

PREFACE

This Installation, Operation & Maintenance Manual has been compiled to guide the Customer/Operating personnel purchase purchasing "REVA" Electric Wire Rope Hoist to become familiar with usage and maintenance of equipment.

The need of safety is much more important for lifting devices since loads are hoisted and moved overhead & any failure can lead to monetary loss or fatal accident. The performance of equipment is related not only to the intensity of its use but to its care and maintenance too. Hence, proper lubrication, systematic inspection/maintenance of the mechanical parts like gears, wire rope and electrical equipment like motors, brakes, limit switches and control gears is most important.

Do not postpone the minor trouble & follow the old adage "**Prevention is better than cure**".

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INTRODUCTION

Thank you for purchasing REVA's EWRH, the first Indian ISO-9001 certified company incorporating 100% helical, hardened & profile ground gears, manufactured from low carbon alloy steel. We thus offer you a truly world class product optimally engineered and manufactured according to a standard quality assurance plan. It is a 100% in house production offered in modular design, manufactured serially using latest State-of-the-Art technology conforming to IS:3938-1983.

The product is widely recognised by the industry for its performance. It is compact and cost effective and has been designed keeping in view the customer needs. Optimum use of electrical energy has been taken into account for achieving speeds with liberal margins for voltage fluctuations, ambient temperature, gear efficiency etc.

1. FRAME

Steel plate & sheet fabricate d rugged in construction machined and bolted.

2. GEAR CASES

Gear cases are fabricated duly shot blasted, stress relieved and machined on upto date CNC machining centre.

3. GEAR AND PINIONS

REVA choose to make all their Gears & Pinions in-house ensuring their quality, compatibility & serviceability, all gears and pinions integral with shafts are made from case-hardening low-carbon allow steels and are hardened to 56-60 HRC. These are helical & profile ground for running in oil bath to give noiseless movement with maximum efficiency to save on consumed electricity. All gears and pinions confirm to DIN-7/AGMA-12 standard.

4. ROPE DRUM

Drum from seamless steel pipe or fabricated from steel plates, revolves on heavy-duty self-aligning roller bearings. The machined spiral grooves accommodate rope in one layer allowing two full turns of rope in the drum when the hook is at the lowest position. Drum size corresponds to relevant IS.

5. ROPE GUIDE AND RETAINER

Casted rope guide leads the rope into spiral grooves m the drum and retains it in the grooves preventing over-lapping on or loosening off the drum.

6. WIRE ROPE

Ungalvanised extra flexible wire rope of 6x37-6x36 construction of breaking strength 180Kg/mm² made of best plough steel conforming to IS: 2266 with factor of safety appropriate to the class of duty is used for every wire rope hoist.

7. HOOK BLOCK

Standard forged trapezoidal section hooks conforming to IS 3815/TS: 8610 are used. Hook is carried in steel crosshead on the thrust ball bearing. The hook sheaves are supported on ball bearings. Sheaves dimensions correspond to relevant IS.

8. MOTORS & BRAKES

High starting torque, crane duty, totally enclosed squirrel cage induction motors, in international frame sizes of Crompton make are used. Motors conform to IS:325. All motors used are S4 duty suitable for 415±10% V, 50±5% Hz, 40% CDF, 150 starts/hour, 50°C AMB temperature. Motors suitable for different voltages & frequencies can be provided.

DC disc brake is a standard feature. If required different brakes can also be supplied.

9. WHEELS

Closed die forged from medium carbon steels, these wheels are machined on CNC lathes for accurate bore & tread profile. Supported on two large dia ball bearings for better rolling effect.

10. CONTROLS

The operation is through pendant push button station or radio remote control having control voltage of 24 V for maximum safety of operator through flush - type hold on push buttons housed in a IP-55 enclosure. Other control voltage can also be given if required. Individual motors are protected by HRC fuses, solid-state/ thermal overload relays, single phasing & wrong sequence preventers. Limit switches for over hoisting / over lowering are also provided. We can also provide AC drives for obtaining speed control. Soft start & soft stop can also be provided.

11. EQUALISING SHEAVE BRACKET

Bracket bent to shape from steel sheets holds C. I. sheaves running in sealed ball bearings. Free rope end clamp is also mounted on this bracket.

12. TROLLEY

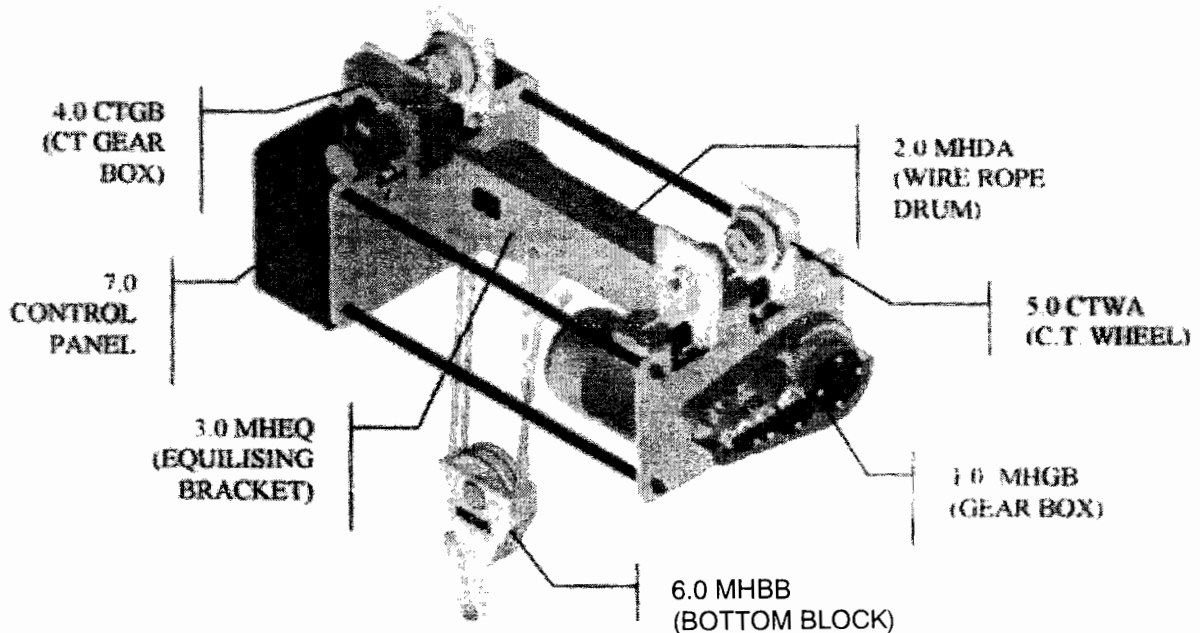
Electric Wire Rope hoist can be supplied for fixed mounting or with hand geared or electric driven trolleys according to the purchaser's requirements.

