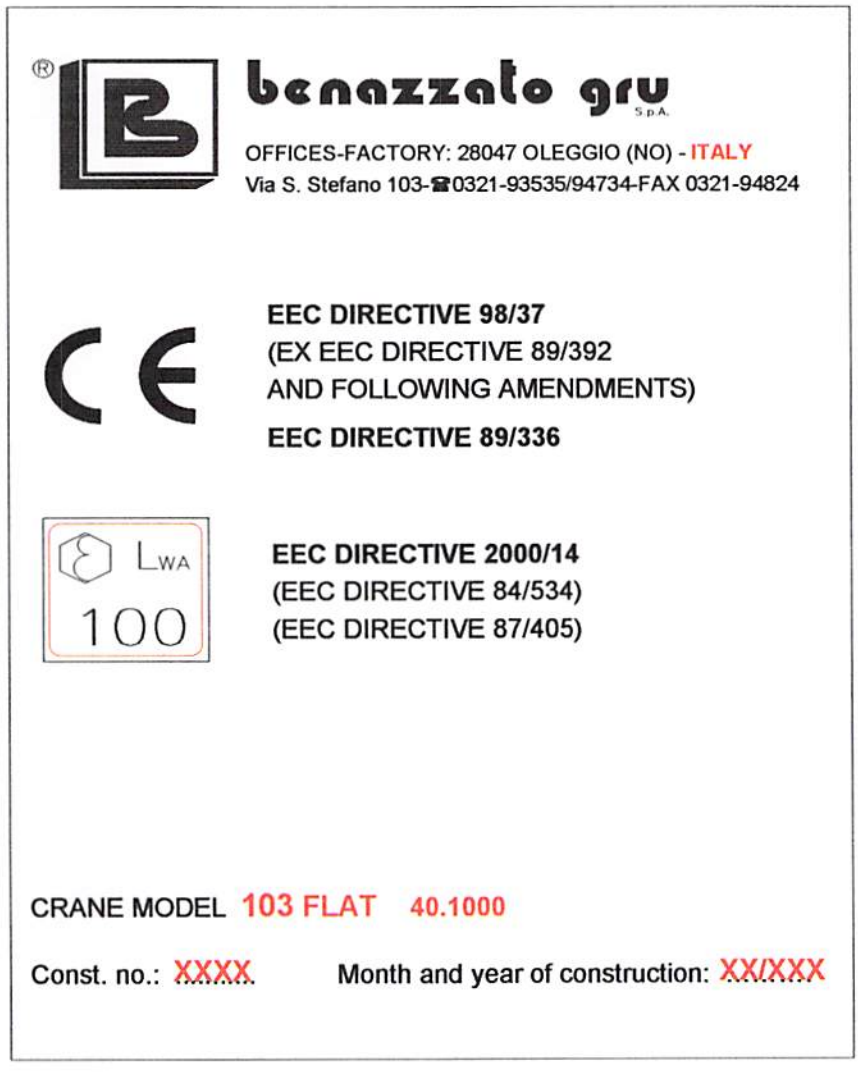
1. – SPECIFICATIONS OF THE CRANE

1.0 – MARKING OF THE CRANE

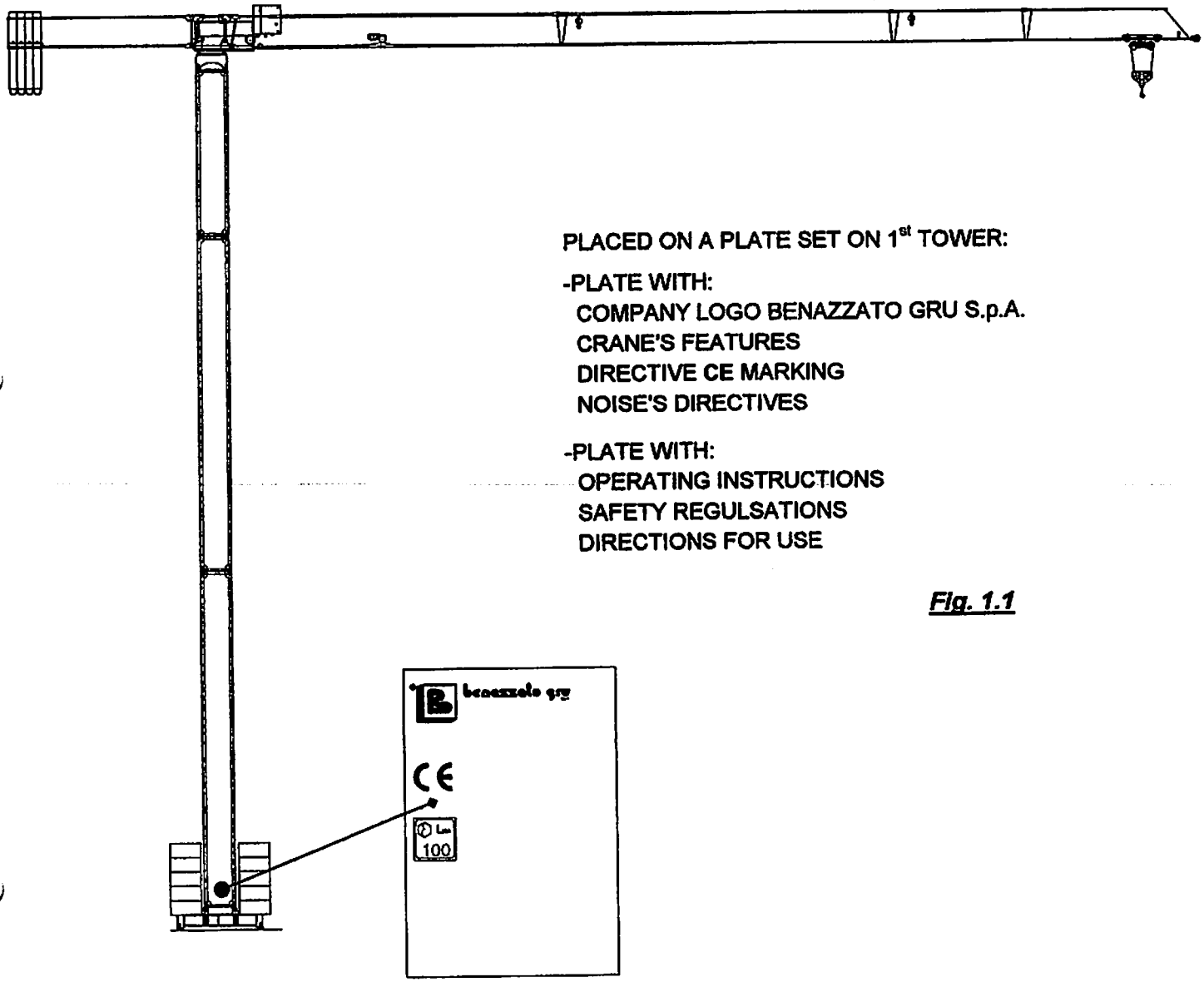
1.0.1 - FACSIMILE OF THE PLATE

The tower crane for construction works, according to the standards UNI - ISO 4306-1, is a machine for non-continuous operation, designed to hoist from a rigid base and handle in space a single not-guided load which is hung on the hook directly or by means of allowable hoisting or slinging devices.
The crane is marked as follows:



Crane sold or hired on ..... to:
COMPANY.....
STREET.....
TOWN ..... PROV./STATE .....
TEL. .....

1.0.2 – LOCATION OF THE PLATES



PLACED ON A PLATE SET ON 1st TOWER:

-PLATE WITH:
COMPANY LOGO BENAZZATO GRU S.p.A.
CRANE'S FEATURES
DIRECTIVE CE MARKING
NOISE'S DIRECTIVES

-PLATE WITH:
OPERATING INSTRUCTIONS
SAFETY REGULSATIONS
DIRECTIONS FOR USE

Fig. 1.1

1.0.3 - List of warning and prohibition signs

- BEWARE! OVERHANGING LOADS
- WEAR ACCIDENT-PREVENTION EQUIPMENT
- CHECK THE ROPES PERIODICALLY
- DO NOT STAND IN THE RANGE OF THE CRANE
- AUTHORIZED PERSONNEL ONLY
- DO NOT UPLIFT PERSONS
- DO NOT REMOVE PROTECTIONS
- DO NOT REMOVE THE SAFETY DEVICES
- DO NOT REPAIR OR SET DURING THE CRANE'S MOVING

1.1 – CONFIGURATIONS:

1.1.1 - MODEL 103 version 40/1000 general configuration

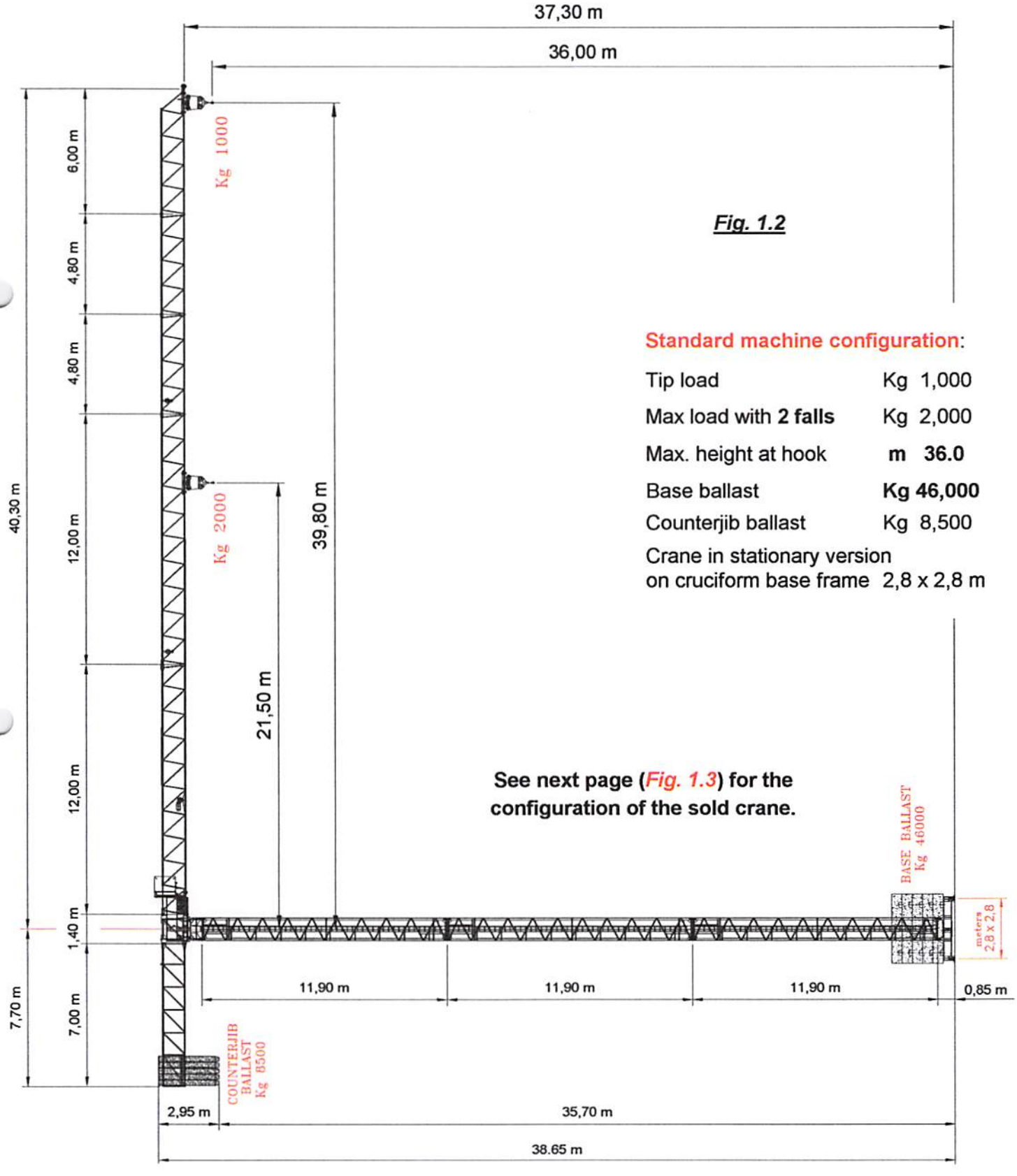


Fig. 1.2

Standard machine configuration:

Tip load	Kg 1,000
Max load with **2 falls**	Kg 2,000
Max. height at hook	**m 36.0**
Base ballast	**Kg 46,000**
Counterjib ballast	Kg 8,500

Crane in stationary version
on cruciform base frame 2,8 x 2,8 m

See next page (*Fig. 1.3*) for the configuration of the sold crane.

1.1.2 – MODEL 103 version 40/1000

Configuration of the crane serial No. xxxx registered in xxx XXXX

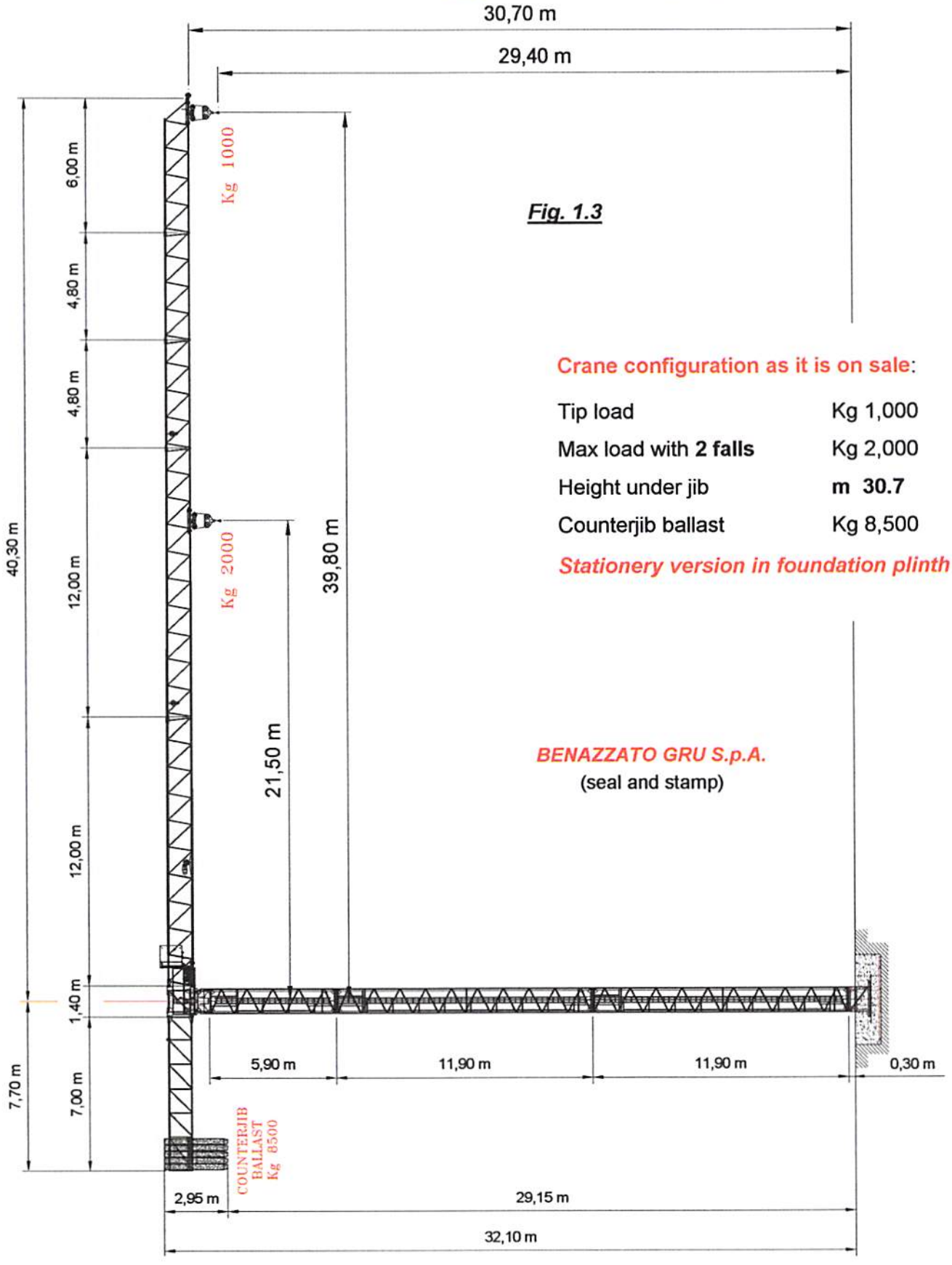


Fig. 1.3

Crane configuration as it is on sale:

Tip load	Kg 1,000
Max load with **2 falls**	Kg 2,000
Height under jib	**m 30.7**
Counterjib ballast	Kg 8,500

Stationery version in foundation plinth

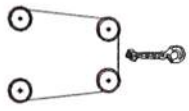
BENAZZATO GRU S.p.A.
(seal and stamp)

1.2 - PERFORMANCE

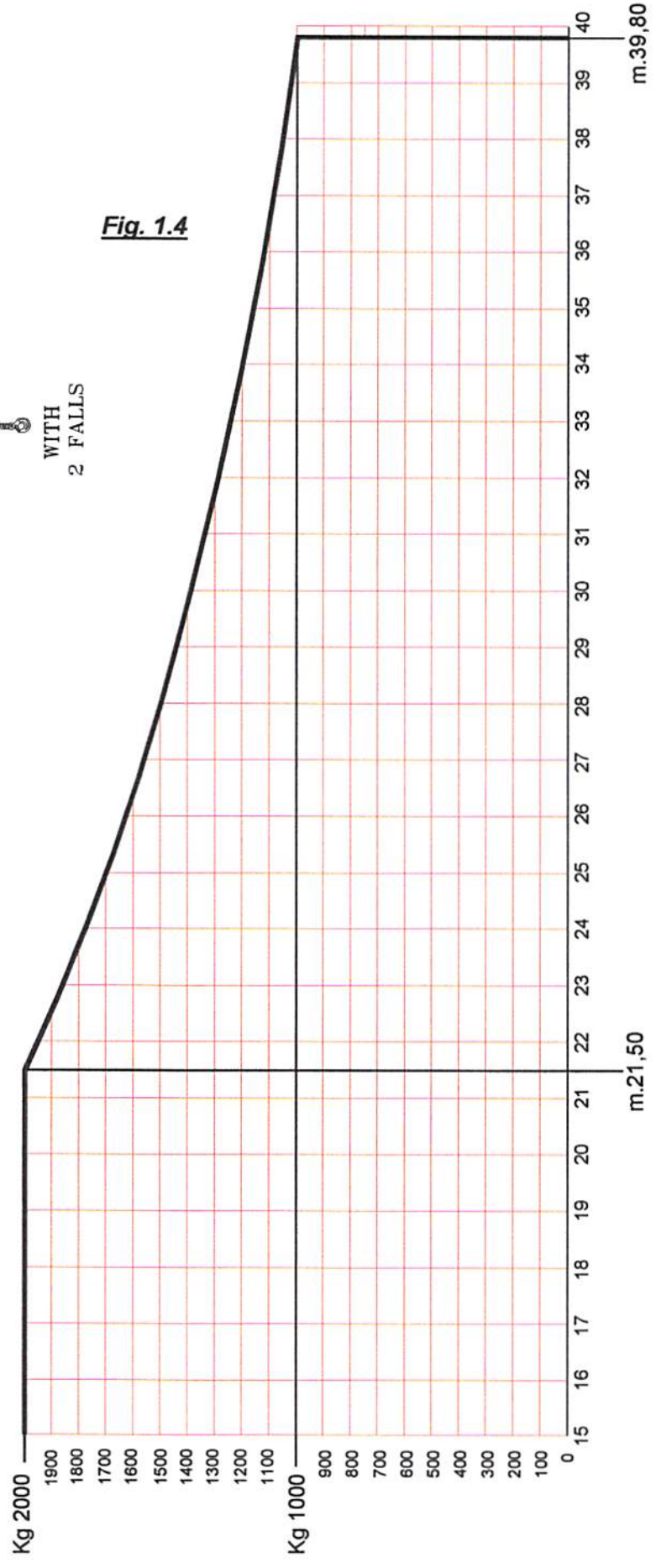
1.2.1 – Chart of capacity

Version 40-1000

Fig. 1.4

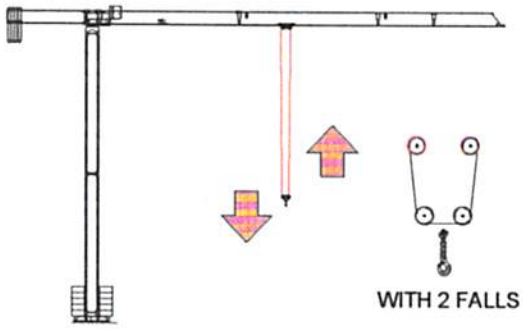
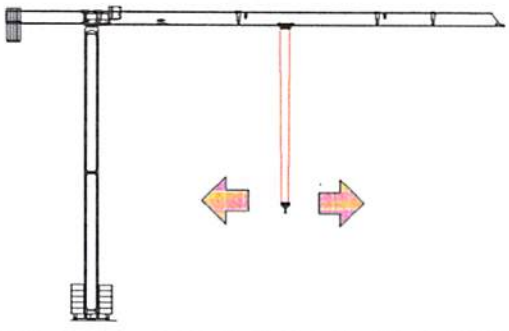
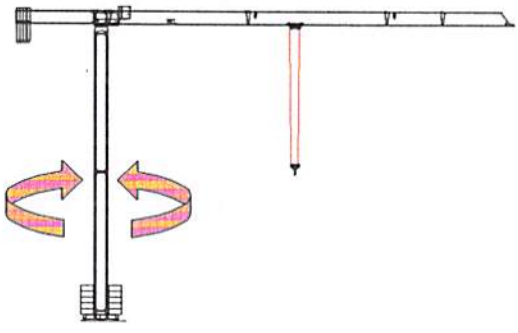


WITH 2 FALLS



1.2.2 – Speed of motion

Fig. 1.5

		UNTIL LOAD	SPEED	POWER
 WITH 2 FALLS		max. 1000 kg	m/min. 30	Kw 5,5
		max. 2000 kg	m/min. 15	Kw 5,5
		max. 2000 kg	m/min. 4	Kw 1,3
		max. 1000 kg	m/min. 46	Kw 2,2
		max. 2000 kg	m/min. 23	Kw 2,2
	SLEWING RULED BY INVERTER	max. 2000 kg	giri/min. 0÷1,1	daNm 6

1.2.3 – Calculation rules

- DIN 15018 and UNI 9309 Loads and load combinations (=ISO 8686/1).
- UNI ISO 4301 Classification.
- UNI ISO 4302 Wind loads.
- UNI ISO 4304 Stability.
- UNI ISO 4310 Test.

