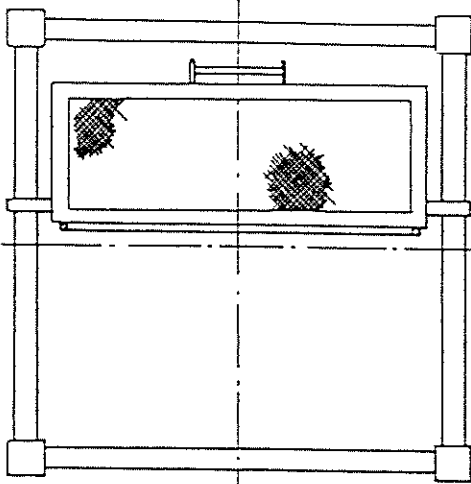
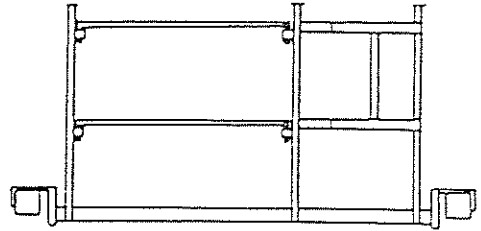
S 20 RTL



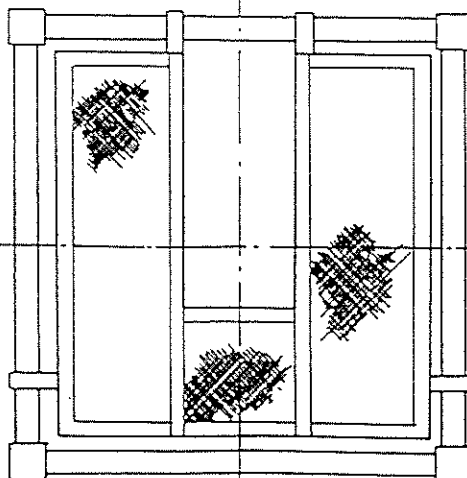
BASE MAST SECTION PLATFORM



MAST SECTION PLATFORM



LAST MAST SECTION PLATFORM



SECTION

10

SAFETY AND CONTROL SYSTEMS

Each function of the crane is completely protected by mechanical and electrical control devices.

Should the loads for each function be higher than the indicated ones, a warning light or an aelectric bell positioned in the cabin, warns the operator to intervene and eliminate the dangerous situation. If the operator does not intervene, the alarms stop the functions, even if it is still possible for him to restore the normal conditions.

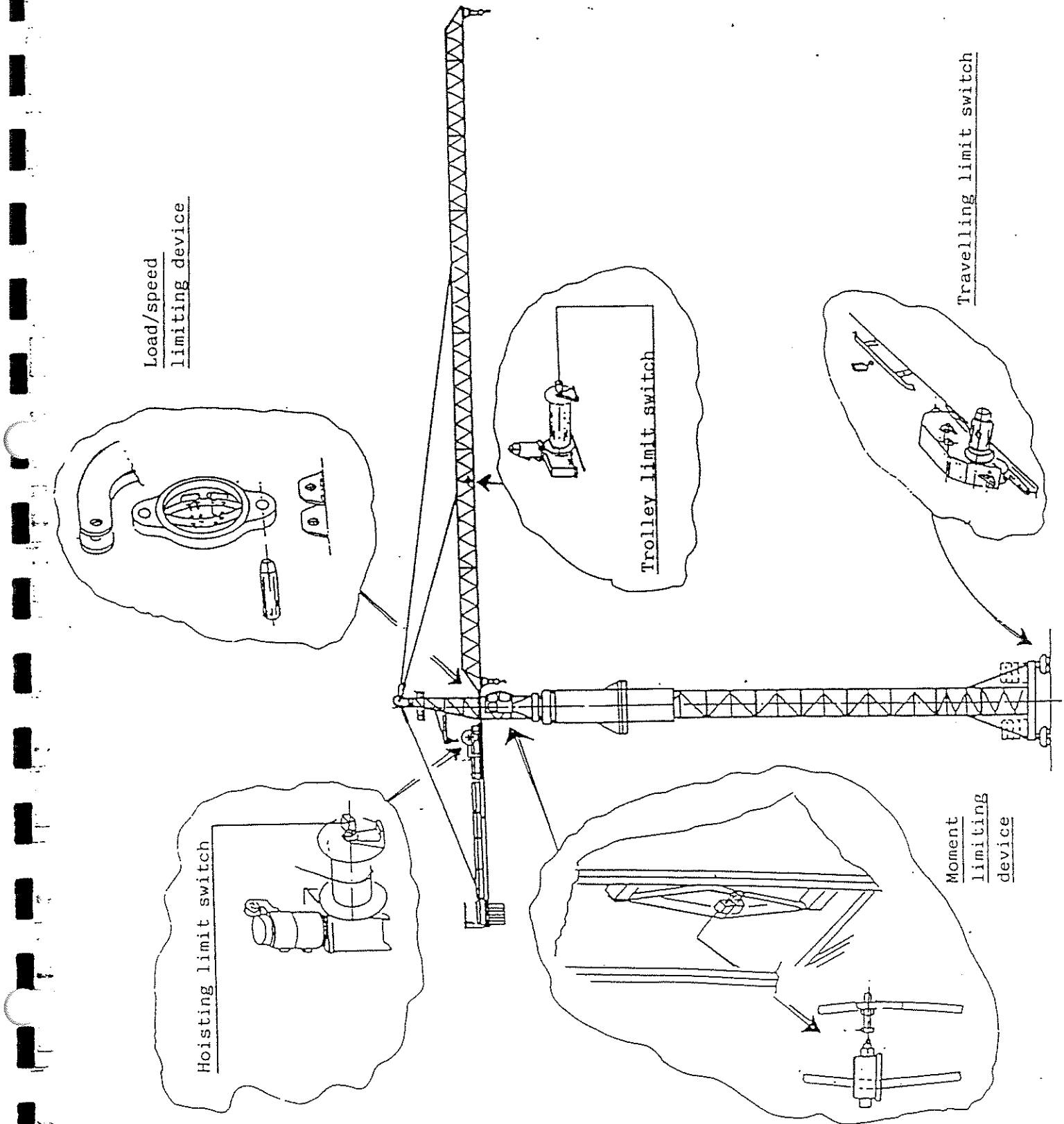
The crane is therefore constantly controlled and works in full safety conditions.

In the following page you can find the location of these 'control and safety' devices.

IMPORTANT ADVICE

THE PROPER RUNNING OF THE SAFETY DEVICES ASSURES THAT THE CRANE WORKS IN COMPLIANCE WITH THE LOAD AND SERVICE LIMIT CONDITIONS FORESEEN. IT IS NECESSARY TO CHECK PERIODICALLY THEIR PERFECT EFFICIENCY.

THE CRANE OPERATOR IS NOT ALLOWED TO ALTER THE LOAD AND TORQUE LIMITING DEVICES, SINCE THE CRANE STABILITY AND SAFETY MIGHT BE COMPROMISED.



SETTING AT WORK

After any working stop at the job-site and, anyway, at the beginning of each working day, it is necessary to restore the electrical power, reinserting the slewing brake, release the anchoring tongs and check the following:

- . the efficiency of the slewing, trolley, travelling and hoisting parking brake;
- . the efficiency and connection of the limit switch devices, as well as of the load/torque limiting devices;
- . joy-sticks' proper operation.

SERVICE RECOMMENDATIONS

1. For the hoisting operations use the micro-speed as far as the load is completely raised from the ground. It is forbidden to use the high speeds in case the hoisting rope is not perfectly stretched by the load.
2. The rotation of the jib, as well as the travelling of the trolley, are forbidden in case the load is not completely raised from the ground.
3. It is forbidden to stop the crane movements by "STOP" push button, unless in case of real emergency. This operation is in fact dangerous because it cuts out the automatic gradual stop devices of these movements.
4. The intervention of the thermostat prevents the hoisting motors from burning due to overloading, but it cannot prevent the wearing out of the insulating protection on the windings. Therefore, interventions repeated more than three or four times, might compromise the motors insulation.

SETTING OUT OF WORK

When wind exceeds - even if only in gusts - 72 Km./h., or at the end of a working day, or still in the imminence of a storm, IT IS COMPULSORY TO PUT THE CRANE "OUT OF SERVICE" as follows:

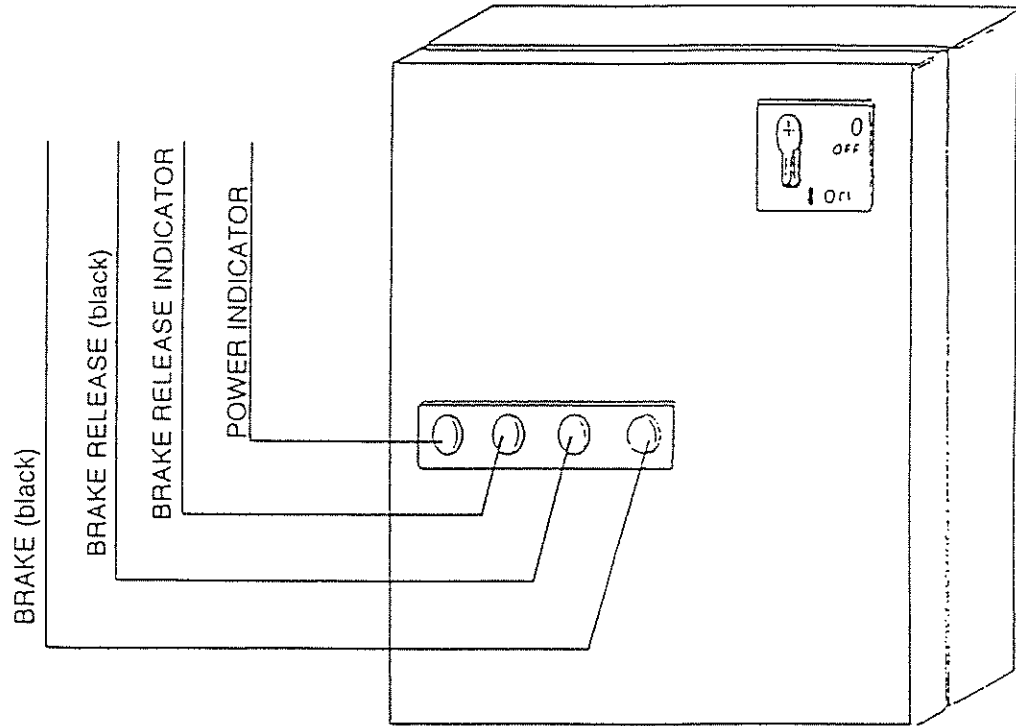
- . anchor the crane - if travelling version one - to the tracks in the special ballasted area, by clamping the tongs;
- . release the rotation brake by the electromechanical system (see page 10.5 and 14.11).
- . raise the hook and move the trolley as close as possible to the tower;
- . disconnect the line knife switch or the power supply from the main control panel.

SLEWING BRAKE RELEASE

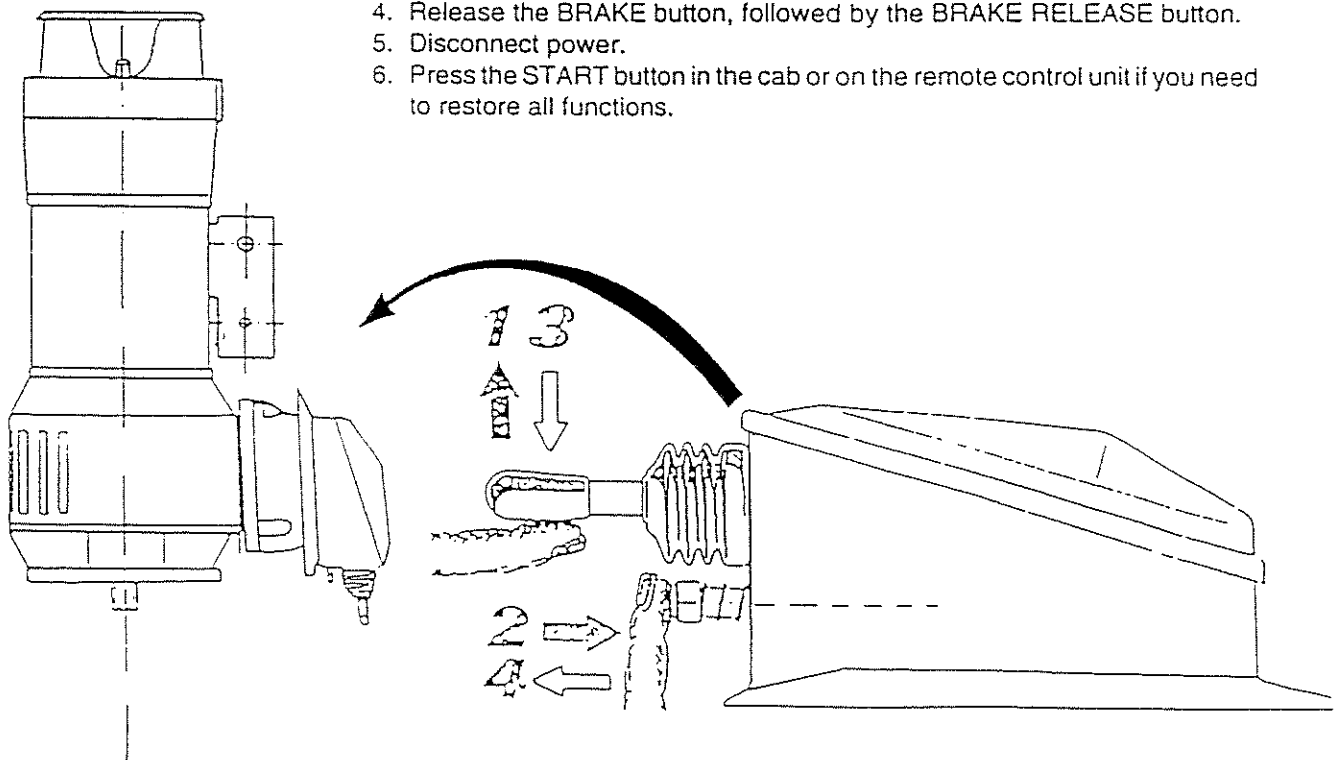
Before leaving the crane release the slewing brake so that the jib is free to weathercock. For this operation use the special lever moving it from position "A" (open) to position "B" (close).

Periodically check that the small rope "F" strength is sufficient to release the motors brakes of the slewing unit holder.

1. Make sure that all slewing movement has stopped and press the red STOP button in the cab or on the remote control unit.
2. Press the black BRAKE button nearest to the main power switch.
3. Hold down the BRAKE button and press the black BRAKE RELEASE button.



4. Release the BRAKE button, followed by the BRAKE RELEASE button.
5. Disconnect power.
6. Press the START button in the cab or on the remote control unit if you need to restore all functions.



The crane operator is helped, as far as safety standards are concerned, by some safety devices. Such devices, which are essential and often compulsory, prevent from errors or carelessness when manoeuvring and, therefore, must not be used for standard operations or as control buttons.

MAXIMUM LOAD LIMITING DEVICE

It intervenes with both two or four falls. It prevents the load from being hoisted but not from being lowered.

MAXIMUM SPEED CUT-OUT DEVICE

It intervenes when the load exceeds the maximum value allowed for that speed, either when being hoisted or lowered. This device, as well as the previous one, is positioned at the beginning of the jib.

MAXIMUM LOAD/MOMENT LIMITING DEVICE

It intervenes when reached any moment maximum values regarding load/jib ratio. It is located on the cabin mast section and sometimes - when foreseen by the law in force - composed of two sensors, correspondent respectively to the maximum static moment and to the maximum dynamic moment.

HOISTING LIMIT AND PRE-LIMIT SWITCHES

These devices intervene during hoisting and descending when reaching or approaching the ends. They are positioned on the hoisting winch drum and their intervention depends on the falls. On the control panel there is a controller that select II (FC1) or IV (FC2) falls.

TROLLEY LIMIT AND PRE-LIMIT SWITCHES

They intervene when reaching or approaching the buffers that limit the trolley movement towards the tower or towards the jib end.

Pre-limit switch device reduces the speed in case the trolleys moves at the maximum speed. The limit switch device stops the movement, reducing the speed to zero.

SLEWING LIMIT SWITCH

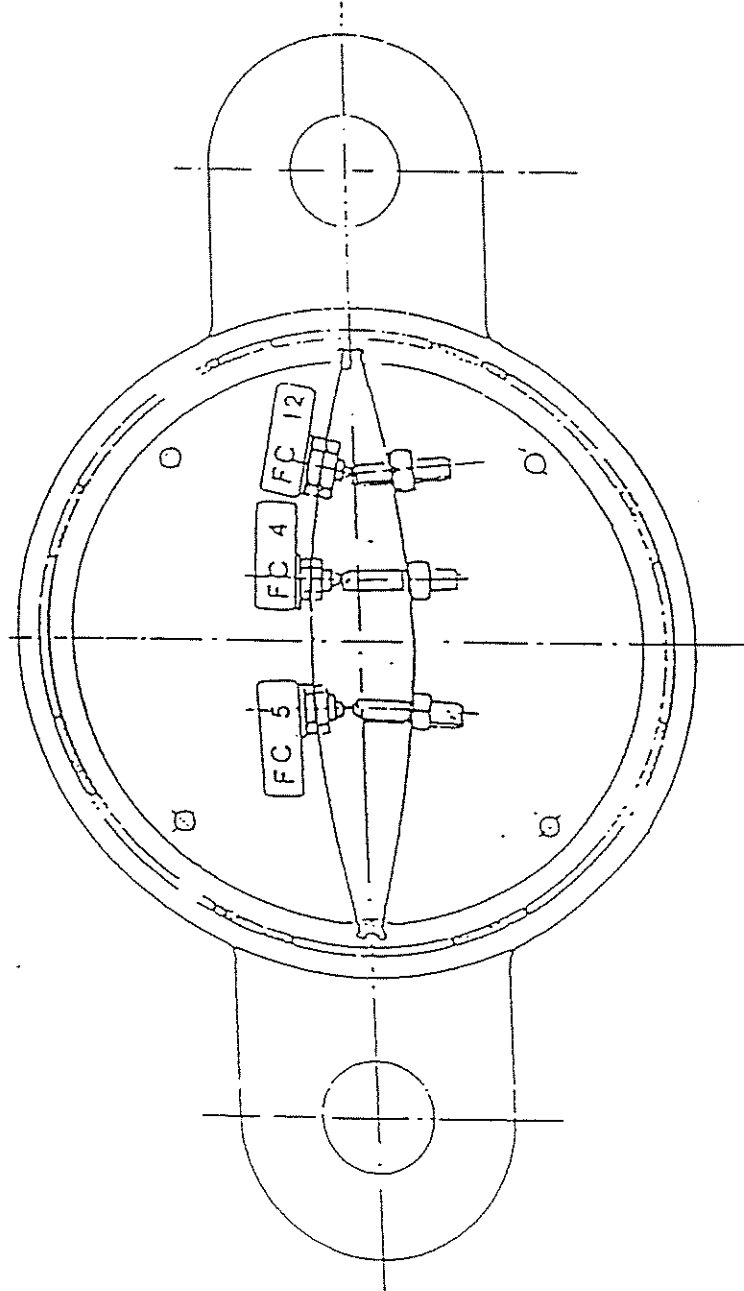
This device is located in the slewing unit.

It is usually composed of one pinion (having same characteristics as reduction gear one) that, interacting with the slewing unit, operate a standard limit switch.

This device is set to achieve 1.5 complete turns of the slewing unit in both directions. This to prevent any eventual kink of the feeding cable that reaches the crane top.

In case needed, it is possible to install a couple of limiting devices, so to delimit into predetermined areas the crane working field.

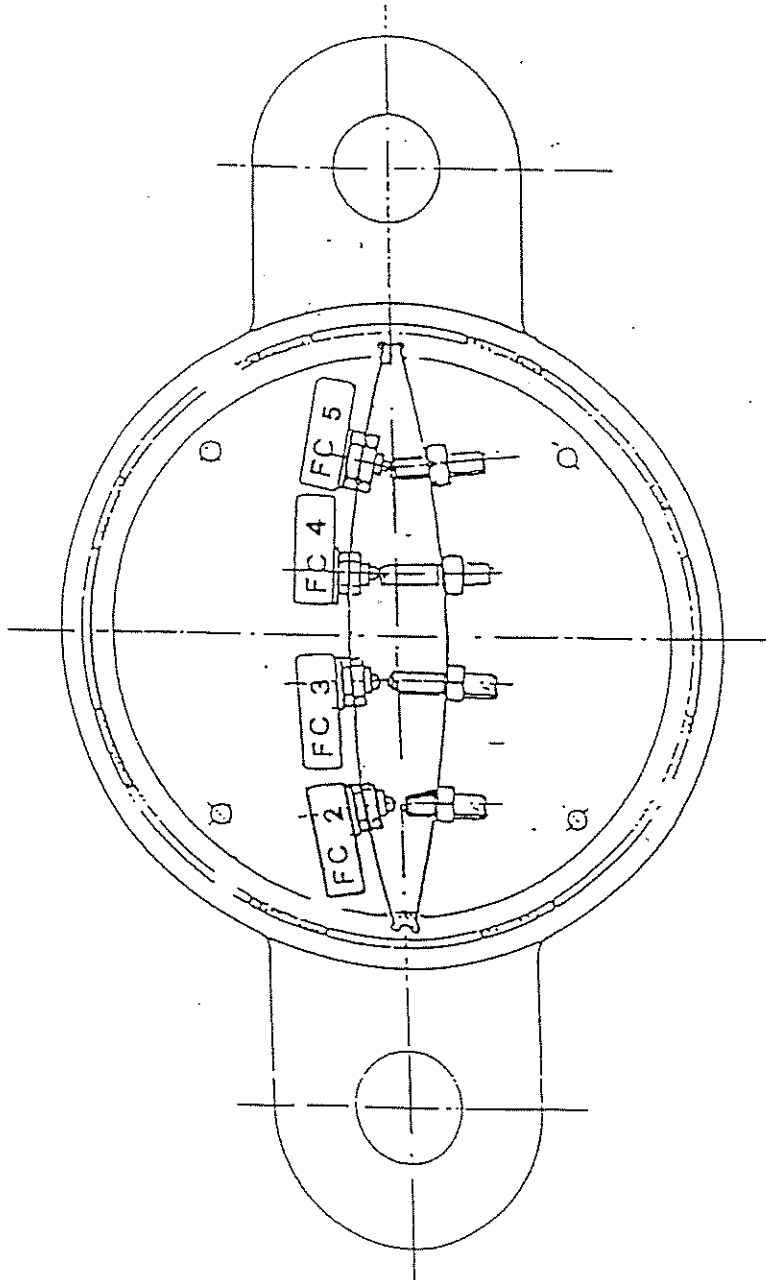
MAXIMUM LOAD LIMITING SWITCH , HOISTING AND TROLLEY
THIRD SPEED CUT-OUT DEVICE FOR 'AL' WINCH



- FC 5 Maximum load limiting switch
- FC 4 Hoisting third speed cut-out device
- FC 12 Trolley third speed cut-out device

Adjust these switches to the values given at page 10.9.1

MAXIMUM LOAD LIFTING SPEED SELECTION SWITCHES (AWL - R WINCHES)