13. CREEP SPEED

Not provided in the standard models but can be equipped if required, at an extra cost. For $1/10^{\text{th}}$ of the main hoisting speed by means of an additional motor and planetary gearing. AC Drives can also be used for this feature.

14. ACCESSORIES

- Brakes & limit switches for Cross- Travel movement is not provided in standard hoist upto & including 3t capacity. Beyond 3t both brake & limit switch is provided. Should you however desire to have limit switch and brake in hoists upto 3t these can be provide at an extra cost.
- Electronic dynamic braking is available at extra cost. This gives tremendous life to the hoist brake.



FOR TROUBLE FREE OPERATION OF ELECTRIC WIRE ROPE HOIST

DOS'	DONTS'
1) Tighten all visible nuts & screws	1) Lift overload
2) Switch off the main supply before wiring.	2) Lift imbalanced Load.
3) Switch off Main switch & put a placard to warn when: a) Repairing/Replacing electrical parts. b) Checking/Rectifying faults	3) Lift obliquely.
4) Use only dedicated slings of sufficient strength	4) Inactivate safety upper limit switch.
	5) Leave the hoist with suspended load.
	6) Walk/stay under suspended load.

INSTALLATIONS

01. Check the width of Beam & note deviations in the same at approximately every 2 m over entire length

Table 1.:

Load (T)	Flange width (B) [m.m.]					
	80/90	100	125	140/150	180	210
Upto 1.0			✓			
2.0			*	✓		
5.0				*	✓	
>7.5					*	✓

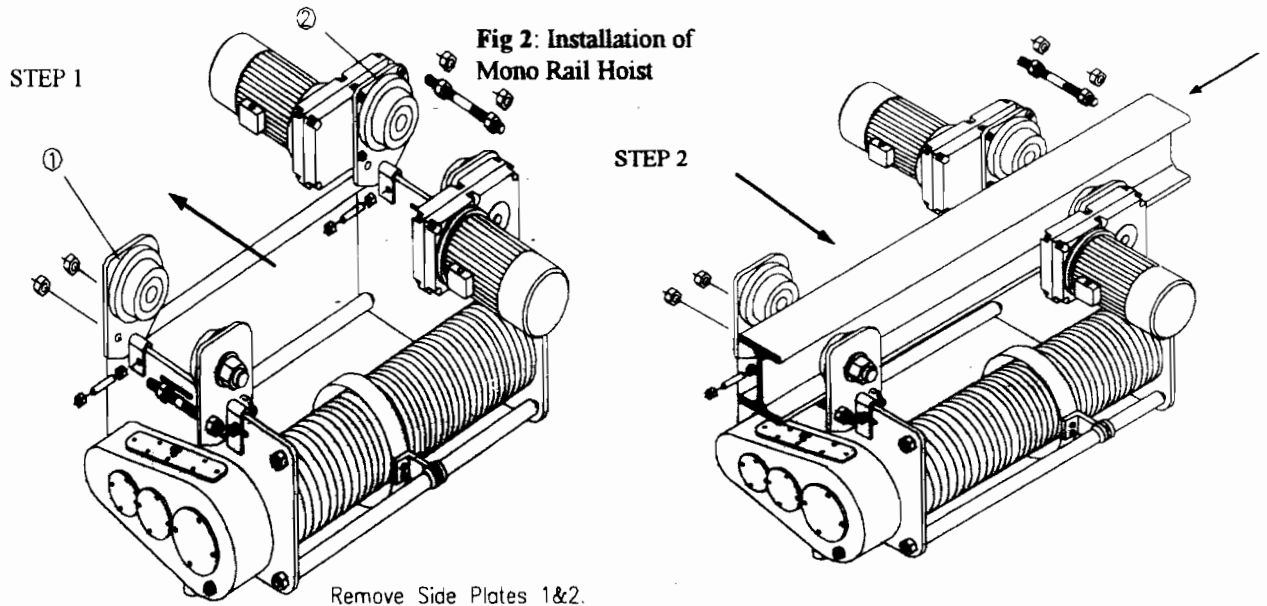
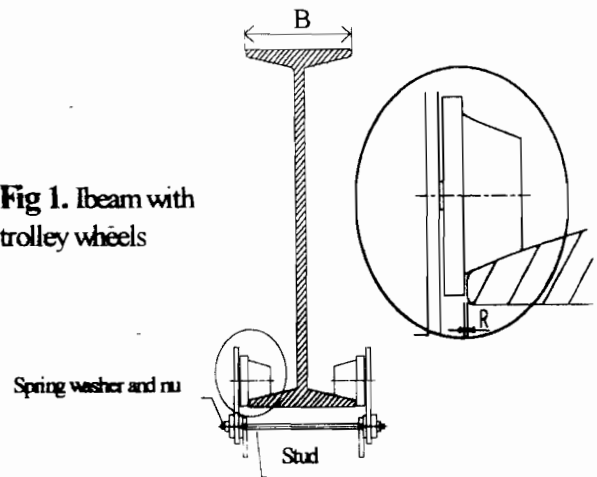
* Preferred

✓ Can be adjusted.

03. Set distance between wheel flanges as illustrated (Fig 1) = $B + R/2$ ($R = 5\text{mm max.}$) Only two pair wheels need to be adjusted when flange widths are according to above table 1.

04. When flange widths are lower than stipulated, both sides wheel pairs need to be adjusted by suspending the hoist on the beam till the hoist frame is parallel in vertical plane thus precluding wheels from not touching the beam which avoids skidding (Rotation w/o Translation) Fig. 2.

Fig 1. Ibeam with trolley wheels



In case of monorail having free end, installation shall be as shown in Fig. 3 otherwise Fig. 2.