1.2.4 - CLASSIFICATION

According to the UNI ISO 4301 Part 3:

- class of the structure: **A4** corresponding to:
  - > 250.000 cycle of hoisting (use class **A4**)
  - > spectrum factor Kp 0,25
- class of hoisting **HC1**
- class of mechanism:
  - > hosting: **M4** (3200 hours with spectrum factor 0,25)
  - > transfer: **M3** (1600 hours with spectrum factor 0,25)
  - > rotation: **M5** (3200 hours with spectrum factor 0,5)

1.3 – IN USE AND OUT OF USE CONDITIONS

1.3.1 – NOT ALLOWED USE

The crane is not thought for:

- Working in corrosive environment
- Working in environment at explosion or fire risk
- Moving explosive material
- Working in environment at radiation risk, because the machine could be damaged.
- Moving materials at extreme temperature (too hot or too cold)

Do not use magnets and every kind of devices that can release the load instantly and especially when the charge is more than 80% of the capacity.

1.3.2. WEATHER CONDITIONS

- **Visibility:** the crane can be used only with sufficient natural light to allow a good evalution of the objects and of the crane in motion.
- **Altitude:** until 3000 m.
- **Temperature:** included between -20 and +50 °C.
- **Wind speed:** the crane can operate with a max. wind speed of 72 km/h (250 N/m^2) provided that the load has a max. exposure at wind of 0,8 m^2 each ton. It is allowed the assembly and disassembly of the crane with a max. wind speed of 50 km/h (12 N/m^2).

N.B.! With a wind speed over 72 km/h the crane can not be used. It is necessary that the slewing brake is released so that the crane jib places itself in wind direction.
It is user's duty to provide for possible instruments suitable for the wind speed evaluation.

- **Humidity:** the crane can operate in environment with humidity not over 90%.
- **Snow:** in course of calculation, the load due to snow has not to be considered because the main structures are made of latex.

1.3.3 - LIGHTING

The machine is thought for use with a suitable general external lighting.
If the light is inferior to what the rules prescribe, the user must provide a suitable artificial lighting for the work and maintenance zones.

1.3.4 – DIVISION OF THE TERRITORY OF THE COUNTRY INTO WIND ZONES

SEE CURRENT REGULATIONS IN CASE

THE CRANE IS USED OUT OF THE ITALIAN TERRITORY

1.4 - CHECKS

The machine has to be constantly maintened in safety condition.
For this purpose, in addition to **checks** made by the user before each workshift, the following periodical checks must be carried out:

- **Inspection:** it must be carried out, at the latest every three months, by an inspector, in according to the rule **UNI ISO 9927/1.**
- **Control:** it must be carried out by a technician at the latest every year, unless the inspections performed do not require a higher frequency.
- **Tests:** they must be carried out by an engineer after important repairs.

1.5 - NOISINESS

The crane is provided with ***"CE certificate"*** regarding the acoustic pressure and power level produced by the crane during operation with load.

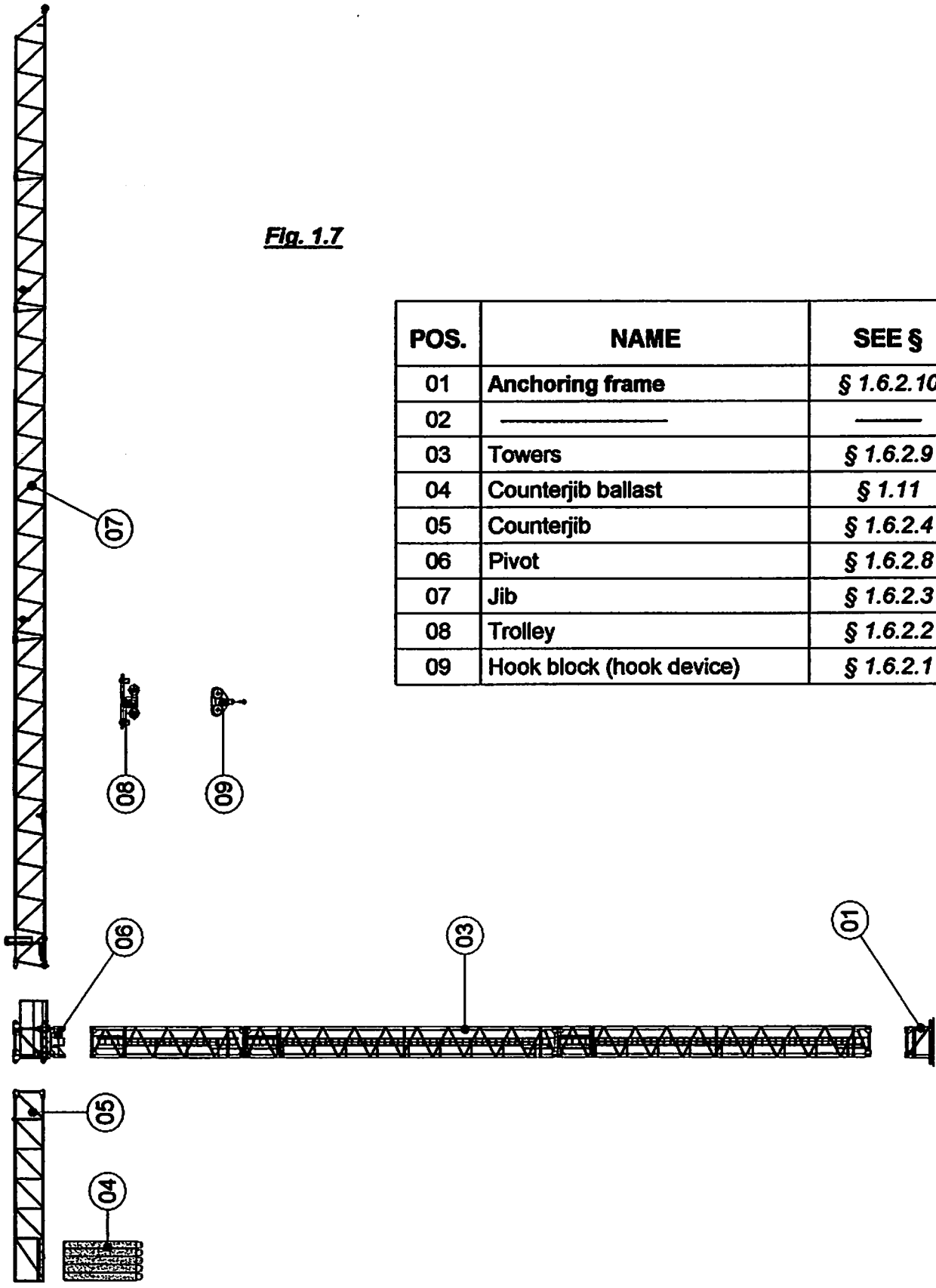
Measurement performed according to directive CEE **87/405:**

- Acoustic pressure level: **LpAm = dB(A) 73,1**
- Acoustic power level: **LwA = dB(A) 96,1**
- Operator's acoustic pressure level: **LpAm = dB(A) 70,0**

1.6 - EQUIPMENT

1.6.1 – Main components: position and names

Fig. 1.7



POS.	NAME	SEE §
01	Anchoring frame	*§ 1.6.2.10*
02	————————	———
03	Towers	*§ 1.6.2.9*
04	Counterjib ballast	*§ 1.11*
05	Counterjib	*§ 1.6.2.4*
06	Pivot	*§ 1.6.2.8*
07	Jib	*§ 1.6.2.3*
08	Trolley	*§ 1.6.2.2*
09	Hook block (hook device)	*§ 1.6.2.1*

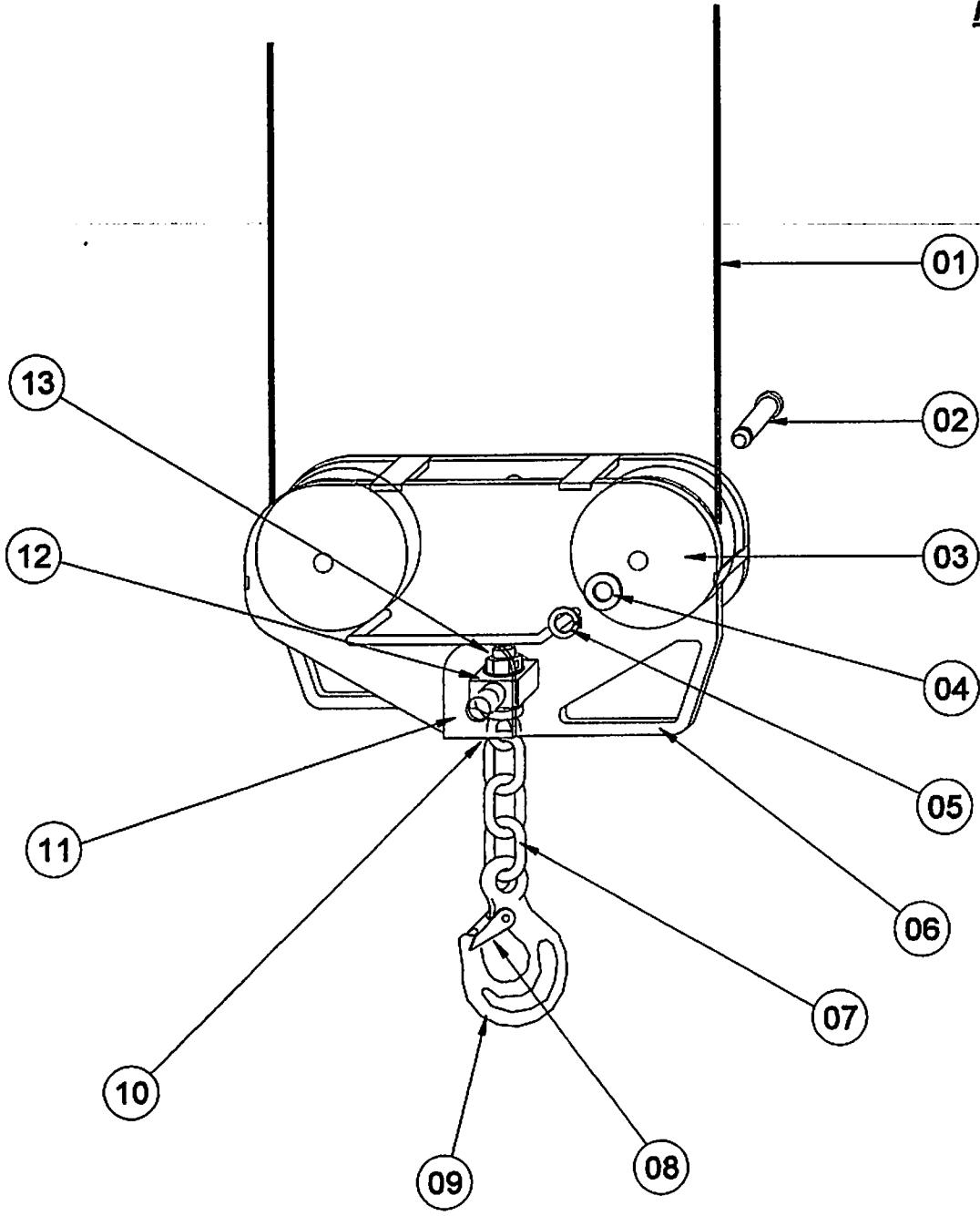
1.6.2 – Description of the main parts

1.6.2.1 – Hook device

The hook device is composed by the HOOK and the HOOK BLOCK. The HOOK BLOCK is formed by two plates kept together by pins, containing the fleeting pulleys of the hoisting rope and the turning device of the hook. Together with this handbook you find the manufacturer's certificate of the HOOK and its CHAIN.

This crane, having two fall reeving (**2 FALL**) and **2000 Kg** as maximum capacity, is represented in the next picture, ***Fig. 1.8***, and its main parts are described in the key to simbols at the following page:

Fig. 1.8



Key to symbols n.1 – parts of the hook device ***(see fig. 1.8)***

POS.	NAME	*PIECES*
01	Hoisting rope ***ø 9*** mm (***2 fall reeving***)	1
02	Pin ø 30 mm for pulley	2
03	Pulley ***ø 200*** inner diameter with anti-slipping off device	2
04	Flat washer	2
05	Security ring	2
06	Hook block (structural work)	1
07	Chain	1
08	Anti-unhooking spring device	1
09	Hook	1
10	Eyebolt	1
11	Swinging reveal	1
12	Thrust bearing (ø 25 ø 42 x 11)	1
13	Eyebolt's nut	1

Key to symbols n. 2 – hook device features ***(2 fall reeving)***

- Number and outer diameter of the pulleys	n° 2 of 240 mm
- Inner diameter of the pulleys	200 mm
- Total weight of the structural work only	35 Kg
- Total weight of every part (rope not included)	50 Kg
- Simple hook type	UNI-ISO 4779 or UNI 4395
- Hook's minimum capacity	2 t.
- Chain breaking's load	120 kN
- Load's anti-unhooking device	spring
- Minimum number of the rings in the chain	3
- Chain wire's diameter	18 mm
- Diameter of the eyebolt's threaded stem	M 24 x 3
- Thrust bearing's inside diameter	25 mm
- Rope's anti-unhooking device	rope-guard plates
- Colour	Crane's colour with yellow and black stripes area

N. B.! See *§ 5.8.3.* to find all the instructions and tricks useful for mounting the hoisting rope.

1.6.2.2 – Trolley

Composed by a framework of structural steel, it runs over the lower elements of the jib thanks to four rollers. You can see the configuration of the trolley in the following picture (***Fig. 1.9***): it is mounted on crane having **2 fall reeving** and **2000 Kg** maximum capacity. The features of the trolley are described in the key to symbols at the next page:

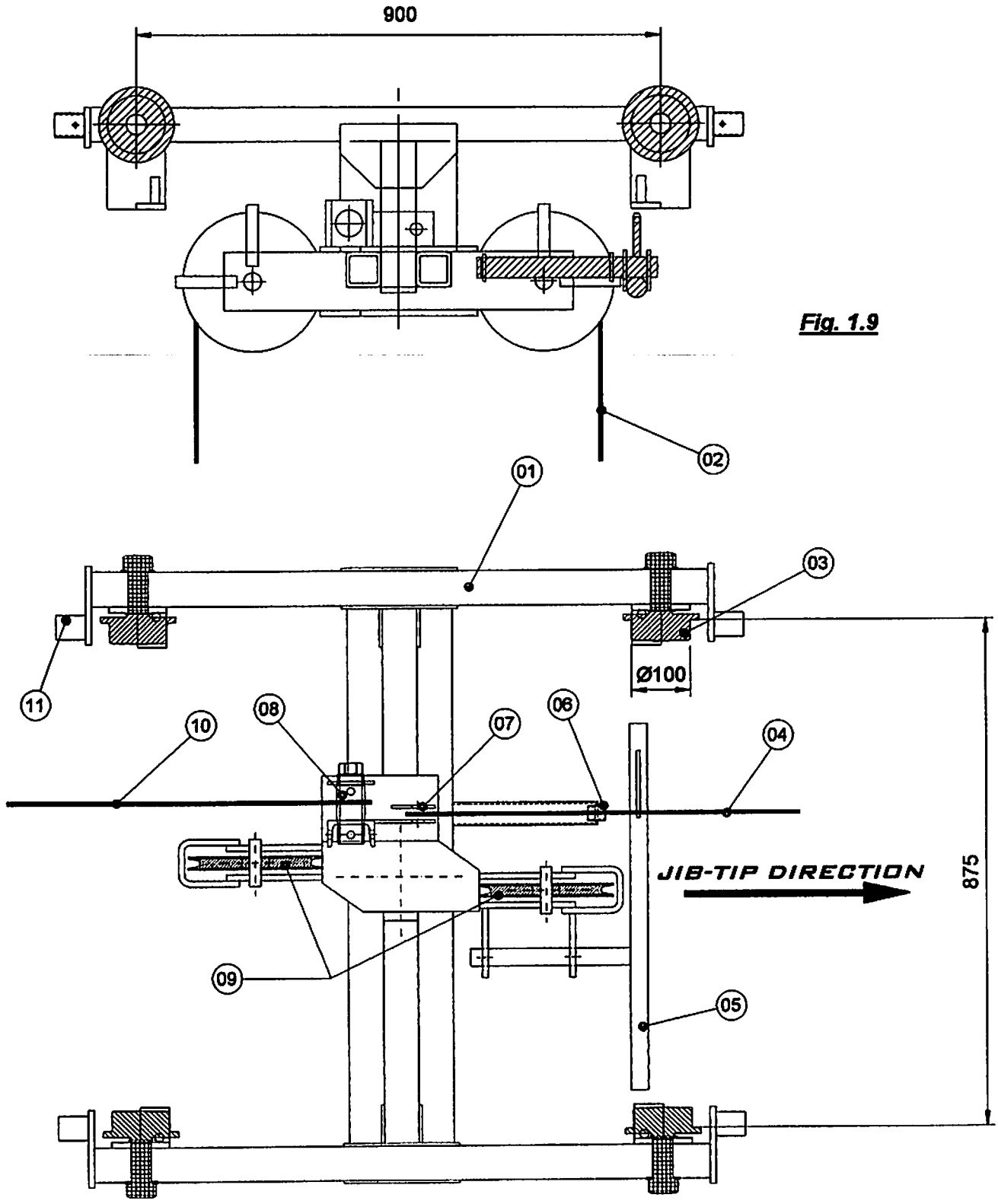


Fig. 1.9

Key to symbols n.1 – main parts of the trolley (see fig. 1.9)

POS.	NAME	*PIECES*
01	Trolley frame	1
02	Hoisting rope ***ø 9 mm***	1
03	Running rollers with pin and bearing	4
04	Trolley rope ***ø 6 mm, front part***	1
05	Security block preventing the rope's breaking	1
06	Trolley rope prop, front part	1
07	Trolley rope swivel, front part	1
08	Trolley rope swivel, back part, with tensioner	1
09	Fleeting pulley of the hoisting rope ***ø 200*** inner diameter	2
10	Trolley rope ***ø 6 mm, back part***	1
11	Stops	4

Key to symbols n.2 – main features of the trolley

- Gauge	**87,5 cm**
- Rollers' axle base	**90 cm**
- Diameter of the rollers	**10 cm**
- Numbers and outer diameters of the pulleys	n° 2 of 240 mm each
- Race's diameters of the pulleys	200 mm
- Rope's anti-unhooking device	Plates protecting the rope
- Diameter of the running rollers' pins	35 mm
- Inside diameter of the rollers' bearings	30 mm
- Total weight of the structural work	95 Kg
- Total weight of every part (rope not included)	120 Kg
- Total lenght	1,18 m
- Total width	1,07 m
- Total height	0,46 m

Note! See *§ 5.8.2* and *§ 5.8.3.* to find all the instructions and tricks useful for mounting the trolley and hoisting ropes.

1.6.2.3 - Jib

The jib has triangular section. The lower members have tubular section in order to reduce the frame and to have a better penetration of the wind. The different jib elements are joint by pins and bolts. The upper member is made of square tubes. For the frame we use only round tube. This permits to reduce the wind effect.

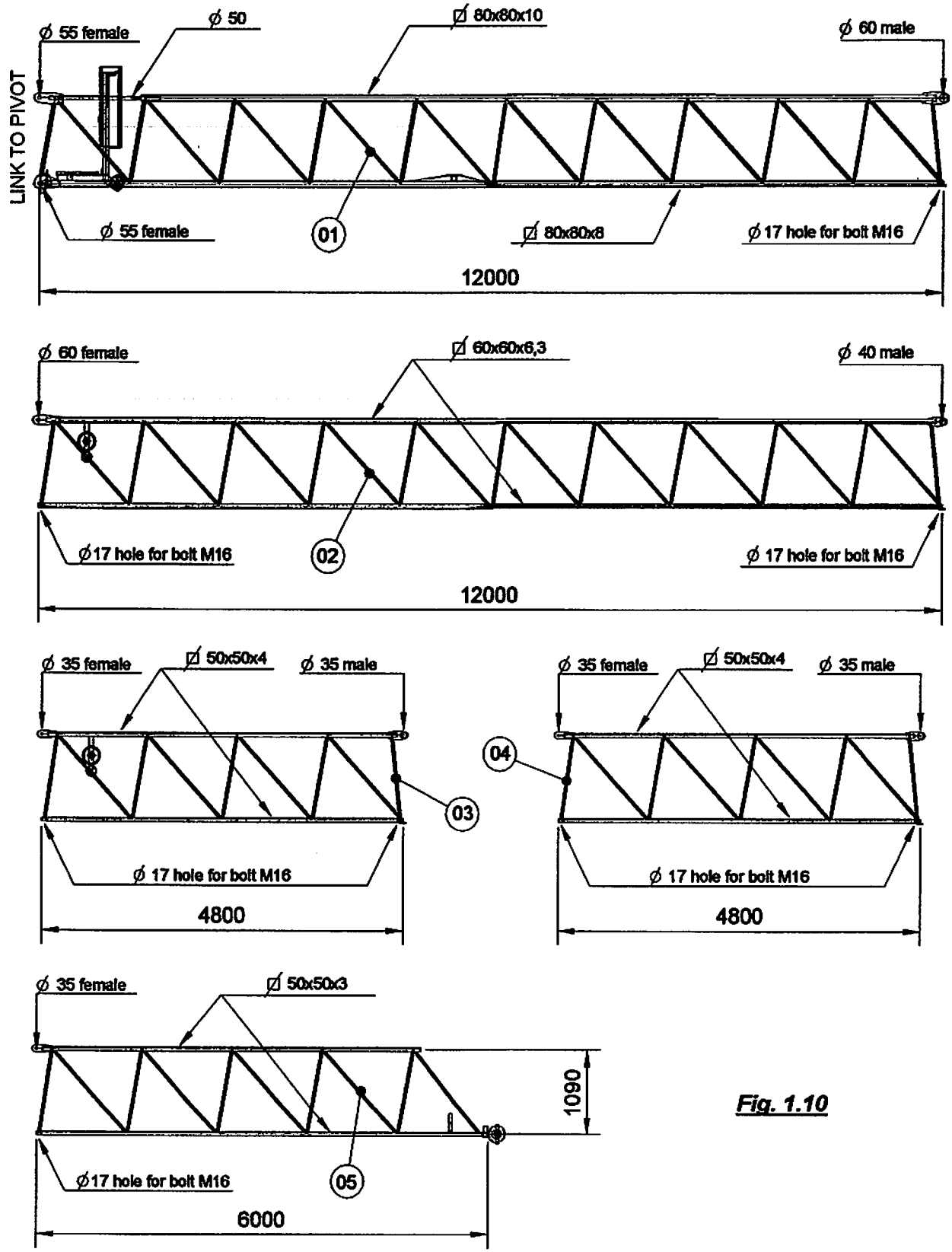


Fig. 1.10

The jib sections starting from the junction at the slewing ring frame towards the tip are listed in the following table, with reference to ***fig. 1.10*** at the previous page:

POS.	NAME	USEFUL LENGHT	WEIGHT EACH Kg + 5%	PIECES	DIMENSIONS (m)
01	Jib element E1 + E2	12.00	1300	1	12.19 x 1.65 x 0.96
02	Jib element E3 + E4	12.00	670	1	12.15 x 1.21 x 0.87
03	Jib element E5	4.80	190	1	4.93 x 1.20 x 0.87
04	Jib element E6	4.80	180	1	4.93 x 1.20 x 0.87
05	Jib element E7	6.00	175	1	6.31 x 1.27 x 0.87

1.6.2.4 – Counter-jib

The frame of the counter-jib has rectangular section. The lower and upper members are made of square tubes in order to reduce the frame and to have a better penetration of the wind. For the frame we use square and round tubular. This permits to reduce the wind effect.