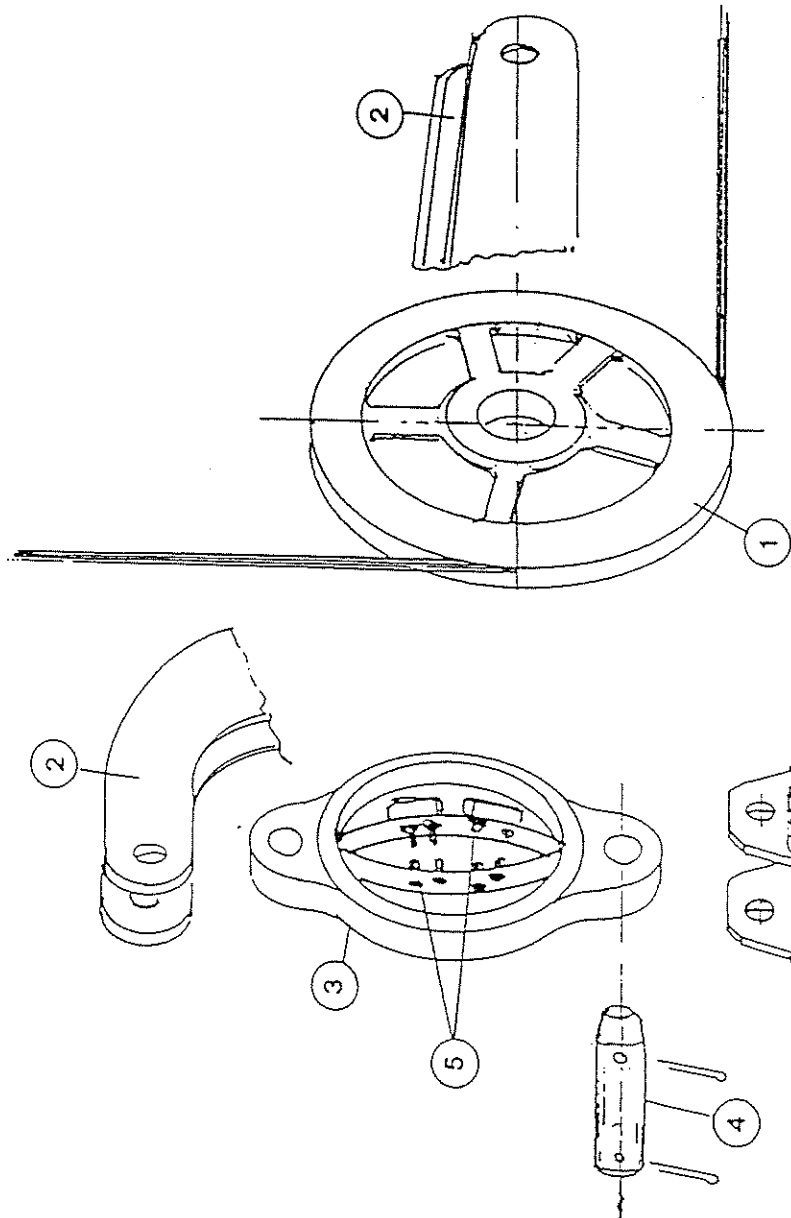


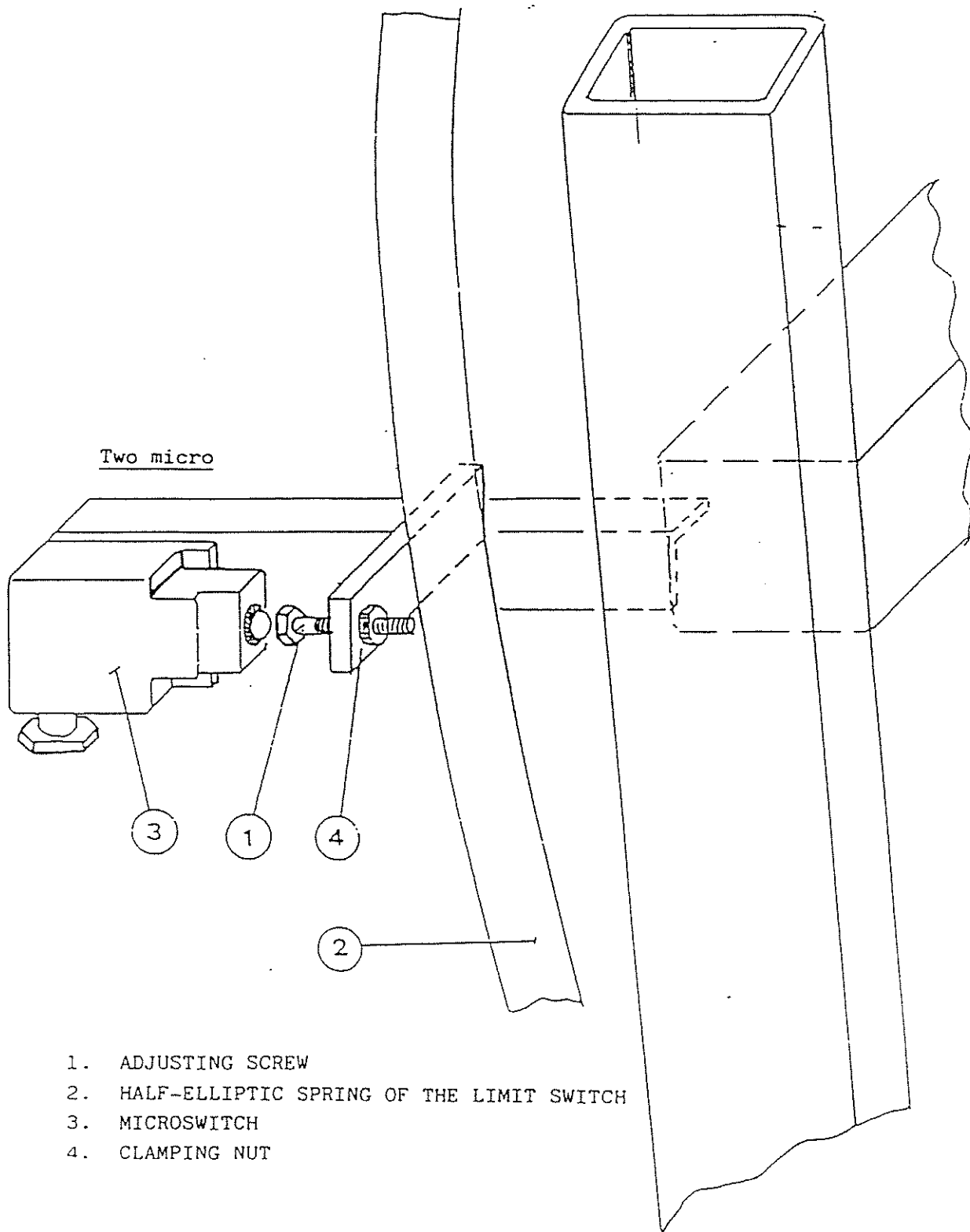
- FC2 Microswitch for cut-out of 1st speed
- FC3 Microswitch for cut-out of 2nd speed
- FC4 Microswitch for cut-out of 3rd speed
- FC5 Microswitch for maximum load limiting device

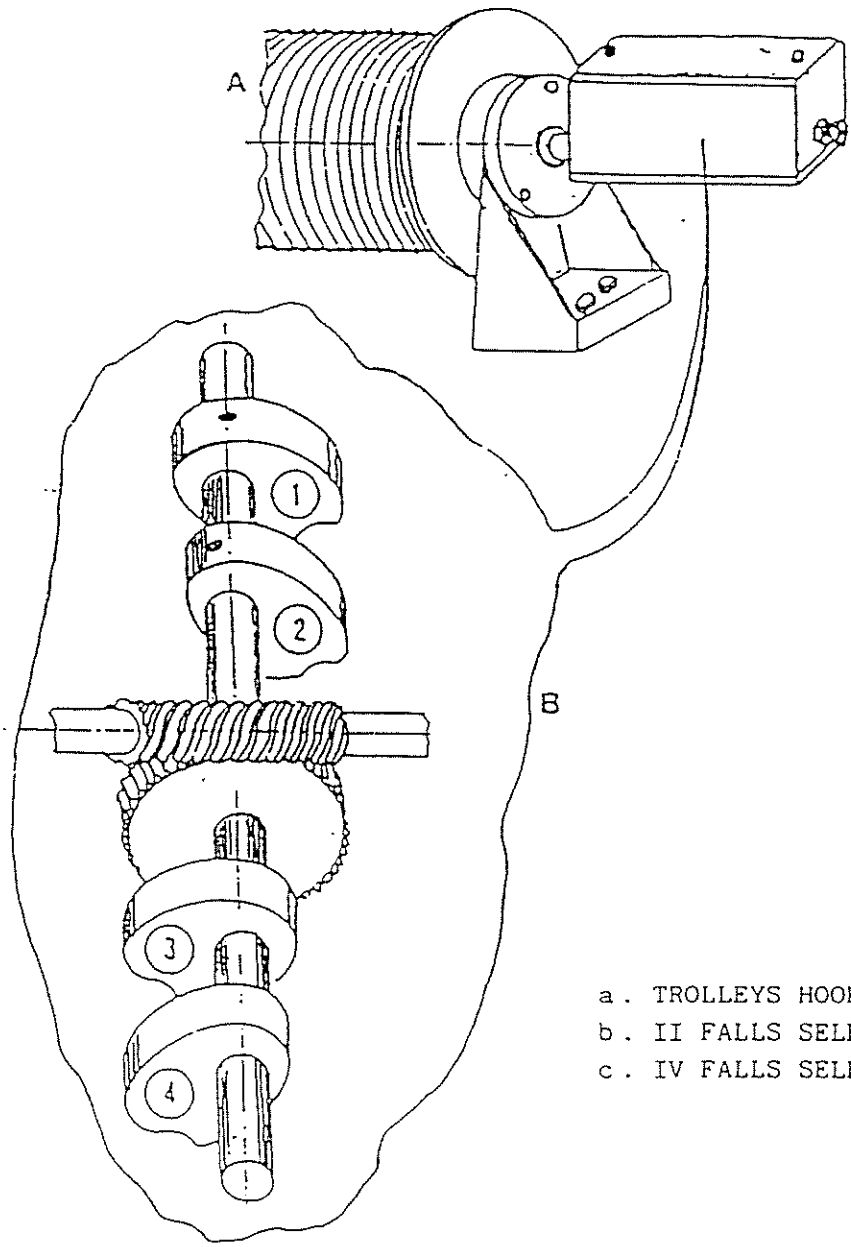
MICRO SWITCH ADJUSTMENT MUST BE DONE ACCORDING TO THE TABLE OF THE FOLLOWING PAGE

WINCH TYPE AWL-R	FC 2 SETTING II FALLS		FC 3 SETTING II FALLS		FC 4 SETTING II FALLS		FC 5 SETTING II FALLS	
	NET CAPACITY Kg.	EXTRA SETTING WEIGHT Kg. min. max.	NET CAPACITY Kg.	EXTRA SETTING WEIGHT Kg. min. max.	NET CAPACITY Kg.	EXTRA SETTING WEIGHT Kg. min. max.	NET CAPACITY Kg.	EXTRA SETTING WEIGHT Kg. min. max.
403 (40 HP)	1.200	80 - 100	1.750	110 - 140	2.400	150 - 190	3.000	250
404 (40 HP)	1.600	100 - 130	2.400	150 - 190	3.200	200 - 250	4.000	300
405 (40 HP)	1.900	110 - 150	2.880	190 - 230	4.000	250 - 300	5.000	400
504 (50 HP)	1.600	100 - 130	2.400	150 - 190	3.100	200 - 250	4.000	300
505 (50 HP)	2.000	120 - 160	3.000	200 - 240	4.000	250 - 300	5.000	400
506 (50 HP)	2.400	150 - 190	3.500	230 - 280	4.600	300 - 350	6.000	500
705 (70 HP)	2.400	150 - 190	3.400	220 - 270	4.200	270 - 320	5.000	400
706 (70 HP)	2.400	150 - 190	3.400	220 - 270	4.600	300 - 350	6.000	500
708 (70 HP)	3.100	200 - 250	4.700	300 - 350	6.000	400 - 450	8.000	600

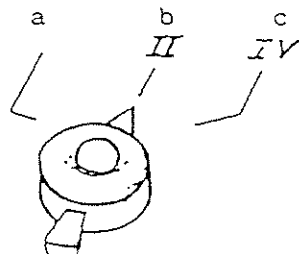
1. PULLEY
2. PULLEY SUPPORT
3. DYNAMOMETRIC RING
4. CLAMPING PINS
5. ADJUSTING SCREWS



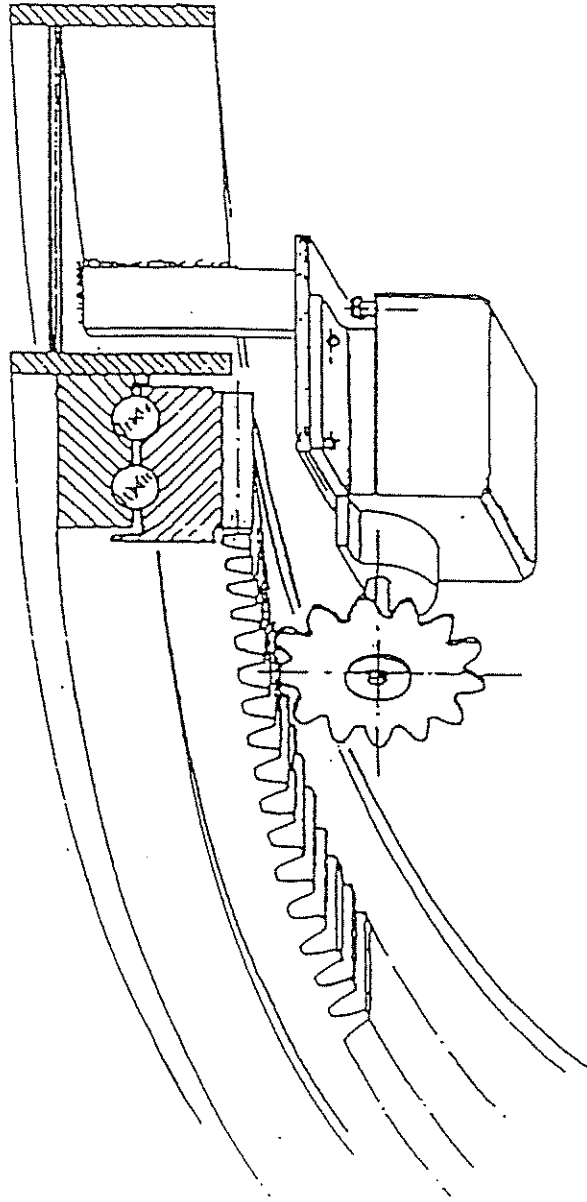




- a. TROLLEYS HOOKING
- b. II FALLS SELECTOR
- c. IV FALLS SELECTOR



C



TROLLEY SAFETY DEVICE IN CASE OF ROPES BREAKAGES OR SLACKENING

To avoid any dangerous motion of the trolley in case of failure of the traction rope, the crane has been equipped with a special mechanism, that permits to the hoisting pulleys on the trolley to rotate when the rope is stretched, stopping the movement in case of rope slackening.

Stop is achieved by inserting a return-pin into the pulley holes, so that these pulleys cannot rotate (motion that, on the other hand, permits the travelling of the trolley). The hook can anyway be released; in fact, during raising/lowering operations the locked pulley does not rotate.

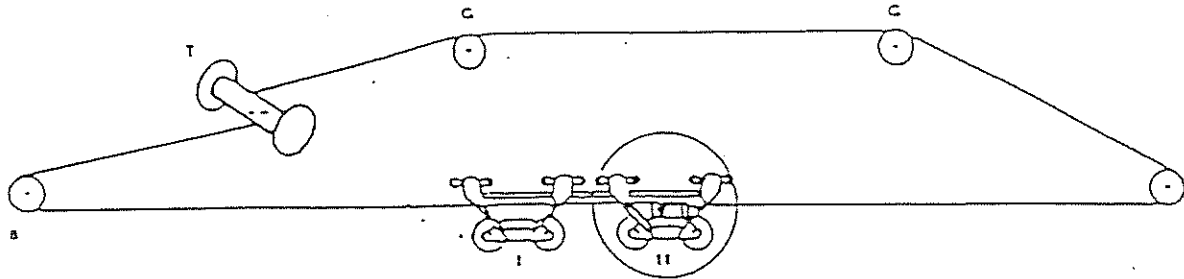
In case the crane is equipped with such a device, be sure the movement of the rope - which controls the trolley motion - is correct.

Position the stop device in neutral position (open) so that the pulley - placed on the trolley - can rotate. The rope has to press on the lever connected to the locking pin, so that this pin does not interfere with the hoisting pulley (see scheme at page 8.18).

ROPES

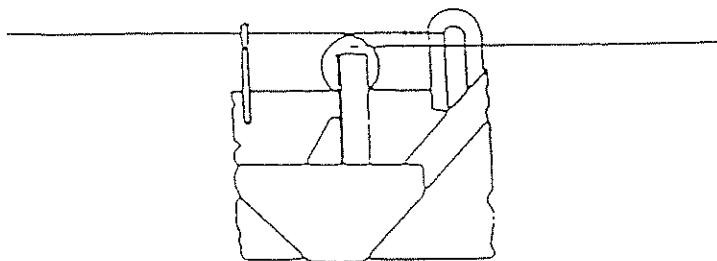
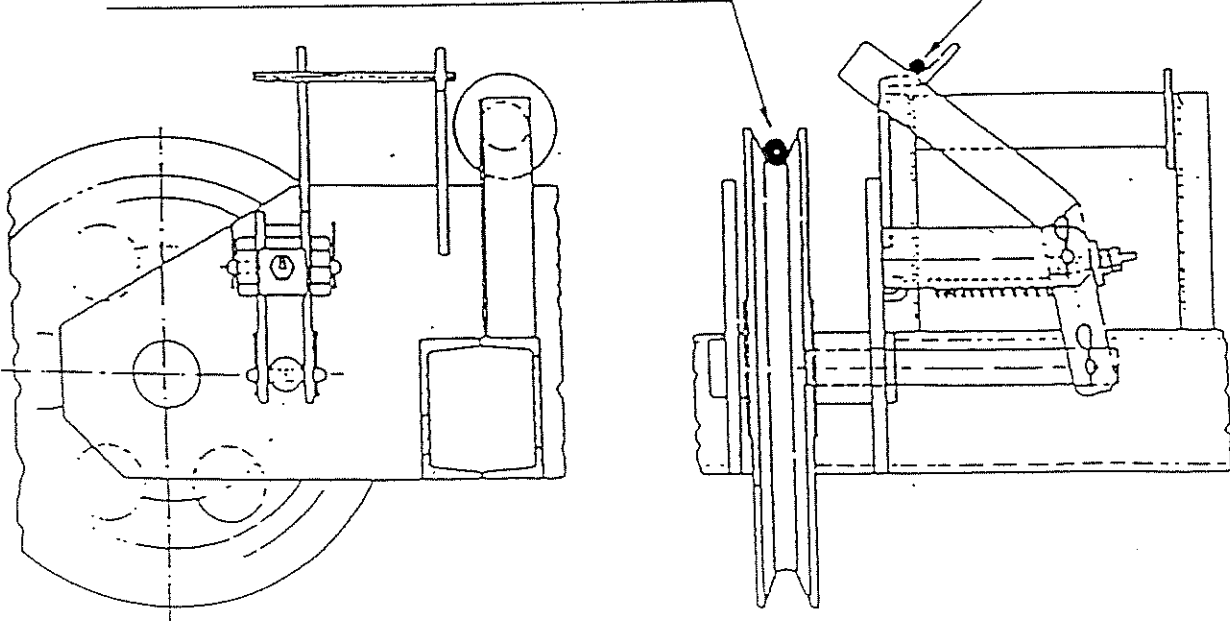
Ropes must be properly stretched but be careful not to stretch them too much to avoid any possible loss of the pulley efficiency and damages to the geared box. Do not slack them too much as well, since this may cause oscillating deflections and let them come out from their own seats.

To adjust the ropes use a small winch positioned on the trolley (picture 8.19).



HOISTING ROPE

TROLLEY ROPE





SECTION

11

LUBRICATION



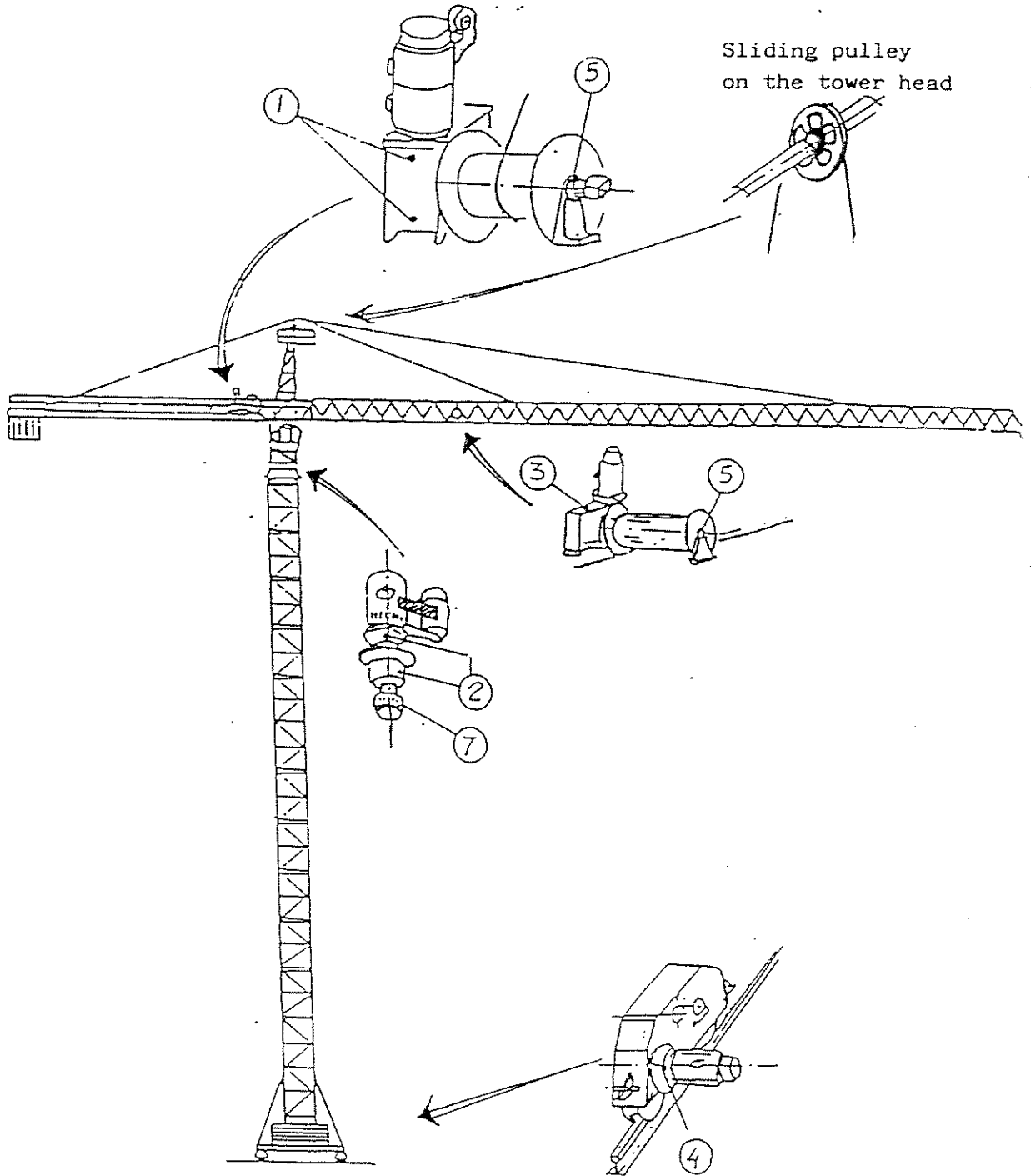
Functionality of the machine and its life as well, depend on the accuracy its operator has before, during and after it use. To this purpose, it is necessary to check very carefully the greasing conditions of the various elements.

In the following pages you can find the references for the parts to be greased, as well as how to carry out this operation.

In case the crane is not used for more than 3 (three) months, it is advisable to replace completely all the gear lubricants and the hydraulic system oil, as well.

To grease the rotation pinion and the slewing unit tothing, the operator has to stand on the slewing unit platform.

To grease the bearings - the operator standing on the above platform - the crane is equipped with some greasers that, through a canalization system, let the grease arrive to the bearing's balls.



SYSTEMS TO BE CHECKED	GREASE	QUANTITY (1)	ASSEMBLY				MONTHLY	1x6 MONTHS
			ASSEMBLY	DAILY	WEEKLY	MONTHLY		
REDUCTION GEARS	MOBILUBE 85-140 MOBILGEAR 630	6 30	S		C	C.R.	S	
	MOBILGEAR 630	6,5	S		C	C.R.	S	
	Spartan EP 150	3	S.I		C	C.R.	S.I.	
	Spartan EP 150	1,5	S.I.		C	C.R.	S.I.	
TELESCOPIC CAGE	MOBIL DTE 26	40	C				S	
SLEWING UNIT (TURNTABLE)	BEACON 2	/	I	I				
	BEACON 2	/	I		I			
ROTATION PINION								
PULLEYS	Shield fluid 3K	/				I		
ROPES	Shield fluid 3K	/				I		
PINS	Shield fluid 3K	/	I					

C = CHECK
 S = REPLACE
 I = GREASE
 R = TOP UP



SECTION

12

MAINTENANCE



"Maintenance" comprehends all the operations performed to keep the machine efficient. Besides the necessary lubrication, previously described, the operator has to follow some basic rules.

The crane structure is completely hinged except for the turntable. Even if all pins and screws have been previously weather proofed, it is suggested to protect them using some paraffin. This operation shall be carried out every 6 months.

It is furthermore suggested to check periodically (every three months) the tightening of the electric system wiring screws and the system connecting plugs, as well.

Ropes condition shall be inspected regularly . We recommend to wash them by petroleum naphtha before every installation. The most important maintenance operation is checking the turntable bolts tightening. The verification of the tightening torque has to be carried out at least once a month according to the values given in the next page (screws with a thread of M24 class 12.9)

It is anyway advisable the the operator periodically inspects the whole machine.

IMPORTANT ADVICE

- Do not tighten the slewing unit bolts for more times than the value indicated in the chart;
- Bolts have to be tightened always from the thread side (nut) ;
- Be sure of the right calibration of the dynamometric key ;
- In case the slewing unit has to be completely disassembled due to extraordinary maintenance operations or for any possible replacement, IT IS COMPULSORY to replace all the bolts and nuts.

ROPES :

When the crane is supplied with IV-falls but mainly works with II-falls, at least once a week use it with the IV-falls engaged. Unwind the rope from the drum completely so removing any internal tension arisen. Then wind it again with a light weight hanging from the hook : this keeps the rope taut. Always make sure of the proper and uniform winding of the rope on the drum.

If the final height of the crane is considerable, you'd better provide for two rope coils having different length: one to be used for heights lower than or like the maximum free standing height of the crane, the other for heights exceeding this value.

TYPE OF CRANE	SCREW DIA. MM.	PITCH	TYPE OF SCREW / Q.TY	MATERIAL OF SCREW	CLAMPING		MATERIAL OF NUT	MATERIAL OF WASHER
					K N.m	V N		
GTS 351	18	2.5	36 18x140 UNI 5931	10.9	304	121,000	8.8	C.50
			36 18x 60 UNI 5737					
GTS 421	18	2.5	40 18x140 UNI 5931	10.9	304	121,000	8.8	C.50
			40 18x60 UNI 5931					
GTS 484	18	2.5	40 18x140 COMEDIL	12.9	365	145,000	8.8	C.50
			40 18x140 COMEDIL					
MCA 501 MCA 551	22	2.5	80 22x140 UNI 5931	10.9	589	195,000	8.8	C.50
CT 602	24	3	80 24x150 UNI 5931	10.9	735	224,000	8.8	C.50
CT 651	24	3	40 24x150 UNI 5931	10.9	735	224,000	8.8	C.50
			40 24x160 UNI 5931					
CT 604	24	3	144 24x110 UNI 5737	10.9	735	224,000	8.8	C.50

CLAMPING TORQUE VALUES (K=N.m) AND PRE-LOAD ONES (V=N), INDICATED IN THIS CHART, REFER TO SCREWING OPERATIONS WITH BRAND NEW PARTS, LUBRICATED IN ALL THEIR CONTACT POINTS.
IT IS RECOMMENDED TO VERIFY MONTHLY THE SLEWING UNIT SCREWS TIGHTENING OF "IN SERVICE" CRANES.