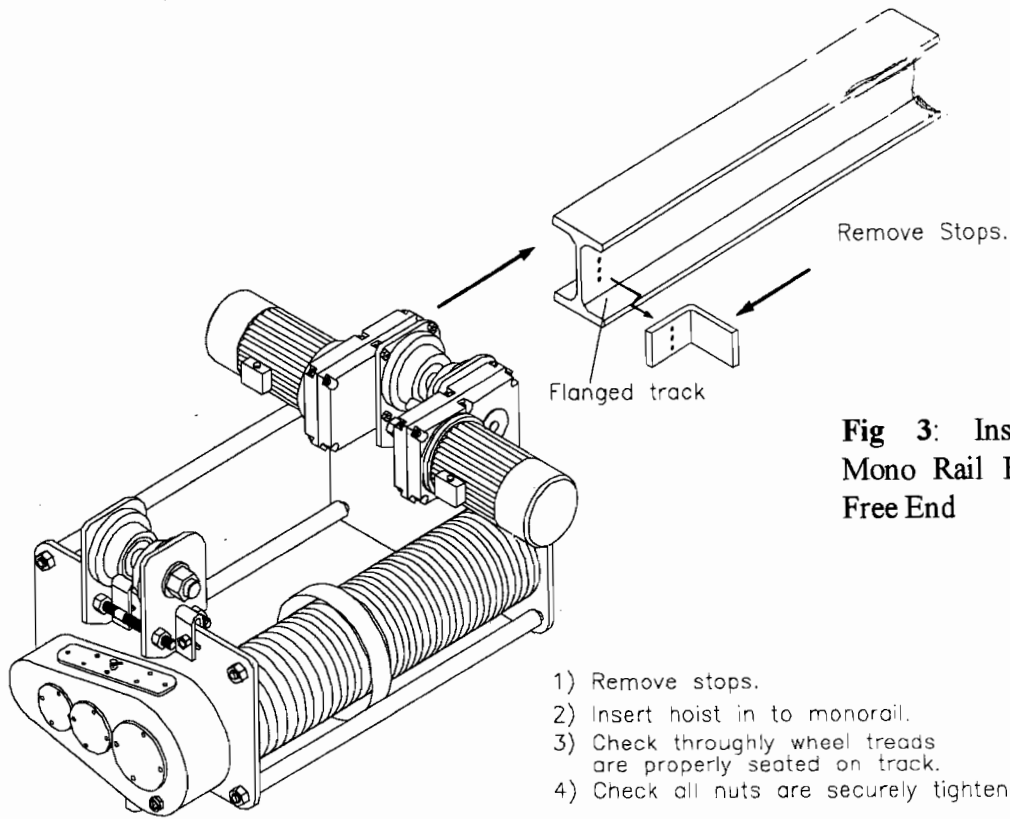


Fig 3: Installation of Mono Rail Hoist having Free End

- 1) Remove stops.
- 2) Insert hoist in to monorail.
- 3) Check thoroughly wheel treads are properly seated on track.
- 4) Check all nuts are securely tightened.

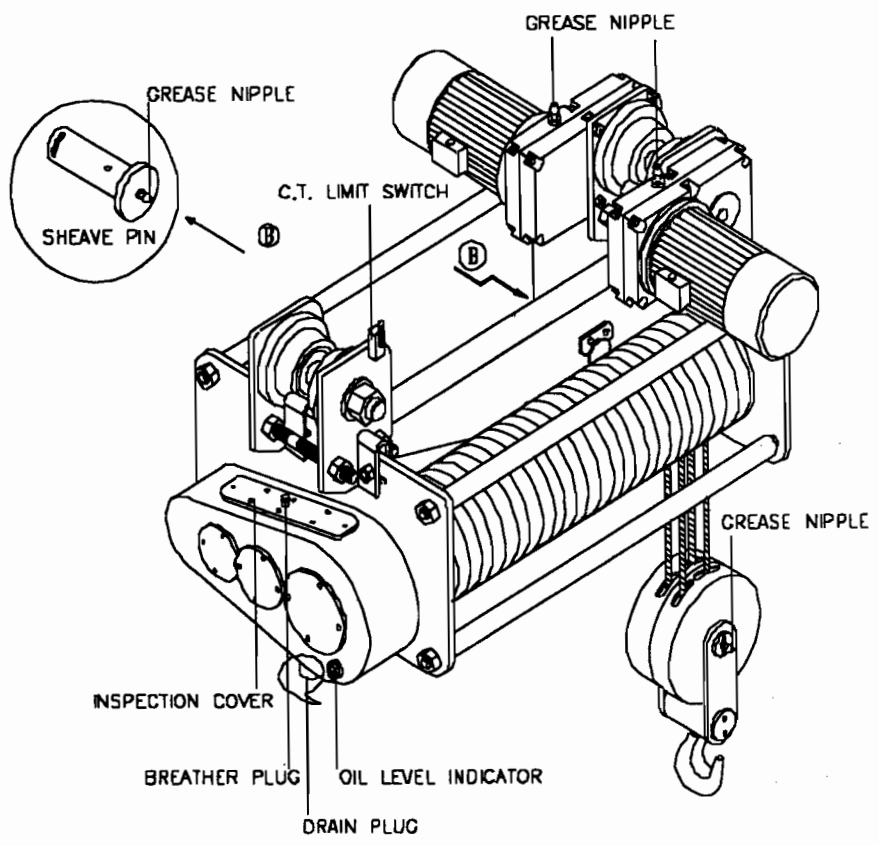
LUBRICATION

During installation & maintenance open the Breather Plug & fill the gear box with ISO VG 220 oil (or equivalent) upto oil level indicator. Restore the plug back. If oil is contaminated, all the oil should be taken out by opening drain plug & fill it up with fresh one.

Cross travel gear box, equalising sheave & electric motors generally are life lubricated with Servo, Gem/80 greases. However during complete overhaul

or change over of any damaged bearing provision is made to replenish the same through grease nipples provided at appropriate location as shown in the Fig. 4.

Fig 4: Lubrication Diagram



WIRE ROPE (FORT WILLIAMS/USHA MARTIN) & HOOK BLOCK:

The hoist is shipped duly reeved with wire rope & hook block assembly and is normally in readily installable condition. However in rare cases, during transit or long storage at site the rope may need to be changed. The following steps as illustrated in figure 5 need to be followed.