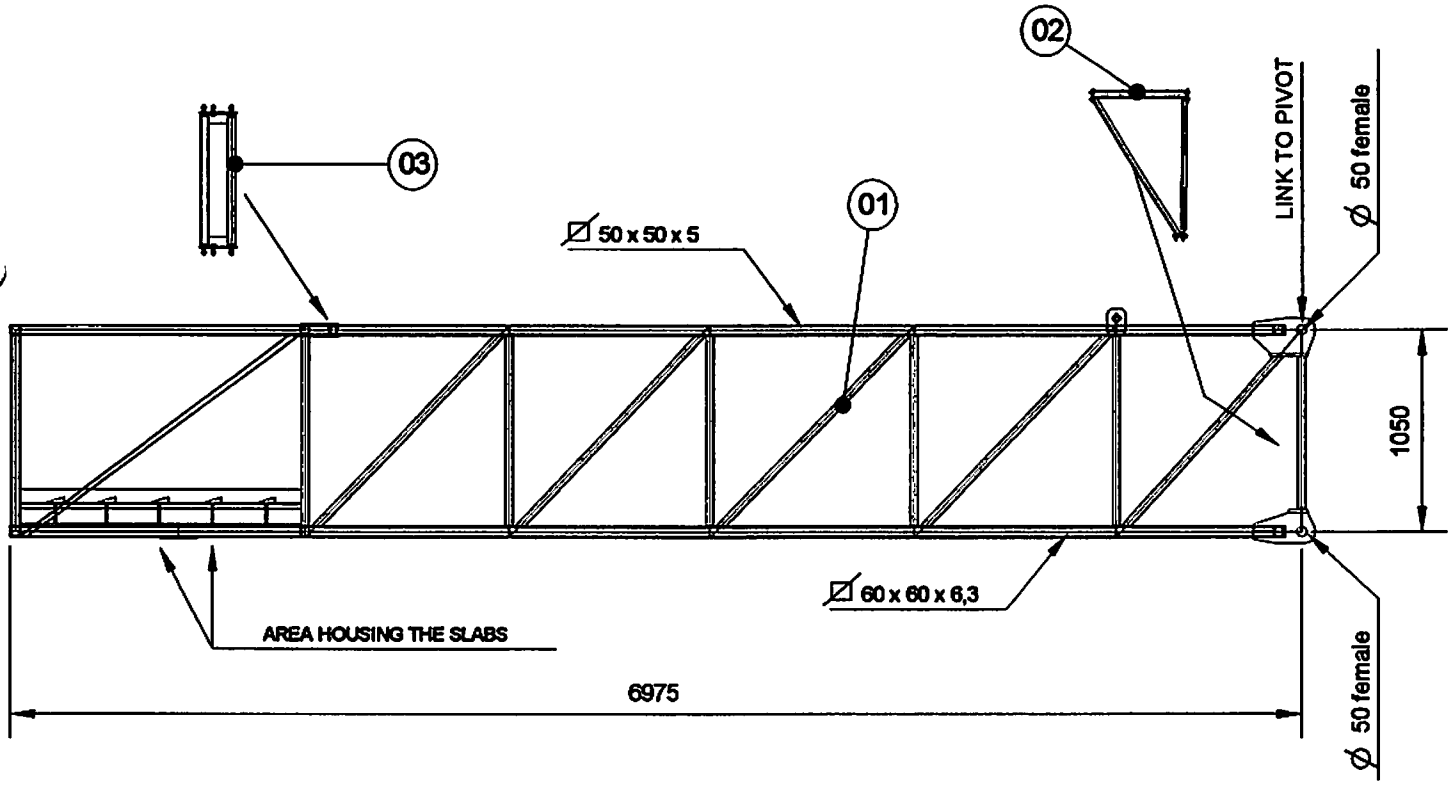


Fig. 1.11

One end of the beam bears the joint to the pivot while at the other end is located the counter-jib ballast.
The end with the joint to the pivot hasn't any locking bolster: this permits to combine this parts with the jib elements and so to save space on the lorry transporting the crane.
During the assembling, you will restore the frame by connecting the removable tubular and the horizontal upper cross-beam with the proper bolts, as described at *§ 5.6 – Fig. 5.10-B*.
A plate of expanded metal is placed on one side of the frame forming a whole floor that permits to reach the place housing the ballast blocks.
So the counter-jib is composed of two parts, whose features are listed in the following chart (see fig. 1.11 at the previous page)

POS.	NAME	WEIGHT EACH Kg + 5%	PIECES	DIMENSIONS (m)
01	Counterjib	600	1	7.04 x 1.22 x 0.95
02	Removable tubular	15	1	1.05 x 0.71 x 0.14
03	Horizontal upper cross-beam	12	1	0.73 x 0.20 x 0.15

1.6.2.5 – Cat-head

Crane Model *103 FLAT* has no cat-head.

1.6.2.6 – Counter-jib tie rods

Crane Model *103 FLAT* has overhanging ballast and so it has no counter-jib tie rod.

1.6.2.7 – Jib tie rods

Crane Model *103 FLAT* has overhanging ballast and so it has no jib tie rod rods.

1.6.2.8 – Pivot

It is composed by two frames: one is fixed to the tower, the other one turns and is linked to the counterjib. The two frames can turn thanks to the slewing ring placed between them, which is linked to the frames by means of two crowns of bolts.

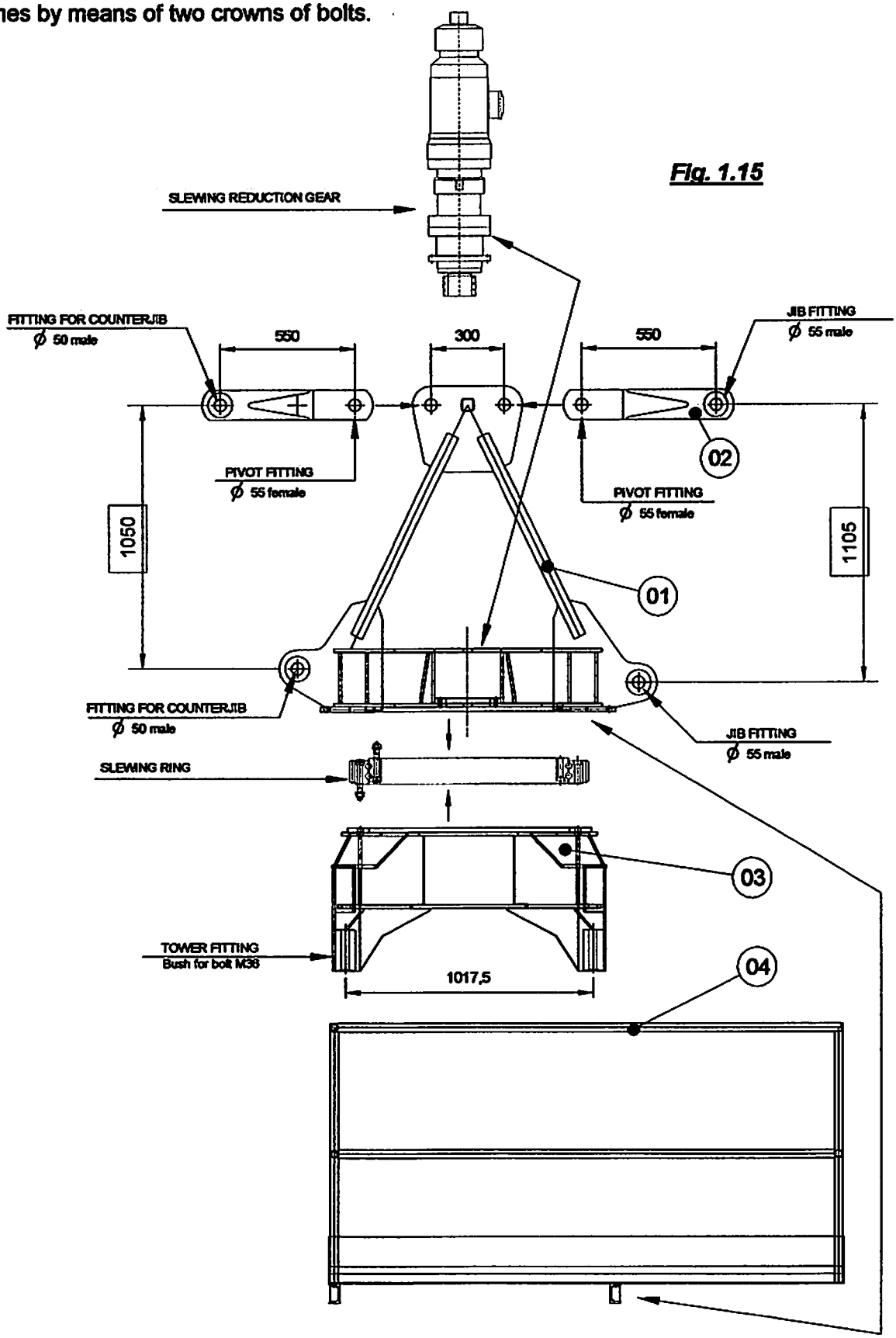


Fig. 1.15

On the bottom part of the slewing pivot frame are positioned the seats of the slewing reduction gear on a side and the seats of the landing on the other one. When ***Benazzato Gru S.p.A.*** delivers the crane, the pivot is completely linked and the slewing reduction gear is already flanged to the rotating part. On the contrary, the landing must still be linked to the rotating parts.

Note! The distance between the pins' hole centers marks the two parts. The part to be linked to the jib has a distance of *1105 mm*, while the part to be linked to the counter-jib has a distance of *1050 mm*.

The parts composing the pivot with landing are listed in the following chart. See also picture ***Fig. 1.15*** above:

POS.	NAME	WEIGHT EACH. Kg. + 5%	No.	SIZE (m)
01	Turning pivot – central part	565	1	1.55 x 1.29 x 1.19
02	Butt joints for upper beams	30	4	0.71 x 0.13 x 0.08
03	Pivot fixed to the tower	390	1	1.12 x 1.12 x 0.57
04	Landing	95	1	2.11 x 1.12 x 0.95

1.6.2.9 – Tower

The tower is composed by angle-iron uprights and bolted sleeves. The frame of the tower is composed by CNP iron. The connecting screws are protected against oxidation.
In the frames there are ladders and tops for stopping.
The elements are ***12 meters*** and ***6 meters*** long and can be assembled according to the following chart, so that you can have the height needed (***without anchorages***), from ***24 meters*** till the maximum height of ***36 meters***.
According to the user's demand, the manufacturer assembles the elements, as showed in the chart below. See also ***Fig. 1.16*** at the following page.

POS.	NAME	USEFUL LENGHT	WEIGHT EACH Kg. + 5%	No. PIECES	SIZE (m)
01	St. element *12 m* L 120 x 120 x 10	11.90	1750	——	11.91 x 1.12 x 1.12
02	St. element *12 m* L 120 x 120 x 12	11.90	1900	——	11.91 x 1.12 x 1.12
03	St. element *6 m* L 120 x 120 x 10	5.90	950	——	5.91 x 1.12 x 1.12
04	St. element *6 m* L 120 x 120 x 12	5.90	1030	——	5.91 x 1.12 x 1.12

N.B.! We remind you that at the end of the fig. 1.16 is reported the type of the STANDARD BOLTED JUNCTION and the prescriptions to follow in order to control the tightening torque of the screws that constitute it.

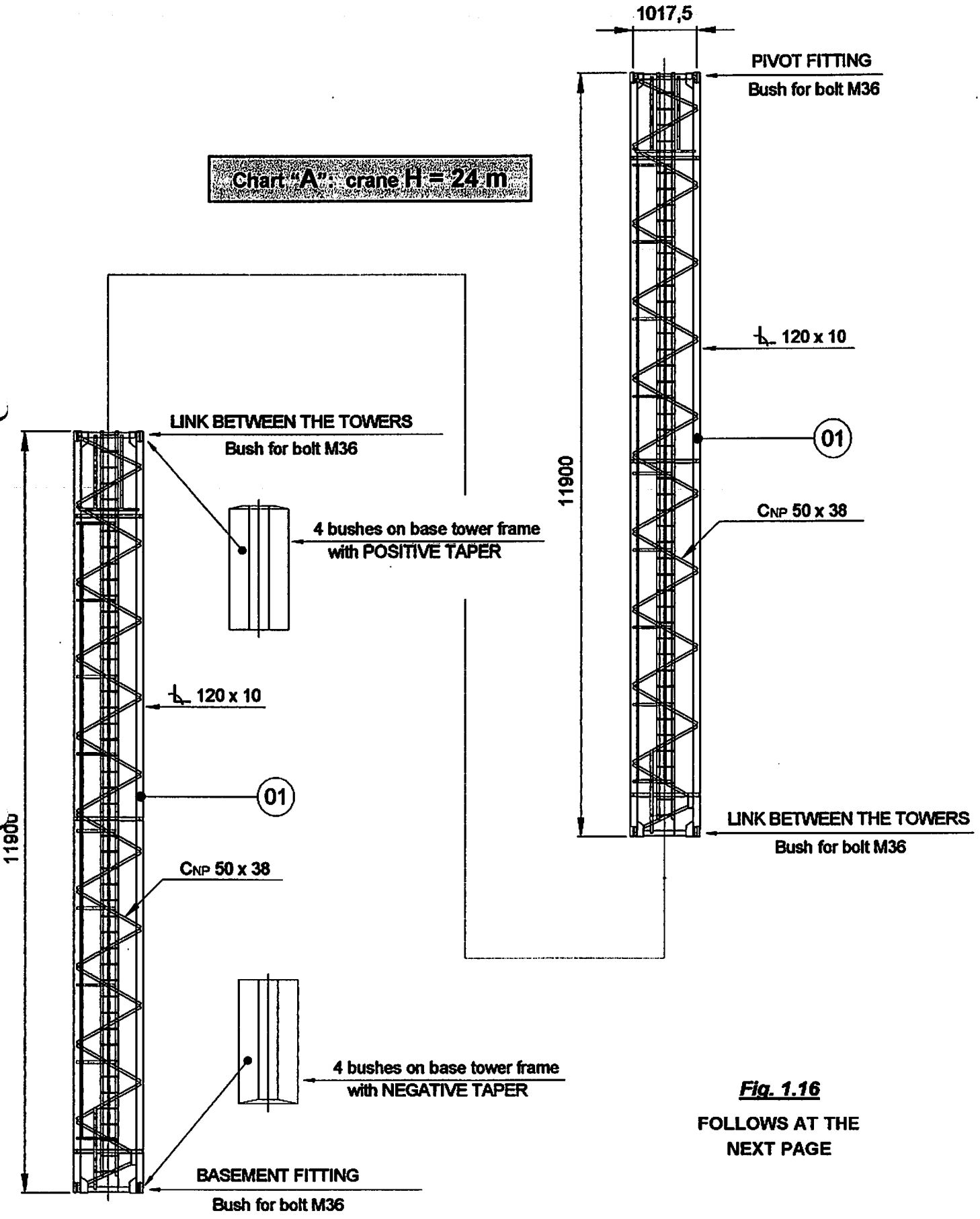
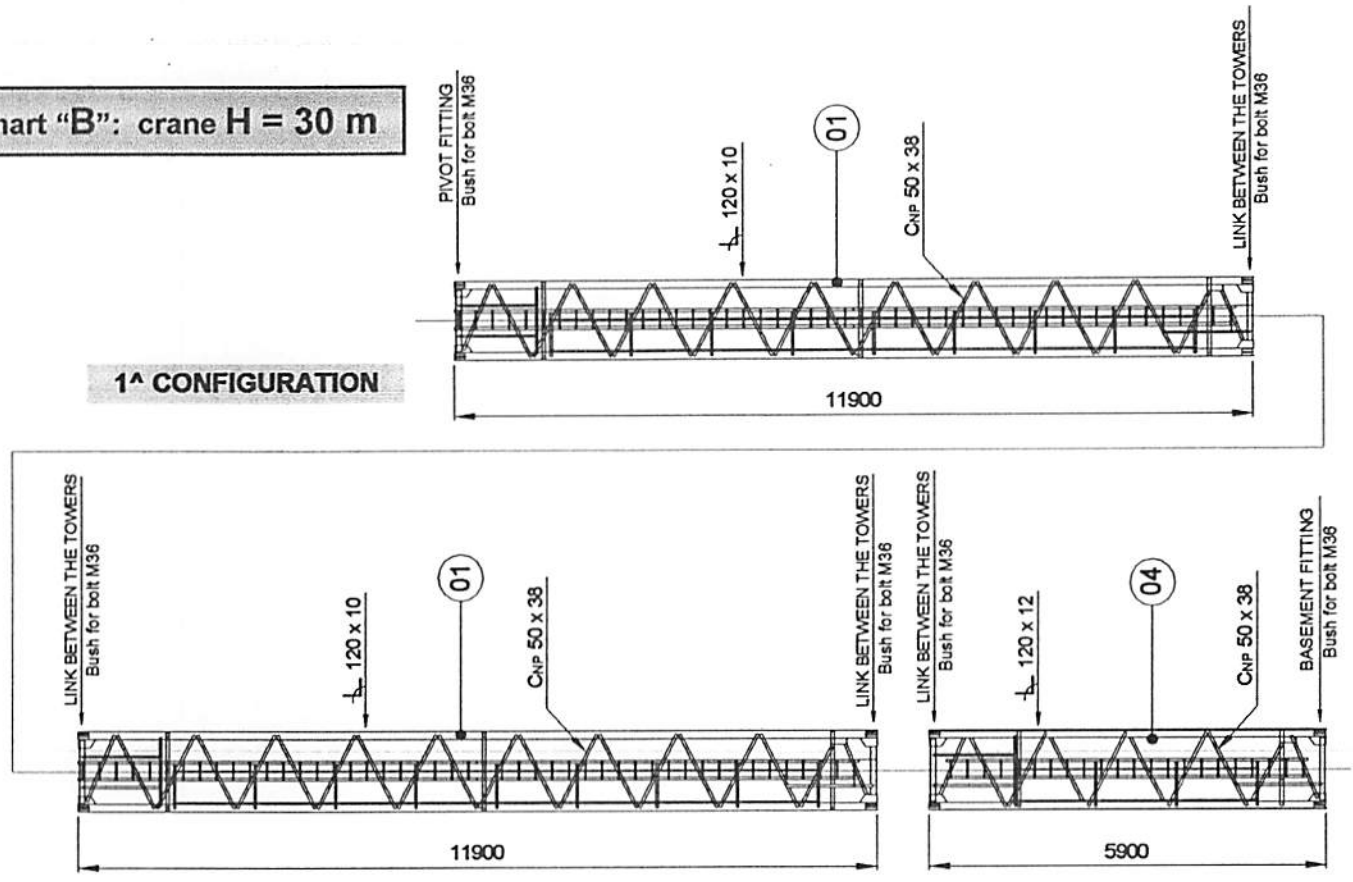