For a correct maintenance, we would suggest to the operator to keep a log-book as per facsimile hereinafter described, recording the inspections and the interventions carried out to the crane.

These forms, that GRU COMEDIL S.r.l. gives separately from this manual, along with the electric schemes, if constantly and correctly up-to-date, will be of great help in case any exceptional maintenance intervention is carried out by GRU COMEDIL's personnel.

REDUCTION GEAR AND UNCOVERED GEARS

Periodically check the lubricating oil level as indicated at page 11.3.

Replace the oil and grease the mechanisms every erection or at least once a year.

LOAD LIMITING DEVICE

Periodically check this limit switch is properly fixed (see page 10.10).

PULLEYS

Make sure the pulleys are perfectly sliding. Their seizure could seriously compromise the operation of ropes and controls.

Special care has to be used for the sliding pulley positioned at the top of the tower head.

BRAKES

Periodically check the parking brakes efficiency.

SECTION

13

ADJUSTMENTS

- MOMENT LIMITING DEVICE
- LOAD LIMITING DEVICE AND MAX. HOISTING AND TROLLEY SPEED CUT OUT DEVICE
- HOISTING LIMIT SWITCH
- HOISTING
- TROLLEY
- SLEWING
- MOTOR DECELERATOR
- TRAVELLING

Herefollow would you please find a list of all the parts, both electrical and mechanical ones, that have to be adjusted when erecting the crane.

These operations have to be carried out with the maximum accuracy: crane safety and correct running depend on them.

Except for the brakes, the above calibrations initially set, are kept steady, even if it is better to check them periodically as this being part of the standard maintenance operations of the crane.

MOMENT LIMITING DEVICE

Positioned in the cabin mast section, this limiting device has two possible adjustments on the microswitch (see page 10.11):

- A) . The maximum moment limit switch (dynamic - FC 6 on the electric scheme), depending on the load jib combination at the jib end, can be adjusted by lifting of a few centimeters from the ground the maximum load allowed according to the load limits given raised of 3%.
 - . Using the adjusting screw (the one on the right), the hoisting is stopped.

- B) . The maximum moment limit switch (static - FC 8 on the electric scheme), depending on the combination between the load moved by the trolley and the jib, can be adjusted by raising the max. load with II or IV falls, at the indicated jib range.
 - . Move the trolley at about 1.5 - 2 metres before the limit allowed and adjust the screw of the second micro-switch until the "trolley ahead" function is interdicted.
 - . Move back the trolley of a few metres and operate "trolley-ahead" movement. Make sure it stops automatically within the indicated limits (+/- 5%).

The intervention of two moment limiting devices stops immediately the hoisting and "trolley-ahead" motions, while the load descent and "trolley-backward" motions are still possible.

MAXIMUM LOAD LIMITING DEVICE AND MAXIMUM SPEED CUT-OUT DEVICE FOR
HOISTING / TROLLEY

. The maximum load and speed limiting device is positioned at the beginning of the jib and is composed of a dynamometric ring which, through two amplifier plates, operates the microswitches arranged for interdicting both hoisting and trolley functions (Page 10.8).

. To set this limiting device, do the following:

A. Maximum load limit switch

1. Raise the maximum load indicated in the load table, increased of 10%, for few centimetres from the ground;
2. Adjust the screw that operates the microswitch (FC 5), until the hoisting stops;
3. Reduce the weight of the above 10% overload, and make sure that hoisting can be achieved using the indicated speeds, usually with 1st and 2nd speed.

This device blocks the hoisting operation but allow to lower down the load to restore the crane standard position.

B. TROLLEY MAXIMUM SPEED LIMITING DEVICE

- The trolley speed is limited when working with IV falls and having weights exceeding 70% of the maximum load allowed.
- This limiting device operates therefore when heavy weights have to be hoisted, and interdicts both forward and backward movements with 3rd speed.
- The device is automatically set by the microswitch for cut-out of 2nd speed FC3 (page 10.9).

EXAMPLE: SETTING WITH WINCH TYPE AWL-R 506

C. Maximum speed limiting device

- FC2: 1) Hung 2400 Kg. plus 8% of load with II falls;
2) Operate on the screw (pos. 10.9) to drive the relevant microswitch;
3) Hoist the load operating on the joy stick and check that the winch doesn't succeed in raising it;
4) Restore 2400 Kg. of load; operate the hoist checking the right running of the system;
5) Repeat the hoisting for some times to be sure the setting is the right one.
- FC3: 1) Hung 3500 Kg. plus 8% of load with II falls;
2) Operate on the screw (pos. 10.9) to drive the relevant microswitch;
3) Hoist the load operating on the joy stick and check that the winch doesn't succeed in raising it;
4) Restore 3500 Kg. of load; operate the hoist checking the right running of the system;
5) Repeat the hoisting for some times to be sure the setting is the right one.
- FC4: 1) Hung 4600 Kg. plus 8% of load with II falls;
2) Operate on the screw (pos. 10.9) to drive the relevant microswitch;
3) Hoist the load operating on the joy stick and check that the winch doesn't succeed in raising it;
4) Restore 4600 Kg. of load; operate the hoist checking the right running of the system;
5) Repeat the hoisting for some times to be sure the setting is the right one.
- FC5: 1) Hung 6000 Kg. plus 8% of load with II falls;
2) Operate on the screw (pos. 10.9) to drive the relevant microswitch;
3) Hoist the load operating on the joy stick and check that the winch doesn't succeed in raising it;
4) Restore 6000 Kg. of load; operate the hoist being sure that the maximum speed is not operative;
5) Repeat the hoisting for some times to be sure the setting is the right one.

LOAD LIMITING DEVICE - II FALLS

FC 2	Kg.	2,400	
FC 3	Kg.	3,500	
FC 4	Kg.	4,600	10 14
FC 5	Kg.	6,000	10 23 0

LOADS / SPEEDS

<u>LOAD Kg.</u>	<u>SPEED m/min.</u>	
	<u>Hoist</u>	<u>Descent</u>
4,600 - 6,000	33	35
3,500 - 4,600	43	46
2,400 - 3,500	55	60
0 - 2,400	82	88

HOISTING LIMIT SWITCH

The limit switch or pre-limit switch control device is located on the drum axis. It is composed of an helical wheel-worm mechanism, which operates 1/2/3/4 cams (page 10.12):

- 1 = HOISTING LIMIT SWITCH CAM
- 2 = HOISTING PRE-LIMIT SWITCH CAM
- 3 = LOWERING LIMIT SWITCH CAM (IV FALLS)
- 4 = LOWERING LIMIT SWITCH CAM (II FALLS)

- a) CAM-1: adjusts the hook hoisting maximum limit; once reached the path limit, it intervenes cutting off the power to the motor;
- b) CAM-2: adjusts the hook hoisting maximum limit approach; it intervenes shifting from the maximum to the minimum speed, thus eliminating any eventual load recoil;
- c) CAM-3: adjusts the descent limit switch when using IV falls;
- d) CAM-4: adjusts the descent limit switch when using II falls.

When, while working - shifting from II to IV falls - it is needed to operate the lowering limit switch, it is necessary to operate the commutator located on the control board (page 14.5).

To carry out the inverse manoeuvre, operate the commutator concontraywise.

Would you please note that, even if the limit switch is set for IV falls, the crane does work with II falls, but with positions which are not correct.

SLEWING CONTROL

The problems typically associated with slewing suspended loads are caused by the oscillation imparted to the load at the start and end of the movement. The crane is equipped with an eddy current motor brake to provide smooth slewing action.

THE EDDY CURRENT MOTOR BRAKE

Adjust the eddy current motor brake so that when the crane is slewing at full speed and power is disconnected from the motor, the tip of the jib does not describe an arc of more than 7-10 m before the brake stops it. The eddy current motor brake prevents structural stress to the crane and unwanted oscillation in suspended loads.

The eddy current motor brake ensures that slewing is started and stopped in a smooth and gradual manner.

Do not purposefully slew in low speed for prolonged periods of time, since this can overheat the eddy current motor brake. Use slow speed only to finely position the load.

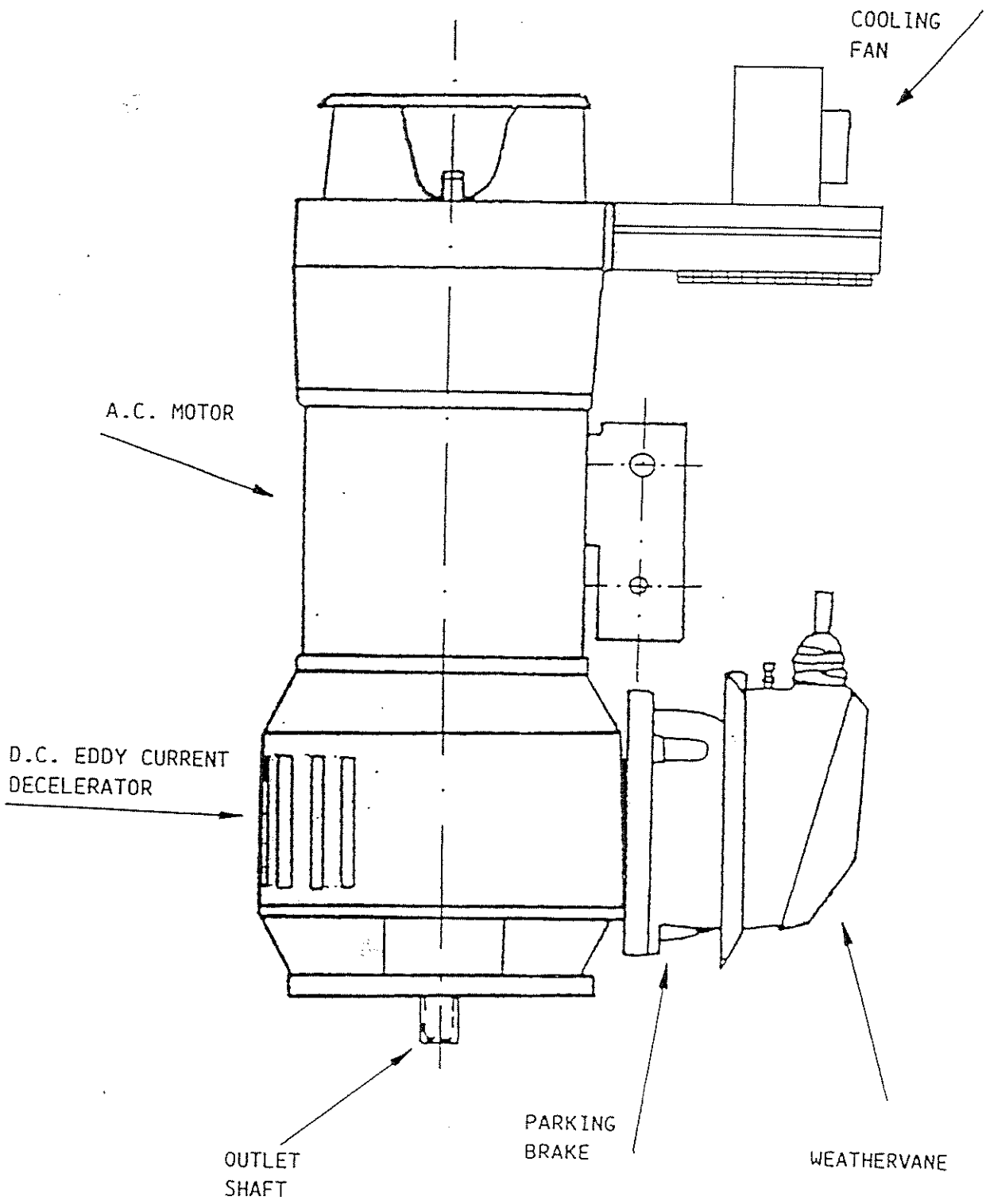
THE SERVICE BRAKE

The service brake (Page 13.7) should be used only to hold the jib stationary. As slipping between the braking parts is not allowed to avoid any wear problem, the service brake is adjusted when mounting the crane. Further adjustments are not necessary.

SLEWING LIMIT SWITCH

The slewing limit switch is installed in the turntable unit (See page 10.13), and consists of a pinion (with the same toothing as the slewing drive pinion). This pinion is driven by the turntable crown gear and operates the slewing limit switch.

The slewing limit switch should be adjusted to prevent more than 1.5 complete turns in either direction to avoid twisting the power and control cables which run up the mast. Additional limit switches can be installed to restrict the slewing angle to tighter limits.



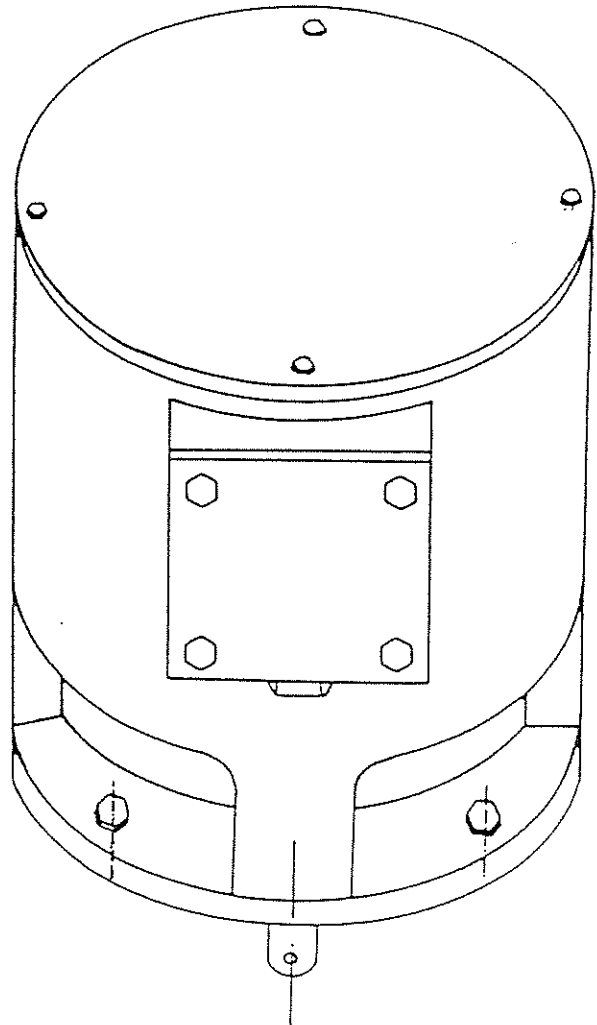
As additional safety, this device is equipped with a time-relay ("A45" on the scheme) to control the unsuccessful running of the above device.

In case "A45" intervenes, the rotation manoeuvre is limited just to the first speed (right or left), whichever the requested one.

In this case, the device guarantees the work at a reduced speed until the intervention of the assistance service, who will restore the original conditions.

"A45" timer calibration can be achieved in 3-6 seconds.

../.
..



- Assembled on the slewing motor it prevents any sudden change of rotation (slewing), that could damage the crane structure.
- No adjustments are necessary.

JIB TROLLEY

The jib trolley is controlled by an electromagnetic (GVP) progressive speed unit. In this case the brake is needed just as parking brake.

To be sure the brake runs well, the following tests have to be carried out:

- a) hung a weight 20% heavier than the maximum one allowed for II falls and make the trolley travel in 2nd speed. When braking without the decelerator operating the microspeed, the trolley has to stop in about 0.6/0.8 m.
- b) hung the maximum weight allowed for IV falls and make the trolley travel in 1st speed. When braking, still with decelerator off, it has to stop after 1/1.2 m.

The "limit switch or pre-limit switch" control unit is positioned on the drum axis of the trolley travelling mechanism.

To adjust this mechanism (same described for hoisting), follow the instructions of paragraph 10.

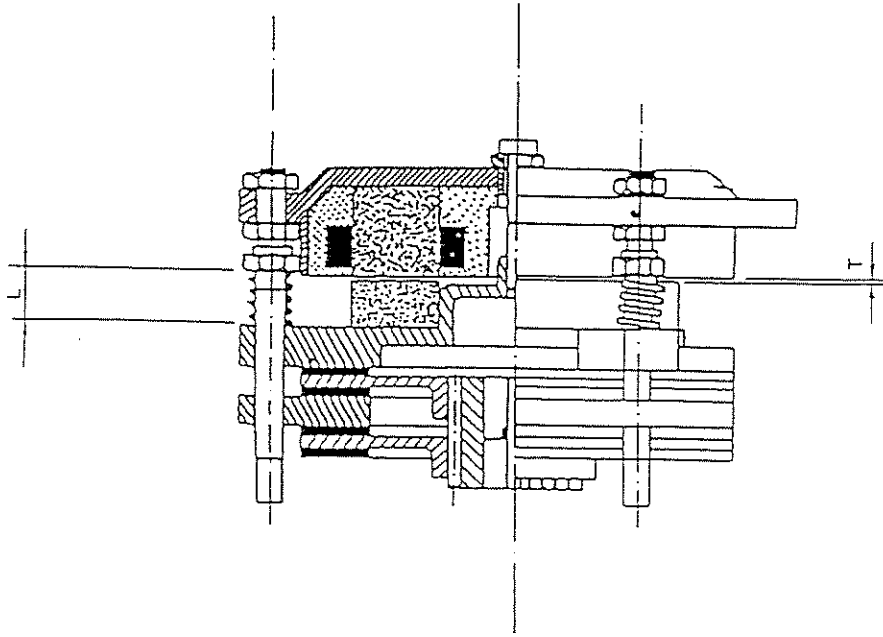
When IV falls have to be used, therefore it is necessary to connect the two trolleys together, approaching the standard service trolley to the one positioned at the beginning of the jib, the limit switch device intervenes. In order to translate the trolley and carry out the coupling, operate on commutator lever (page 14.6); moving this lever to "trolleys coupling" position, the previous "limit switch" signal is cancelled.

Once the coupling is achieved and the commutator is in IV falls position, the limit switches will be operative again.

For the brake adjustment, please refer to page 13.9.

Type of brake: 100 SD.

HOISTING BY "AG" WINCH



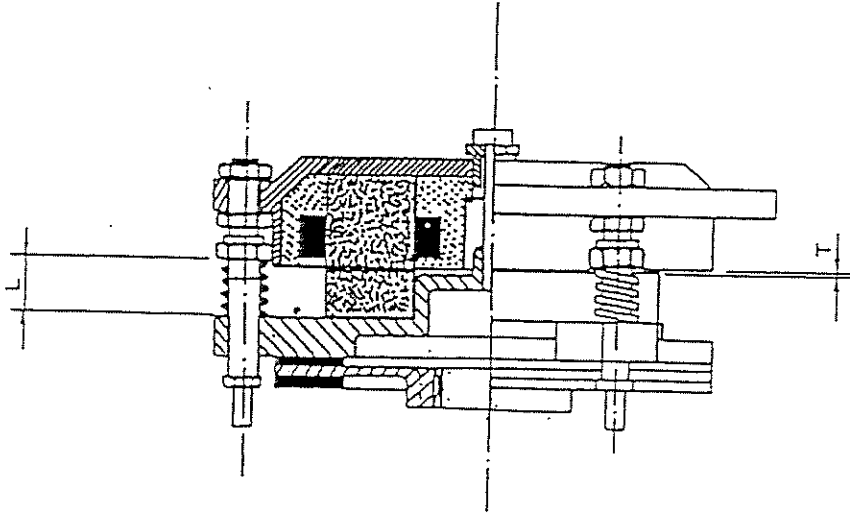
BRAKE TYPE: 200 DOUBLE DISK

SPRING N°: 6

SPRING CALIBRATION "L": For 40 HP Winch mm 32

GAP CALIBRATION "T": mm 0,7 + 1,2

TROLLEY



BRAKE TYPE: 100 SINGLE DISK

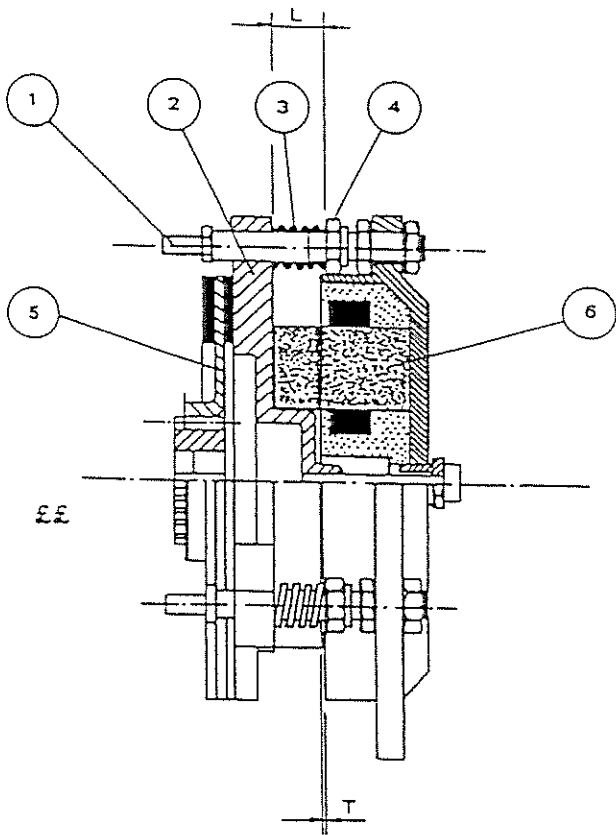
SPRING N°: 3

SPRING CALIBRATION "L": Double Brake

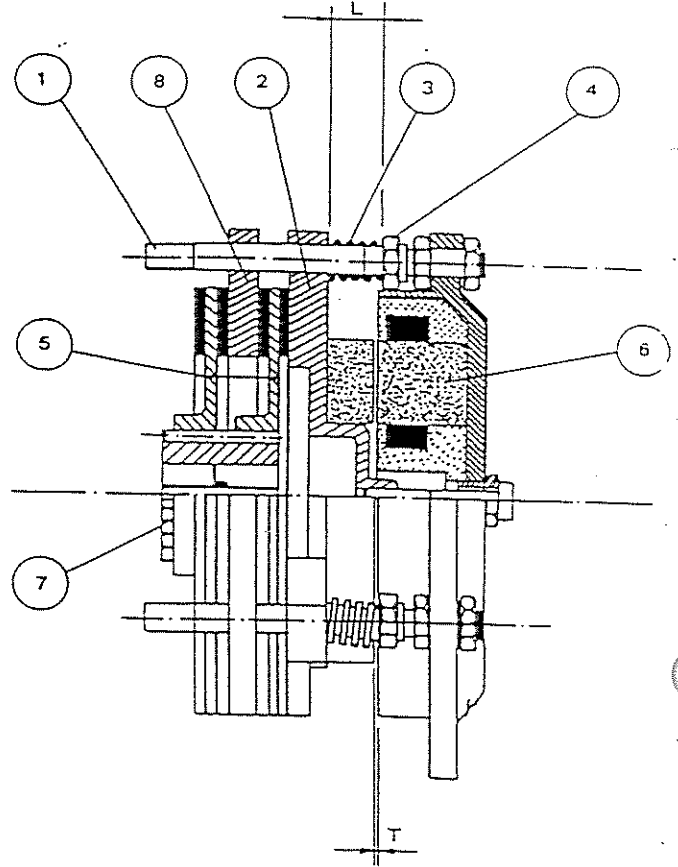
GAP CALIBRATION "T":

mm 22 + 23

mm 0,3 + 0,5

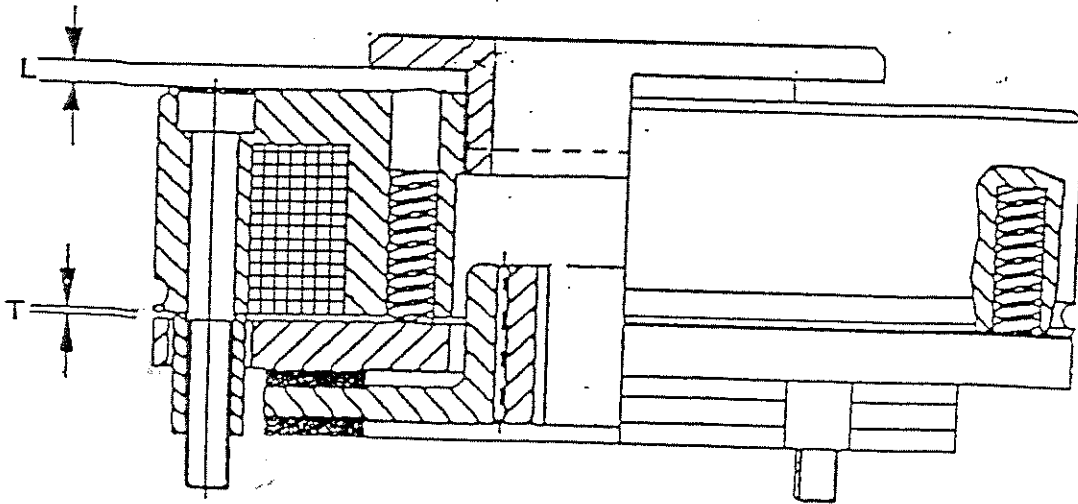


SD



SDD

N.	TYPE TIPO	SPRINGS N. MOLLE	C cN.m	T mm	L mm	REMARKS NOTE
1	80 SD	3	1.2	0.3	14	
2	90 SD	3	2	0.3	14	
3	100 SD	3	3.5	0.4	17	
4	110 SD	3	5.5	0.4	22	
5	110 SM	3	5.5	0.4	22	
6	120 SMDD	3	14	0.5	25	
7	140 SMDD	6	20	0.6	25	
8	160 SMDD	6	25	0.6	25	
9	180 SMDD	6	35	0.8	35	



BRAKE TYPE: FMPR 300 Single disk

SPRING No.: 12 (adjustable) + 6

SPRING CALIBRATION "L":

for 50 Hp winch 9 mm.

for 70 Hp winch 6 mm.