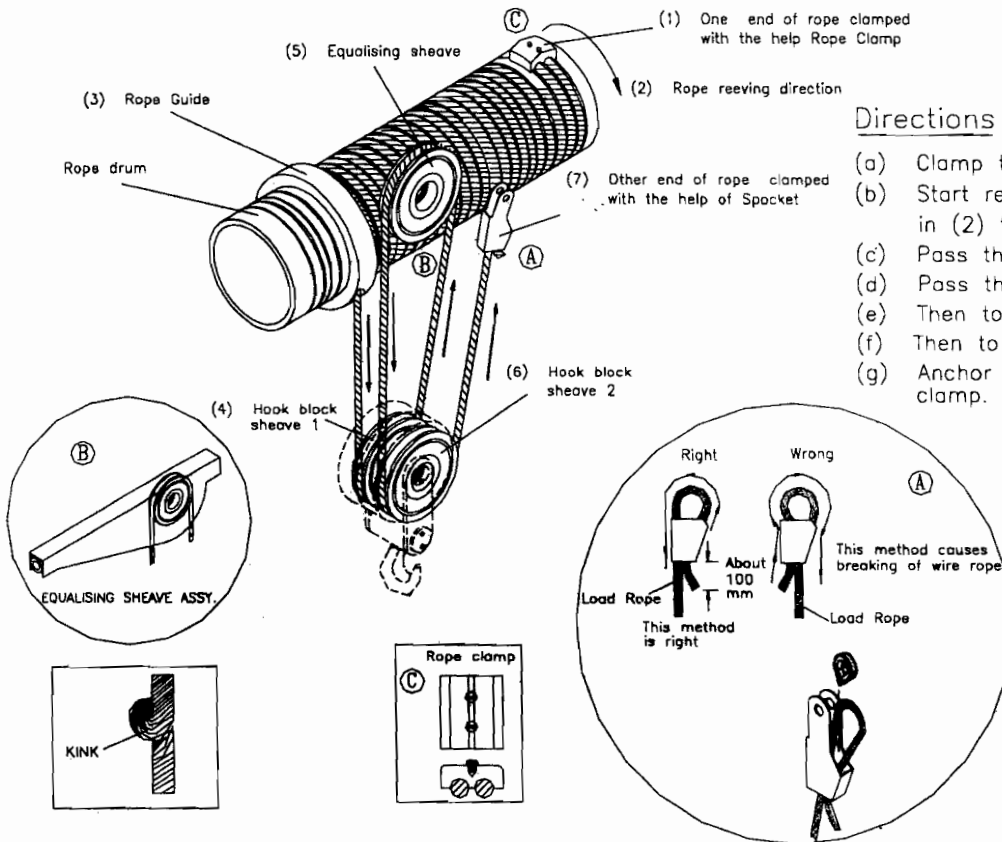


Fig 4: Rope Reeving for 4/1 Arrangement

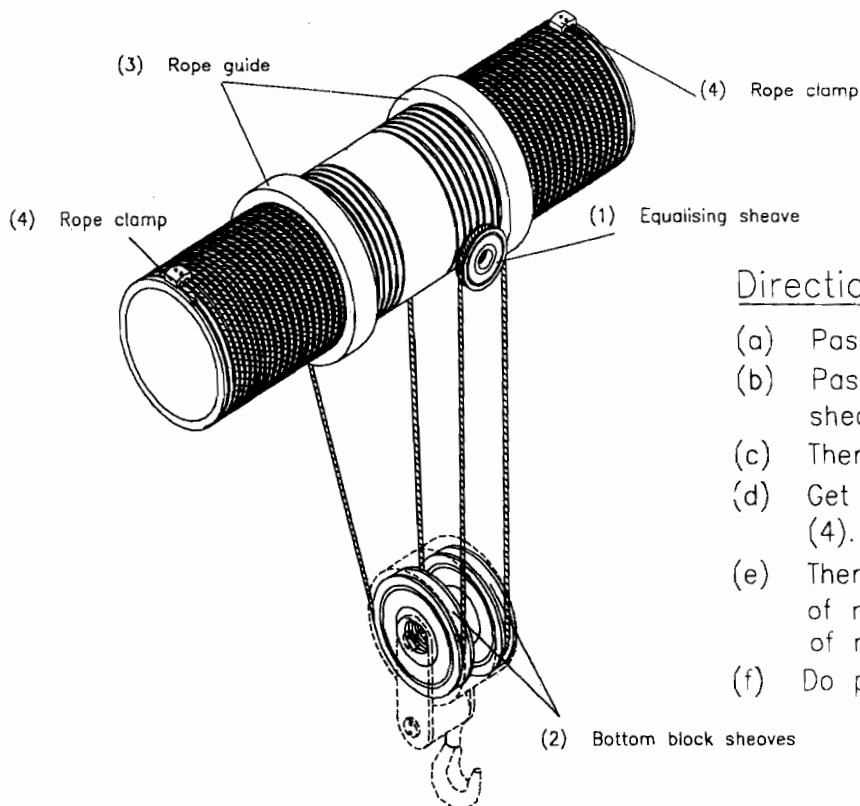


Fig 5: Rope Reeving for 4/2 Arrangement

Directions

- Pass the rope through equalising sheave (1).
- Pass both end of the rope through the two sheaves of bottom block (2).
- Then through the rope guide (3).
- Get both the free ends clamped as shown in (4).
- Then start winding after ensuring that direction of rotation of the drum is same as the direction of reeving by switching on hoisting motor.
- Do proper lubrication.

STORAGE & HANDLING OF WIRE ROPES

Handling

Improper handling or coiling of rope from reels or coils often results in the "springing" of strands and kinking of the rope both of which are very difficult to be corrected. It reduces the effective rope life considerably.

If the rope is supplied on a reel, it should be mounted on a shaft and rope laid off from the reel while it rotates. Suitable brakes should be applied on the flanges of the reel. If the rope is supplied in large coils, these should be mounted on a turn-table with suitable brakes and the rope paid off while the turn-table rotates. Small coils of wire ropes can be made to roll along with the ground for uncoiling. Rope should neither be pulled straight from the coil while the coil rests on the ground, nor taken off turn by turn from reel while it is lying on its flange on the ground, also never allow the reel to rotate at high speed (i.e. exceeding 2 km per hour at any time) during pay off.

Kinks

The wire ropes are damaged due to improper handling. The most common form of damage is kink formation, which starts first, with the formation of a loop as illustrated and then the loop tightens when pulled up forming kink. The loop should immediately be removed by turning the rope in other direction. The illustrations show stages of kink-formation.

- a) How a kink starts (See fig. 5)
- b) When pull gets on, further damage is done.
- c) When kink is straightened, the wires may or may not be broken, but the damage is done and when rope is put to service, wires will quickly break.

Never use a rope that has been kinked unless the kinked portion is removed.

Inspection of Wire Ropes in Use

Inspection of a rope in use is essential at regular intervals to observe the presence of excessive wear on the outside wires resulting in marked reduction of rope dia., broken wires, corrosion and pitting, state of lubrication, core condition, etc.

The reduction in diameter of a rope is generally due to excessive wear of outside wire and bedding-in, in case of a fiber cored ropes. However, marked reduction in rope diameter should be thoroughly investigated and its cause determined.

In case of broken wires, their number and distribution should be taken into account to calculate their effect.

The inside wires and core can also be damaged due to lack of lubrication. Where corrosive conditions exist, these should be controlled by correct and timely lubrication.

Rope Care

- ⇒ Do not allow your rope to be stored in a damp or open place. This causes deterioration of rope and fiber core.
- ⇒ Do not let your rope be mishandled when uncoiling or unreeling. This causes kinks to form.
- ⇒ Do not cut a rope before it has been sized-even if it is a preformed rope. The lays can become loose.
- ⇒ Do not use a rope that is not flexible enough for the size of your drum and pulleys. This causes bending fatigue.
- ⇒ Do not operate your rope on sheaves and drum with worn out grooves and broken flanges. This damages the rope.
- ⇒ Do not subject the rope to severe overload and sudden jerks. This causes severe damage to rope and shortens its life.
- ⇒ Do not load a rope beyond its safe working load. Reduction of safety factor may jeopardize not only your rope, but also your equipment, your work and everything.