Fig. 1.16

FOLLOWS AT THE NEXT PAGE

Chart "B": crane H = 30 m



OR

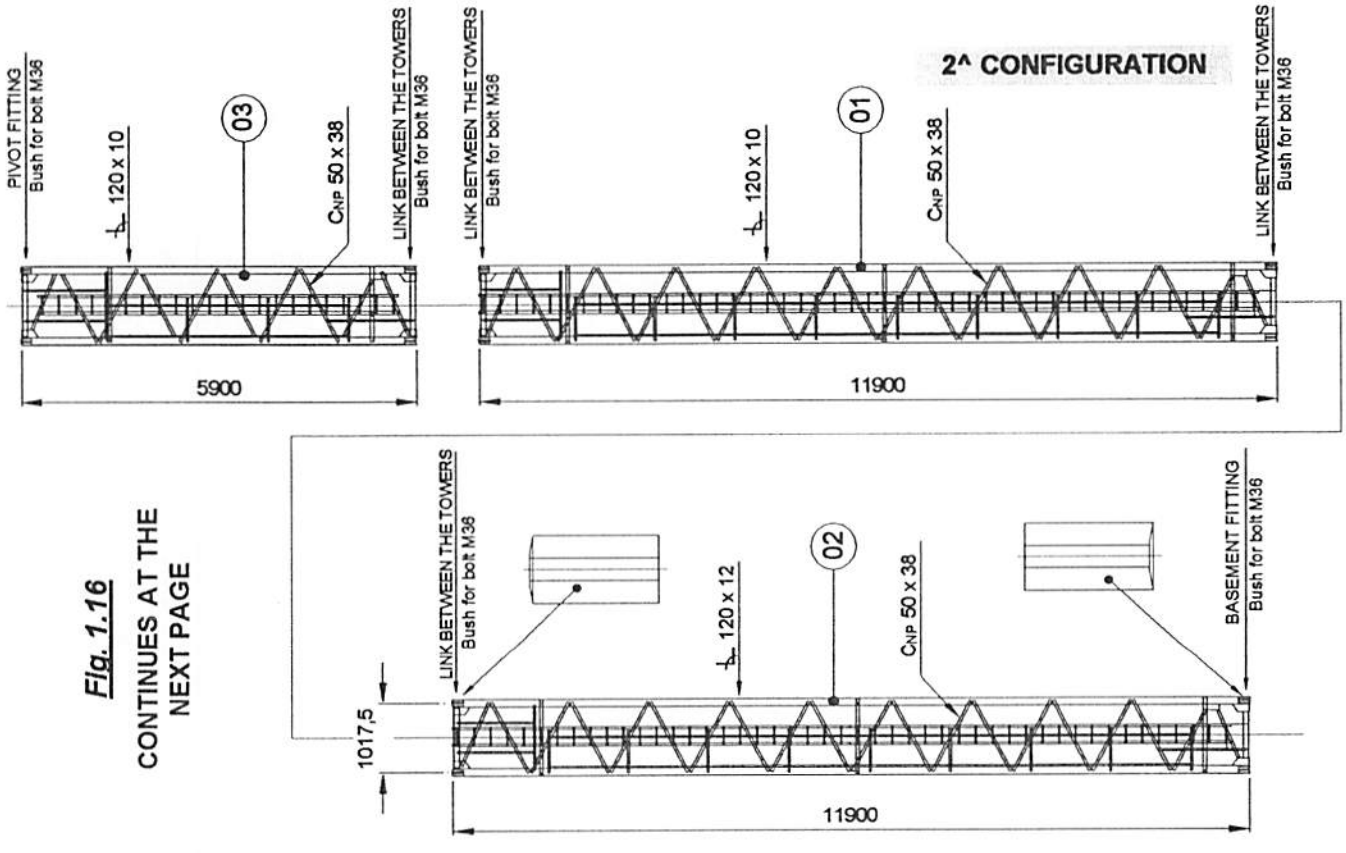


Fig. 1.16

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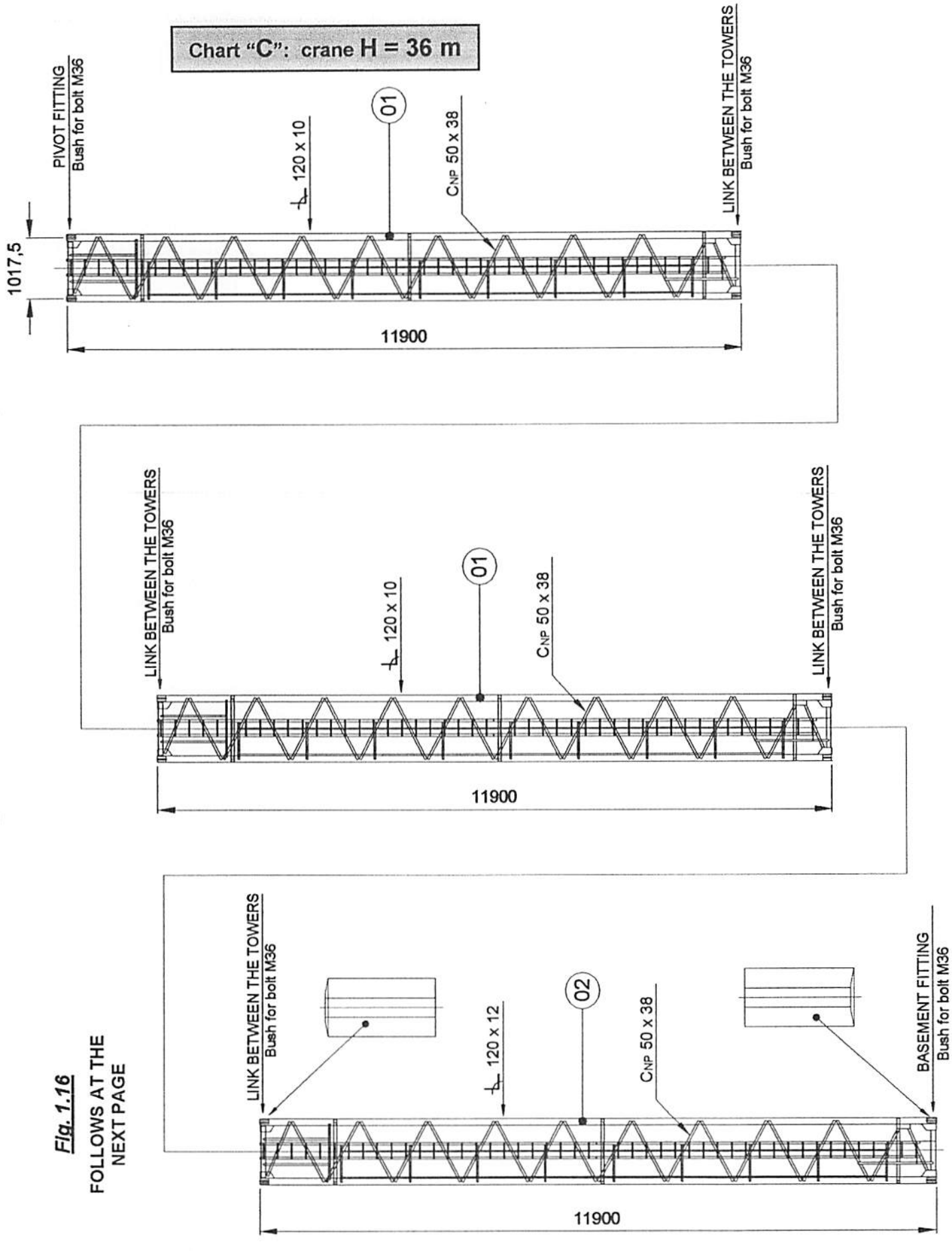


Fig. 1.16

FOLLOWS AT THE NEXT PAGE

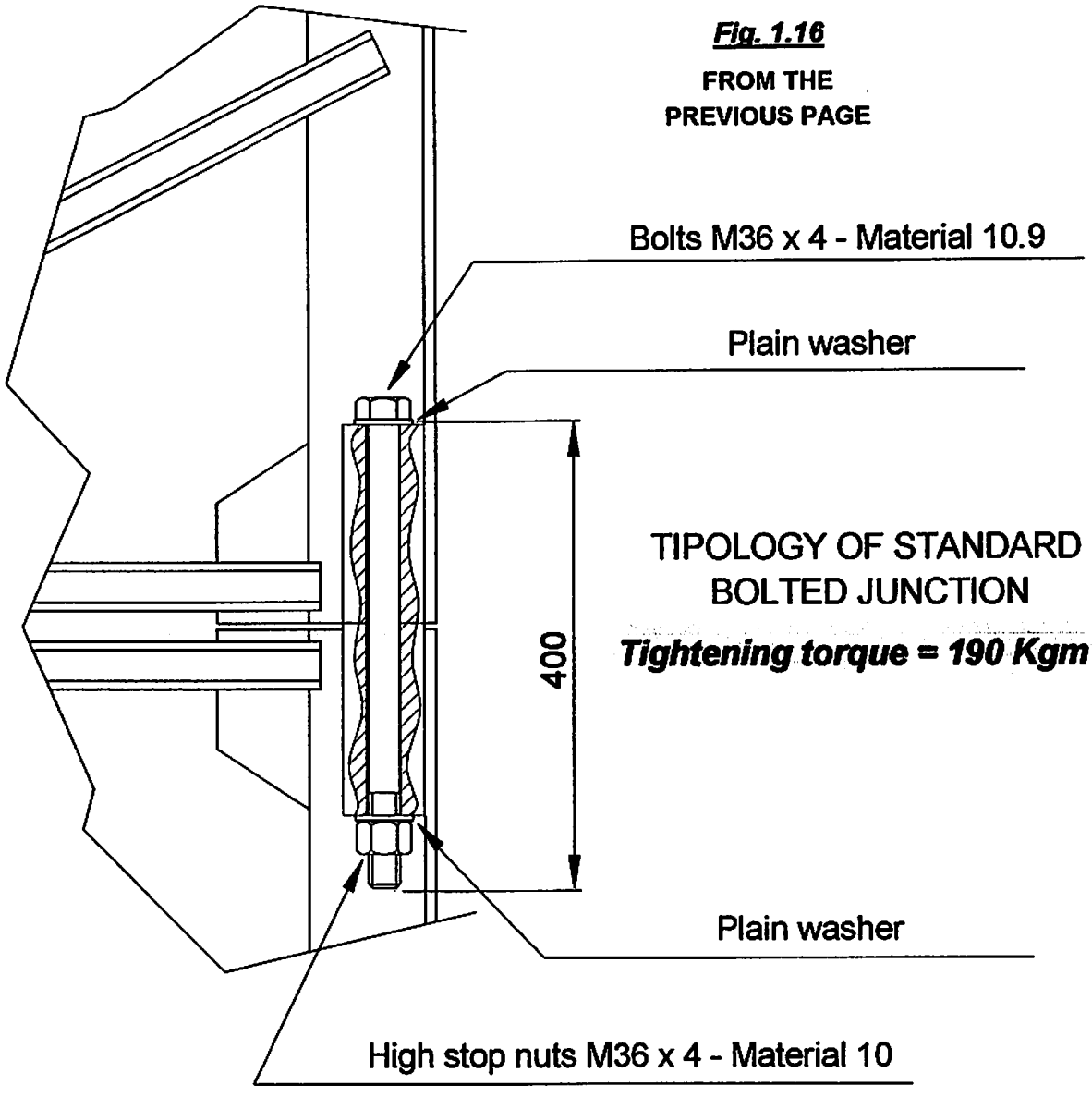


Fig. 1.16

FROM THE PREVIOUS PAGE

TIPOLOGY OF STANDARD BOLTED JUNCTION

Tightening torque = 190 Kgm

ATTENTION!

During the use of the crane, every 40 WORKING HOURS or rather WEEKLY, it is necessary to check the tightening of the screws constituting the standard bolted junction and to verify their integrity.

During this operation the bolted junctions must be discharged from tractive forces through compensation of the slewing ring according to the procedure described at § 4.4.2

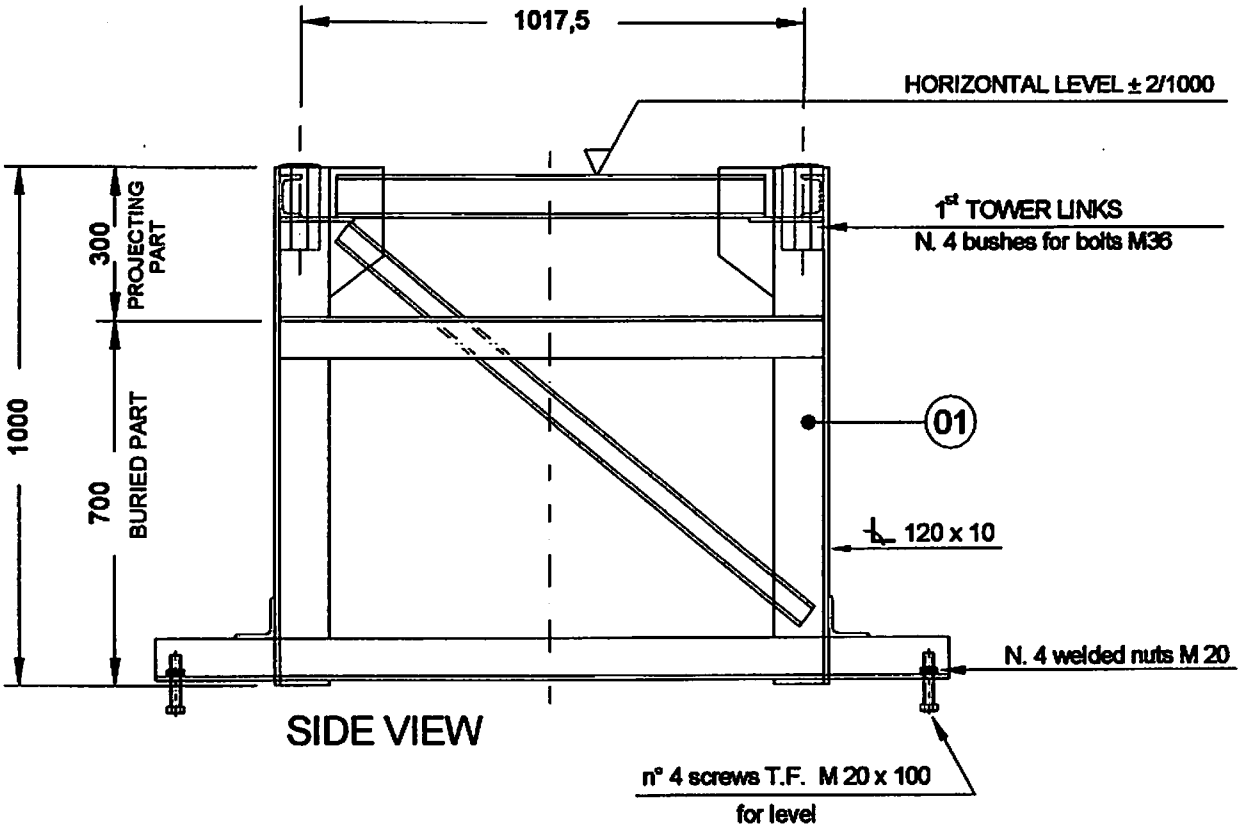
In case of loose junction, restore the tightening by means of a torque wrench.

1.6.2.10 – Anchoring frame

This crane is thought to be erected in fixed position in the foundation plinth.
The basement is an element to let into the concrete. It is a trestle with uprights made in angle iron and beams in angle iron and *CNP* bars.
The tower is connected to the anchoring frame thanks to bolted bushes; the linking screws are protected against oxidation.
The anchoring frame is always delivered by ***Benazzato Gru S.p.A.*** and has the features listed in the chart below.
See also ***Fig. 1.17*** at the next page.

POS.	NAME	WEIGHT Kg. + 5%	No.	SIZE (m)
01	Anchoring frame	270	1	1.01 x 1.60 x 1.60

In order to make the rigging of the element and lay the frame right into the plinth, there are four adjusting screws.
Once let into the concrete, the frame will have ***700 mm buried*** and ***300 mm projecting.***
The buyer will carefully let the anchoring frame into the foundation plinth.
The instructions to follow are listed at ***§ 1.9.***


1017,5
HORIZONTAL LEVEL ± 2/1000
1st TOWER LINKS
N. 4 bushes for bolts M36
300
PROJECTING PART
1000
700
BURIED PART
01
L 120 x 10
N. 4 welded nuts M 20
SIDE VIEW
n° 4 screws T.F. M 20 x 100
for level

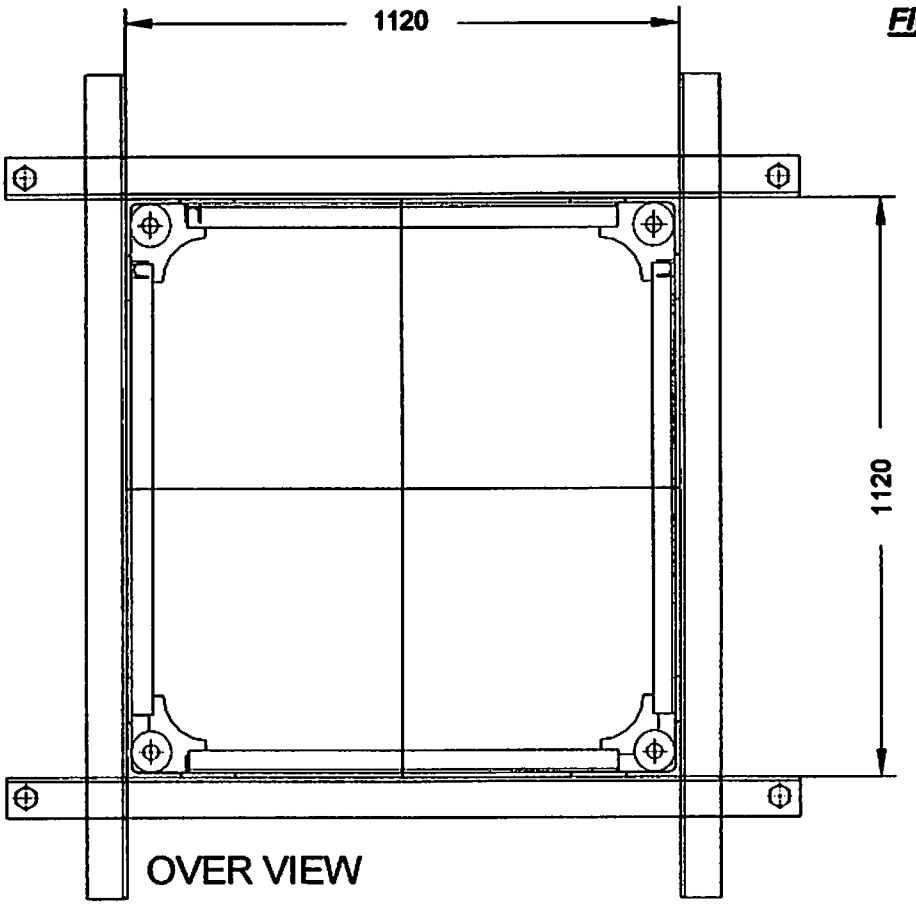
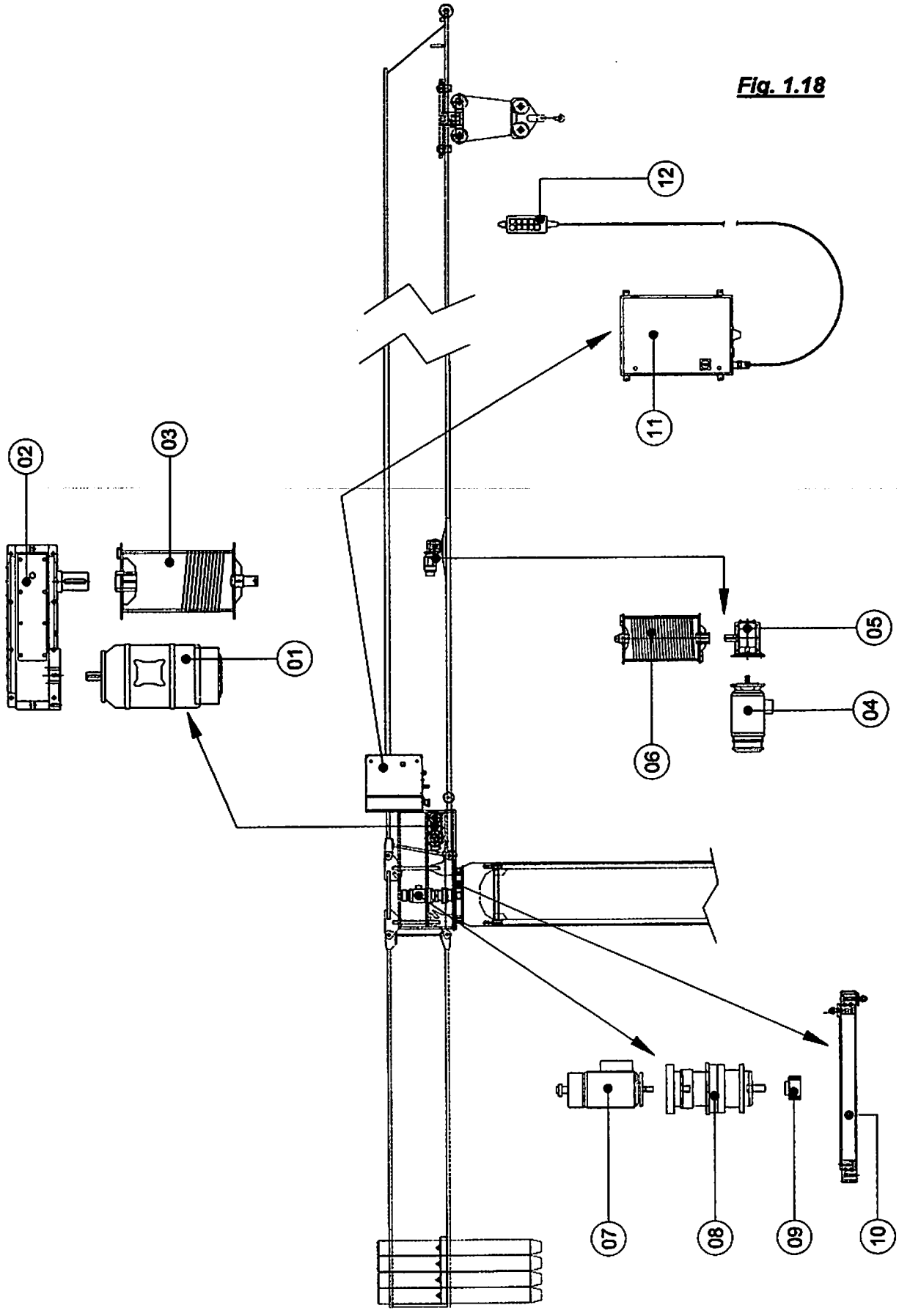

1120
1120
OVER VIEW

Fig. 1.17

1.6.3 – Mechanisms: location and names

Fig. 1.18



This chart refers to ***fig. 1.18*** at the previous page:

POS.	NAME	WEIGHT EACH Kg. + 5%	No. PIECES	SIZE (m)
01	Hoisting motor ***7.5 H.P.***	95	1	0.70 x 0.37 x 0.31
02	Hoisting reduction gear for ***7.5 H.P.***	104	1	0.59 x 0.27 x 0.29
03	Hoisting drum	53	1	ø 0.32 x 0.63
04	Trolley travel motor	42	1	0.45 x 0.25 x 0.22
05	Trolley travel reduction gear	24	1	0.21 x 0.29 x 0.23
06	Trolley travel drum	27	1	ø 0.26 x 0.55
07	Slewing motor with unlocking electric brake	58	1	0.62 x 0.30 x 0.28
08	Slewing reduction gear	92	1	ø 0.36 x 0.48
09	Slewing pinion	4	1	ø 0.14 x 0.08
10	Slewing ring	210	1	ø 0.98 x 0.10
11	Electric cabinet	68	1	1.10 x 0.69 x 0.25
12	Button control box with cable	13	1	0.70 x 0.30 x 0.20