GAP CALIBRATION "T": 0.5 - 1 mm.

TRAVELLING LIMIT SWITCH

The guides which control the "backward" and "forward" limit switches, must be positioned along the runway. On the chassis there's a box with the microswitches acting on the electric controls of the travelling motor and the stationary brake.

To set the stop position, move the operating guides along the runways, bearing in mind that inertia lets the crane move forward of 0.5-1 m. after the electric limit switch intervention.

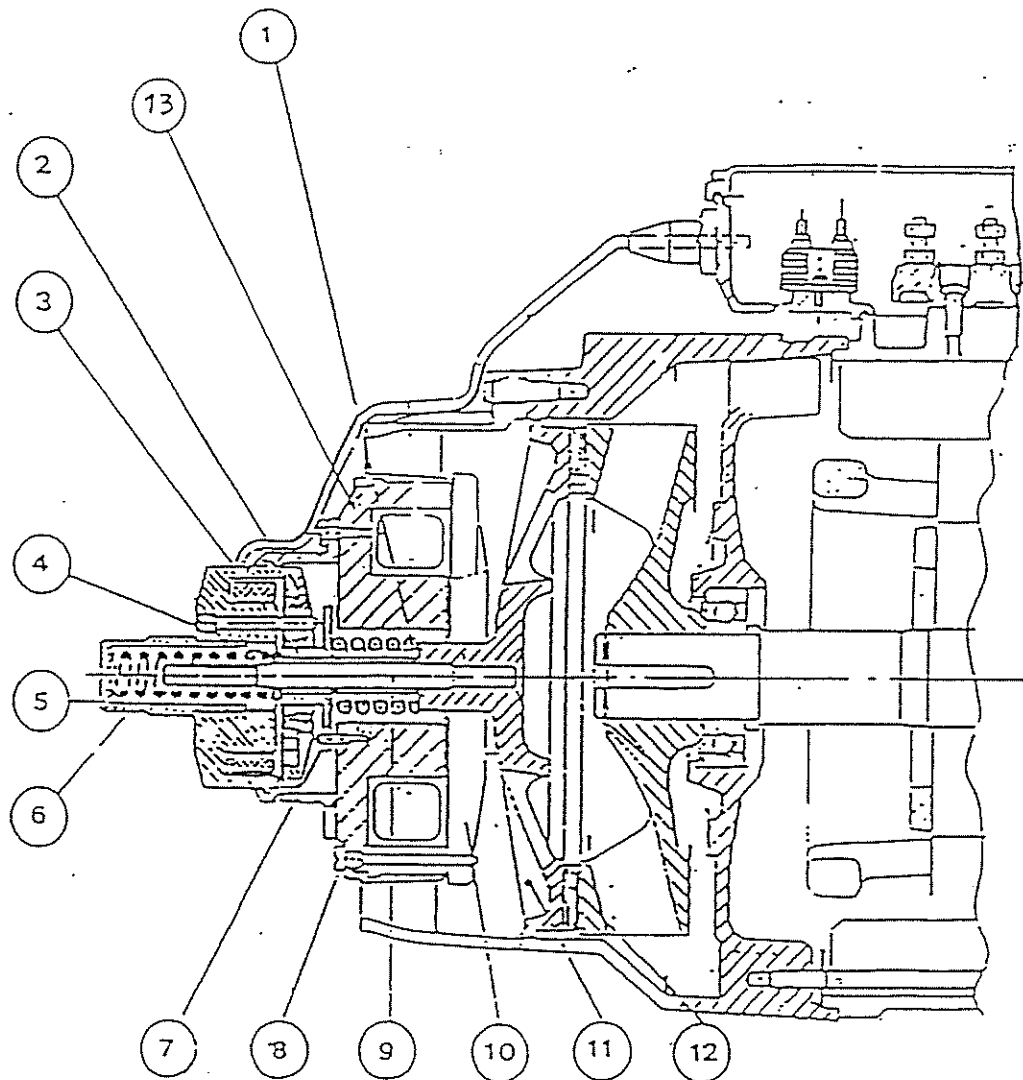
To adjust the intervention of the microswitches operate on their screws, which fasten them to the chassis (rough regulation), and move the carrying out lever (precise regulation).

Make sure that, after the passage of the carrying out roller on the limit switch guide and the consequent microswitch release, the same roller can make an extra run of 4-6 m. as to the guide level.

TRAVELLING BRAKE ADJUSTMENT

1. Unloose and extract the screw (pos. 8);
2. Turn the cap (pos. 10) counterclockwise using a screwdriver through the slip (5) until it enters in touch with the electromagnetic coil;
3. Place the screw (pos. 8) on the cap pressing slightly the cap and rotating it clockwise. Count three inserting holes.
4. Once reached the 3rd hole, insert the screw (pos. 8).
5. Repeat the same operations with the cap (pos. 2), as well as with the outside coil.

TRAVELLING MOTOR 37/37 N.m.



1. SPRING x 20 N.m.
2. ARMATURE x 6.6 N.m. (PARKING)
3. COIL x 6.6 N.m.
4. GUDGEON PIN
5. SPRING COVER
6. SPRING x 6.6 N.m.
7. GUIDE PIN
8. ADJUSTMENTS SCREWS
9. CLAMPING PIN
10. ARMATURE x 20 N.m.
11. CROWN
12. BRAKE DISC
13. COIL x 20 N.m. (DECELERATOR)



SECTION

14

INSTRUCTIONS TO USE THE CRANE

- CRANE " IN SERVICE " AND " OUT OF SERVICE "
- CONTROL BOARD
- CHANGE FROM II TO IV FALLS AND VICE - VERSA



POSITIONING THE CRANE "IN SERVICE"

At the beginning of each working day or, anyway, after any stop at the job-site, it is necessary to:

- . restore the electrical power;
- . release the anchorage tongs in case of a travelling version crane;
- . check the parking brakes efficiency, as well as the rotation, trolley and travelling ones;
- . verify the efficiency of the safety systems (particularly of the limit switches and load/moment limiting devices);

SERVICE RECOMMENDATIONS

1. Hoisting must be carried out using the microspeed as far as the load is completely raised from the ground. It is forbidden to use both 1st and 2nd speed if the ropes are not properly stretched.
2. It is forbidden to rotate the jib or travel with the trolley unless the load is completely raised from the ground.
3. It is furthermore prohibited to stop the crane motions by using "STOP" push button, unless in case of real emergency. This manoeuvre is in fact dangerous because it cuts out the automatic devices that assures a gradual control.
4. The intervention of a thermostat prevents the hoisting motors from overheating, but cannot warn off against the wearing out of the winding protections. Therefore, in case the intervention is repeated more than three or four times, this winding protection is compromised.

The crane can be operated from:

- . the panoramic slewing driver's cabin
- . a portable remote control
- . a radio control

Considering the performances of the crane, it is advisable to operate it from the cabin, so to have the best job-site view.

In case the other two controls are used, it is advisable that the crane operator pays the utmost attention to all those controls and safety systems that are positioned on the top of the crane, i.e. close to the cabin, therefore being always under direct control.

Picture at page 14.4 shows schematically the operator working position.

Symbols are valid for all the three working possibilities.

CONTROL UNIT FOR 3-SPEED WINCH TYPE AG

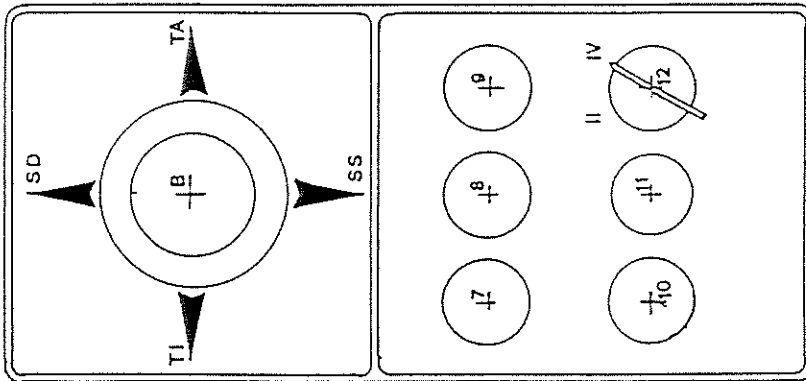
- | | | |
|----|---|--------|
| 1 | Warning light for trolley thermic probe | bleu |
| 2 | Warning light "on" | green |
| 3 | Push button with signalling light for gear "on" | green |
| 4 | Push button for trolley coupling | black |
| 5 | Head push button for slewing emergency | red |
| 6 | Push button with key "reset" | red |
| 7 | Warning light for 3rd speed cut out device | yellow |
| 8 | Warning light for 4th speed cut out device | yellow |
| 9 | Warning light for 5th speed cut out device | yellow |
| 10 | Warning light for moment limiting device | yellow |
| 11 | Hoisting anomalies | black |
| 12 | II/IV falls selector | |
-
- A Control lever on the left (with dead-man-control safety device)
 - B Control lever on the right (w/ dead-man-control safety device)
 - CA Trolley positioned at the end of the jib
 - CI Trolley positioned close to the tower
 - RS Slewing from right towards left
 - RD Slewing from left towards right
 - SD Load descent
 - SS Load raising
 - TI Backward travelling
 - TA Forward travelling

The crane allows 4 manoeuvres contemporaneously; it is anyway the crane operator that has to be careful according to the loads to be hoisted.

JOY-STICK ON THE RIGHT

MD

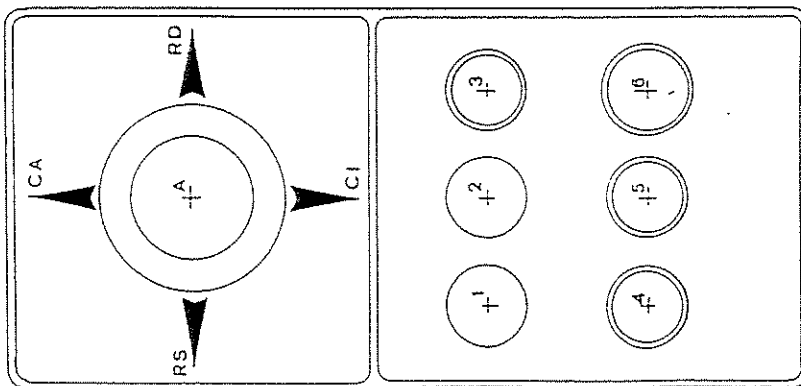
CLOCHE DESTRA



JOY-STICK ON THE LEFT

MS

CLOCHE SINISTRA



POSIZIONE OPERATORE

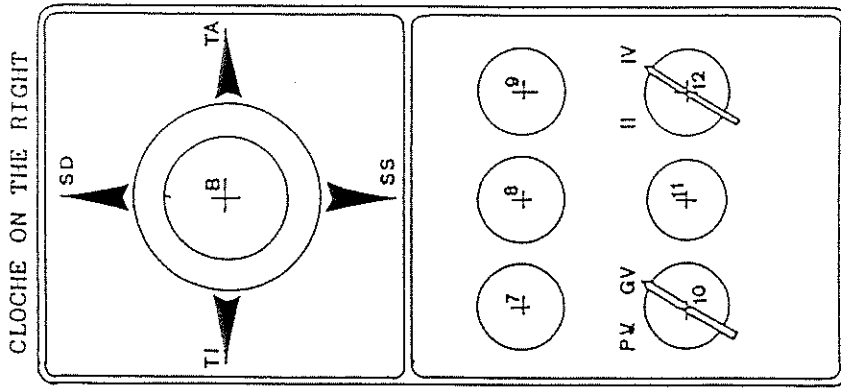
POSITION OF THE CRANE OPERATOR

CONTROL BOARD FOR AWL-R WINCH

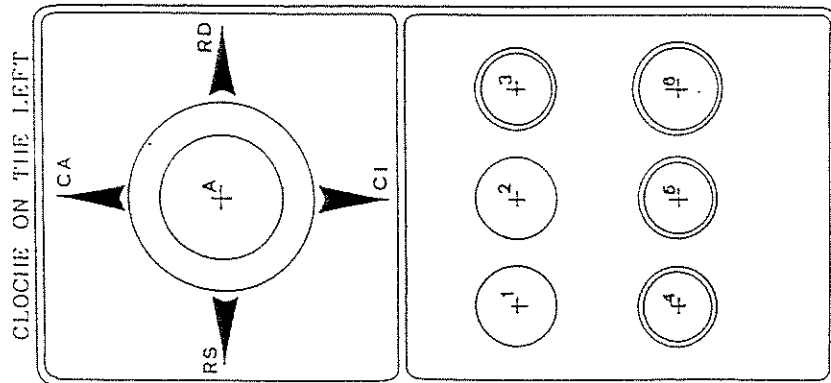
1	Warning light for trolley thermic probe	bleu
2	Warning light for line "on"	green
3	Lit push button for gear "on"	green
4	Trolleys coupling push button	black
5	Slewing emergency push button (head type)	red
6	"Reset" push button with key	red
7	Warning light for moment limiting device	red
8	Warning light for hoisting faults	red
9	Horn (head type)	yellow
10	Selector for high/low speeds	red
11		
12	Selector II/IV falls	black
A	Left control lever (with dead-man safety)	
B	Right control lever (with dead-man safety)	
CA	End direction trolley	
CI	Tower direction trolley	
RS	Rotation from left to right	
FD	Rotation from right to left	
SD	Hoisting: load descent	
SS	Hoisting: load raising	
TI	Backward travelling	
TA	Forward travelling	

The crane accepts four manoeuvres contemporaneously; it is anyway the crane operator that has to be careful with the loads he is handling.

MD



MS



CRANE'S OPERATOR POSITION

COUPLING AND UNCOUPLING THE TROLLEYS

You must couple the two trolleys to switch between 2 and 4 fall hoisting. This operation can be controlled from the cabin or from the ground.

2 fall hoisting can be performed with the C2 trolley and B2 block (See page 14.8). The C1 trolley and B1 block normally remain parked at the mast.

4 fall hoisting requires both trolleys to be coupled together and both blocks to be yoked up.

Proceed as follows to couple the trolleys:

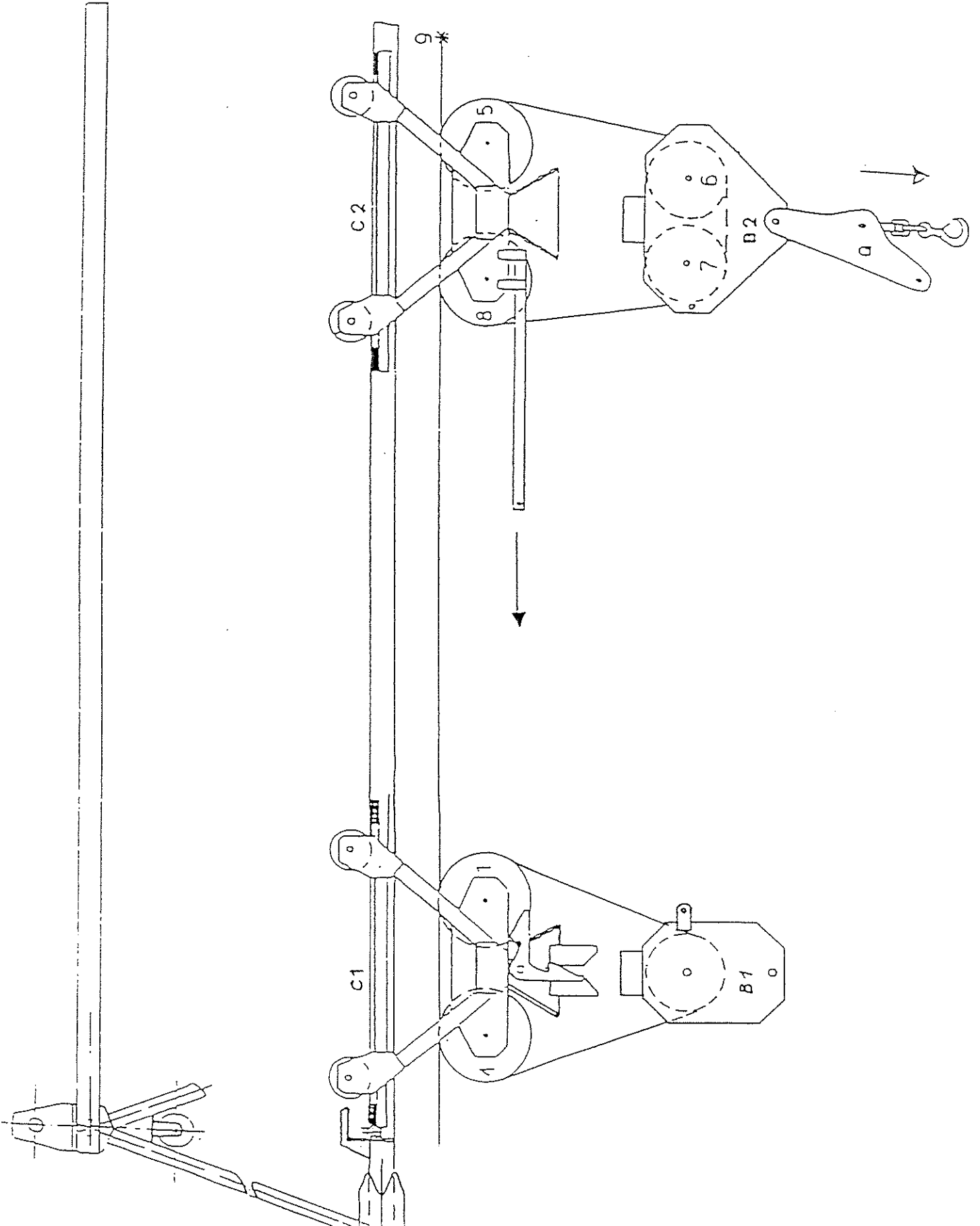
- Use the MS joystick and selector 4 (Page 14.4 - 14.6) to move trolley C2 up to trolley C1 (Page 14.8 and 14.6) so to allow immediate release of block B1 (Page 14.8).
- Lower block B2 and then block B1 to the ground.
- Yoke up the two blocks B1 and B2 with the hook bracket and secure with pin S.

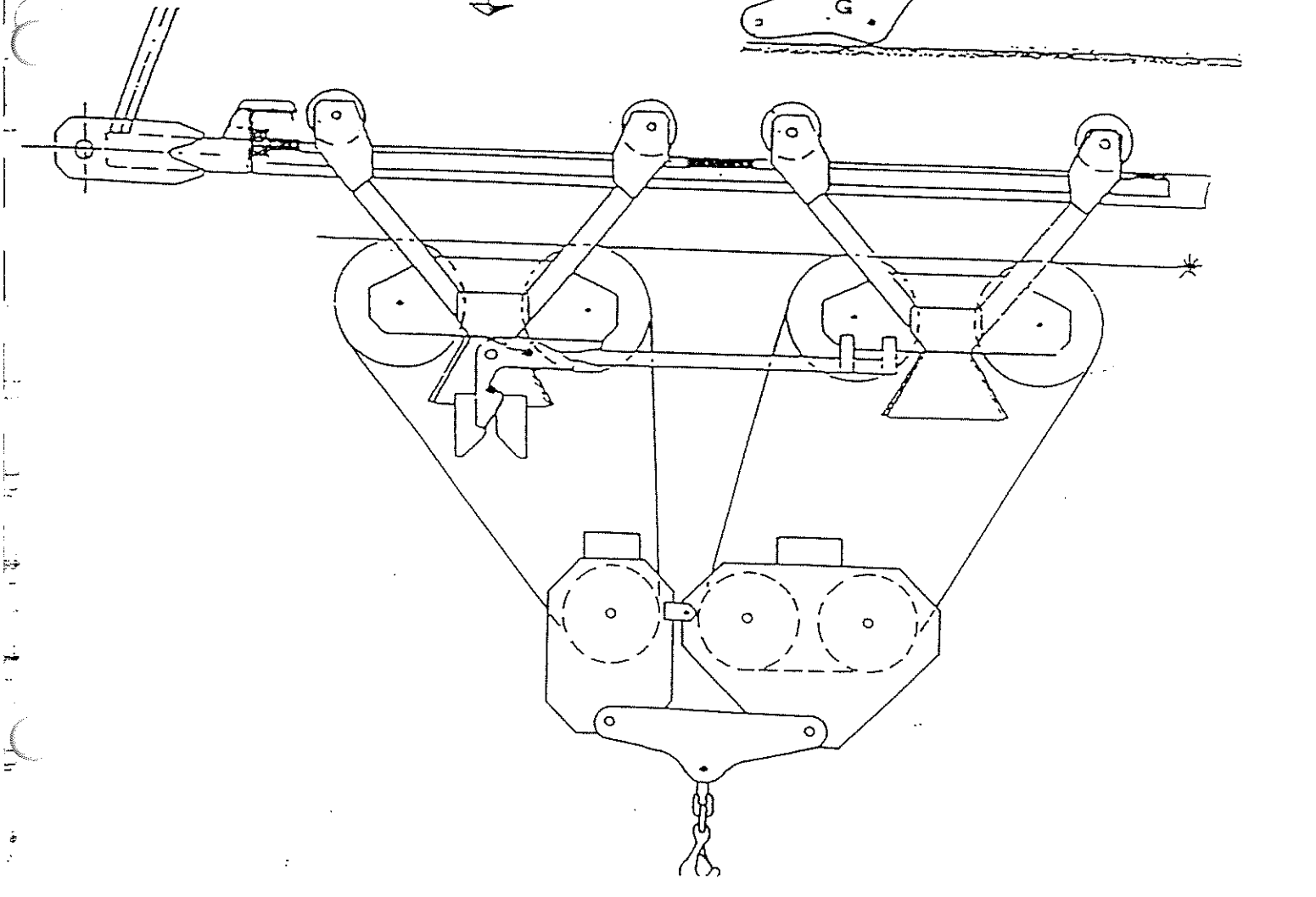
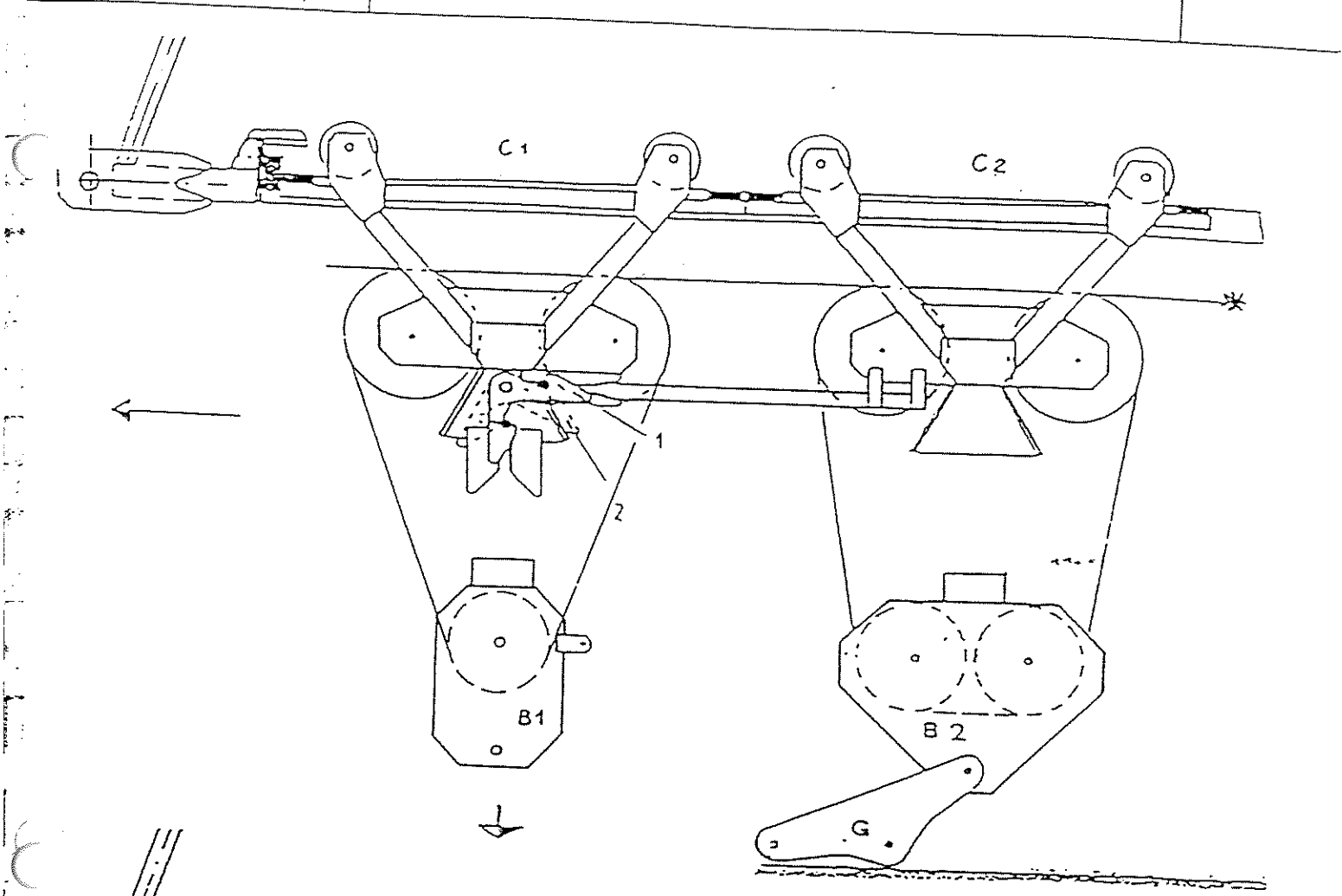
The crane is now set up for 4 fall hoisting. The two trolleys are securely coupled and act as a single unit.

Proceed as follows to uncouple the trolleys:

- Move the trolleys tight up to the mast with selector 4 so that the rollers of trolley C1 lie past the limit switch.
- Lower both blocks and remove the securing pin.
- Hoist block B1 up to trolley C1 which is parked at the mast. Trolley C2 and block B2 remain free.