- ⇒ Do not allow your rope to get dry and thereby corrosion setting in. Lubricate it with the best quality lubricant and at regular intervals.
- ⇒ Do not forget to check the conditions of your rollers, pulleys, drum and sheaves. The rope life depends very much on the conditions of these auxiliaries.

It is of utmost importance that proper care is taken in handling, fitting and maintenance of your rope.

When to Change a Rope

A close examination and regular inspection of rope will indicate if a new rope is to be put in. Following are the guiding factors for putting in a new rope:

- ◆ When the number of visible broken per cracked wires exceeds 10 per cent of total number of outer wires within 'one rope lay.'
- ◆ When wear on outer wires exceeds one-third of their diameter.
- ◆ When the loss in effective metallic area in the form of broken/cracked wires along with wear on outer wire exceeds 10 per cent.
- ◆ When gradual loss in rope strength due to wear or corrosion or both exceeds 1/6th of the original rope strength.
- ◆ When corrosion on wires show noticeable pitting and loosening of wires.
- ◆ When rope gets deformed or distorted and the affected portion cannot be cut out.

However, the experience of the ropeman and statutory regulations are the final words as to when a rope is to be changed.

BRAKE (DC Fail Safe, EMCO)

a) Details: Blown up diagram showing components (Fig.6)

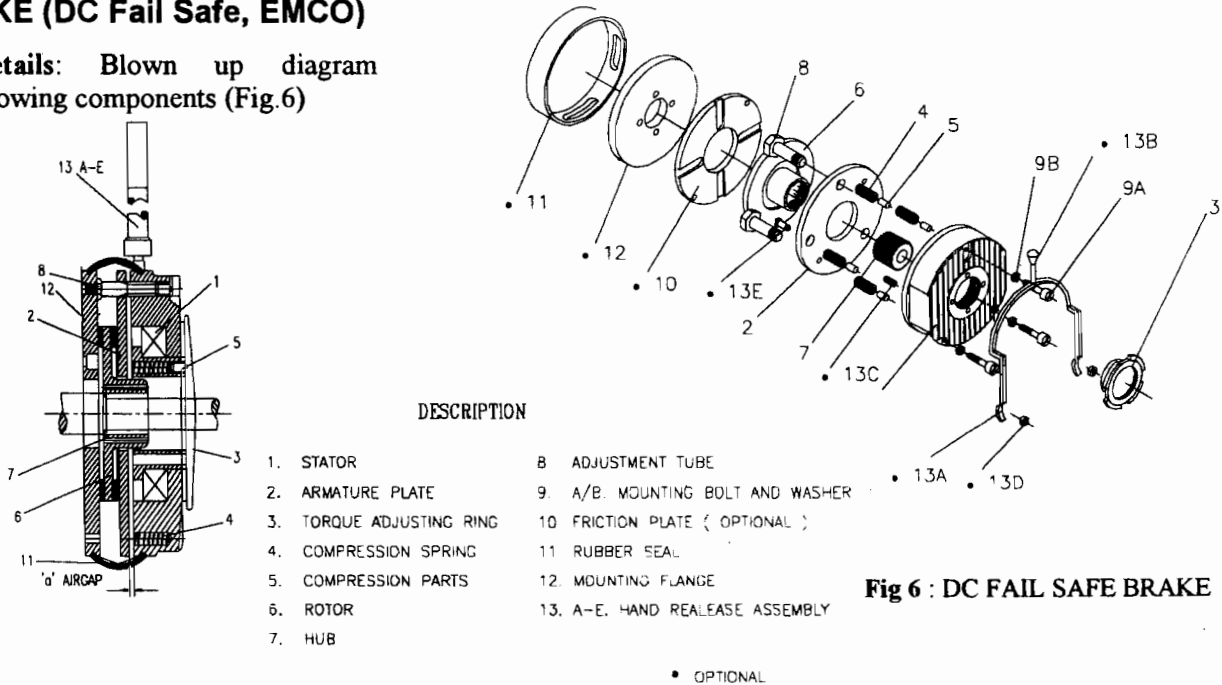


Fig 6 : DC FAIL SAFE BRAKE

b) **Switching & working:** The brakes used are fail safe i.e. the brakes releases when DC voltage is supplied to them. On applying a DC supply to the coil, the magnetic field produced pulls the stator against the spring force and the rotor is free to rotate.

The hand release mechanism provides a mechanical way of releasing the brake. This can be used to temporarily move the load in case of power failure.

b) **Safety:** The brakes must run dry. Friction materials must be protected from frozen materials, lubricants, etc.

c) **Adjustment:** In case of excessive wear out adjustments can be carried out by maintaining a gap of 0.3 mm between stationary to friction plates.

WIRING

Refer Electrical Wiring Circuit Diagram Fig. 12 & 13 for wiring, BOM (appendix 1) for replaceable spares and Fig. 7 for pendant functions.

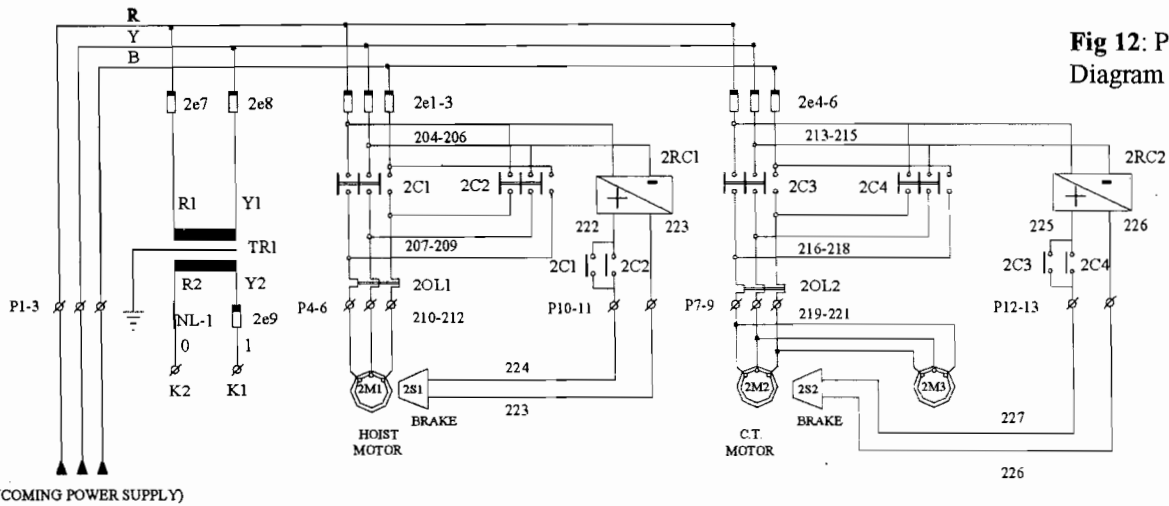
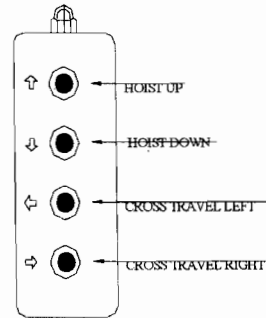
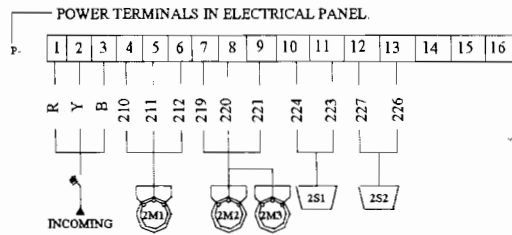