The mechanisms of the machine are described with full particulars in:

§ 1.7.1 – **Hoisting**
§ 1.7.2 – **Trolley travel**
§ 1.7.3 – **Slewing**
§ 1.8.1 – **Button control box**
§ 4.8 – **Electric chart**

1.6.4 – Safety devices: location and name

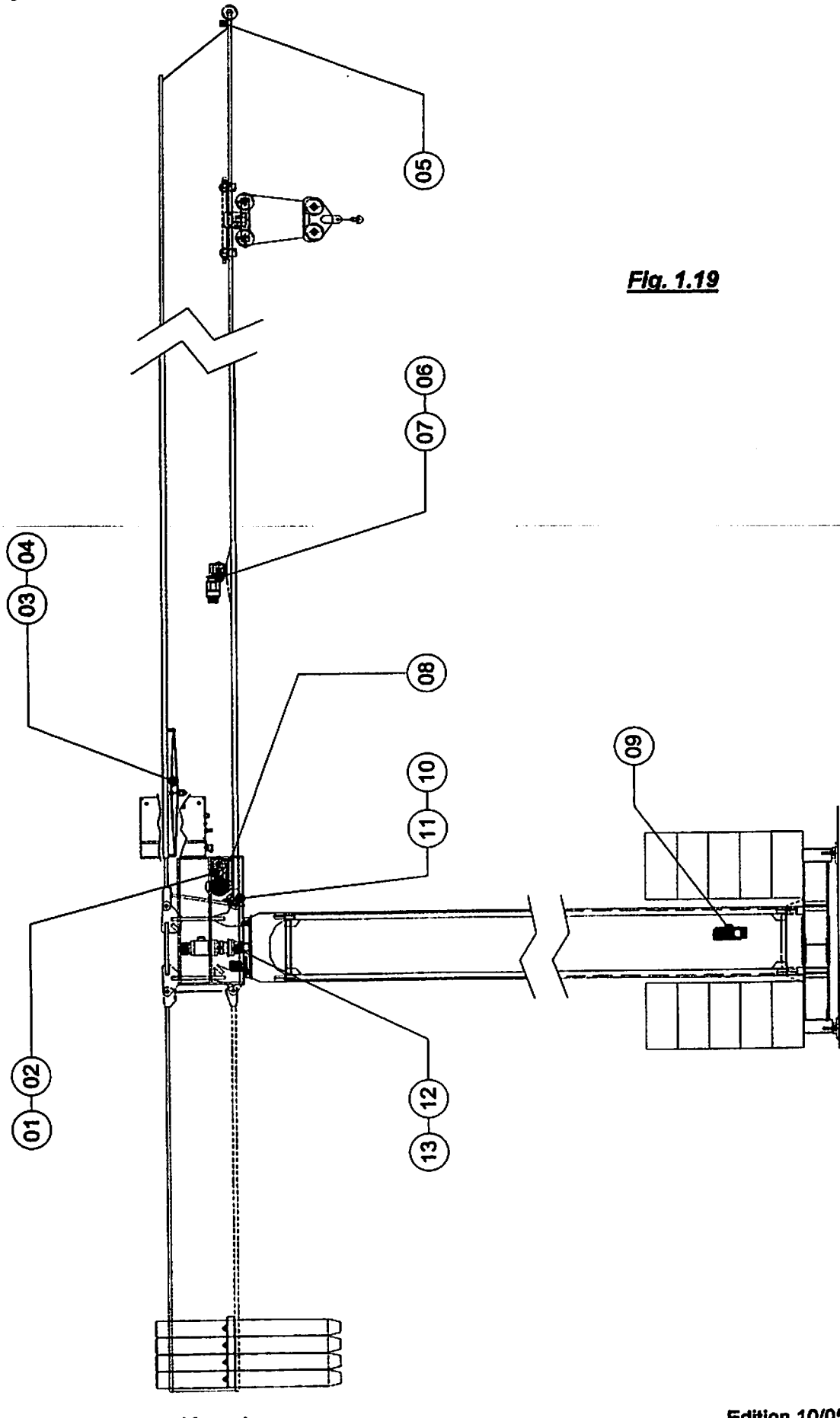


Fig. 1.19

This chart refers to ***fig. 1.19*** at the previous page:

POS.	NAME	No.
01	Hoisting motor brake 7,5 H.P.	1
02	Limit switch up-down	1
03	Hoisting moment limiting device (dynamic moment)	1
04	Far moment limiting device (static moment)	1
05	Buffer for trolley far limit switch	2
06	Trolley travel motor brake	1
07	Trolley limit switch near-far	1
08	Buffer for trolley near limit switch	2
09	Push button for electrical unlock of the slewing brake	1
10	Max load limitino device	1
11	Load/speed limiting device	1
12	Slewing motor brake	1
13	Slewing right/left limit switch	1

The safety devices mounted on the crane are handled with full particulars at paragraphs:

- ***§ 1.7.1 – Hoisting***
- ***§ 1.7.2 – Trolley travel***
- ***§ 1.7.3 – Slewing***
- ***§ 1.7.4 – Torque limiting device***

- ***For setting of the safety devices see § 4.3***
- ***For adjustment of the brakes see § 4.2***
- ***For the electrical unlock of the slewing brake see § 3.6.3***

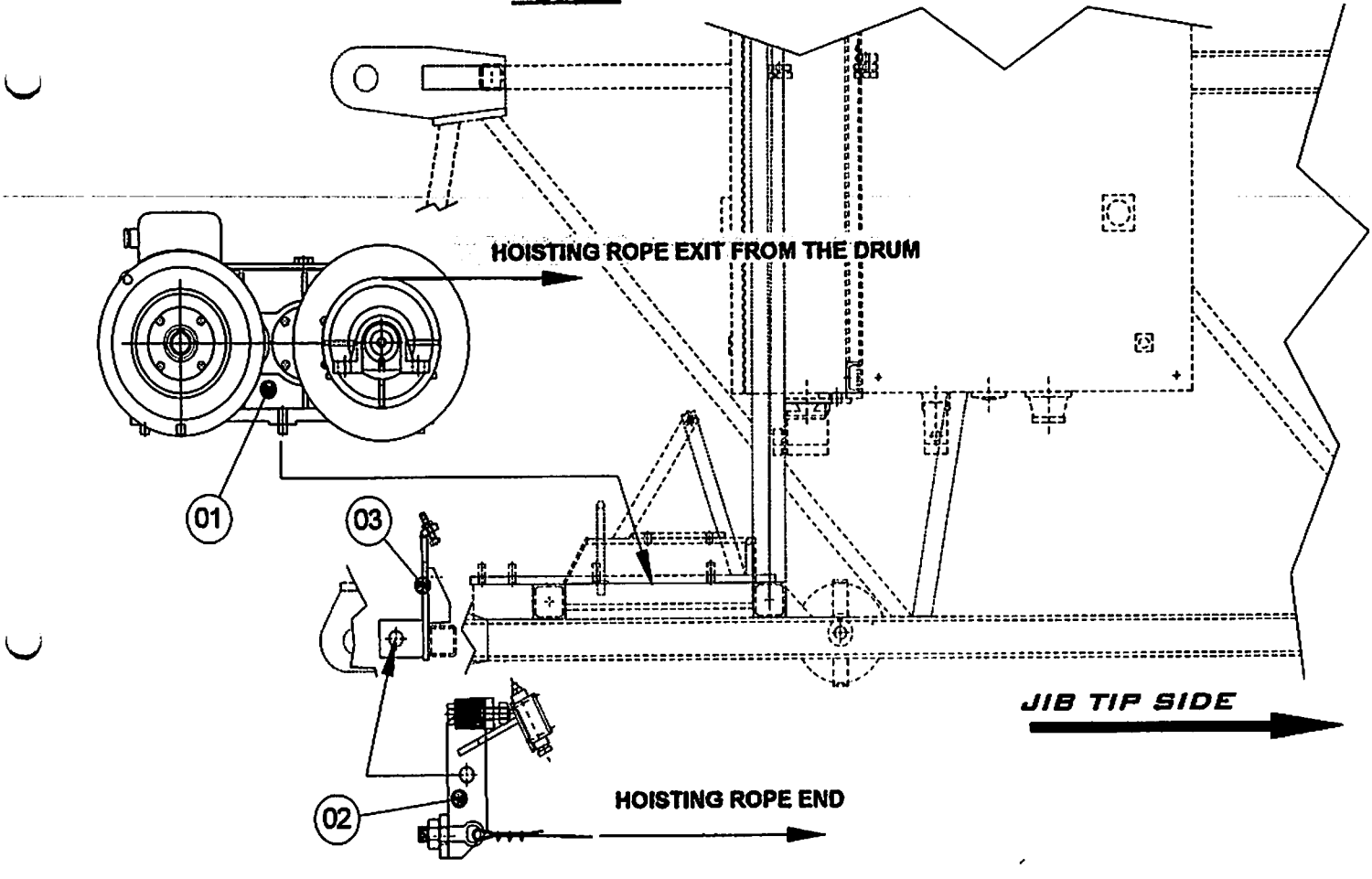
1.7 – Mechanisms and safety devices

1.7.1 – Hoisting

The hoisting mechanism is mounted on the tail of the jib section with winches (***see fig. 1.10-part. 01)*** and is composed of the winch itself, formed by MOTOR, REDUCTION GEAR and DRUM of the rope winding, and by the following safety devices: UP-DOWN limit switch, MAX. LOAD limiting device and LOAD/SPEED limiting device.

The different components of the mechanism are shown in **fig. *1.20***.

Fig. 1.20



- ***Part. 01*** – Winch composed of motor, reduction gear, drum for rope winding and limit switch for rise-descent of the load (see ***fig. 1.21***).
- ***Part. 02*** – Max. load limiting device mounted on Belleville washers carrying two microswitches and activated by the rope pull, which has its end here (see ***fig.1.23***).
- ***Part. 03*** – Support carrying two screws for the microswitches (for max. load limit and for load/speed limit).

1.7.1.1 – Hoisting winch

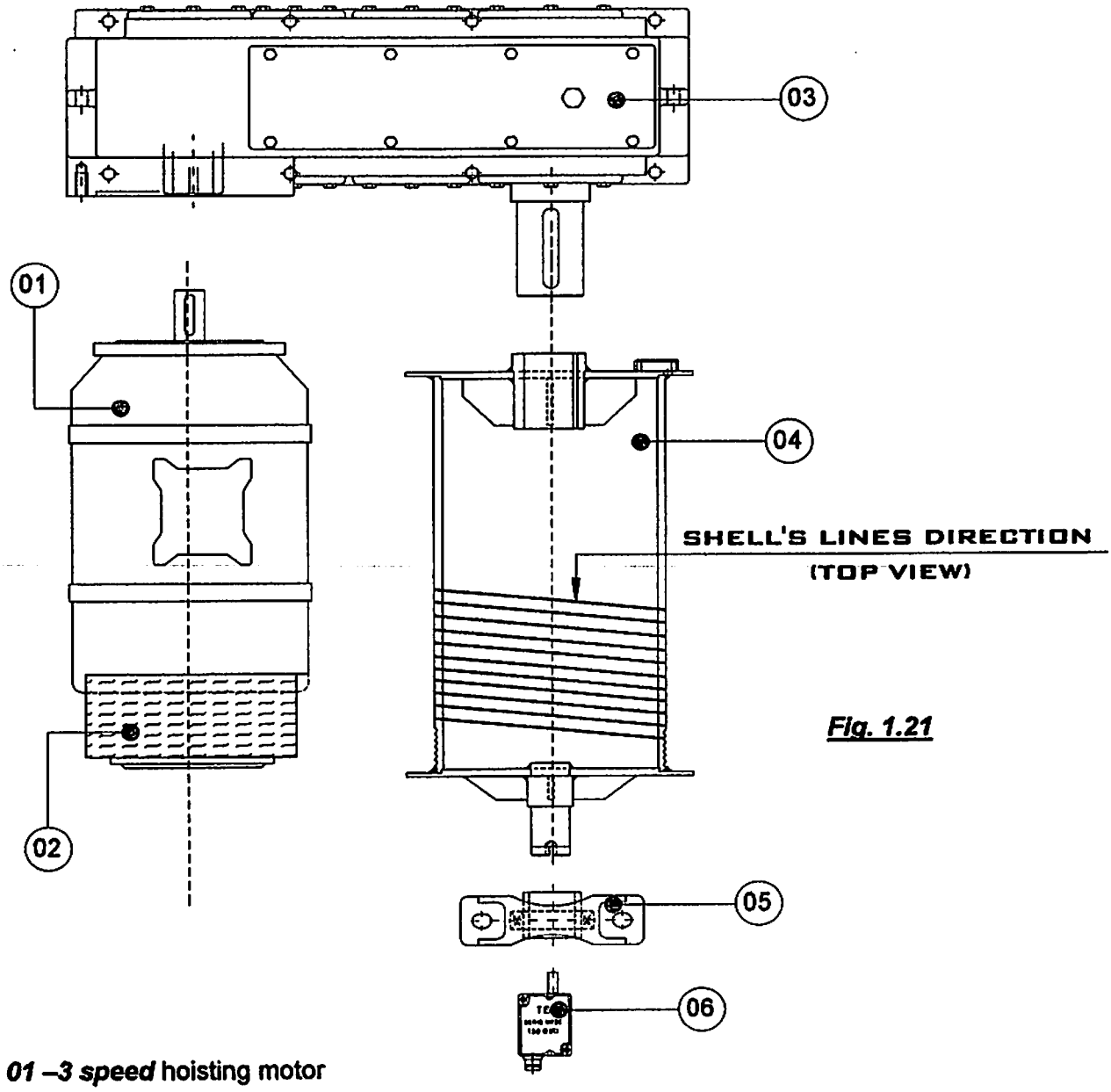


Fig. 1.21

- ***Part. 01 –3 speed*** hoisting motor
- ***Part. 02*** – Motor brake
- ***Part. 03*** – Hoisting reduction gear
- ***Part. 04*** – Hoisting drum
- ***Part. 05*** – Drum support (opposite side of the reduction gear)
- ***Part. 06*** – UP-DOWN limit switch

1.7.1.1.1 - Motor

It is composed by 3 windings corresponding to the 3 speeds of the motor.
The hoisting motor is ruled by the button control box with the following buttons:

- Up/down: the motor starts at 1st speed (330 r.p.m.) and contemporary opens the brake.
- Slow: the motor increases the rotation speed (1400 r.p.m.).

- Fast: this is the max. speed and the motor increases the rotation speed (2800 r.p.m.).
- When downshifting, the electrical system changes down automatically, so that the load stops slowly and without oscillation.
- When shifting from one speed to another, the brake is always connected. In order to change the speed, you have to press the button corresponding to the speed you need and meanwhile pressing the "*UP/DOWN*" button.

-Type	Asynchronous, threephase with 3 speeds type **"BESOZZI DAFN 7"**	
- Drive-shaft diameter	**ø (mm)**	**32**
- Flange diameter	**ø (mm)**	**250**
-Nominal power	Kw.	5.5 / 5.5 / 1.3
-Speed	r.p.m.	2800 / 1400 / 330
-Nominal torque	daNm	1.87 / 3.75 / 3.76
-Pick-up torque	daNm	5 / 10 / 10
-Y- connection power supply	V.	400
-Y- connection nominal power	A.	14.5 / 14.8 / 12.2
-Y- connection pick-up current	A.	85 /94 / 22
-Maximum number of operations in an hour	man/h	150
-Intermittence	%	50
-Insulation class		F
-Protection of boards		IP 23
-Service		S 3
-Ventilation		internal

The motor is a rotary engine squirrel cage motor.

1.7.1.1.2 - Brake

The instructions for adjusting the hoisting brake are given at *§ 4.2.1*.

Electromagnetic brake with **2 disks** having braking couple acting on the driving shaft and automatic fastener when motive power lacks. In particular, when the electromagnet is not connected, the springs push the brake anchor and the brake linings against the motor frame: this causes the braking of the driving shaft.

But when the electromagnet is connected, the springs pressure is nullified by the electromagnet's attraction power, and so the brake is unlocked. The braking couple can be adjusted thanks to a right tuning of the pressure springs.

The distance between magnet and braking anchor must be maximum 1 mm.

-Type	**120 MSDD** (CEI-2-3) 1988	
-Type of disk		With **4** braking surfaces
-Nr. of disks		**2**
-Static braking torque	daNm.	14
-Y- connection power supply	V.	400
-Air gap	mm.	0,5 ÷ 0,7
-Unlock device		not required

1.7.1.1.3 – Hoisting reduction gear

-Type	With parallel shafts; spur gears and helical toothing	
-Model	"**RUGGERI RS-4A**" or "**SARME RF-6**"	
-Transmission ratio		1 : 33.3
-Input power at ***1400 r.p.m.***	Kw	5.5
-Output torque	daNm	119.7
-Flange diameter at motor entrance	mm.	250
-Shaft diameter at entrance	mm.	32
-Shaft diameter at output	mm.	48
-Shaft length at output	mm.	70
-Lubrication	Permanent with oil; content **lt 6.5** ca.	

It is fixed to the frame thanks to 6 screws M 14 having distance between centres 2 x 250 mm in lenght and 188 mm in width.

1.7.1.1.4 – Hoisting drum

-Frame groove with left pitch for rope ø 9 mm

-Primitive diameter on 1st layer	mm.	219
-Flange external diameter	mm.	320
-Useful lenght	mm.	470
-Lenght at hubs	mm.	569
-Groove pitch	mm.	9.6
-Capacity	2 layers + some turns on the 3rd layer	

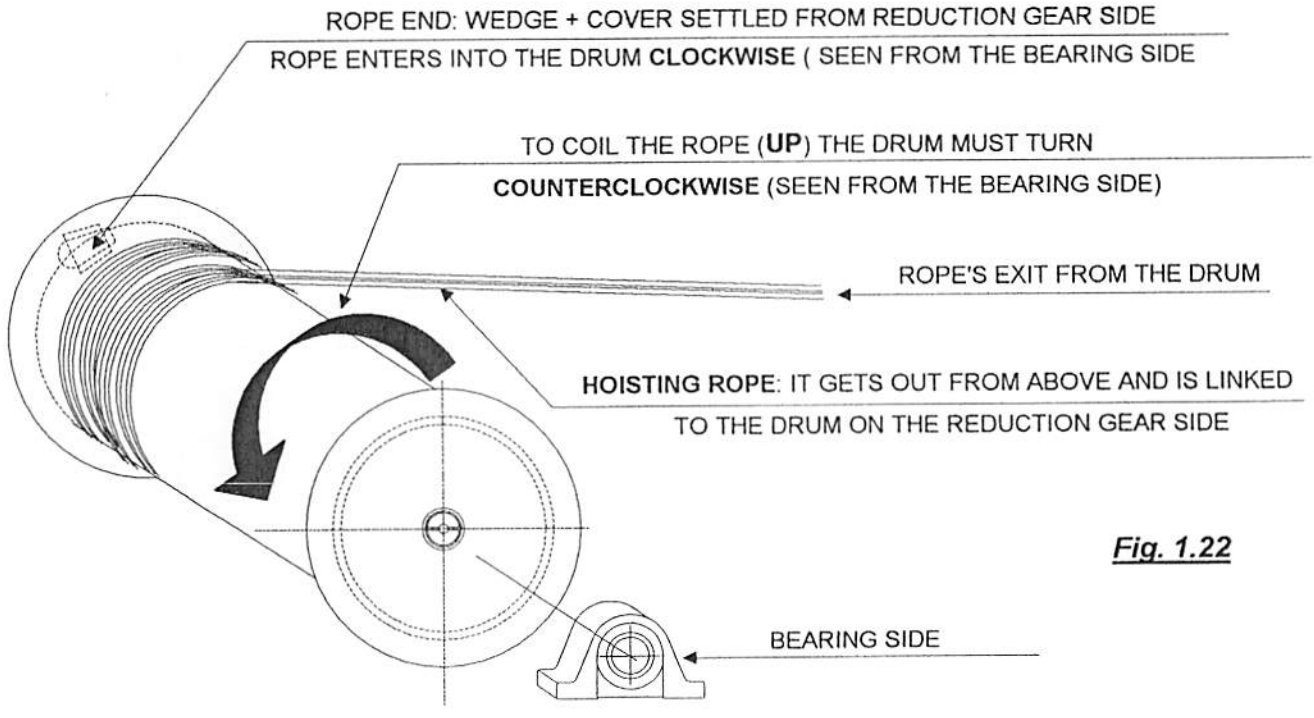


Fig. 1.22

1.7.1.1.5 – Hoisting rope

- It is connected to the drum thanks to wedge and cover and to the jib swivel thanks to grips and thimbles. The rope end on the drum is shown in ***fig 1.22,*** while the swivel is shown in ***fig. 1.23.*** The last one is made up by an eyebolt having a blocked nut with welded joint at thread.
- The drum and the pulleys housing the rope are equipped with suitable protections against fleeting.

Rope features	Unit of measure	value
Nominal diameter	mm	9
Tensile strength	Kg/mm²	220
Minimum breaking load	Kg	6880
Maximum acting load	Kg	1000
Construction		6 (12+(6)+6+1) F + IWRC
Core		Steel
Diameter of external wires	mm	0,56
Number of strands		6
Number of wire for each strand		25
Steel wires		carbon
Type of lay		right cross
Preformed		yes
Protection		galvanized

Minimum length of the rope for jib **40 metres**	m (for crane **H 24 m**)	*140*
	m (for crane **H 30 m**)	*155*
	m (for crane **H 36 m**)	*170*

- In the enclosed documents, when the crane is sold, there is anyway the manufacturer's certificate of the rope supplied by ***Benazzato Gru S.p.A.***

1.7.1.1.6 – Limit switch up - down

The directions for the calibration are given at ***§ 4.3.2***

It is composed of a worm screw limit switch with rate 1/150, positioned in line with the hoisting drum and pulled by the shaft of the drum itself. The limit switch has the function of stopping the rise and the descent of the pulley block at fixed distances:

- from the trolley to avoid the contact of the same with the pulley block.
- from the ground to avoid the leaning and the consequent loosening of the hoisting rope winded on the drum.

The device is composed of the shaft of the limit switch, which activates two cams that intervene on the contacts of the microswitches with positive opening. The contacts of the microswitches break off the UP and DOWN motions.