The crane is now set up for 2 fall hoisting.





IMPORTANT ADVICE

When the crane is supplied with IV-falls but mainly works with II-falls, at least once a week use it with the IV-falls engaged. Unwind the rope from the drum completely so removing any internal tension arisen. Then wind it again with a light weight hanging from the hook : this keeps the rope taut. Always make sure of the proper and uniform winding of the rope on the drum.

If the final height of the crane is considerable, you'd better provide for two rope coils having different length: one to be used for heights lower than or like the maximum free standing height of the crane, the other for heights exceeding this value.

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IMPORTANT ADVICECRANE "OUT OF SERVICE"

When the wind speeds exceeds, even if at intervals, the speed of 72 Km/h., or at the end of a working day, as well as when a storm is approaching, it is COMPULSORY to make the crane "out of service".

This is achieved through the following operations:

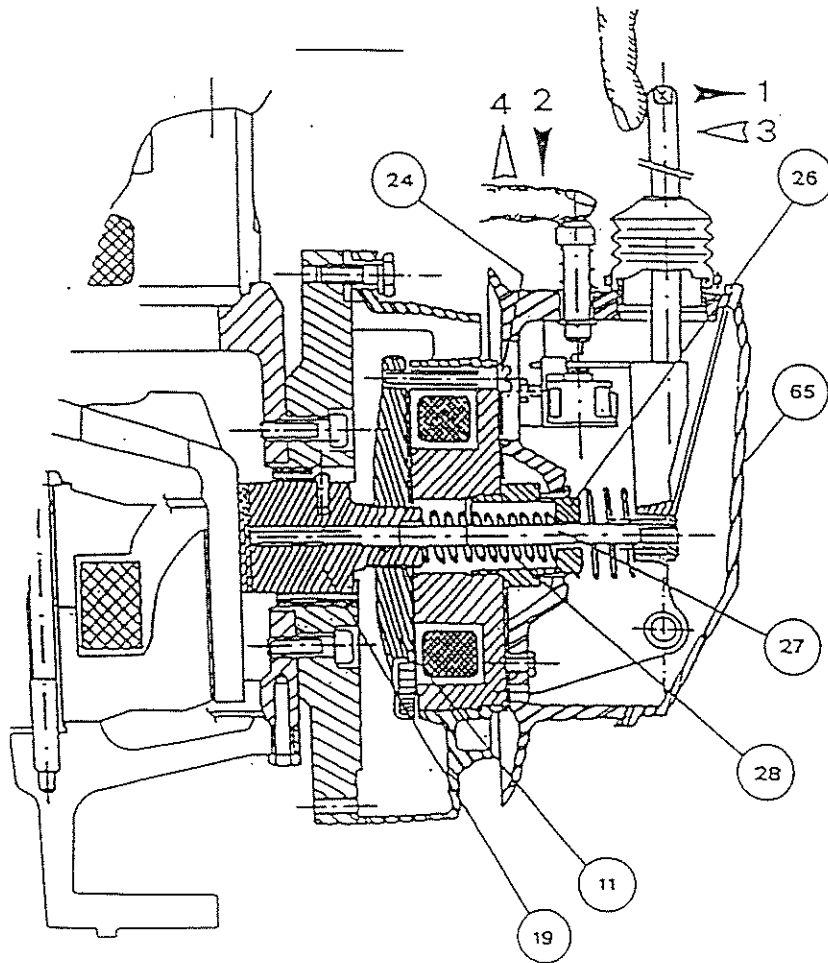
- . anchor the crane (in case it is a travelling one) to the tracks positioned in the area duly ballasted, clamping the special tongs;
- . raise the hook and move the trolley as close as possible towards the tower;
- . release the slewing brake (section 10), as per instructions given (see page 10.5 and 14.11).
- . disconnect the line knife switch or the feeding from the main panel.

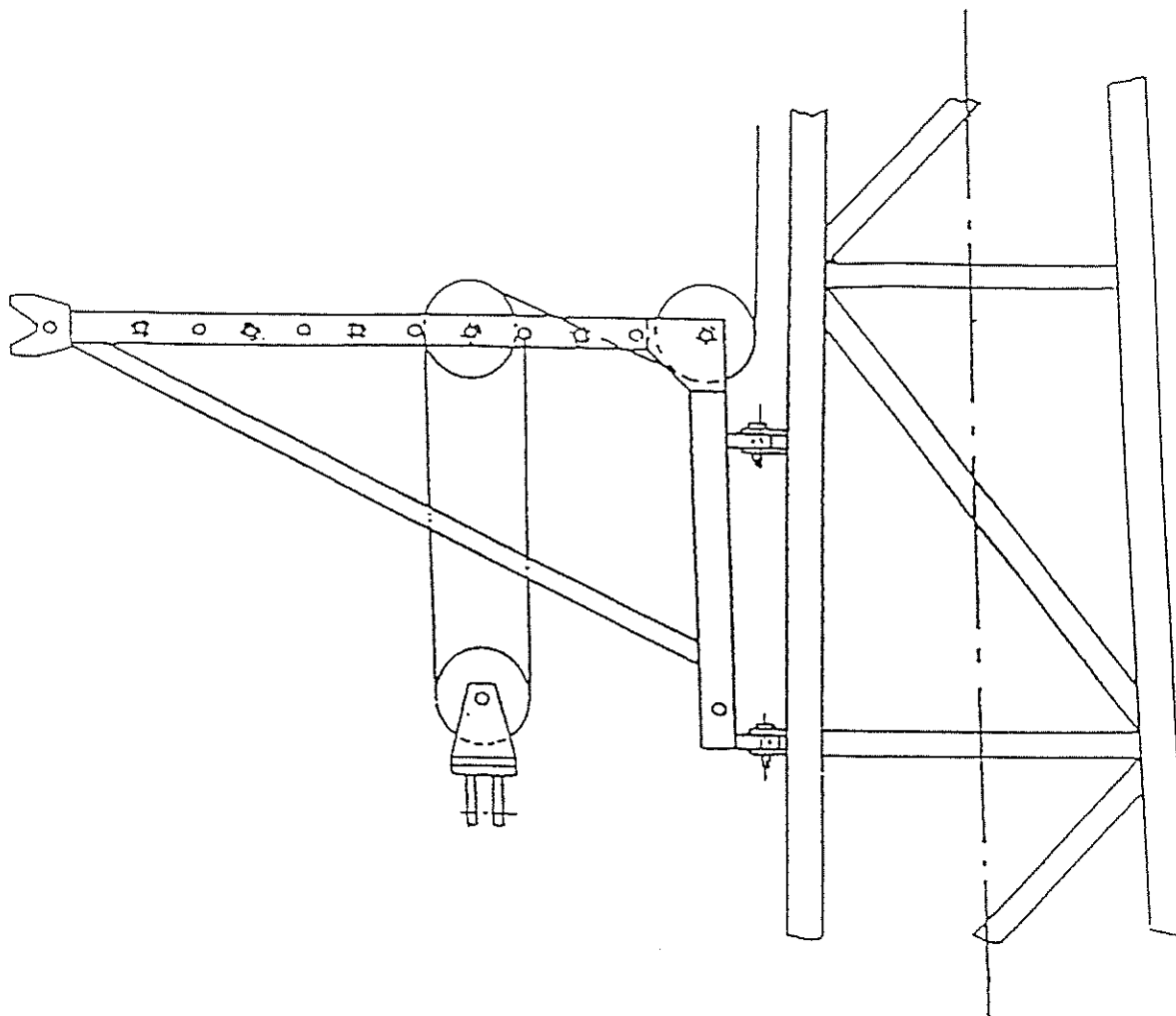
Most attention is recommended to the user when anchoring the crane 'out of service'. A) and B) travelling bogie axis must coincide with the kerb joining traverses axis (section 6). This to allow the crane to stand centered as to the anti-tilting ballast.

The travelling limit buffers must be secured to the rail once taken the crane to the electric limit switch position. Their distance from the travelling bogie head must be of at least 200 mm. (see section 6). There must be still a safety margin of 1.5 m. between the buffer and the track end.

IMPORTANT ADVICE

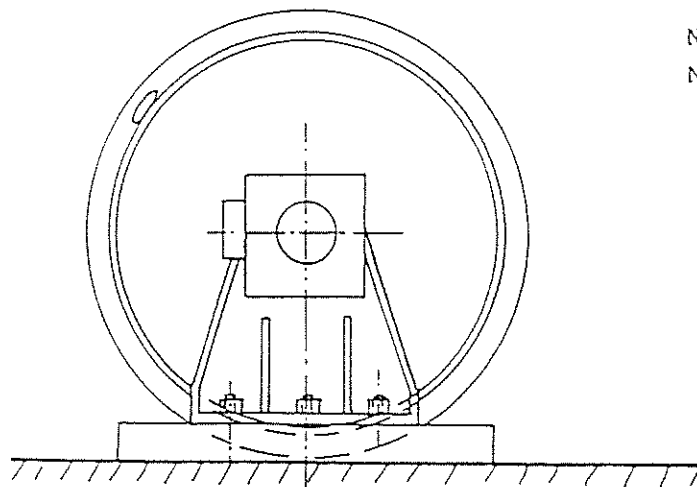
For electric release of slewing brake attain to instruction of page 10.5. In case brake release by hand is needed follow the points from 1 to 4 in the picture.





N. 2 Spine T 25x110

N. 2 Copiglie 6x60

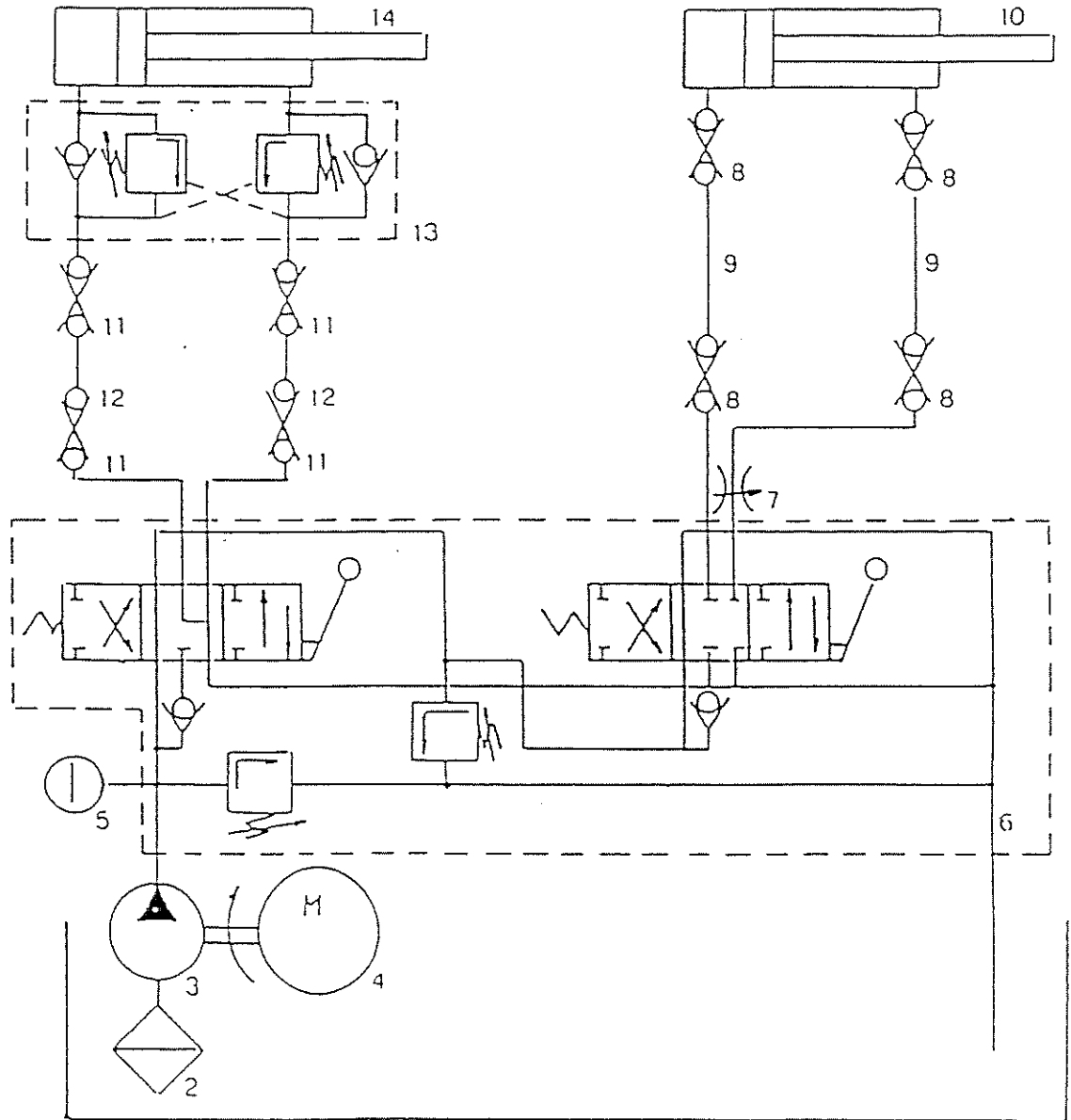


SECTION

15

RAISING (TELESCOPIC CAGE)

HYDRAULIC PLAN SCHEME



- | | |
|---------------------------------|-----------------------|
| 1) TANK | 8) QUICK JOINT |
| 2) FILTER | 9) FLEXIBLE HOSE |
| 3) VOLUMETRIC PUMP | 10) AUXILIARY JACK |
| 4) ELECTRIC MOTOR | 11) QUICK JOINT |
| 5) RADIAL MANOMETER | 12) FLEXIBLE HOSE |
| 6) TWO LEVERS DISTRIBUTOR | 13) OVER CENTER VALVE |
| 7) BIDIRECTIONAL THROTTLE VALVE | 14) MAIN JACK |

TELESCOPIC OPERATIONS:

The system for mounting the tower elements includes the telescopic cage G, the hydraulic group, which in turn comprises the hydraulic unit Cn, the main hydraulic jack Mp, the auxiliary jack Ms, the mobile cross beam Tr and the retractile hook Rt (See page 15.2 - 15.3). The system also includes the rails-trolley group (Page 15.4) and the platforms group of the telescopic cage (Page 15.5).

The first step is to connect the telescopic cage G to the lower slewing ring Pi by the pins K (See page 15.6).

For this purpose a preparatory stroke of jack MP is necessary according to "C" and "D" phases described in the next pages.

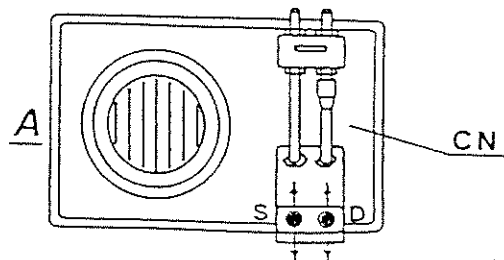
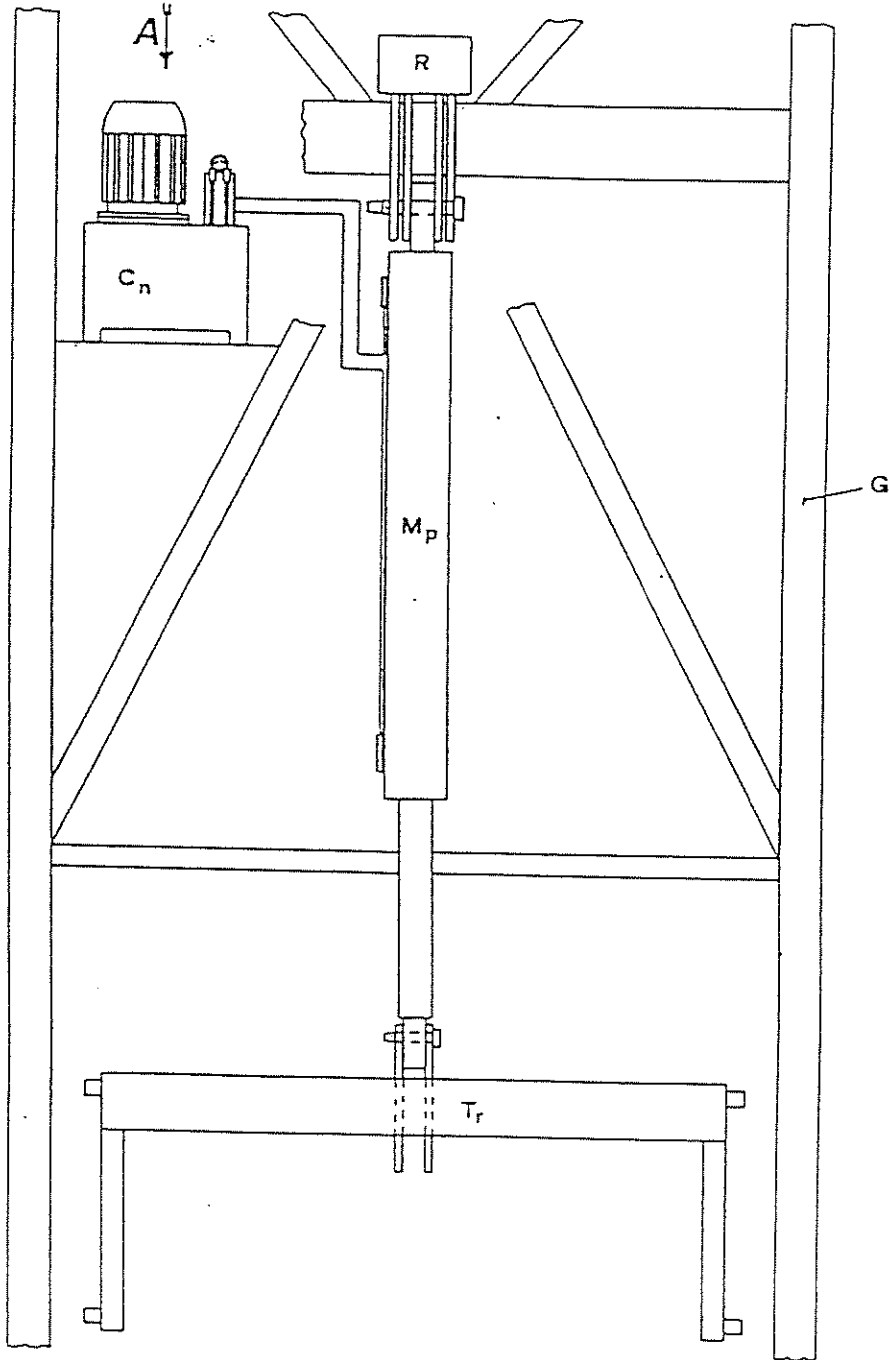
Preparing the telescoping cage:

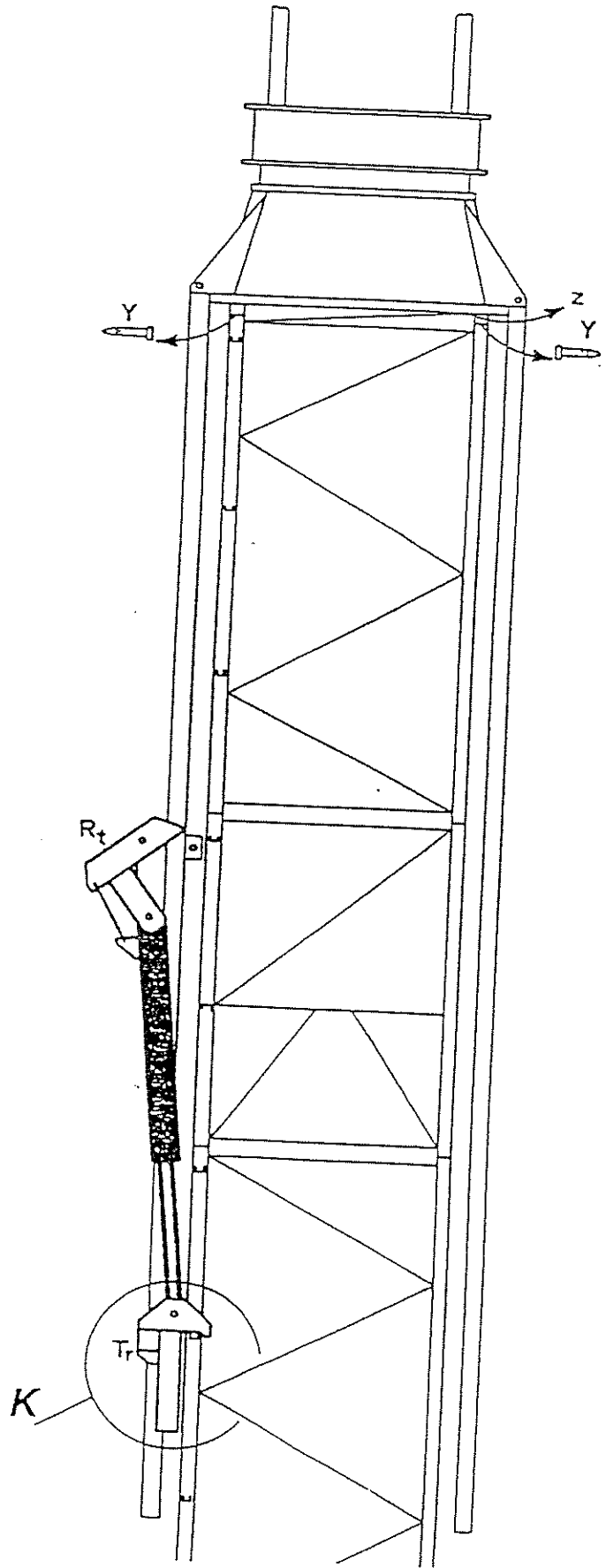
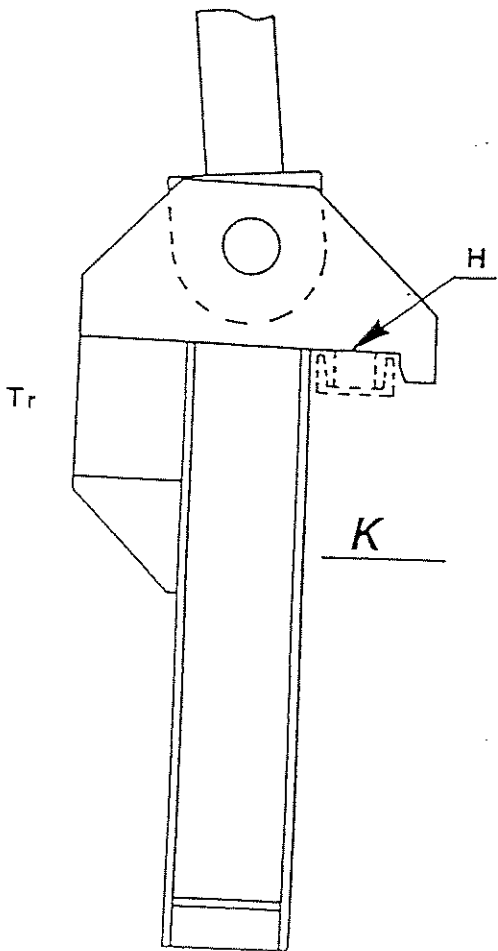
With reference to the page 15.3 arrange the telescoping elements as follows:

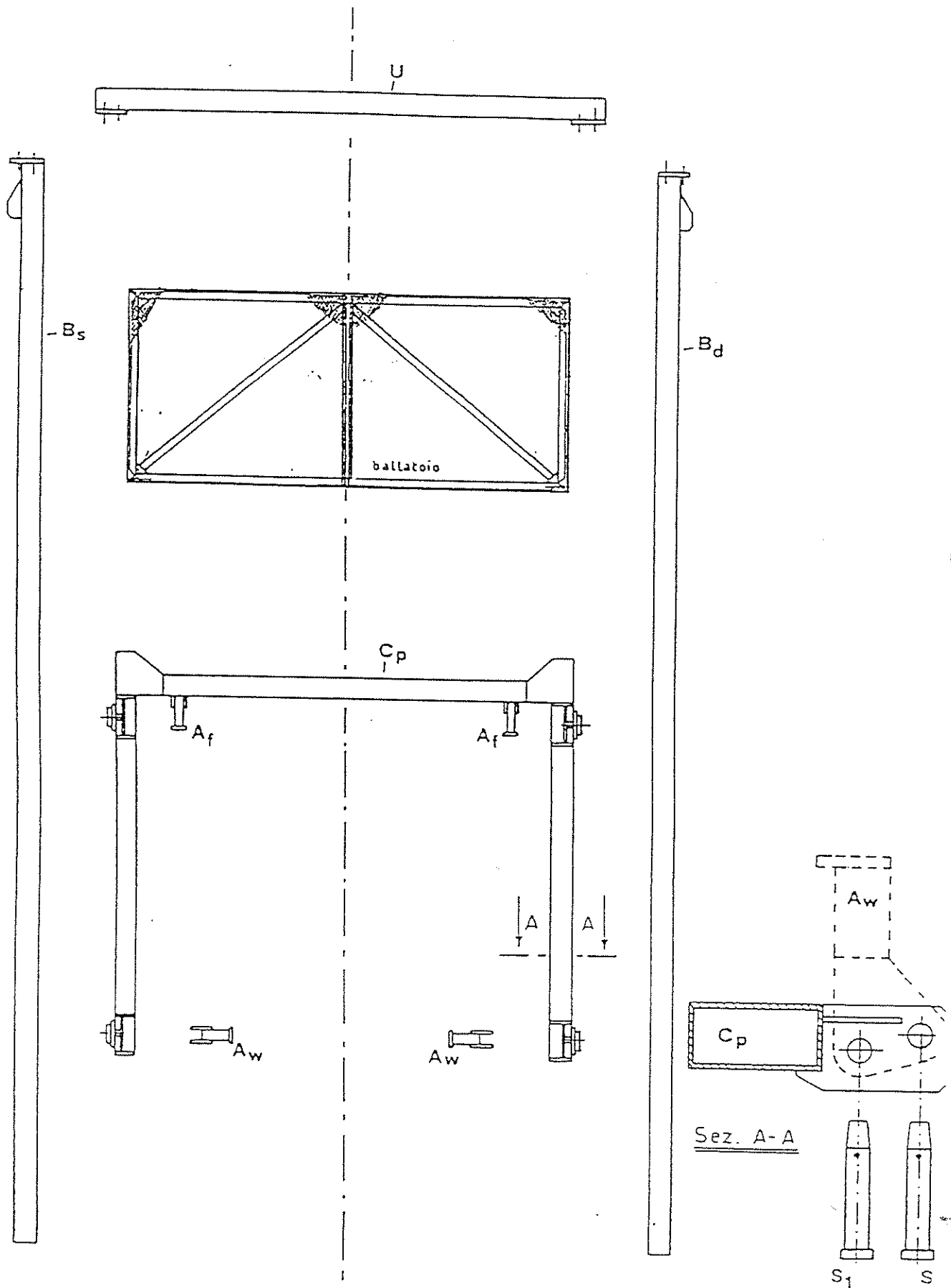
Balance the crane with the first telescoping mast section to attach at a suitable distance (to check for a perfect balance, make sure that there is the same amount of slack at the sides between the telescoping cage and tower guiding rollers).