Fig 12: Power Circuit Diagram of EWRH

Fig 7: Pendant

LEGENDS:-

- 2e1-3 FUSES FOR HOIST
- 2e4-6 FUSES FOR CT
- 2e7-8 FUSE FOR CONTROL TRANSFORMER
- 2e9 FUSE FOR CONTROL TRANSFORMER
- TR1 CONTROL TRANSFORMER
- NL1 NEUTRAL LINK
- 2C1-2 CONTACTOR FOR HOIST
- 2C3-4 CONTACTOR FOR CT
- 2OL1 OVERLOAD RELAY FOR HOIST
- 2OL2 OVERLOAD RELAY FOR CT
- 2S1 DC DISC TYPE BRAKE FOR HOIST
- 2S2 DC DISC TYPE BRAKE FOR CT



(FROM CONTROL TRANSFORMER TR1)

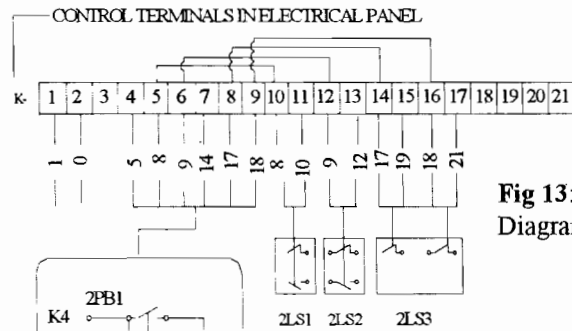
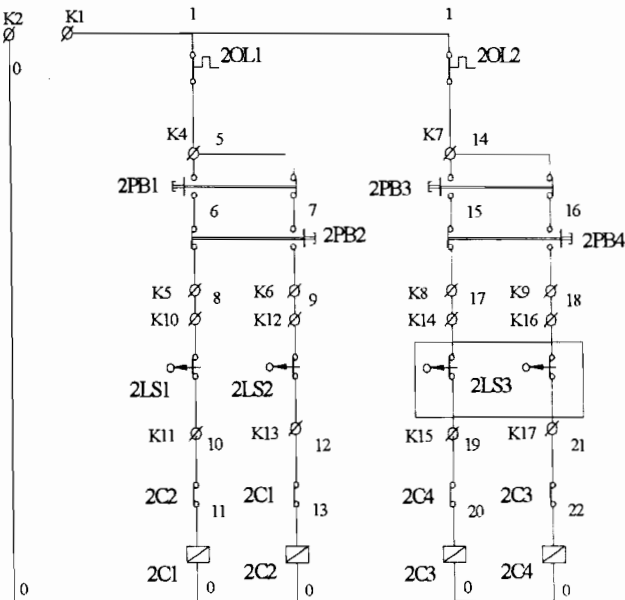
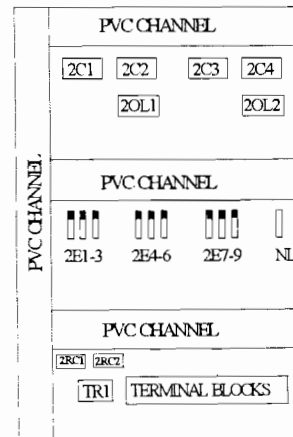
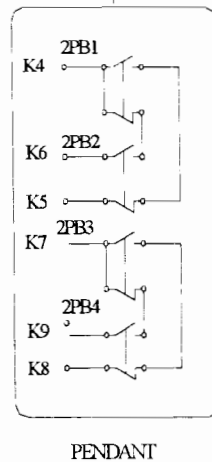


Fig 13: Control Circuit Diagram for EWRH



CONTROL PANEL LAYOUT

INSTRUCTIONS FOR DSL INSTALLATION

The procedure for erecting the DSL shall be as under:

1. In Case of Wall Mounted Panels

⇒ The total length of DSL (m) = (Travel length x 1.2) + (Operating floor - 1) + 2.

⇒ Cut specified cables according to the DSL length and lay them on floor. Tie the cables except control cable with cable tie at an interval of 1/2 meter. Loosen the trolley as shown in Fig(8). Place the grey colour trolley on cables at a distance of 2 meter from one end of the cable (the end, which shall be connected to the junction box)

and insert them in proper grooves and tighten the other trolleys at every 2.5 meter interval. All the cables, which are not moving on the auxiliary beam, shall be tied with cable tie.

⇒ Put the proper lugs at both the ends of DSL and also put the ferrules with proper numbers at both ends as per approved Electrical Drawing.

⇒ Fasten all the bolts assuring that the cables are properly placed in the decks made therein.

Now, this DSL is ready for mounting on the auxiliary beam see Fig 9. Slide the trolleys from one side of the aux. Beam keeping in mind that the grey colour trolley has to be near the hoist. The end of the cables which is near grey colour trolley shall be connected to the junction box fixed on the hoist. the other end of the