1.7.1.2 – Maximum load limiting device

It is located under the hoisting winch, linked to the transversal beam of the tail of the jib 1st section and mounted on a pack of Belleville washers.
It is formed by two microswitches having a SLOW positive opening. Each microswitch is a security device.

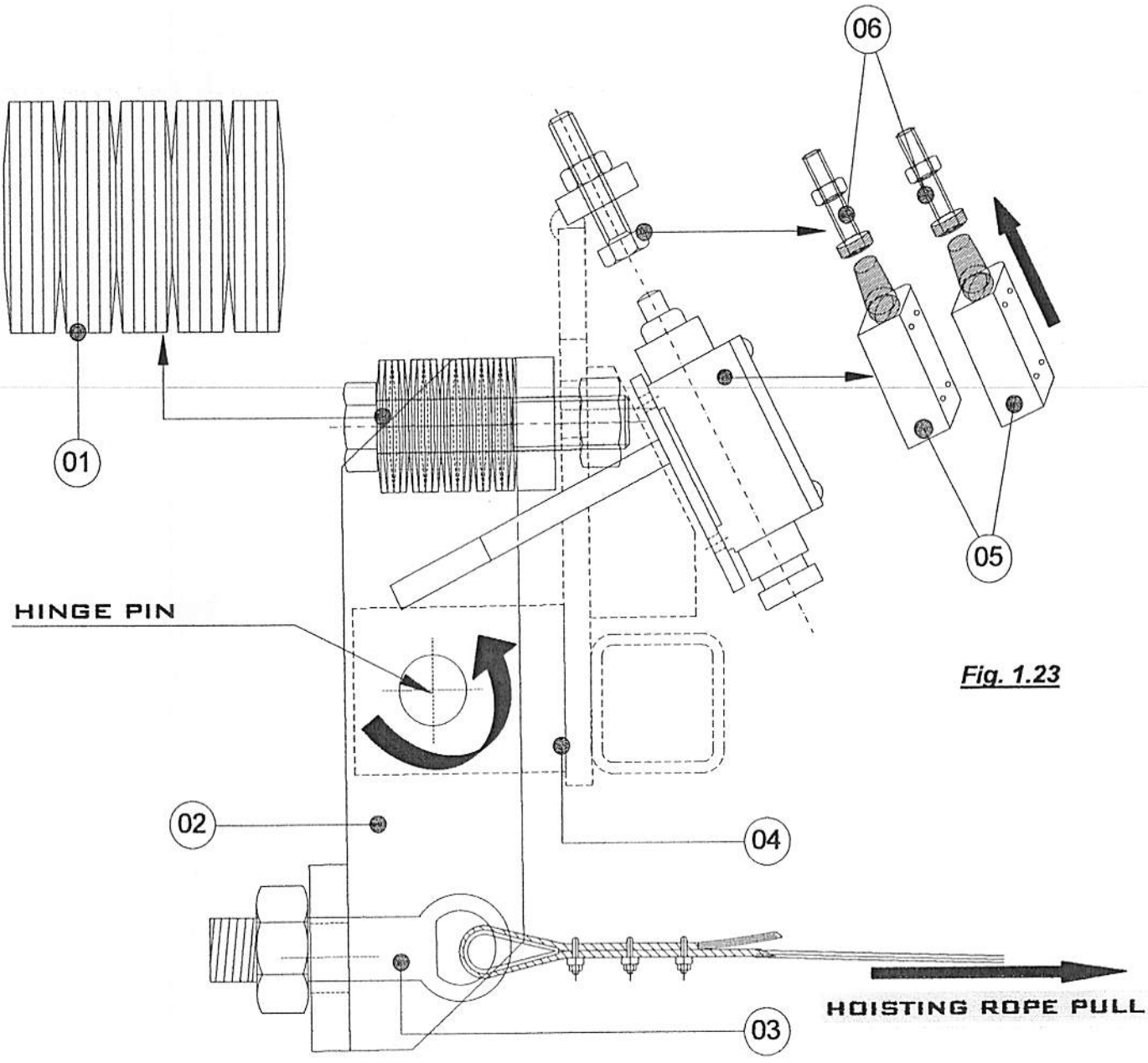


Fig. 1.23

- ***Part. 01*** – Pack of Belleville washers assembled on a bolt: ***no. 20*** washers type ø 50 ø 20.4 - 2.5 settled as shown in ***fig. 1.23***.
- ***Part. 02*** – Mobile frame carrying two adjusting screws: it is linked to the fixed frame and activated by the rope pull. The pack of Belleville washers opposes to the mobile frame rotation.

- ***Part. 03*** – Hoisting rope end.
- ***Part. 04*** – Fixed frame housing two adjusting screws and welded to the cross beam of the tail of the jib 1st section.
- ***Part. 05*** – no. 2 microswitches with piston having SLOW RELEASE.
  1 microswitch acts as ***MAXIMUM LOAD*** limiting device (see ***§ 1.7.1.2.1)***
  1 microswitch acts as ***LOAD/SPEED*** limiting device (see ***§ 1.7.1.2.2)***
  At the moment of the calibration, before using the crane, it will be the assembler's care to find out which kind of action the 2 microswitches exert. This is possible thanks to fast operations with the control device (control box or manipulator).
- ***Part. 06*** – no. 2 adjusting screws, each corresponding to 1 microswitch.

1.7.1.2.1 – Maximum capacity limiting device (maximum load)

The directions for the calibration are given at ***§ 4.3.7***.

It is composed by one microswitch having SLOW positive opening (SLOW RELEASE), linked in line to the coils of the UP remote-switch.
It is put into operation by the rope's pull, which is proportional to the circulating load, and by the consequent compression of the Belleville washers' pack.
Once the maximum load limiting device is set, every time the load exceeds the maximum load, the head of the screw housed on the leaning plate pushes on the piston of the microswitch. This causes the opening of the connections and so the movement UP stops.
In order to reset the crane you have to remove the overload.

1.7.1.2.2 – Load/speed limiting device

The directions for the calibrations are given at ***§ 4.3.8***.

It is composed by one microswitch having SLOW positive opening (SLOW RELEASE) linked in line to the coils of the SPEED remote-switch. It is put into operation by the rope's pull, which is proportional to the circulating load, and by the consequent compression of the Belleville washers' pack.
Once the load/speed limiting device is set, every time the load exceeds the maximum hoisting value in speed, the head of the screw housed on the leaning plate pushes on the piston of the microswitch. This causes the opening of the connections and so the movement up of the load turns to SLOW.
In order to reset the crane you have to remove the overload from as regards to the hoisting speed capability.

1.7.2 – Trolley travelling-mechanism

The trolley travelling-mechanism is mounted on the first jib section (see ***fig 1.10–part. 01***) and is composed by the winch itself, formed by MOTOR, REDUCTION GEAR and DRUM of the rope winding, and by the safety device called NEAR/FAR TROLLEY limit switch.

The several components of the device are shown in ***fig. 1.24***.

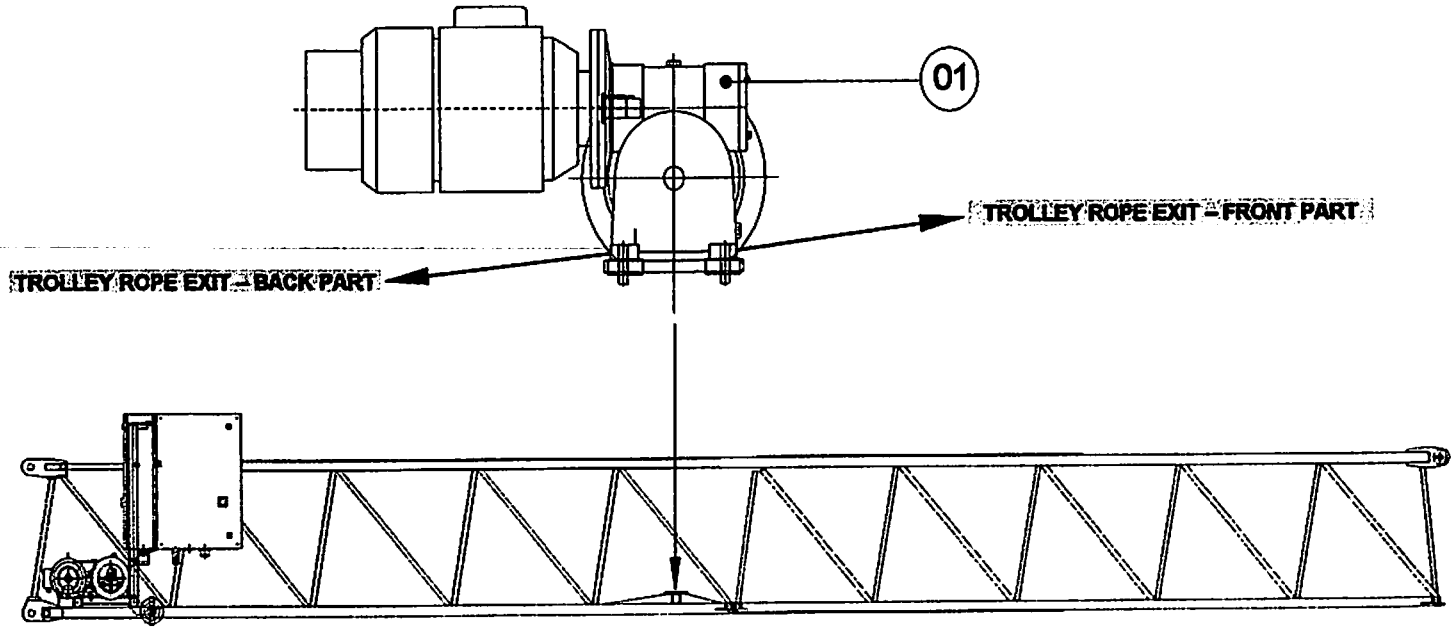


Fig. 1.24

- ***Part. 01*** – Winch inclusive of motor, reduction gear, drum for rope winding and near-far trolley limit switch (see ***fig. 1.25***).

N.B.! The complete circuit of the trolley rope is shown at **§ 5.8.2** in ***fig. 5.16*** and ***fig. 5.19***.

1.7.2.1 – Trolley travel winch

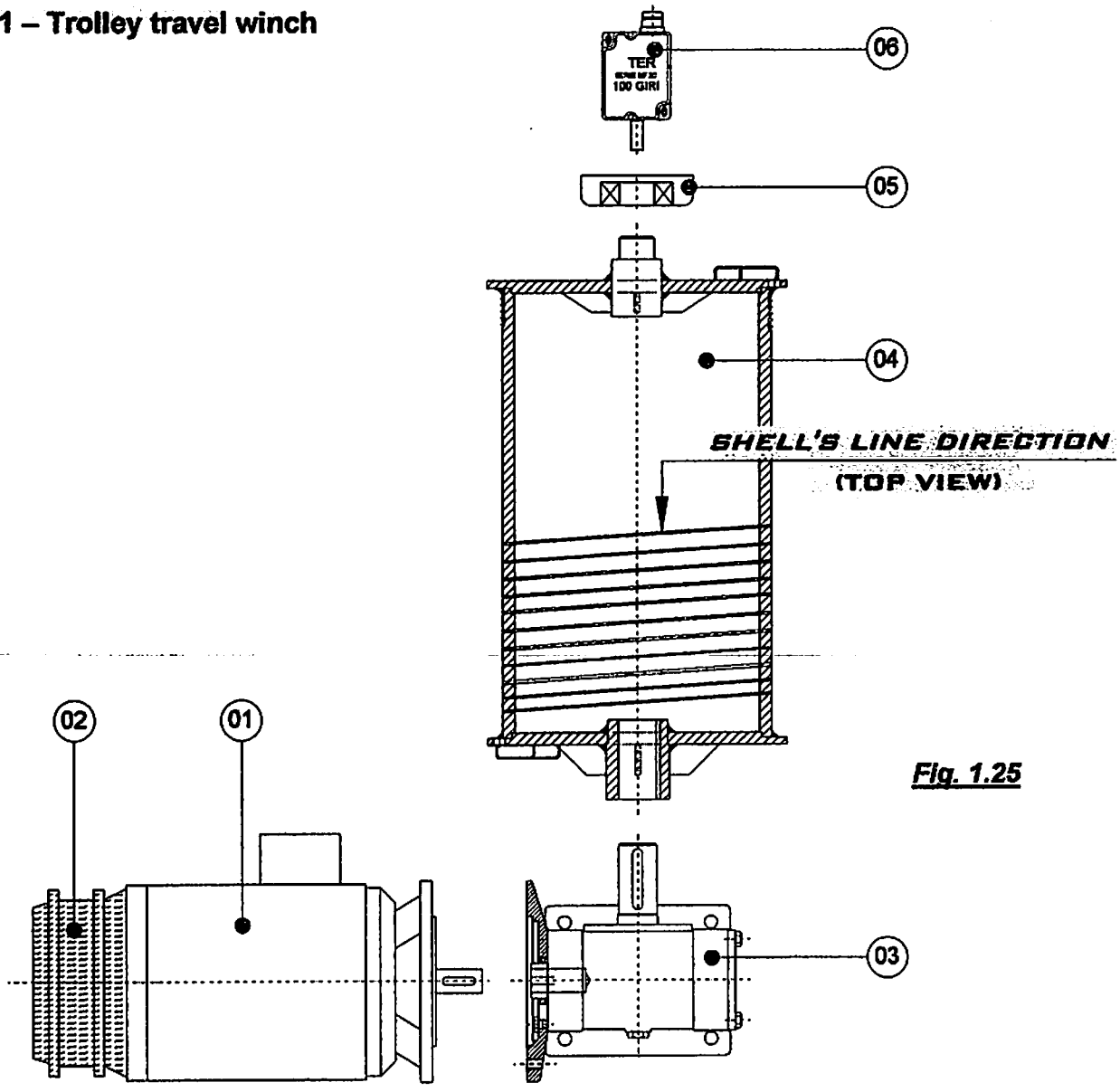


Fig. 1.25

- ***Part. 01*** – Trolley travel motor with ***2 speed.***
- ***Part. 02*** – Motor brake.
- ***Part. 03*** – Trolley travel reduction gear.
- ***Part. 04*** – Trolley travel drum.
- ***Part. 05*** – Drum support bush with bearing SKF 6006-2RS (ø 30 ø 55 x 13)
- ***Part. 06*** – TROLLEY FAR/NEAR limit switch.

1.7.2.1.1 - Motor

It is composed by two windings corresponding to the two speeds.
The trolley travel motor is controlled by the button control box with the following buttons:

- Far: towards the jib tip.
- Near: towards the tower.

The control system has buttons with progressive double release.
At first release the motor starts at 1st speed (1400 g/1') and contemporary opening the brake. At second release the motor follows the 2nd acceleration ramp till it reaches the maximum speed (2800 g/1')
During the change of speed the brake is always supplied.

-Type	Asynchronous, threephase and 2 speeds "BESOZZI MCFA 100"	
- Output shaft diameter	**ø (mm)**	**24**
- Bracket diameter	**ø (mm)**	**200**
-Nominal power	Kw.	2.2 / 2.2
-Speed	r.p.m.	2800 / 1400
-Nominal torque	daNm	0.8 / 1.50
-Starting torque	daNm	2 / 2.75
-Y- connection power supply	V.	400
-Y- connection nominal current	A.	5.7 / 5.7
-Y- connection pick-up current	A.	37 / 28
-Max. no. of operations/hour	man/h	150
-Isolation class		F
-Motor protection		IP 44
-Terminal strip protection		IP 44
-Service		S 3
-Ventilation		external

This motor belongs to the type of short circuit rotor.

1.7.2.1.2 - Brake

The directions for the calibration of the trolley brake are given at ***§ 4.2.2.***

Electromagnetic brake with ***1 disk*** and ***2 braking surfaces*** having braking torque acting on the driving shaft and automatic fastener when motive power lacks In particular, when the electromagnet is not connected, the springs press the brake-anchor and the brake disk causing the brake of the driving shaft. But when the electromagnet is connected, the springs pressure is nullified by the electromagnet's attraction power, and so the brake is unlocked. The braking torque can be adjusted thanks to a right tuning of the pressure springs.
The distance between magnet and braking anchor must be maximum 1 mm.

-Type	100 S (CEI-2-3) 1988	
-Disc type		with 2 braking surfaces
-No. of discs		1
-Static braking torque	daNm.	3.5
-Y- connection power supply	V.	400
-Air gap	mm.	0,5 ÷ 0,
-Unlock device		not required

1.7.2.1.3 – Trolley travel reduction gear

-Type		worm screw
-Model		"RUGGERI RCG-m3c"
-Gear ratio		1 : 39
-Input power at 1450 turns/1°	Kw	2.25
-Output torque	daNm	410.5
-Efficiency	η	0.75
-Input flange diameter	mm.	200
-Input shaft diameter	mm.	24
-Output sahft diameter	mm.	38
-Lubrication		Permanent with oil; content **lt 1** ca.

It is fixed to the frame thanks to 4 screws M 12 having distance between centres 146 mm lenghtwise to the jib and 117 mm crosswise.

1.7.2.1.4 – Trolley travel drum

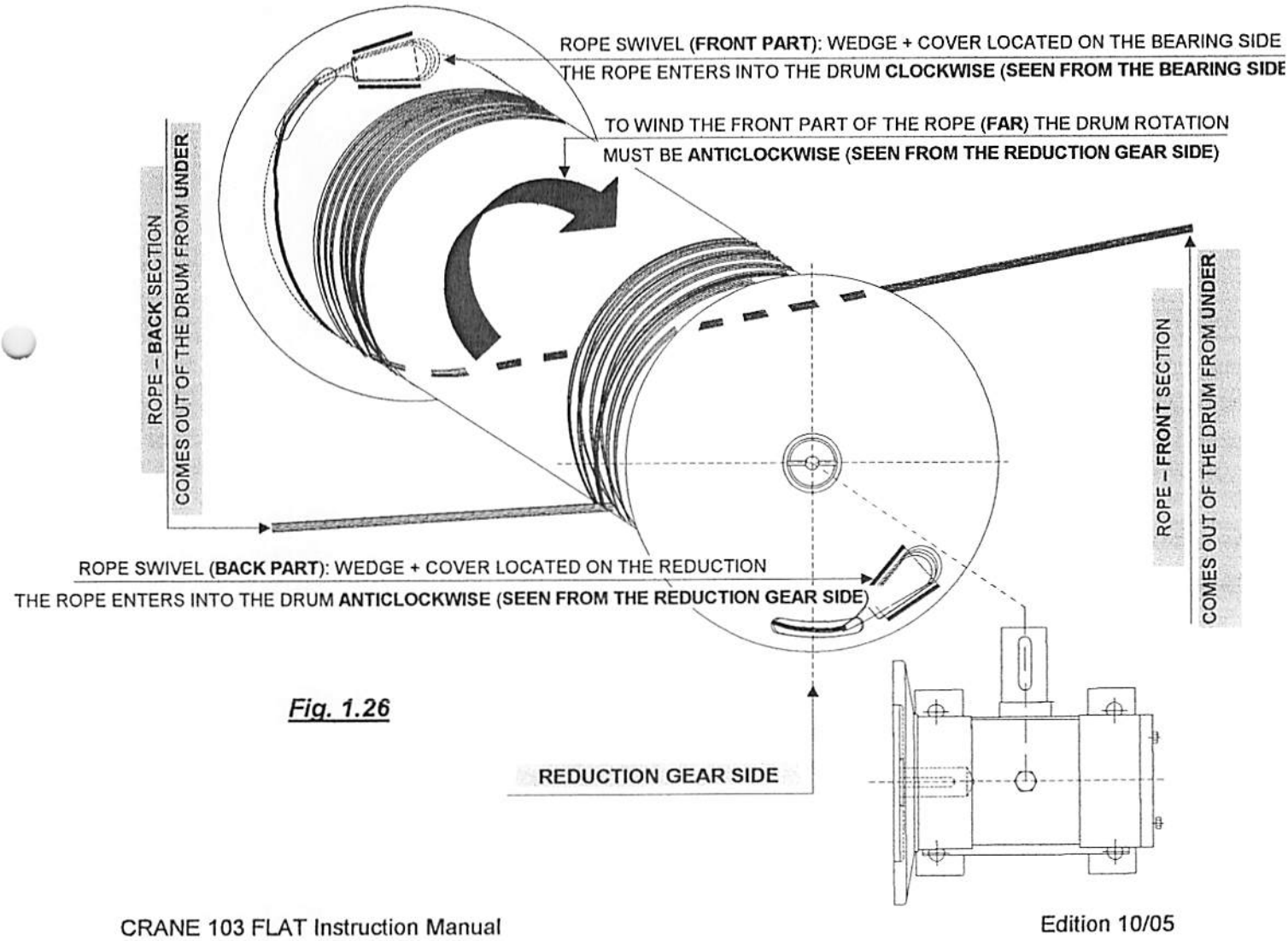


Fig. 1.26

-Frame groove direction with right pitch for rope ***ø 6 mm***

-Primitive diameter	mm.	203
-External flange diameter	mm.	262
-Useful lenght	mm.	430
-Lenght at hubs	mm.	520
-Groove pitch	mm.	6.5
-Capacity	n_o	1 layer

1.7.2.1.5 – Trolley travel rope

- It is formed by two distinct sections, which are fixed on one side to the drum thanks to wedges and covers, and on the other side to the particular wire rope ends located on the sliding trolley of the arm. The swivels of the drum are shown in ***fig 1.26***, while the rope swivels of the trolley are shown in ***fig. 1.9-part. 07 and 08.***
- The pulleys housing the rope are equipped with suitable protections against fleeting.

Features of the rope		Unit of measure	Value
Nominal diameter		mm	6
Tensile strenght		Kg/mm²	220
Minimum breaking load		Kg	3175
Maximum acting load		Kg	305
Construction			6 (12+(6)+6+1) F + IWRC
Core			Steel
Diameter of external wires		mm	0,38
Number of strands			6
Number of wires for each strand			25
Steel wires			carbon
Type of lay			right cross
Preformed			yes
Protection			galvanized
Lenght	**Front section**	m	**75**
	Back section	m	**45**

- In the enclosed documents, when the crane is sold, there is anyway the manufacturer's certificate of the rope supplied by ***Benazzato Gru S.p.A.***

1.7.3 – Slewing-mechanism

The slewing-mechanism is mounted at the top of the highest tower (see ***fig 1.15***) and consists of one GEARMOTOR with a disc brake device and a PINION at the end, fixed in line to the TURNING PIVOT. The pinion engages with the linking bearing (SLEWING-RING) between the turning pivot and the structural element fixed to the tower, called FIXED PIVOT. The cogs of the slewing-ring engage also the cogwheel, made of teflon, which is fixed to the security device (called RIGHT and LEFT SLEWING limit-switch).