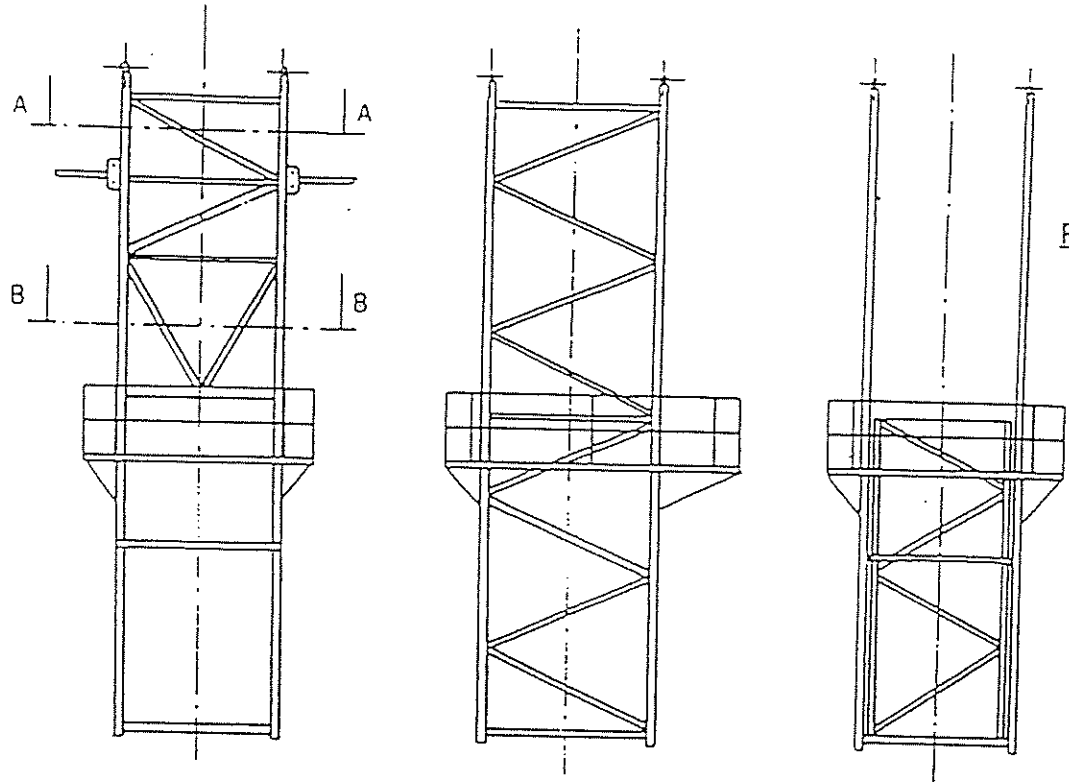
- a) Remove the "Y" and "Z" pins, which connect the tower with the lower slewing ring.
- b) The Rt hook must lie upside down position towards the outside, as indicated on page 15.3. If not already in this position turn it using the auxiliary jack Ms, which is controlled operating the joystick "S" positioned on the hydraulic unit Cn (page 15.2).
- c) Approach the mobile cross beam Tr to the tower and hook the saddle "H" to the next cross beam of the tower, with the hydraulic jack Mp working in the required direction. The control of the hydraulic jack is obtained acting on joy stick "D": act forwards to obtain raising of the cross beam Tr, backwards to allow its descent.

(DESCRIPTION TO BE CONTINUED ON PAGE 15.7)

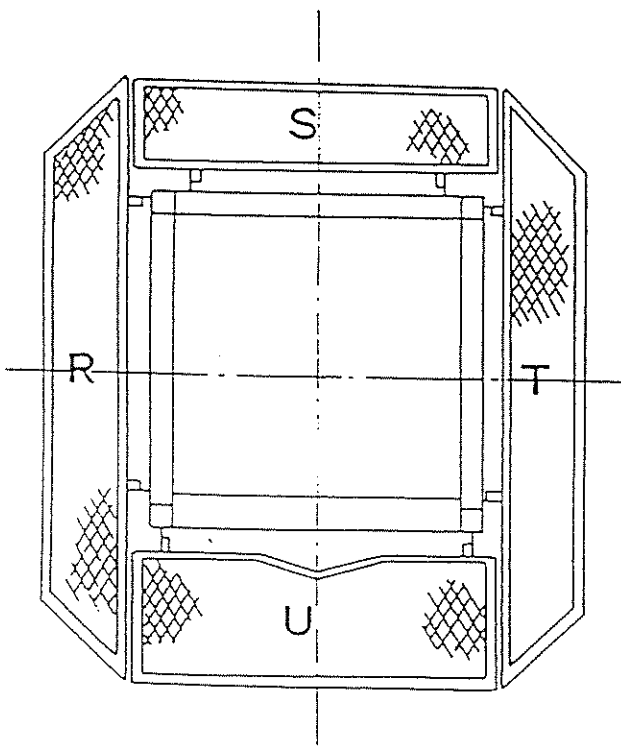




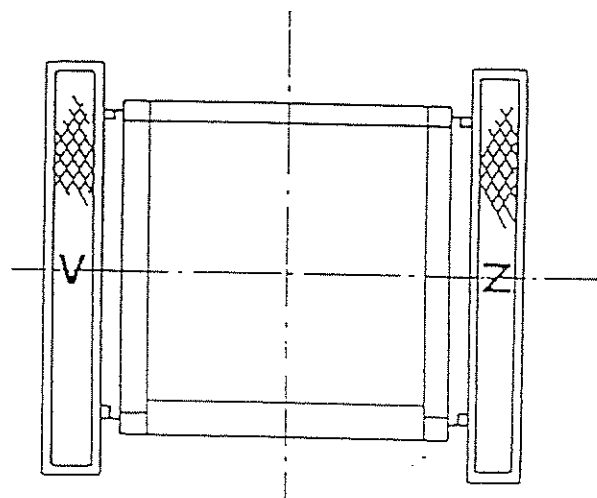




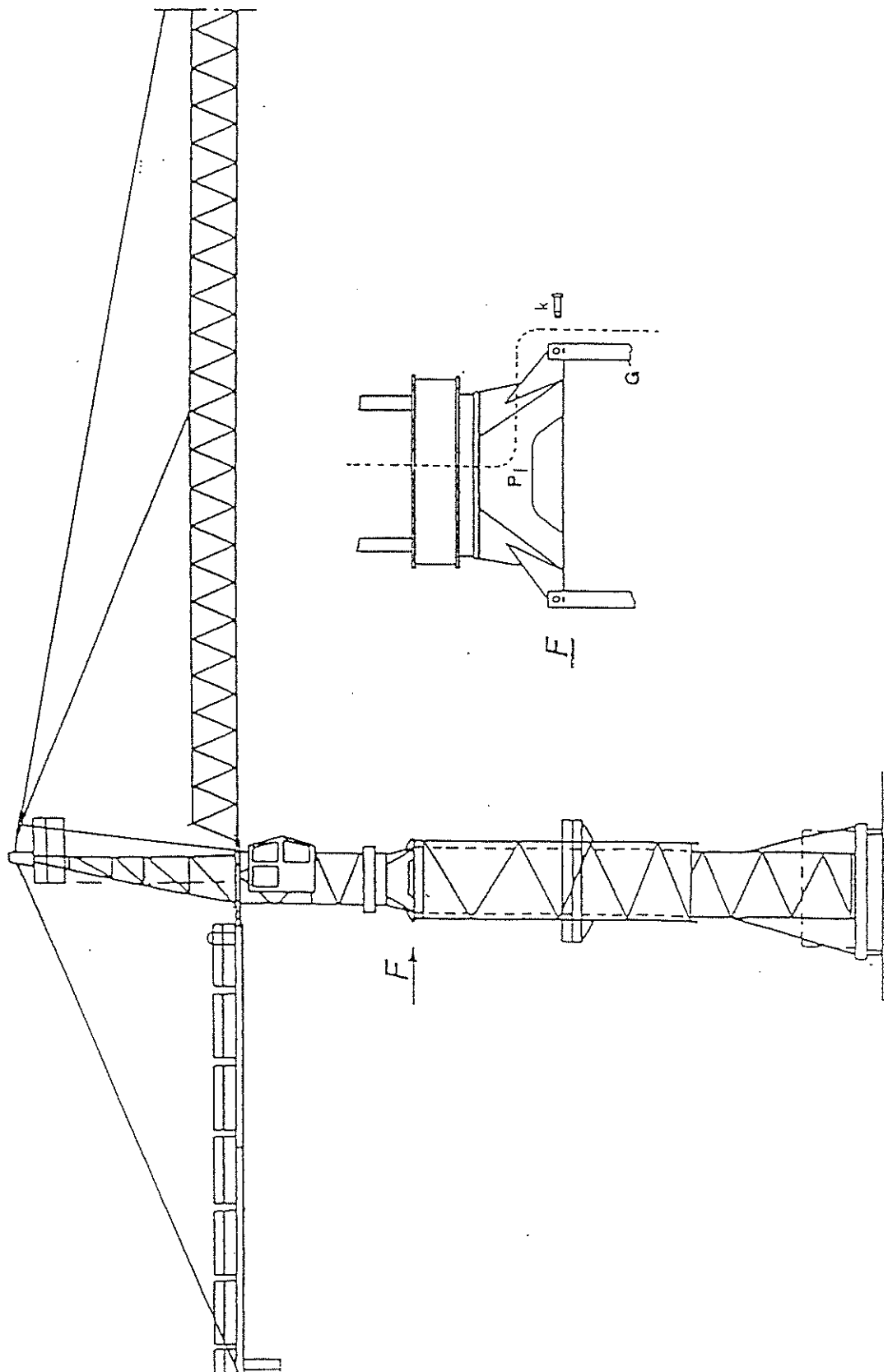
Parapet to remove while moving the mast section or the trolley



Sec. B-B



Sec. A-A



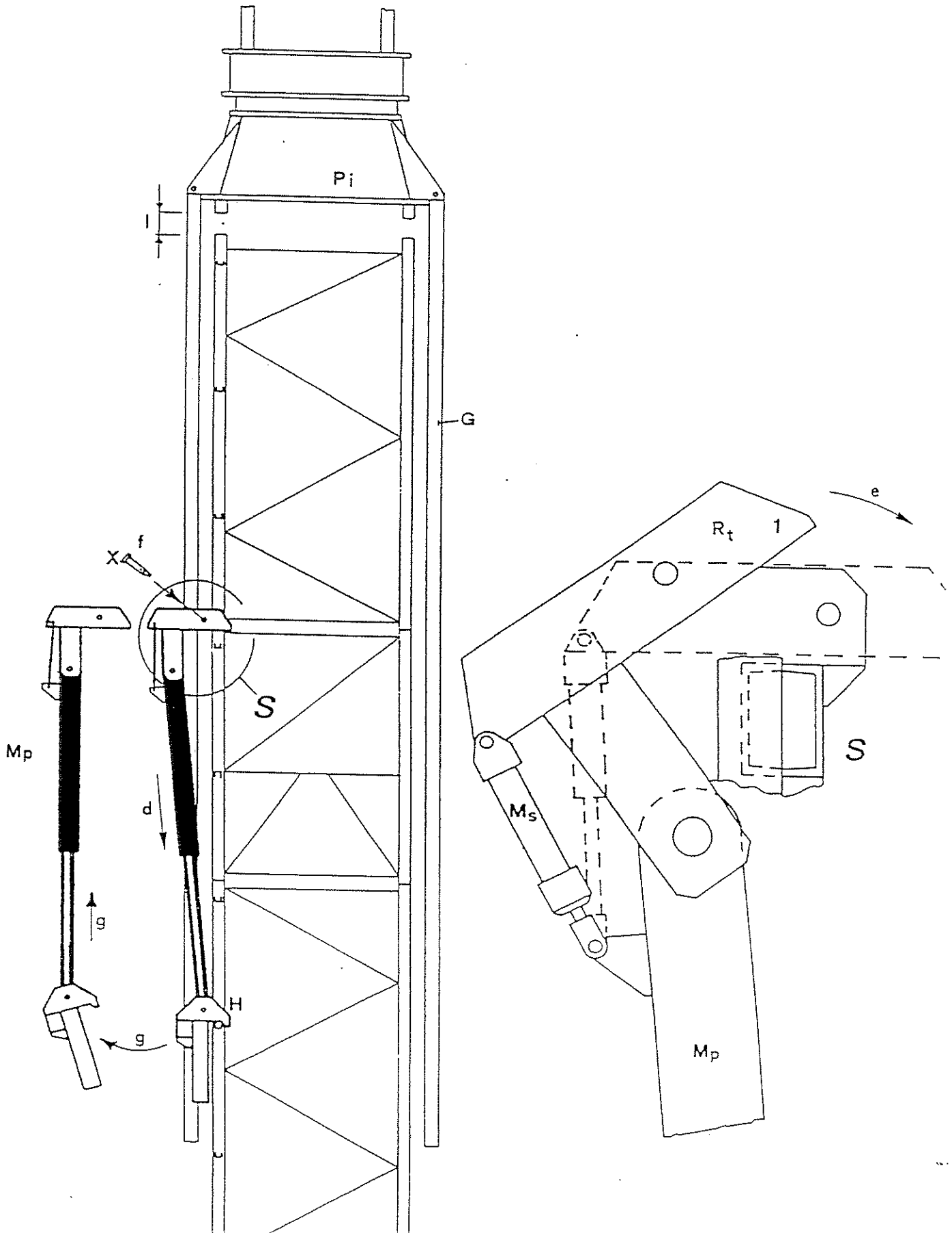
TELESCOPIC OPERATIONS: (DESCRIPTION CONTINUING FROM PAGE 15.1)

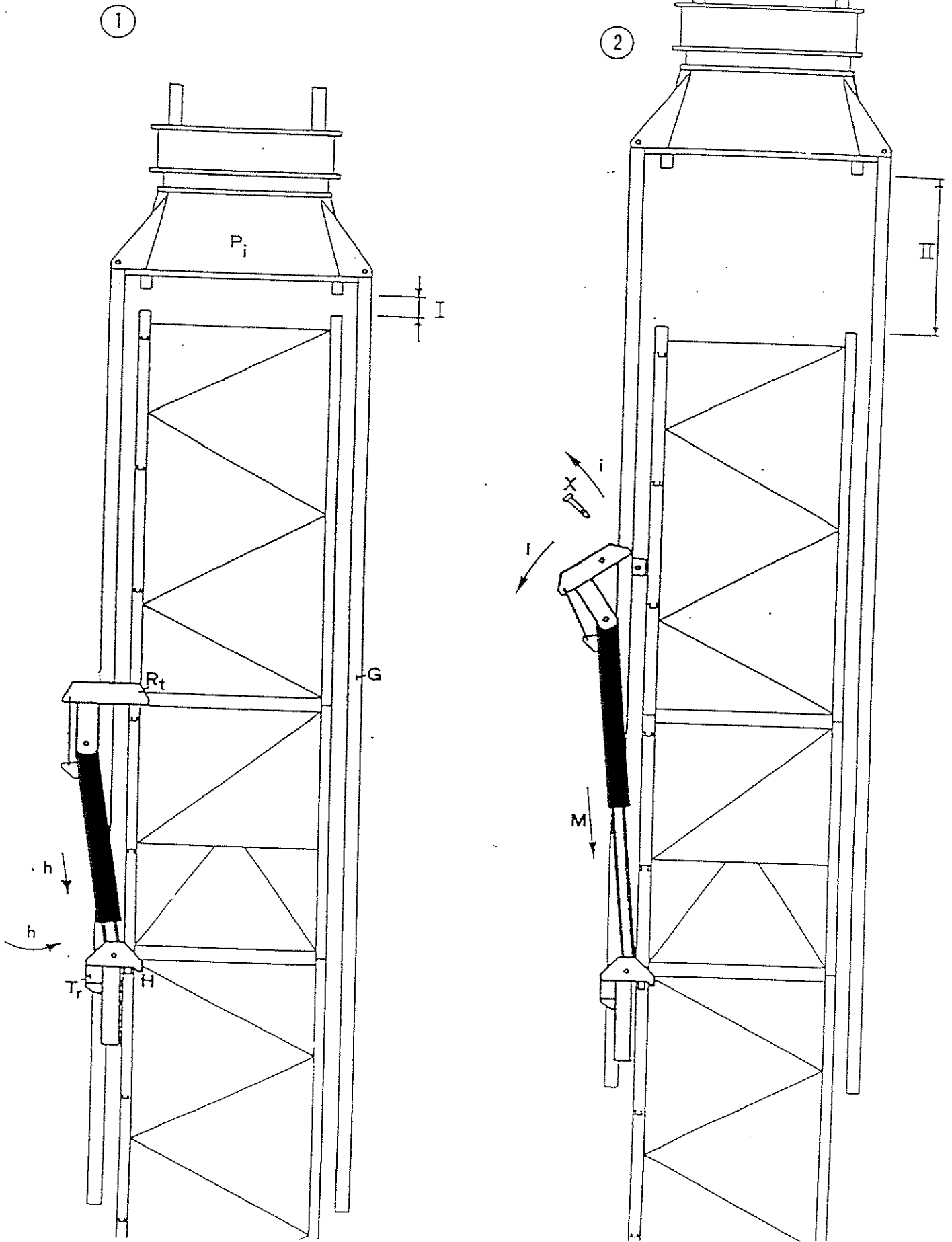
Refer to page 15.8 and proceed according to the following points:

- d) Act on joystick "D" of hydraulic unit and allow "Mp" jack extend to end of stroke. In this manner you can obtain release "I" between the lower slewing ring "Pi" and the tower.
- e) Act on auxiliary jack "Ms" by the joystick "S", which is located on the hydraulic unit, so that the hook "Rt" can fully lie on cross beam of the mast section. Follow sequences 1 and 2 to do this.
- f) Secure the hook "Rt" by pin "X".
- g) Make the rod of "Mp" jack stroke backwards and at the same time make jack "Mp" rotate outwards by means of the jack "Ms".
- h) Once the rod of jack "Mp" is fully on backward stroke act on "Ms" jack to take back "Mp" jack towards the tower. With a little stroke of "Mp" rod check that the saddle "H" of "Tr" is well hooked to the cross beam of the mast section.
- i) Remove the pin "X";
- 1) Turn "Rt" jack outwards by "Ms" jack.

To insert a mast section (L= 3.75 m) repeat three times the complete stages from d) to 1), thus obtaining, in addition to the starting distance "I", the spaces "II" (Page 15.9), "III" and "IV" (Page 15.10).

(DESCRIPTION TO BE CONTINUED ON PAGE 15.11)

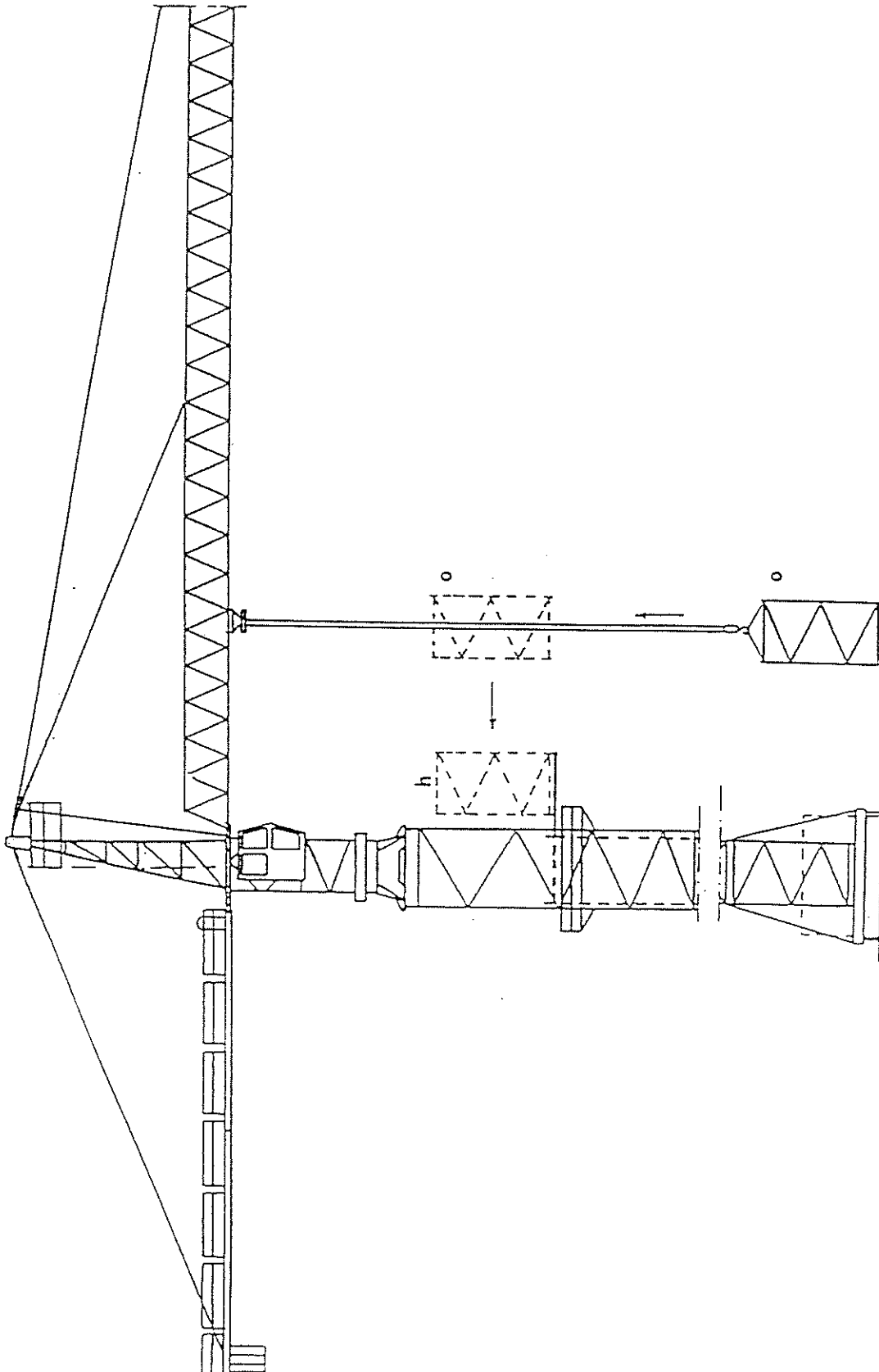




(DESCRIPTION CONTINUING FROM PAGE 15.7)

After having achieved the space IV to enable insert of a mast section proceed as follows (page 15.12):

- m) Rest the mast section on the trolley arranged to insert each mast section into the achieved space.
- n) Hook another mast section or a suitable load to balance the crane.
- o) Once the crane is correctly balanced make the jack "Mp" descend, (the mast section must be in the position as hatched on page 15.10) so that the whole cage "G" may descend for a certain distance "S". Check correct connection of the mast sections.
- p) After having checked correct positioning of the mast section insert the pins "Y" of the tower (Page 15.10).



The complete raising procedure may be summarized as follows:

- 1 - Hook a mast section using block B1 of the first trolley C1 (See page 14.8) which allows easy handling close to the tower. The two trolleys must be perfectly coupled together and the supporting bracket of the hooks fixed to block B1.
- 2 - Hoist the mast section and rest it on the trolley Cp of the telescoping cage (Page 15.12). Either fixed supports Af and rotating supports Aw are arranged on said trolley Cp, ready for operation (Page 15.4).
- 3 - Hook a second mast section (when at the end of the assembly phase use an equivalent load), hoist it from the ground and transport it along the jib so to obtain perfect balance of the slewing unit. A correct balancing is obtained when the telescoping cage rollers can follow the small movements of the trolley in both travel directions.
- 4 - Carry out the full telescopic movement as previously described.
Insert the mast section inside the telescoping cage. To do this make the trolley Cp travel so that the four brackets of the mast section can center opposed brackets of the tower (page 15.10).
- 5 - Once the mast section has been lowered and pin-connected to the tower the trolley must be removed proceeding as follows: turn downwards the rotating supports Aw (Page 15.4), remove the pin S2 and make the trolley Cp travel out of the telescoping cage. Now restore position of the supports Aw and re-insert pins S2. Now the telescoping cage is ready for another telescoping phase and mast section assembly

6 - End of assembly

When assembly of all mast sections is achieved proceed as follows:

- Complete pin-connection of additional diagonals in correspondance with tower connections.
- Disassemble the telescoping cage or lower it to the minimum height allowed by chassis struts.