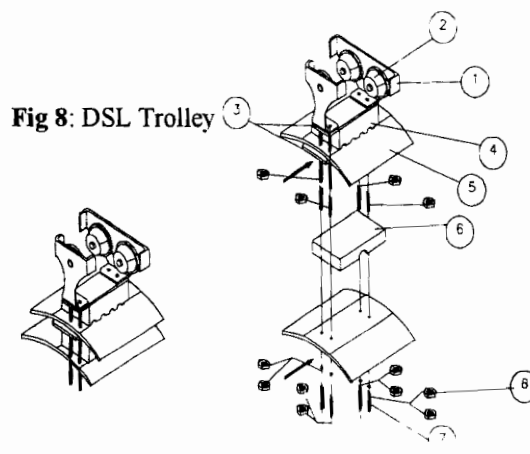
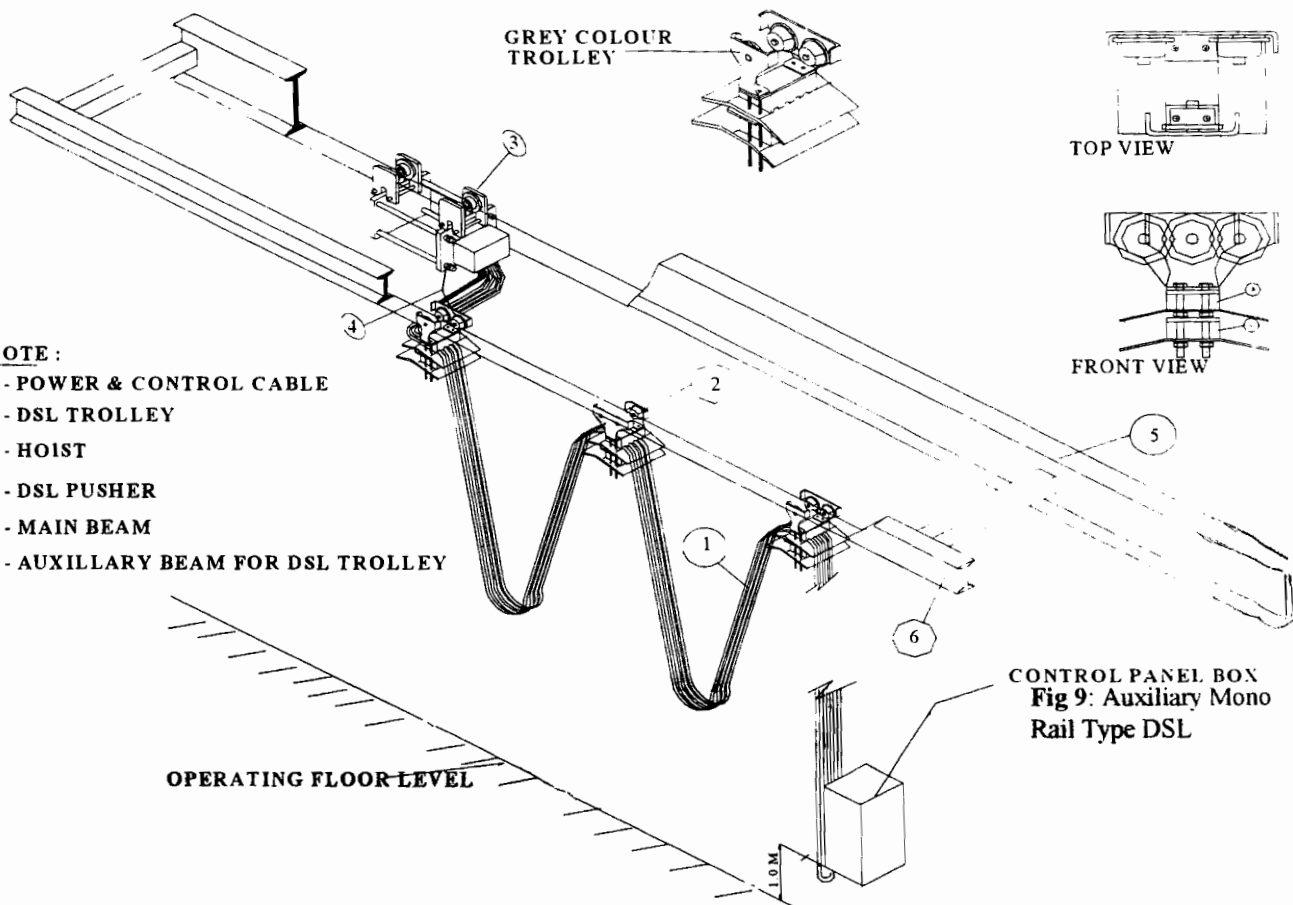


Fig 8: DSL Trolley

S.NO.	BILL OF MATERIALS/TROLLEY	QTY.
1	TROLLEY PLATE	2 NOS
2	WHEEL WITH PIN	3 NOS
3	SUPPORTING PLATES	2 NOS
4	RUBBER BLOCK (CABLE CARRIER) FOR SMALL DIA. CABLE	1 NO.
5	BEND PLATE FOR SUPPORTING CABLE.	2 NOS
6	RUBBER BLOCK (CABLE CARRIER) FOR CONTROL CABLE	1 NO.
7	M-6 BOLT	4 NOS
8	NUT	12 NOS.



NOTE :

- 1 - POWER & CONTROL CABLE
- 2 - DSL TROLLEY
- 3 - HOIST
- 4 - DSL PUSHER
- 5 - MAIN BEAM
- 6 - AUXILLARY BEAM FOR DSL TROLLEY

CONTROL PANEL BOX
Fig 9: Auxiliary Mono
Rail Type DSL

cables shall be connected to panel box, mounted on the wall

2. In case of Control Panel integral to electric hoist DSL system shall be as shown in Fig. 10 (Taut Wire Type)

3. In case there is no Auxiliary Mono rail for DSL arrangement power feeding system shall run through main mono rail as shown in Fig. 11.