The safety device called SLEWING BRAKE UNLOCKING is also part of the mechanism and it is described at ***§ 3.6.3***. It works thanks to a button placed at the base of the 1st tower and combined with a WARNING LIGHT that signals when the unlocking device intervenes.

The components of the mechanism are shown in ***fig. 1.28***.

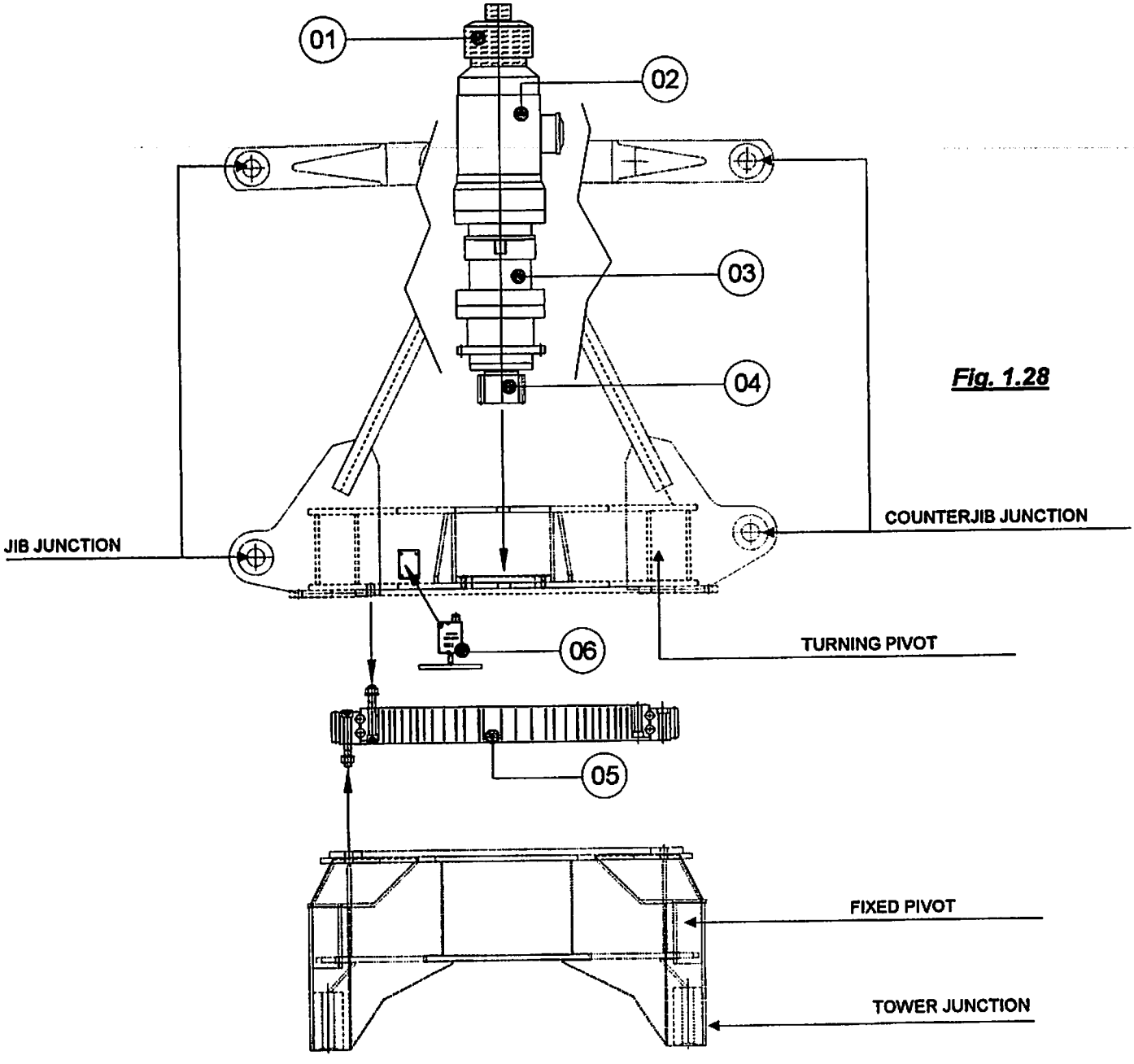


Fig. 1.28

- ***Part 01*** – Gear brake with electric unlocking
- ***Part 02*** – Slewing motor
- ***Part 03*** – Slewing reduction gear
- ***Part 04*** – Reduction gear pinion
- ***Part 05*** – Slewing-ring
- ***Part 06*** – RIGHT/LEFT SLEWING limit-switch

1.7.3.1 - Motor

During the assembling of the machine, it is necessary to place the turning pivot in such a way that the slewing gearmotor is located on the ***OPPOSITE SIDE*** of the electric cabinet.
This motor belongs to the type of short circuit rotor.
The slewing motor is controlled by the button box thanks to the following buttons:

- ***Right: the jib of the crane turns clockwise.***
- ***Left: the jib of the crane turns anticlockwise.***

The calibration of the slewing-mechanism is made thanks to a frequency change device (***INVERTER***), which is set directly by ***BENAZZATO GRU S.p.A.*** when testing the machine, having two acceleration ramps, till it reaches two different frequencies: one low and the other corresponding to the running speed.
The control system has buttons with progressive double release.
At first release the motor starts at 1st speed, following the first acceleration ramp and contemporary opening the brake.
At second release the motor follows the 2nd acceleration ramp till it reaches the maximum speed (1400 runs/1').
During the change of speed the brake is always supplied.
The inverter does the same when changing down to 1st speed and when stopping the movement.

-Type	Asynchronous threephase "BESOZZI MCFA 112" (rif. 5044)	
- Output shaft diameter	**ø (mm)**	**pitch 32/64 24 cogs**
- Bracket diameter	**ø (mm)**	**200**
-Nominal power	Kw	1.65
-Speed	r.p.m.	0 / 1400
-Starting torque	daNm	6.0
-Y- connection power supply	V.	400
-Y- connection nominal current	A.	9.0
-Y- connection	A.	28.8
-Moment of inertia	Kgm²	0.075
-Isolation class		F
-Service		S 3
-Intermittence	%	50
-Max. no. of operations/hour	man/h	150
-Protection		IP 54
-Ventilation		external

1.7.3.2 - Brake

The directions for the calibration of the slewing brake are given at *§ 4.2.3.*

Electromagnetic brake with ***1 disk*** and ***2 braking surfaces*** having braking torque acting on the driving shaft and automatic fastener when motive power lacks. The brake works only as parking brake. When the electromagnet is not supplied, the springs press the brake-anchor and the brake disc causing the brake of the driving shaft. But when the electromagnet is supplied, the springs' pressure is nullified by the electromagnet's attraction power, and so the brake is unlocked.
The braking torque can be adjusted thanks to a right tuning of the pressure springs.
The brake disc is mortised directly on the driving shaft.
The distance between magnet and braking anchor must be maximum 1 mm.
On the slewing brake is placed a control box for the electric unlocking of the brake, used when the crane is not working and whose functioning is described at *§ 3.6.3.*

-Type	110 S (CEI-2-3) 1988	
-Disc type		with 2 braking surfaces
-no. of discs		1
-Static braking torque	daNm.	5.5
-Y- connection power supply	V.	400
-Air gap	mm.	0,5 ÷ 0,7
-Unlock device	with electric control (see *§ 3.6.3*)	

1.7.3.3 – Slewing reduction gear

-Type		Epicycloidal
-Model		"RUGGERI RE-4"
-Transmission ratio		1 : 148.55
-Input maximum torque at 1400 r.p.m.	daNm	6.15
-Output maximum torque	daNm	833.8
-Efficiency	η	0.91
-Bracket diameter	mm.	200
-Shaft diameter	mm	*pitch 32/64 24 cogs*
-Output shaft diameter	mm	*INTEGRAL (heat-forced pinion)*
-Lubrication	Permanent with oil; content lt 4.5 ca.	

It is fixed to the bracket by means of no. 12 screws M 14 x 80 on the circumference having diameter 325 mm.

1.7.3.4 – Slewing pinion

-no. of cogs pinion z	n°	11
-standard module of toothing m	mm	10
-right toothing: correction of the cog	mm	+ 5.157 (type *LEROY*)
-primitive diameter of pinion $ø_p$	mm	120.313
-height of the cogged band	mm	85

1.7.3.5 – Slewing-ring

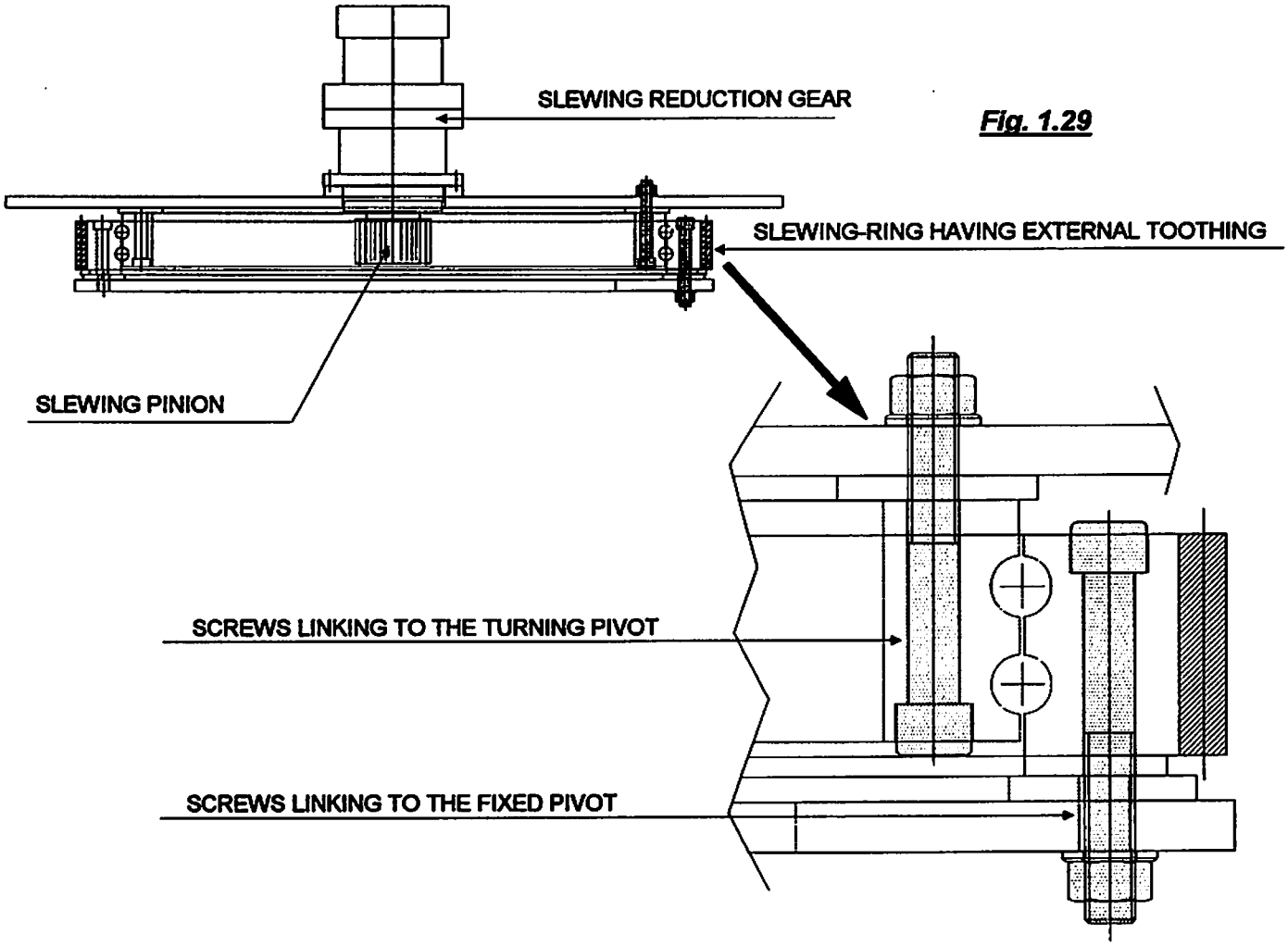


Fig. 1.29

1.7.3.5.1 – Features of the slewing-ring

-Slewing ring manufacturer	**Rothe Erde**	type	*M.R.I. - E-2-098-203*
-External diameter	mm		$979^{-0.9}$
-Slewing ring height	mm		102
-no. of teeth z	n°		94
-Normal module of toothing m	mm		10
-Right toothing: correction of the cog x_m			+11.0
-Primitive diameter of toothing $ø_p$	mm		962
-Toothed ring height	mm		86
-Distance between centers slewing ring/pinion gear	mm		541
-Boring diameter of the internal ring	mm		753
-no. of holes of the internal ring	n°		36 equidistant
-Diameter of holes of the internal ring	mm		21
-Boring diameter of the external ring	mm		893
-no. of holes of the external ring	n°		36 equidistant
-Diameter of holes of the external ring	mm		21

1.7.3.5.2 – Fastening bolts on internal and external ring

a) Slewing ring "*Rothe Erde*" type M.R.I. - E-2-098-203

Use hexagonal socket head screws.

- Fastening on internal ring (connection to the slewing ring frame)

-no. 30 screws TCEI UNI 5587 (DIN 912 – ISO 4762)	Mat. 10.9	M 20 x **140**
-no. 6 screws TCEI UNI 5587 (DIN 912 – ISO 4762)	Mat. 10.9	M 20 X **120** (*STUD BOLT*)
-no. 30 locking nuts UNI 5587	Mat. 8.8	M 20 high
-no. 36 plain washers ø 21	R 40	for screws M 20

- Fastening on external ring (connection to the fixed slewing ring frame)

-no. 36 screws TCEI UNI 5587 (DIN 912 – ISO 4762)	Mat. 10.9	M 20 x **140**
-no. 36 locking nuts UNI 5587	Mat. 8.8	M 20 high
-no. 36 plain washers ø 21	R 40	for screws M 20

Note! Tighten the screws by using a dynamometric spanner. (see **§ 4.4.2**).

1.7.3.5.3 – Max. allowable clearance on the slewing ring

- The initial clearance of the slewing ring is such to ensure a smooth and a safe functioning.
- The maximum allowable value of the clearance is ***2,5 mm***.
- Over this value the slewing ring must be replaced.
- In any case the slewing ring must be replaced after ***6000 hours*** of service.

1.7.3.6 – Slewing limit switch right-left

The directions for the calibration of this limit switch are given at ***§ 4.3.3***.
It is composed of a worm screw limit switch with ratio 1/50, meshed with the slewing ring, shown in ***fig. 1.28-part. 06***.
The limit switch has the function of limiting the number of turns of the crane (**maximum three**) towards RIGHT or LEFT to avoid the twisting of the electrical cable of the crane and of the button control box cable. The device is activated by a pinion of nylon with 12 teeth, with module 8, which meshes with the slewing ring. This pinion is fixed to the little shaft of the limit switch, which activates the two cams which intervene on the microswitch contacts with positive opening.

The contact of the microswitches are arranged in sequence with the contactors' coils SLEWING RIGHT and SLEWING LEFT.

1.7.4 – Moment or torque limiting device

It is composed of an elastic device integral with the upper beam of the first jib section on which are fixed two microswitches on one side and two adjusting screws on the other. See ***fig. 1.30***.

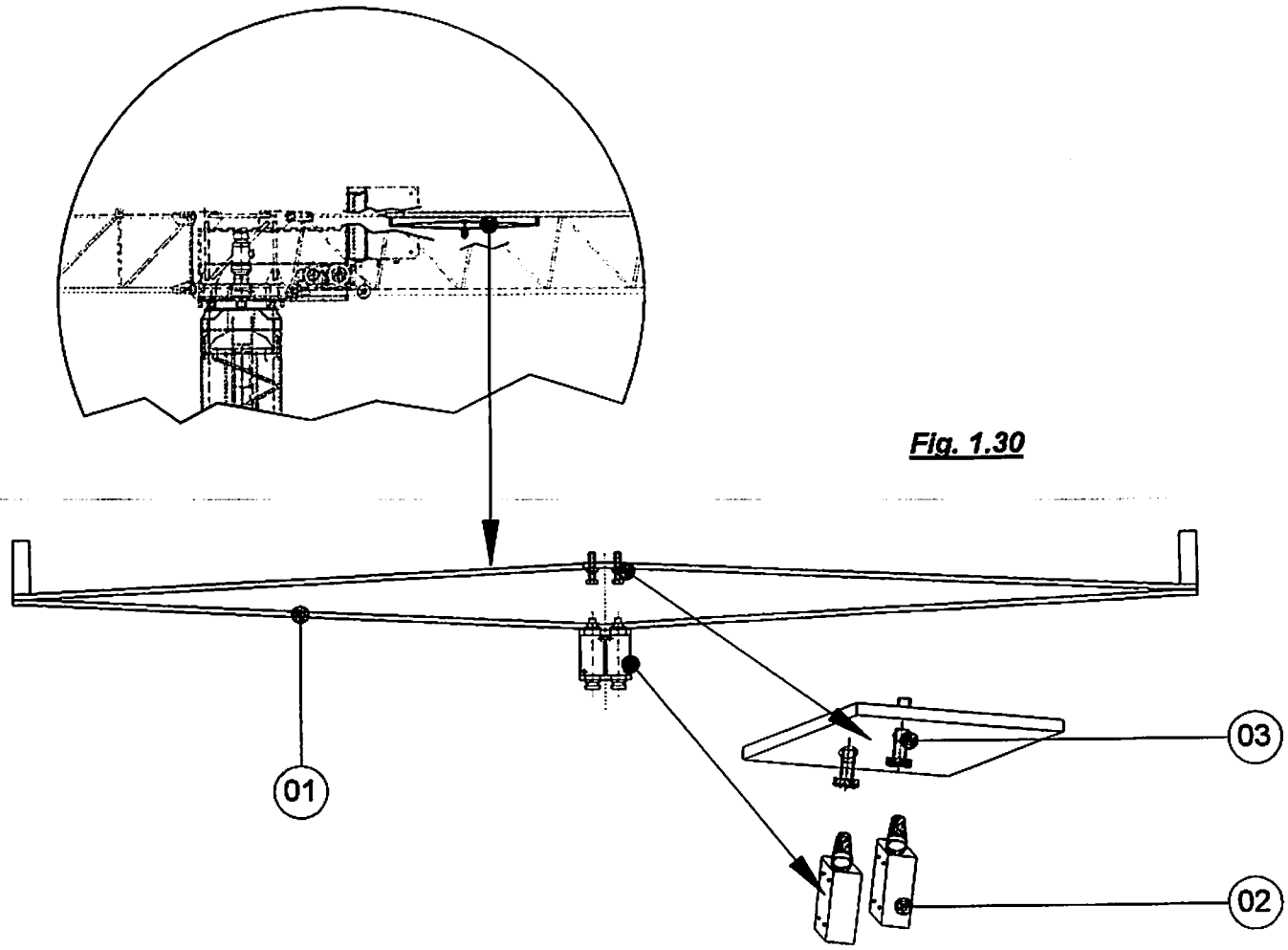


Fig. 1.30

- ***Part. 01*** – Bow consisting of two welded opposed plates constituting the elastic structure of the limiting device.
- ***Part. 02*** – no. 2 microswitches with piston having SLOW RELEASE.
  Each microswitch operates on a different movement breaking it off in case of overload.
  One microswitch operates as HOISTING moment limiting device (DYNAMIC MOMENT).
  One microswitch operates as FAR moment limiting device (STATIC MOMENT).
  During the adjustment, before the use of the crane, the technician in charge of the erection of the crane must individualize which movement the two microswitches induce through short manoeuvres by the button control box.
- ***Part. 03*** – no. 2 adjusting screws, each one in correspondence of one microswitch.
  Calibrate the adjusting screws following the instructions given at ***§ 4.3.5*** and ***§ 4.3.6***.

1.7.4.1 – Hoisting moment limiting device (dynamic moment)

The instructions for adjusting this limiting device are given at *§ 4.3.6.*

It is composed of the elastic structure fixed on the upper beam of the first jib section, shown in ***fig. 1.30-part. 01***, on which are placed the microswitch on one side and the adjusting screw on the other. (see ***fig. 1.30***)

The microswitch with SLOW positive opening (WITH SLOW RELEASE) is arranged in sequence with the UP contactor's coils and is activated by the slewing suffered by the adjusting screw (see ***fig. 1.30-part. 03***), under the effect of the proportional lenghtening, under load, of the upper beam of the jib.

Once the dynamic moment limiting device is adjusted, when the max. load at jib tip exceeds the nominal value, the adjusting screw pushes the head of the microswitch braking off the UP motion.

It is then necessary remove the overload to use the crane again.

1.7.4.2 – Far moment limiting device (static moment)

The instruction for adjusting this limiting device are given at *§ 4.3.5.*

It is composed of the elastic structure fixed on the upper beam of the first jib section, shown in ***fig. 1.30-part. 01***, on which are placed the microswitch on one side and the adjusting screw on the other. (see ***fig. 1.30***)

The microswitch with SLOW positive opening (WITH SLOW RELEASE) is arranged in sequence with the TROLLEY FAR contactor's coils and is activated by the slewing suffered by the adjusting screw (see ***fig. 1.30-part. 03***), under the effect of the proportional lenghtening, under load, of the upper beam of the jib.

Once the dynamic moment limiting device is adjusted, when the max. load exceeds the nominal value at the corresponding max. radius from the rotation axle, the adjusting screw pushes the head of the microswitch braking off the TROLLEY FORWARD motion.

It is then necessary remove the overload or move the trolley towards the tower keeping the same load to use the crane again.