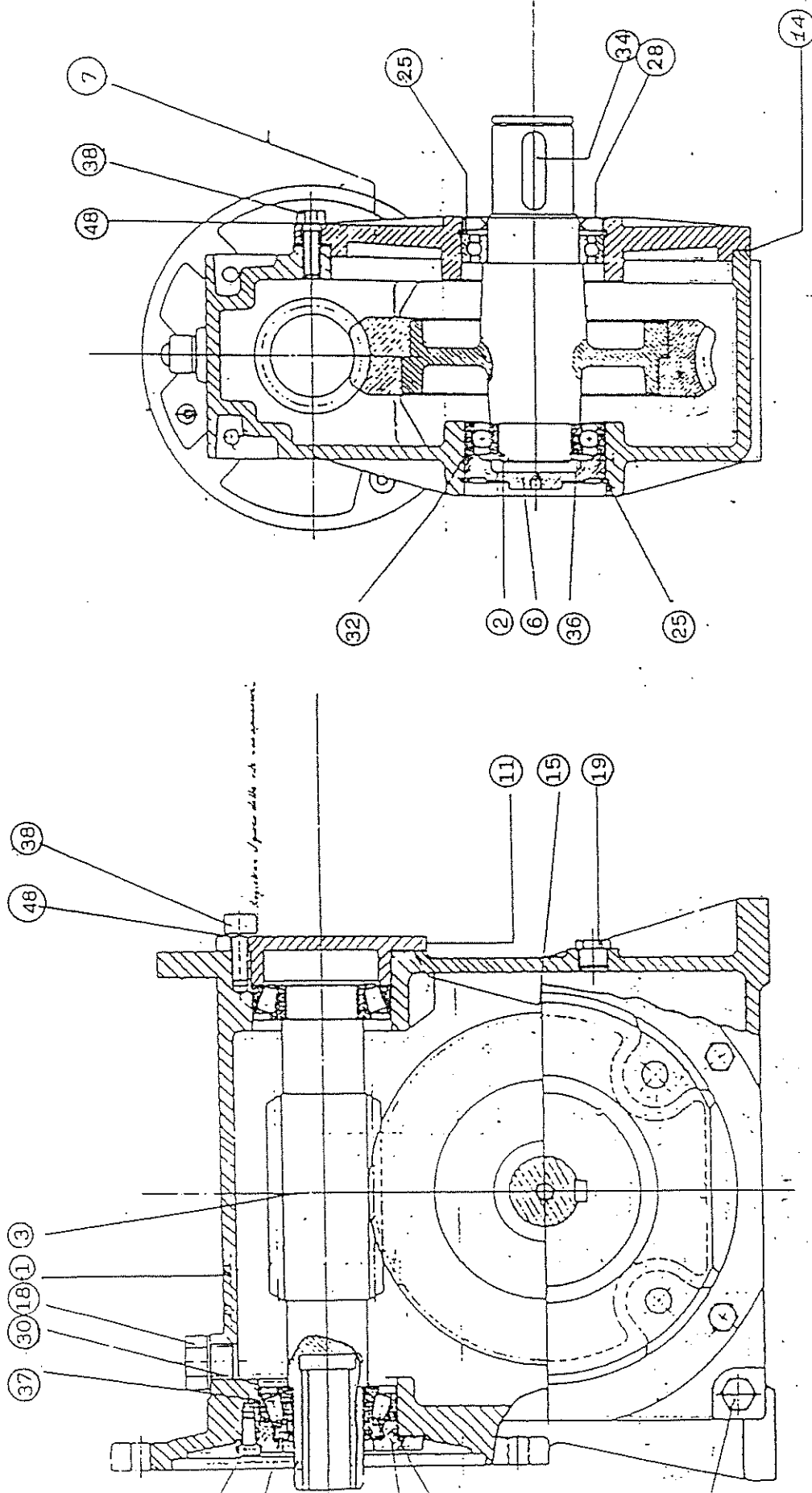
For dismantling, first lower the telescoping cage, following the previous instructions for telescoping in reverse order. Then use the trolley and the hoisting hook to disassemble the various elements.

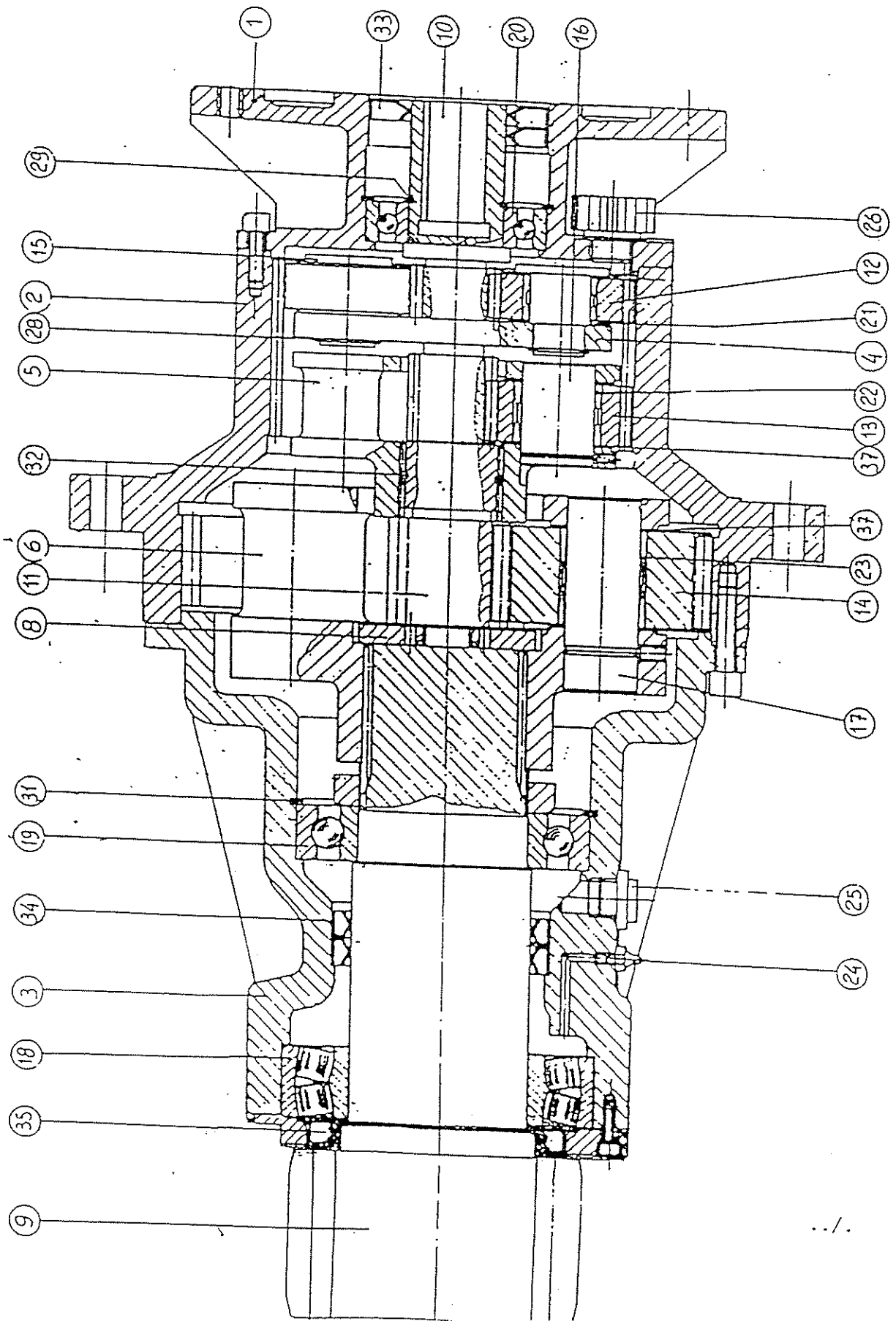
N.B. If a stoppage occurs during telescoping operations, always couple the lower turntable frame P1 to the tower and fix it in position with at least two diagonally opposite pins.