1.8 – CONTROL DEVICES

1.8.1 – BUTTON CONTROL BOX

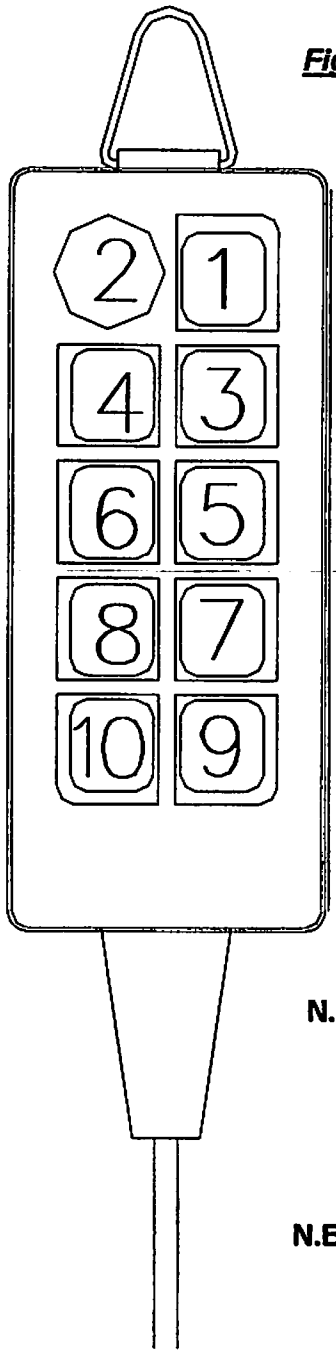


Fig. 1.31

FUNCTION OF BUTTONS

1-GREEN, RUN

2-RED, MUSHROOM-HEAD, STOP

3-FAST HOISTING

4-YELLOW, ALARM

5-HOISTING DOWN

6-HOISTING UP

7-RIGHT SLEWING

8-LEFT SLEWING

9-TROLLEY NEAR

10-TROLLEY FAR

N.B.! Buttons pairs are mechanically interlocked to prevent concurrent opposite movements.
Buttons are flushed in their seats to avoid accidental activations.

N.B.! The button control box is supplied complete with cable **16 x 1 mm²** (length 30 metres) and with extension cable **16 x 1,5 mm²** (length 30 metres).

1.8.2 – Radio control

Cranes type City model **"103 FLAT"** can be equipped with radio control, which must be compatible with the electrical equipment of the crane.
For the functioning of the buttons (button control box) or the controllers (joy-stick), see the instructions supplied by the manufacturer of the radio control.

1.8.2 – JOY-STICK RADIO CONTROL

It replaces the button control box and allows, for cranes equipped with regulation system, to gradually change the work speed parameters of the machine.
In case the joy-stick radio control is supplied with the crane refer to the instructions supplied by the manufacturer of the joy-stick radio control.

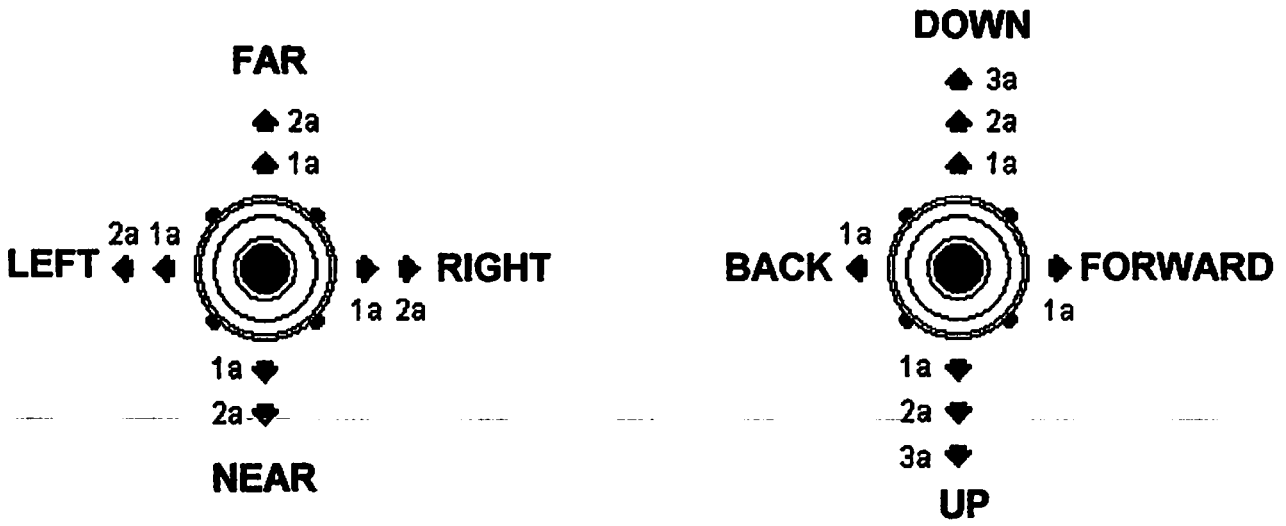
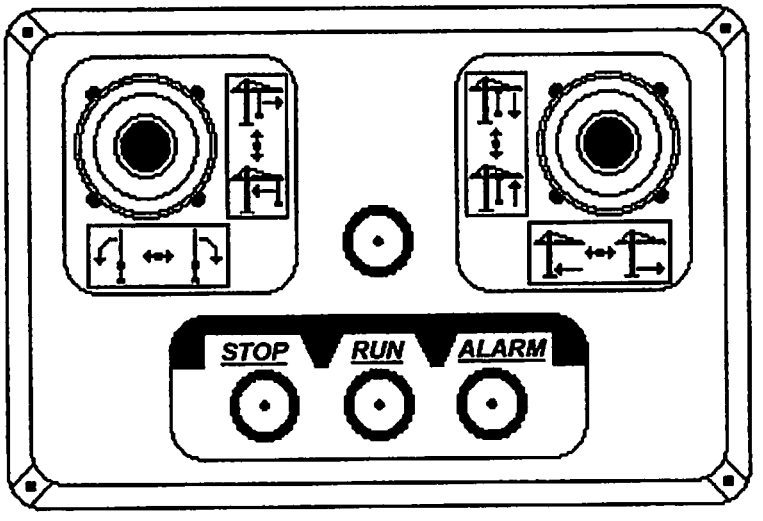


Fig. 1.32



The joy-stick radio controls are equipped with the following safety devices:

- Mechanical lock of the lever in central position
- Electrical lock in central position
- Spring return of the lever in central position

1.9 - FOUNDATION

The crane type **103 FLAT** is engineered for stationary version only, and it can not travel on rail trucks.

1.9.1 – Types of foundation

Two types of foundation are possible:

1 – in stationary version on ***basement 2,80 m x 2,80 m.***

2 – in stationary version on ***anchoring frame let into the concrete plinth.***

1.9.2 – Calculation of the foundation plinth with the frame

The crane **103 FLAT** is sold with the configuration **"in stationary version on foundation plinth"** Benazzato Gru S.p.A. gives **purely as example,** a possible scheme of foundation plinth for a frame. (see ***§ 1.9.2.1*** and ***§ 1.9.2.2)***

We remind you that such a plinth considers a ground with a capacity of 2 Kg/cm², and is given in this handbook as an example only.

In fact, the calculation of the foundation plinth has to be made by an experienced technician, considering the features of the ground and the reactions produced by the use of the hoisting machine.

The foundation frame has the features listed at ***§ 1.6.2.10 - fig. 1.17*** and can be delivered only by Benazzato Gru S.p.A.

At ***§ 1.9.2.1 - fig. 1.33*** you find the scheme of the forces (maximum actions and reactions) the frame can be subjected to.

The frame has to be placed into the reinforced plinth in such a way that it is centred and buried at least for 700 mm.

Once placed, you have to check the horizontality of the frame: it can't be more than **0,2 per cent.** Keep in mind that a bad positioning of the foundation frame can cause danger.

Now pour the plinth and be sure the concrete sticks perfectly to the frame.

Be sure the concrete is perfectly dry before beginning to assemble the crane.
In case the data lack, you can consider the following pressions acting on the ground, given in Kg/cm²:

- rock ground:	20
- solid red gravel:	4
- solid dry gravel	3
- dry clay	3

- gravel in layers with presence of sand	3
- solid sand and clay	2
- solid wet sand	1,5
- turned or made ground	0,3

1.9.2.1 – Scheme of plinth for foundation frame: scheme of the forces and side view

Scheme of forces

N = 20,000 Kg
R1 = 48,000 Kg
R2 = 5,000 Kg
R3 = 38,000 Kg
R4 = 5,000 Kg

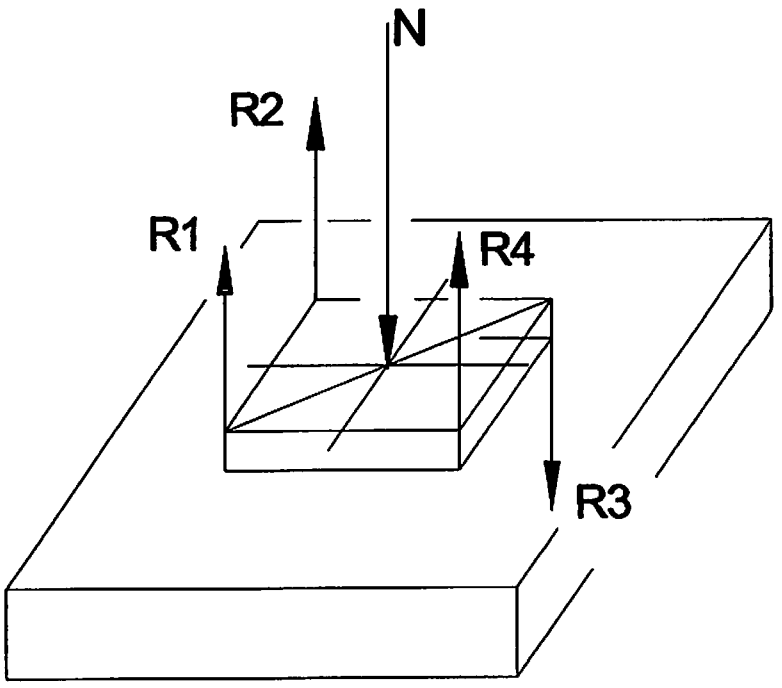
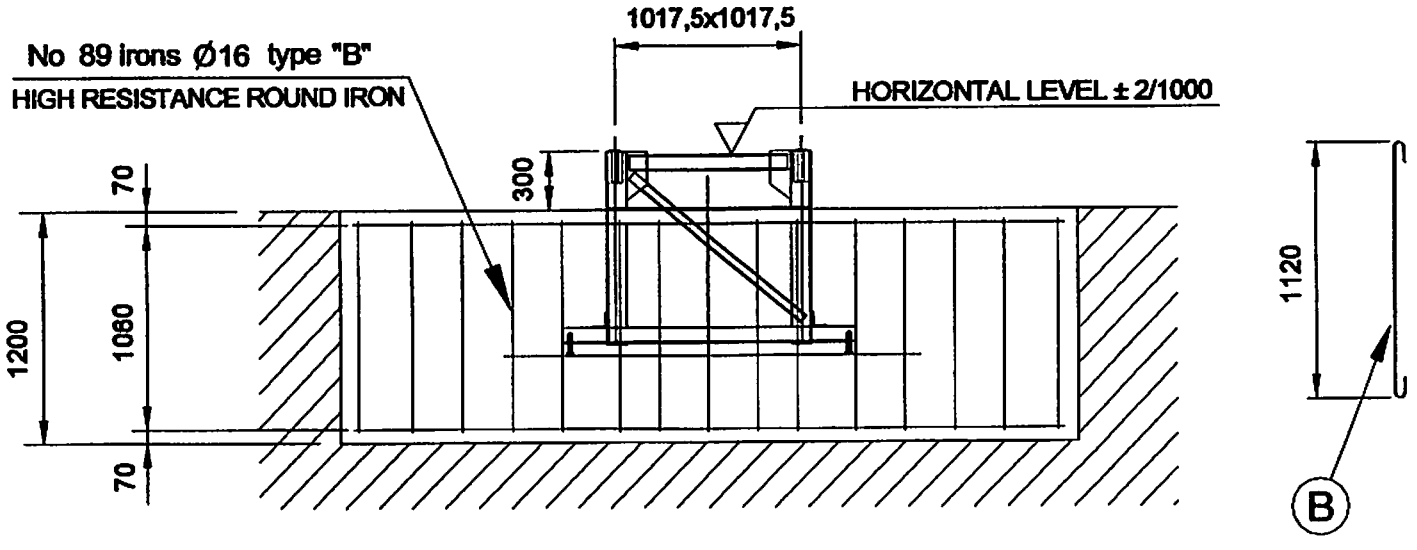


Fig. 1.33



EXAMPLE

1.9.2.2 – Scheme of plinth for foundation frame: view from above

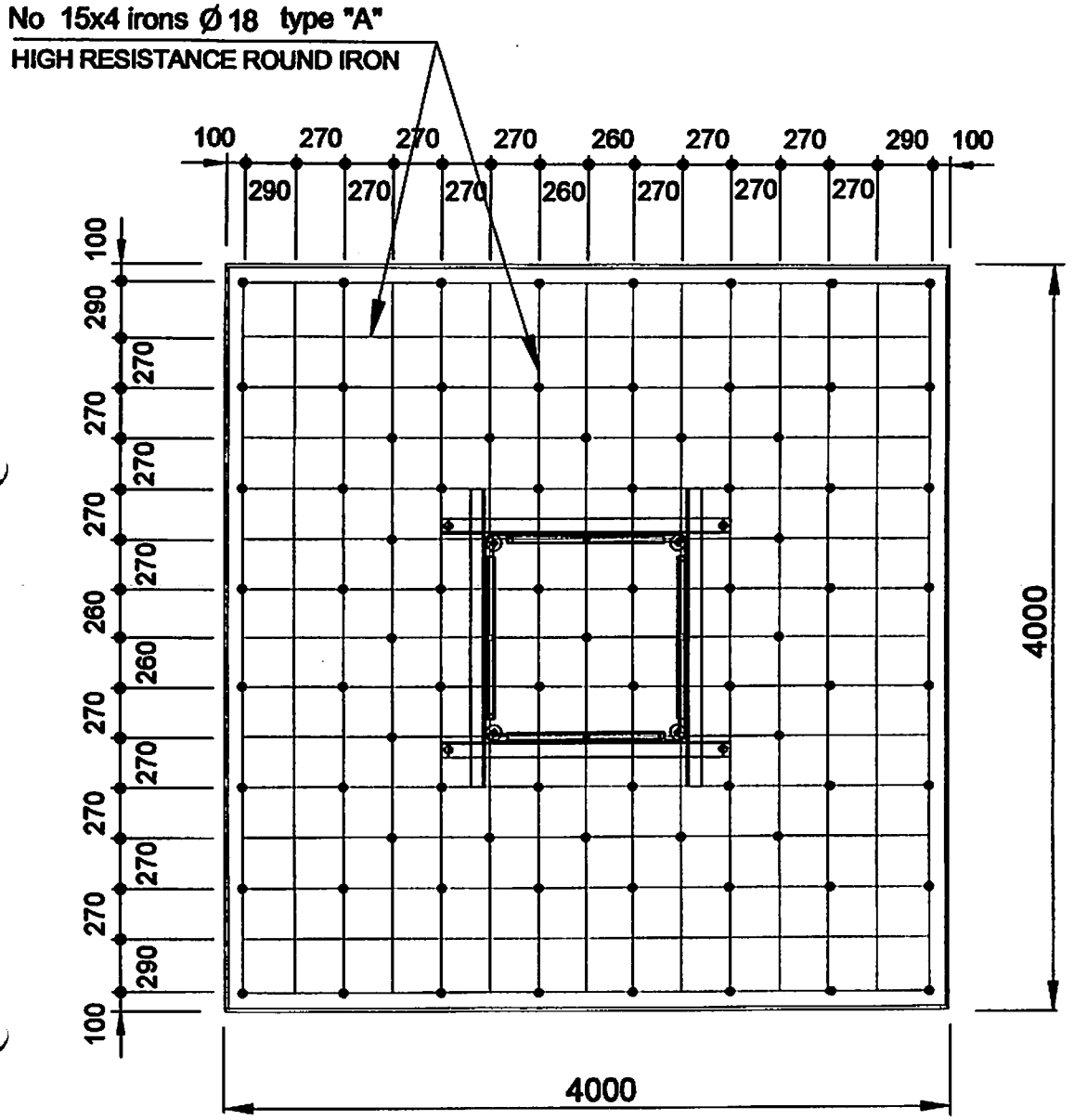
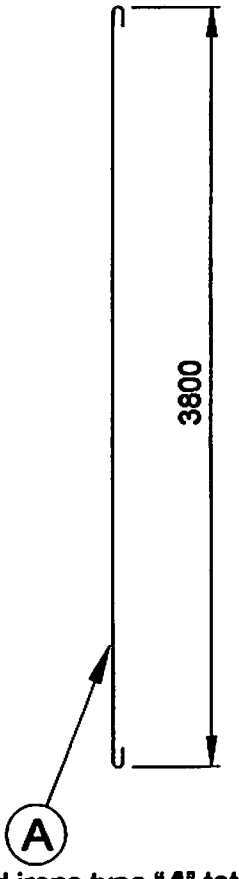


Fig. 1.34

EXAMPLE



No *60* round irons type "*A*" total

SPECIFIC GRAVITY C.S.A. = 2400 Kg/m³
CONCRETE COMPRESSIVE STRENGTH Rck > 30 N/mm²
PLINTH DIMENSIONS COMPATIBLE WITH GROUNDS
WHICH HAVE A RESISTANCE OF AT LEAST 2 Kg/cm²

Note! BENAZZATO Gru S.p.A. accept NO responsability for the execution of the plinth and the reinforcement

1.10 – Base ballast

The crane is engineered for stationary version on foundation plinth and the plinth itself acts as the counterweight mass needed for the stability of the machine.

You can find a scheme of foundation plinth for a frame (**foundation frame**) at ***§ 1.9.2.1 - Fig. 1.33*** and ***§ 1.9.2.2 – Fig.1.34***. This scheme is given purely as example.

1.11 – Counterjib ballast

The counterweight mass to be used on cranes type **103 FLAT** is **Kg 8,500.**
This mass has to be made up with reinforced concrete blocks of the type delivered by the manufacturer (see ***fig. 1.36***). **For this reason it is not admitted any other combination or composition of lighter, equal or heavier ballast without the approval of Benazzato Gru S.p.A.**
The blocks are housed in the fit seats on the counterjib of the crane, as shown in ***fig. 1.11.***

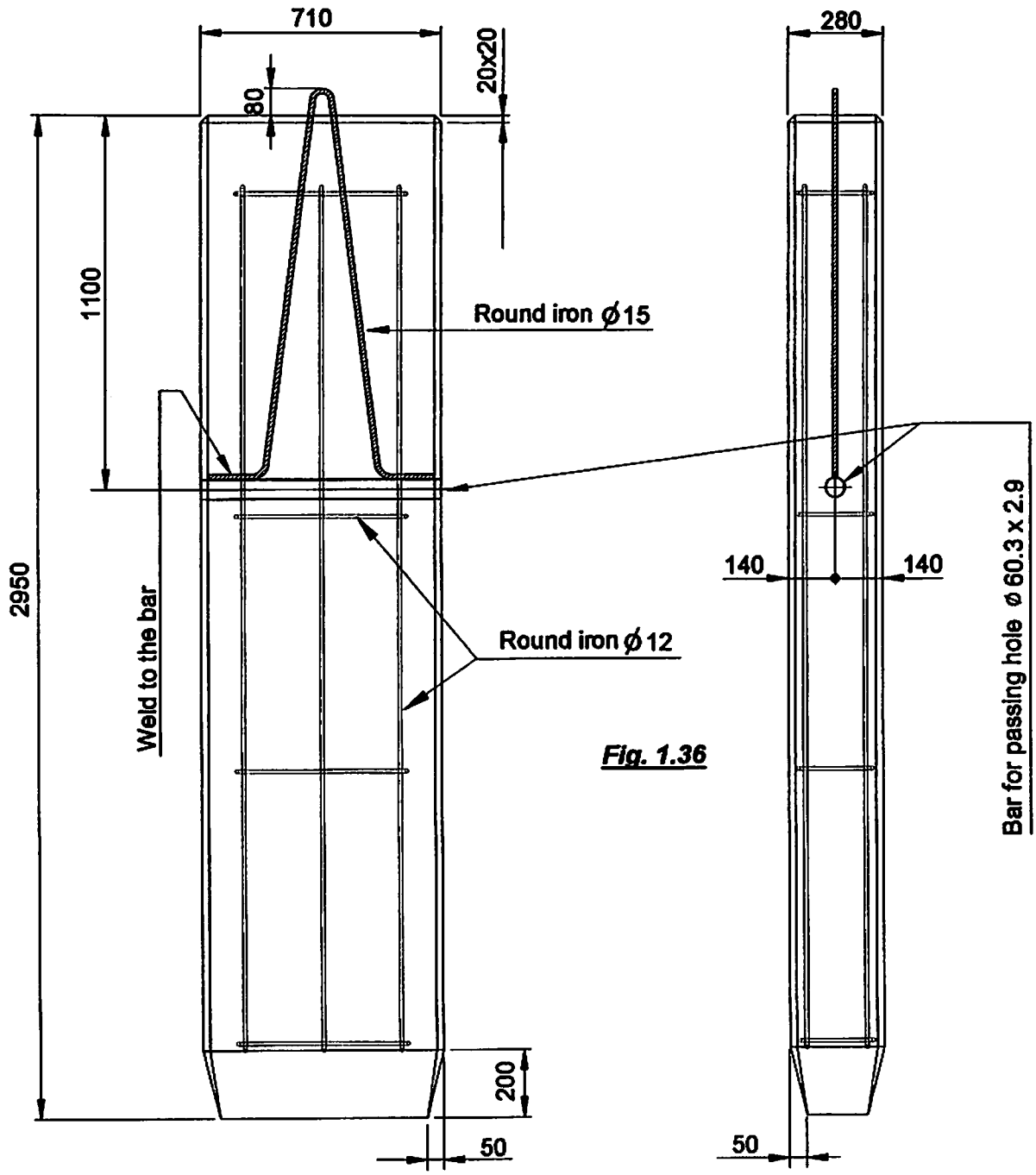


Fig. 1.36

COUNTERJIB BALLAST BLOCKS

VOLUME OF A BLOCK	0,58 m³
Specific gravity of reinforced concrete	3000 Kg/m³
WEIGHT OF A BLOCK	1700 Kg
QUANTITY	No. 5 blocks