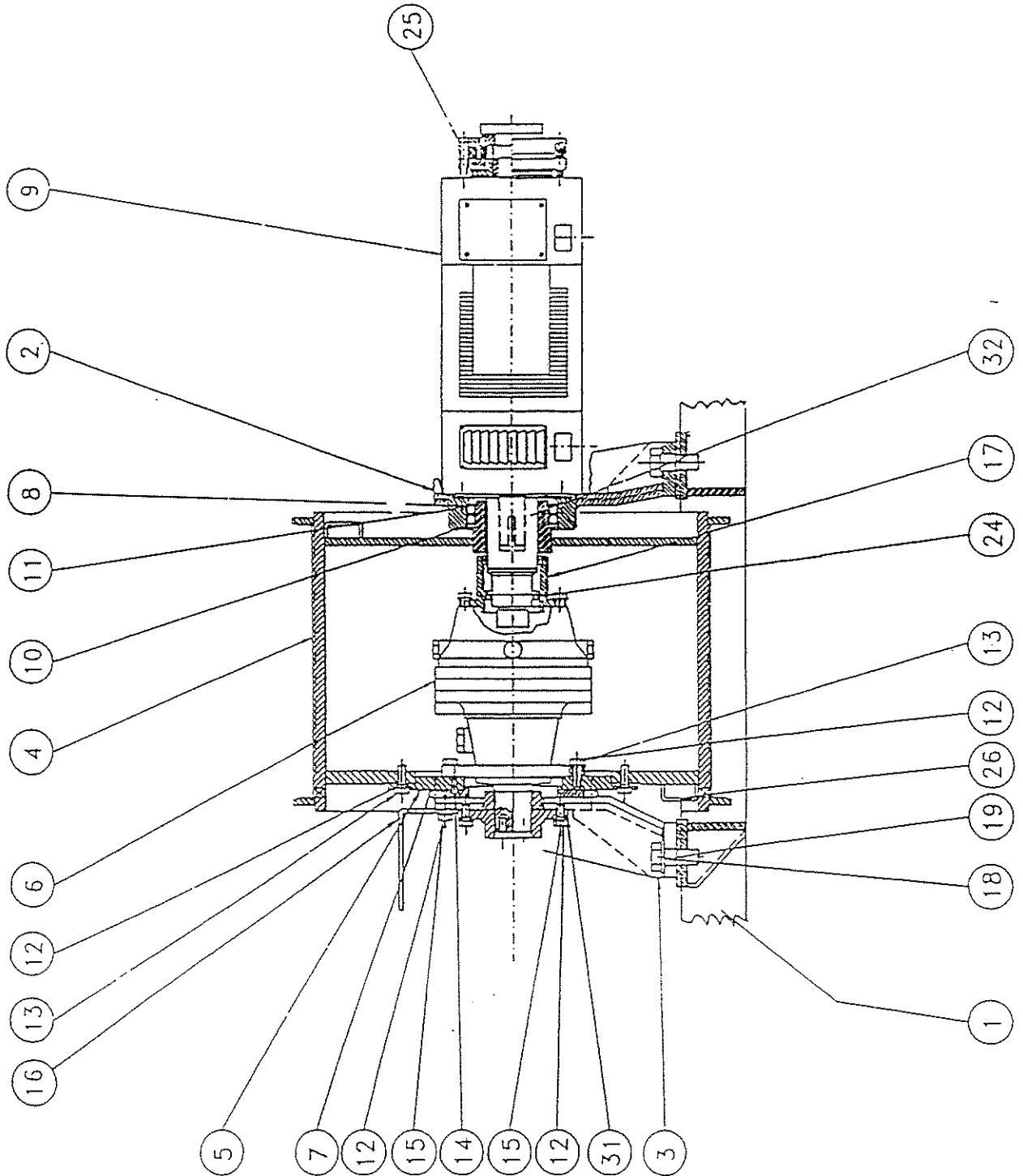
SECTION

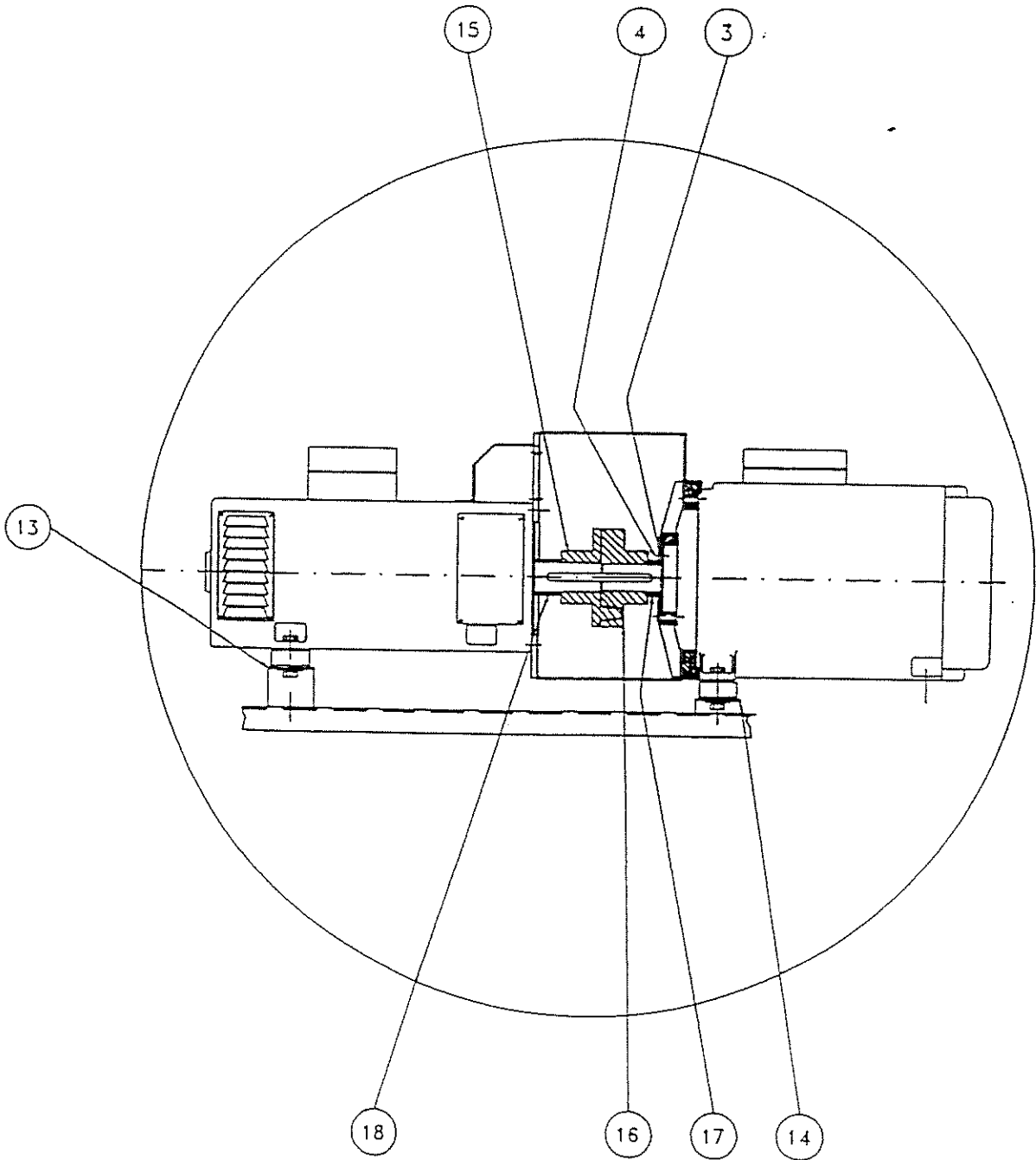
16

SPARE PARTS

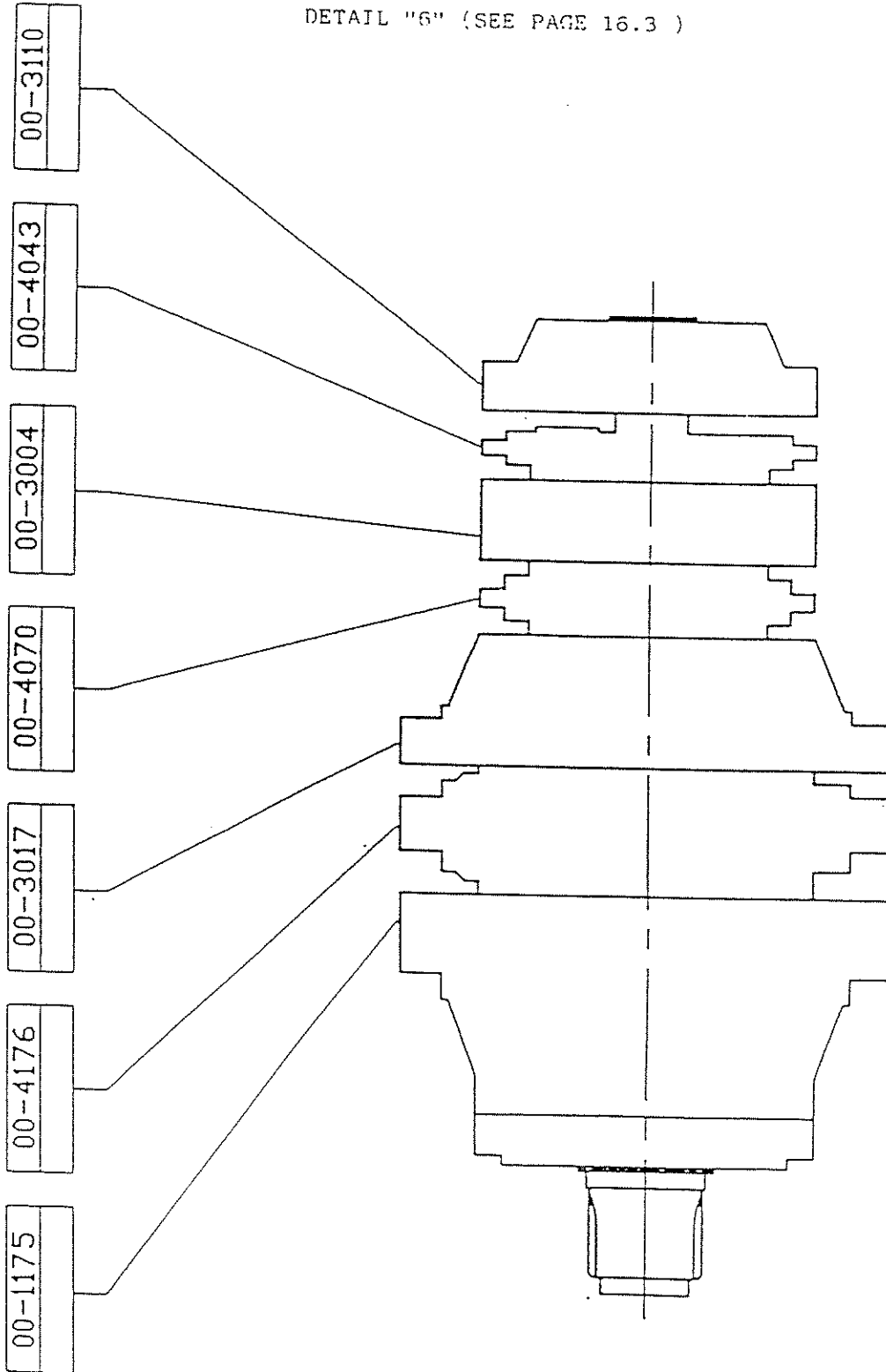


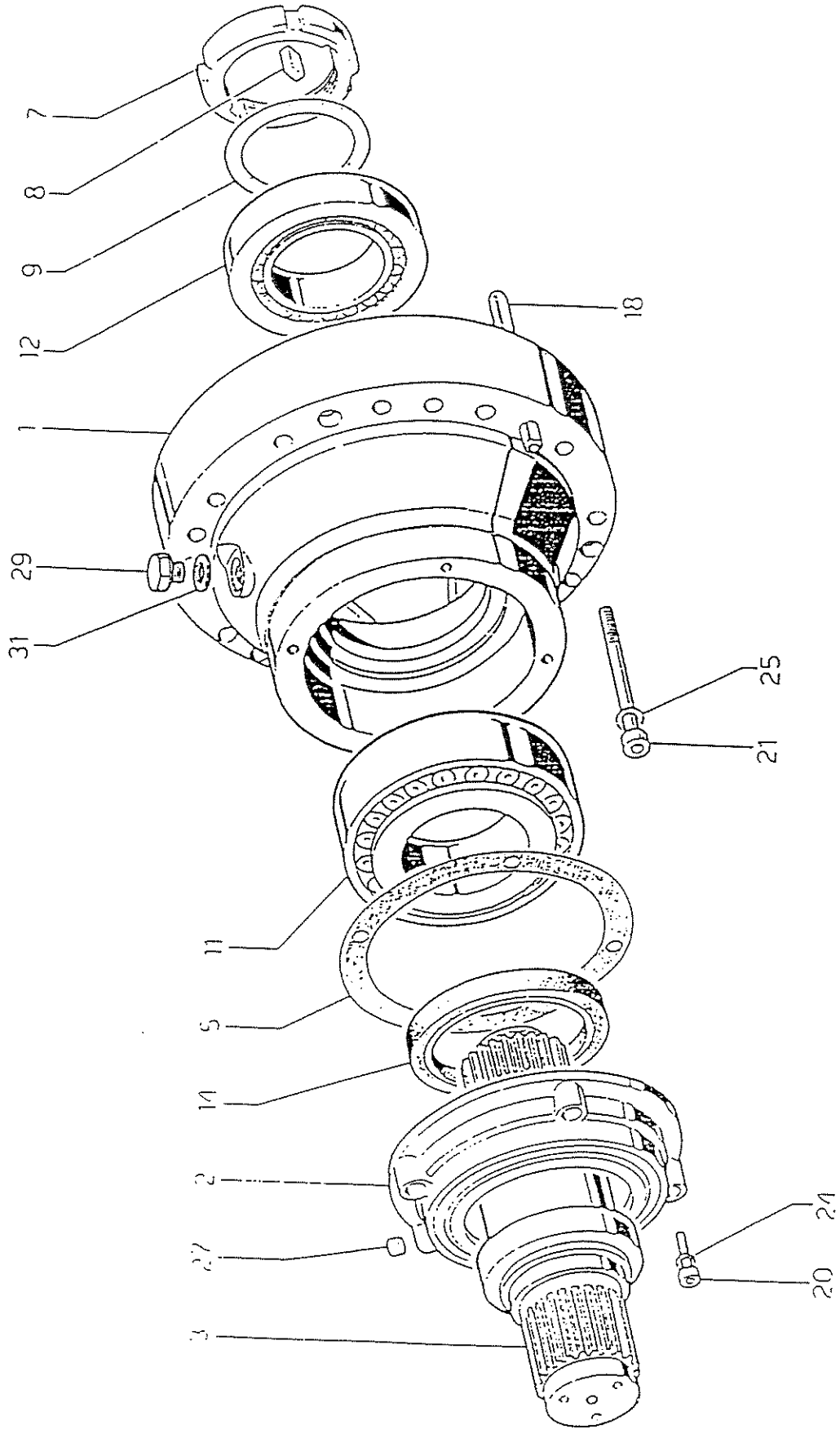


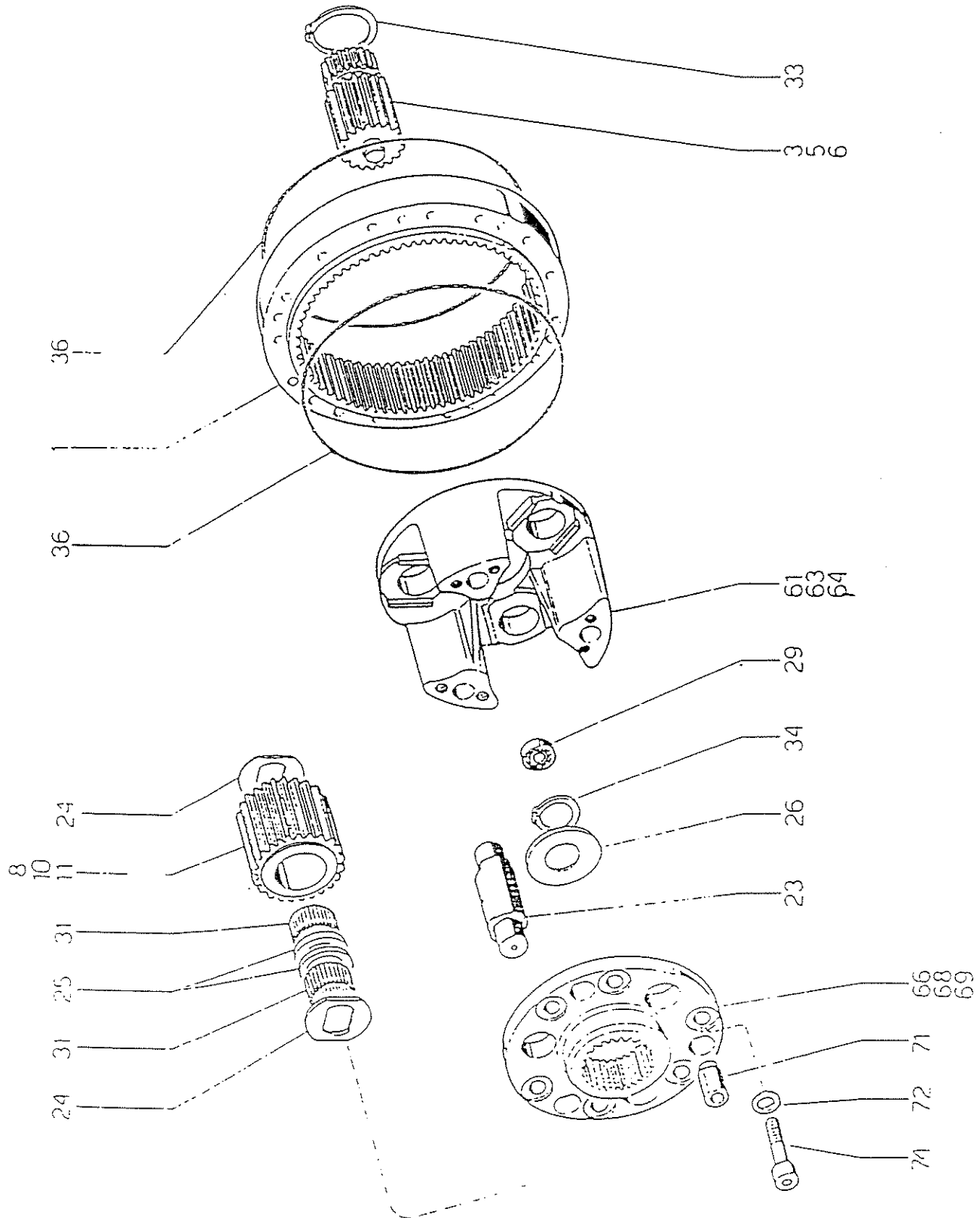


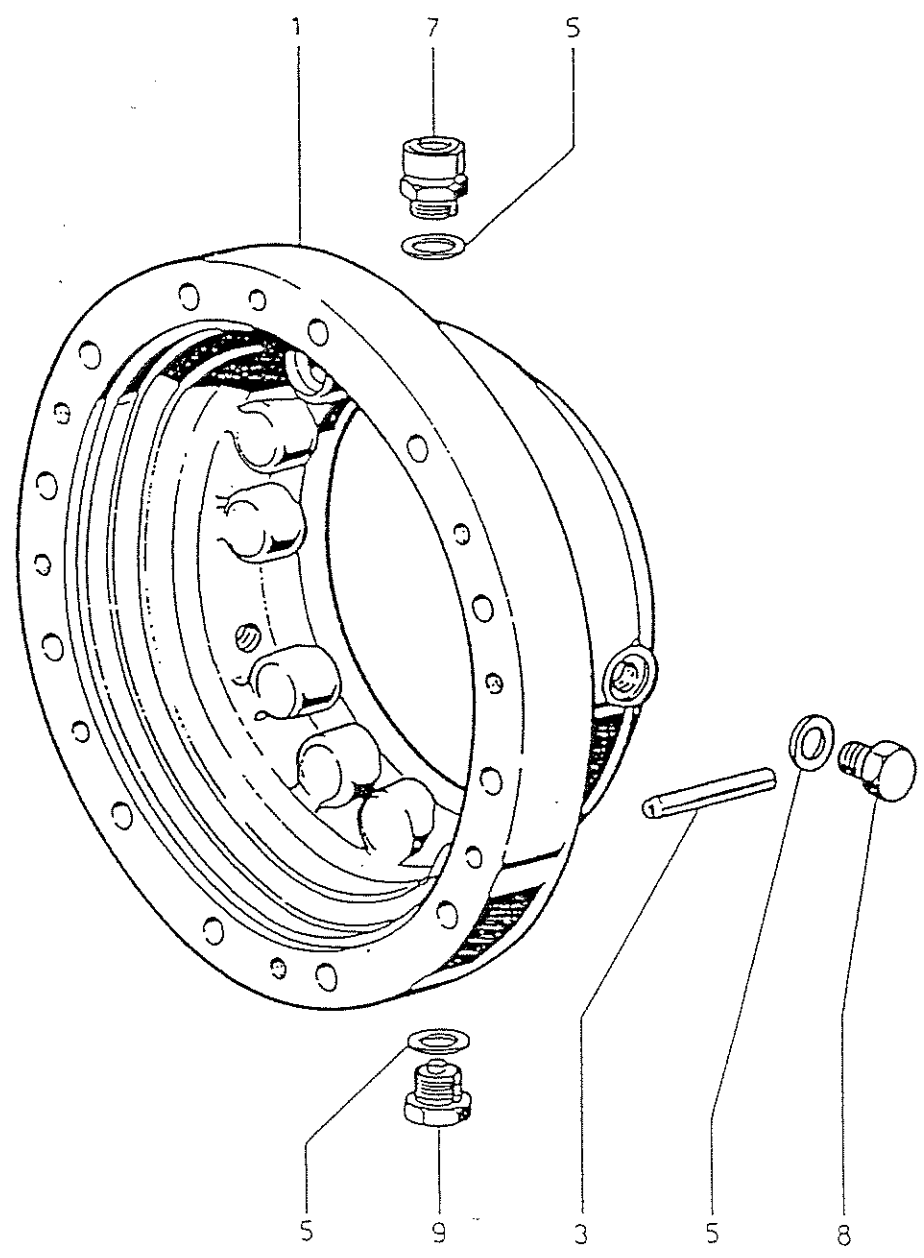


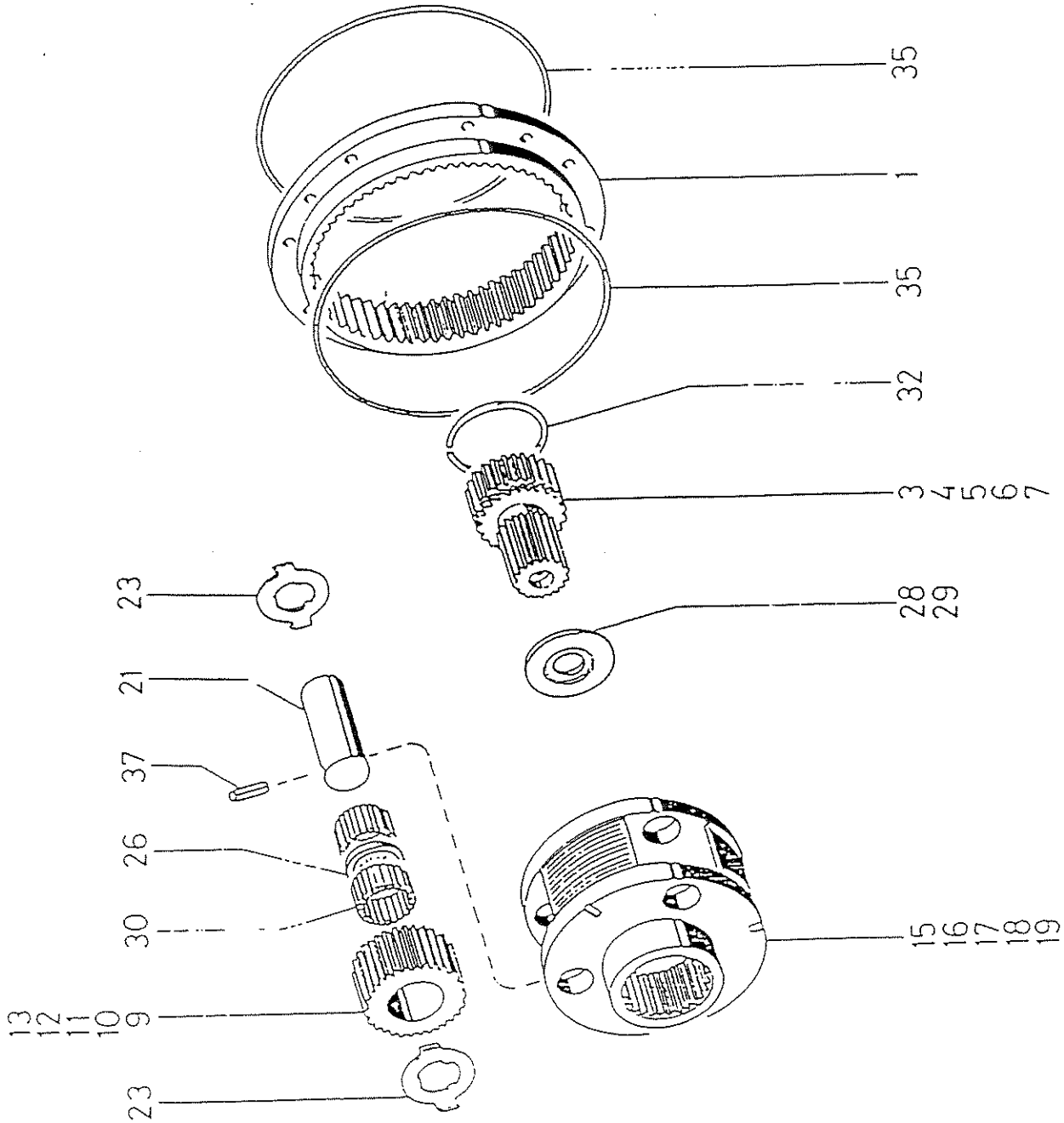
DETAIL "6" (SEE PAGE 16.3)

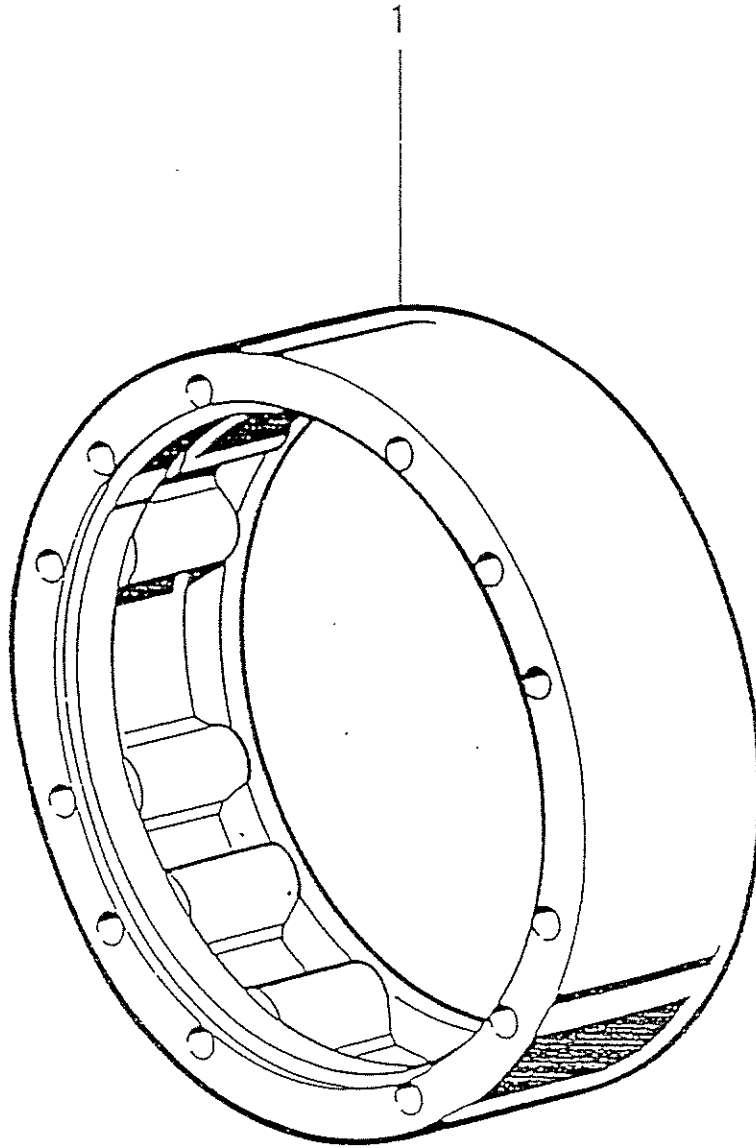


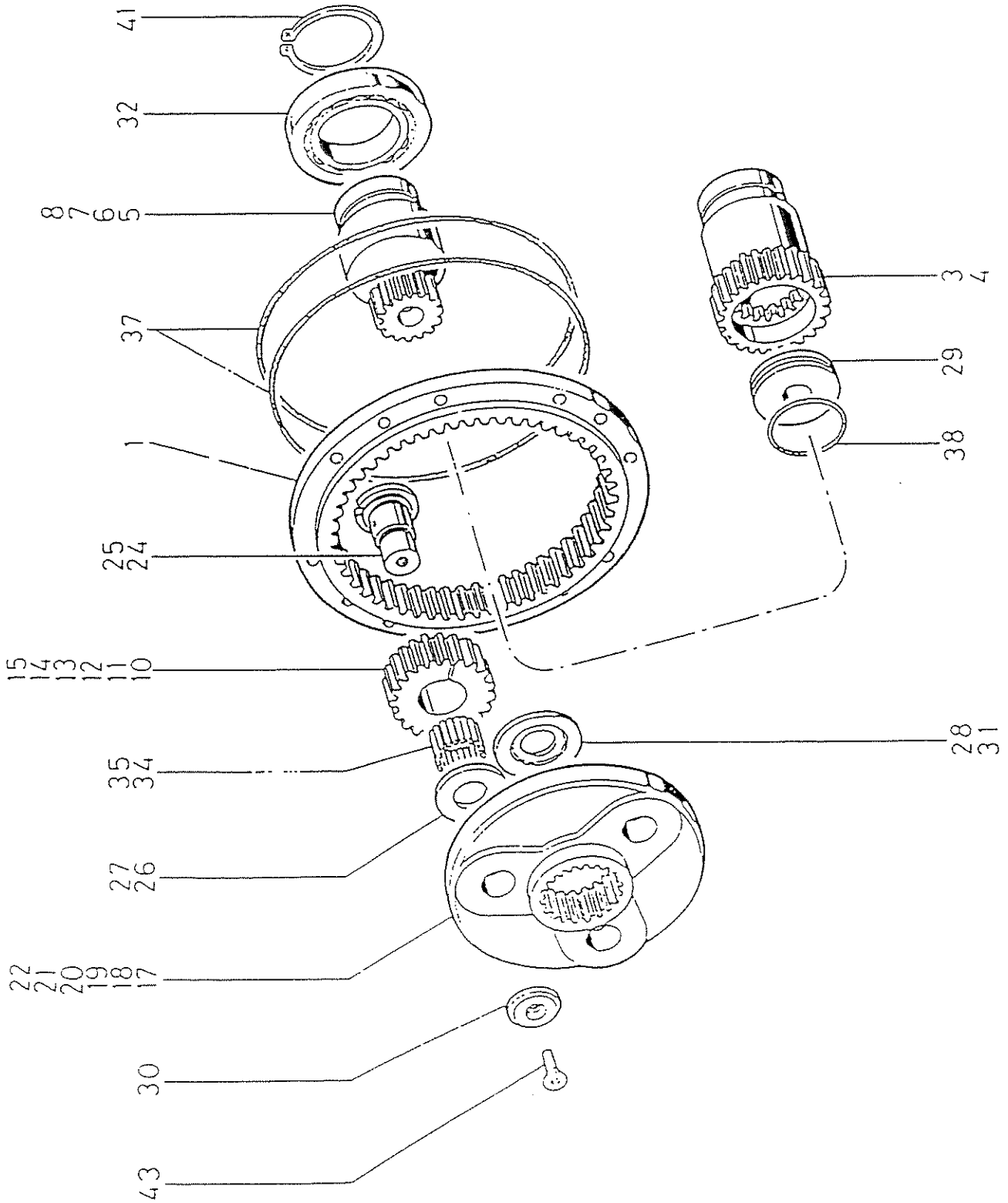


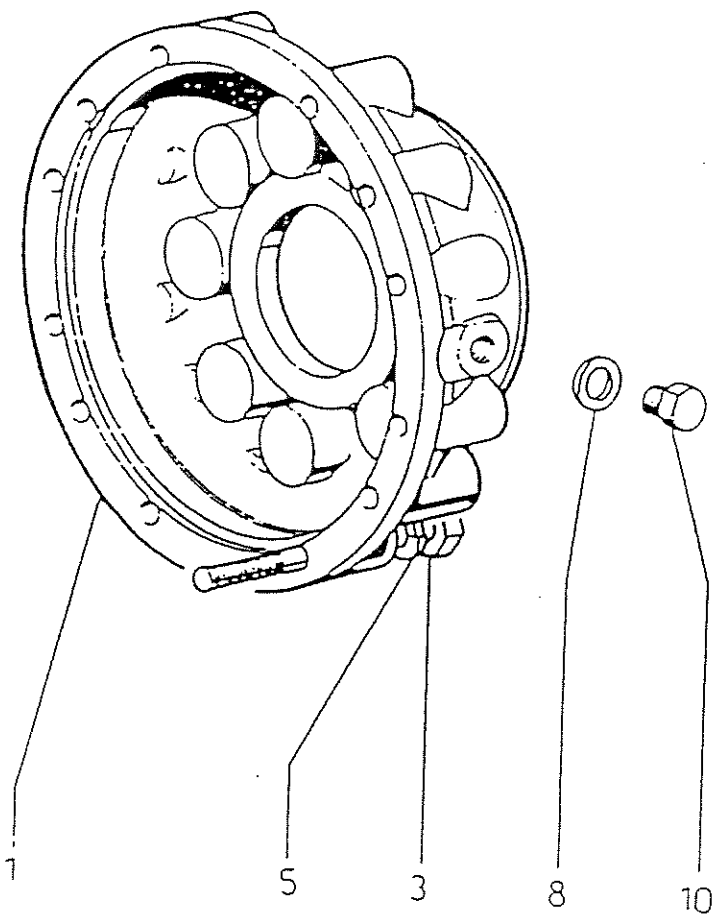




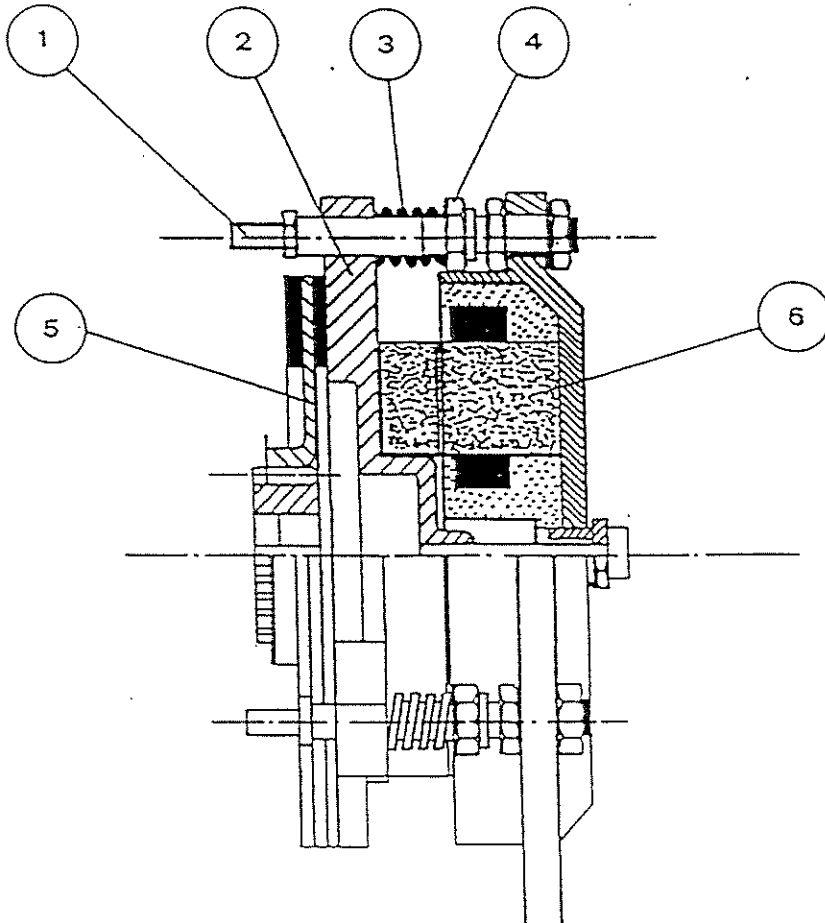




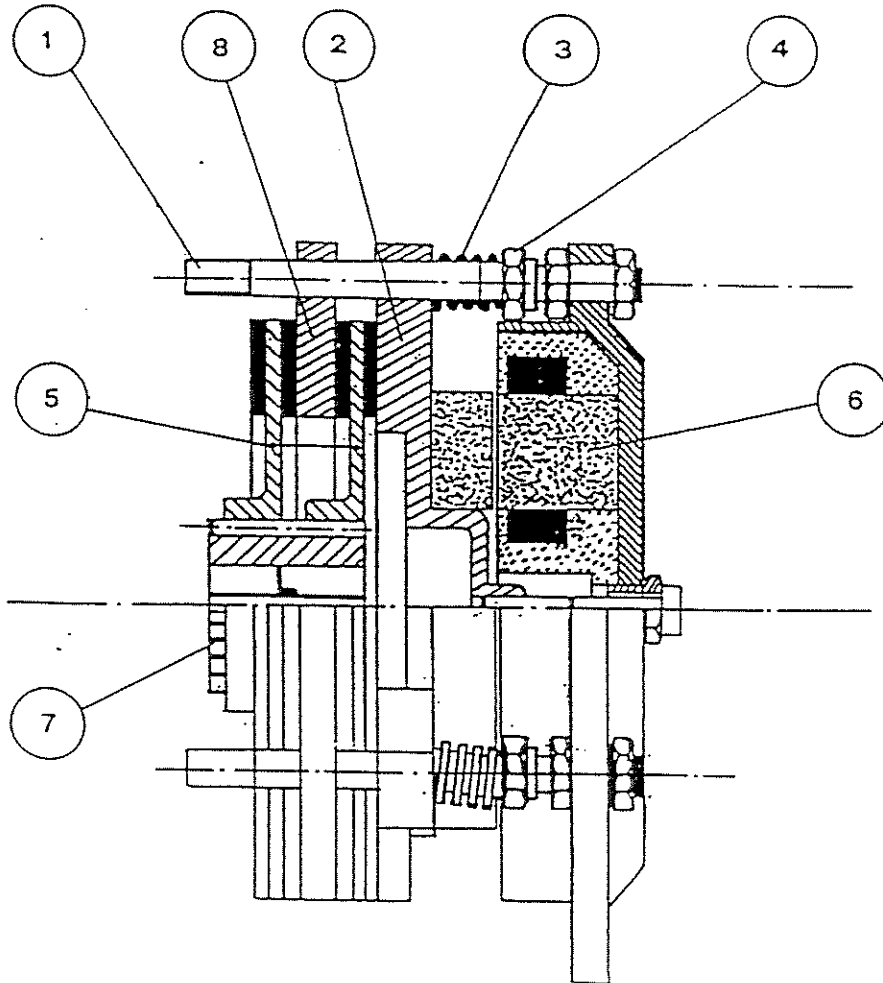


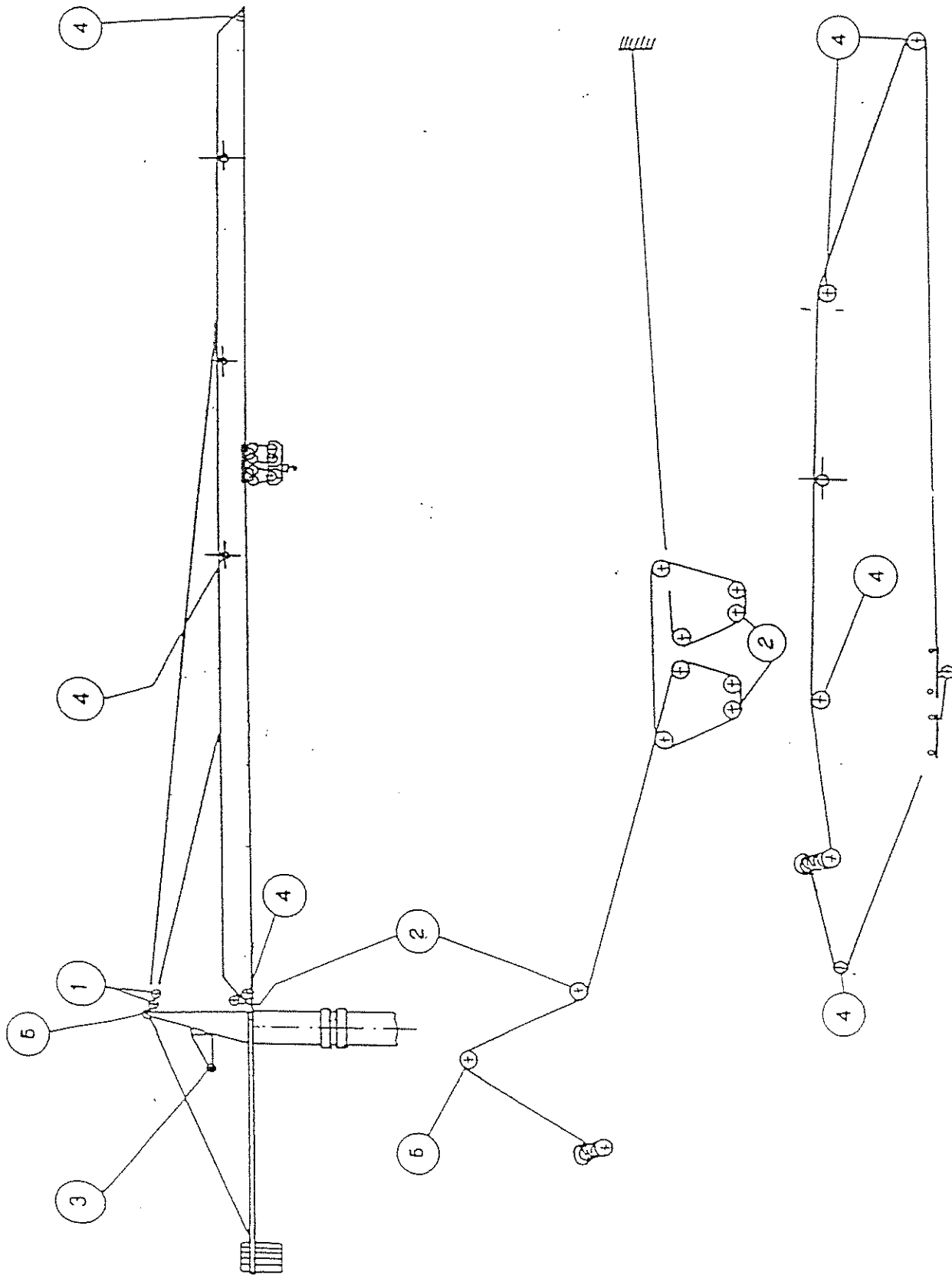


"EMB" COMEDIL BRAKE 100 SD - 380 V - 50 Hz (code 40213065)



HOISTING MOTOR "AG 40"





SECTION

17

ELECTRIC SYSTEM

FOR THE ELECTRIC SYSTEM SCHEME , PLEASE REFER TO THE SEPARATE BOOKLET .