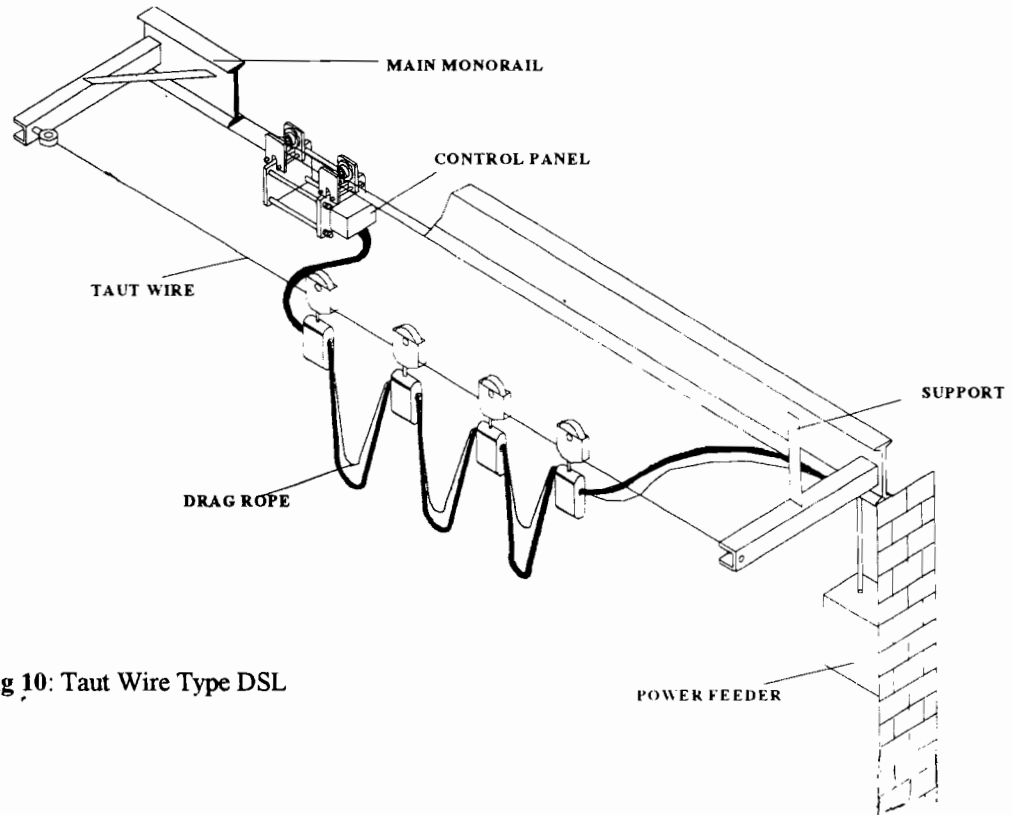


Fig 10: Taut Wire Type DSL

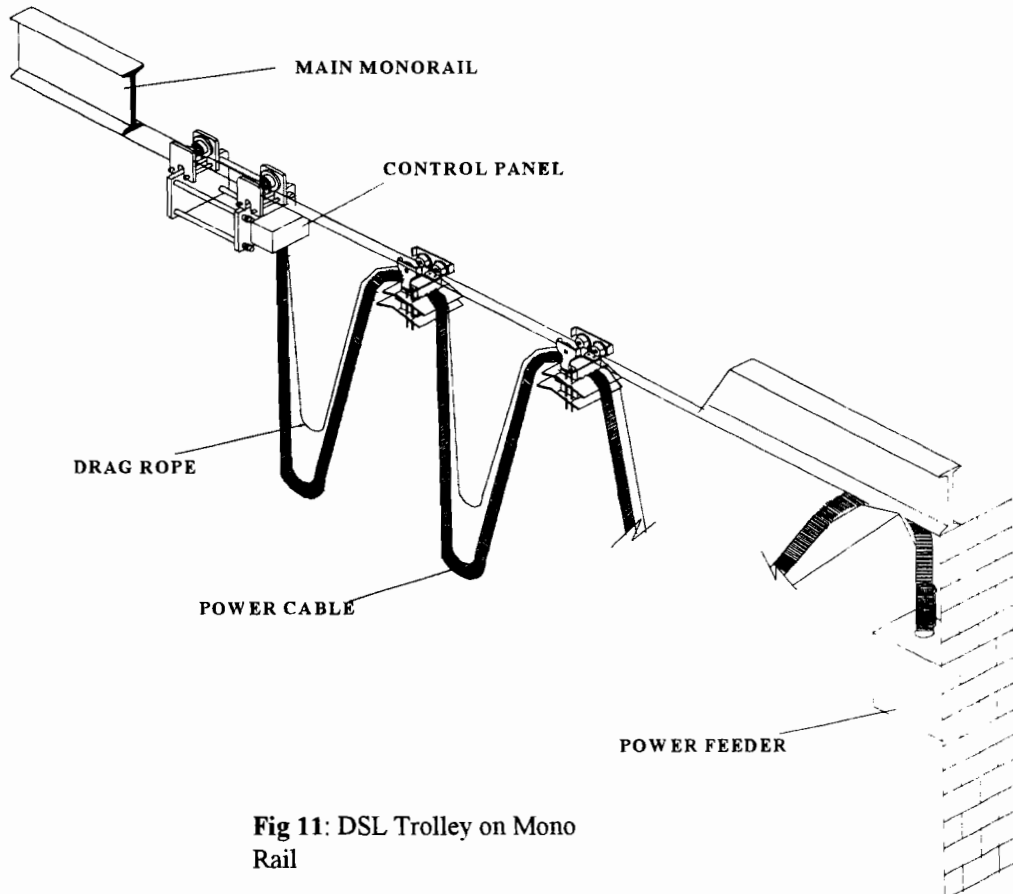


Fig 11: DSL Trolley on Mono Rail

[D] PROCEDURE FOR CHANGING CONTACTS (SIZES D TO F ONLY)

- I) Disconnect all cables/wires.
- II) Remove contactor from its mounting.
- III) Open side clamps.
- IV) Separate top housing and base.
- V) Pull out the fixed contacts.
- VI) Separate contact carrier assembly.
- VII) Take out contact spring by compressing.
- VIII) Tilt and remove contacts.
- IX) Insert new contact and springs.
- X) Assemble contact carrier & housing.
- XI) Push in new fixed contacts.
- XII) Assemble top housing & base and close the clamps.

TROUBLE DIAGNOSIS/REMEDY CHART (ELECTRICAL)

[A] CONTROL PANEL

S.NO	TROUBLE	PROBABLE CAUSES	REMEDY
01	Hoisting/traversing Motion is in-operative.	Discontinuity in line Protective Device Operated.	Check all three lines & control supply. Check for blown fuses, if it is so, first check for any short circuit than replace blown fuses. Check for tripping of overload relays, if operated then look for causes of over loading. It may be due to application of more load than specified or under voltage. Remove extra load/ensure rated voltage & then reset O/L relay by pressing reset knob Check for over hoisting/traveling traversing Operate the respective in reverse direction to reset limit switch
02	Chattering of contactor	Loose connection	Tighten connections
03	Contactors refuse to open	Contact welding	Replace contacts.
04	Contactor refuse to hold.	Open control supply/contactor coil.	Reconnect control/change coil.

[B].MOTORS

S.NO	TROUBLE	PROBABLE CAUSES	REMEDY
01	Vibration	Motor misaligned Coupling pulleys out of balance. Defective ball or roller bearing.	Realign Rebalance driven equipment. Replace bearings.
02	Bearing Overheats	Excess grease Insufficient grease Deterioration of grease or lubricant contaminated Incorrect assembly.	Reduce surplus grease. Maintain proper quantity of grease. Remove old grease, wash bearing replenish with new grease. Ensure bearing assembled squarely on shaft.
03.	Motor Fails To Start	Broken ball or rough races. Main supply switched off Motor may be overloaded. disconnect load to see if motor will start light Wrongly connected Single Phasing	Replace bearings. Check main switch. Reduce starting load. Check with diagram and see that connections are right. Check for loose connections. If so tighten it.
05	Motor Fails	Overload motor Low motor voltage Open circuit	Reduce load Ensure that nameplate voltage is available at motor terminals. Replace fuses. check overload relays.
06	Motor Runs And Then Dies Down	Power failure Over load.	Check for loose connections to line. fuses and control gear. Examine overload relay & ensure proper setting.

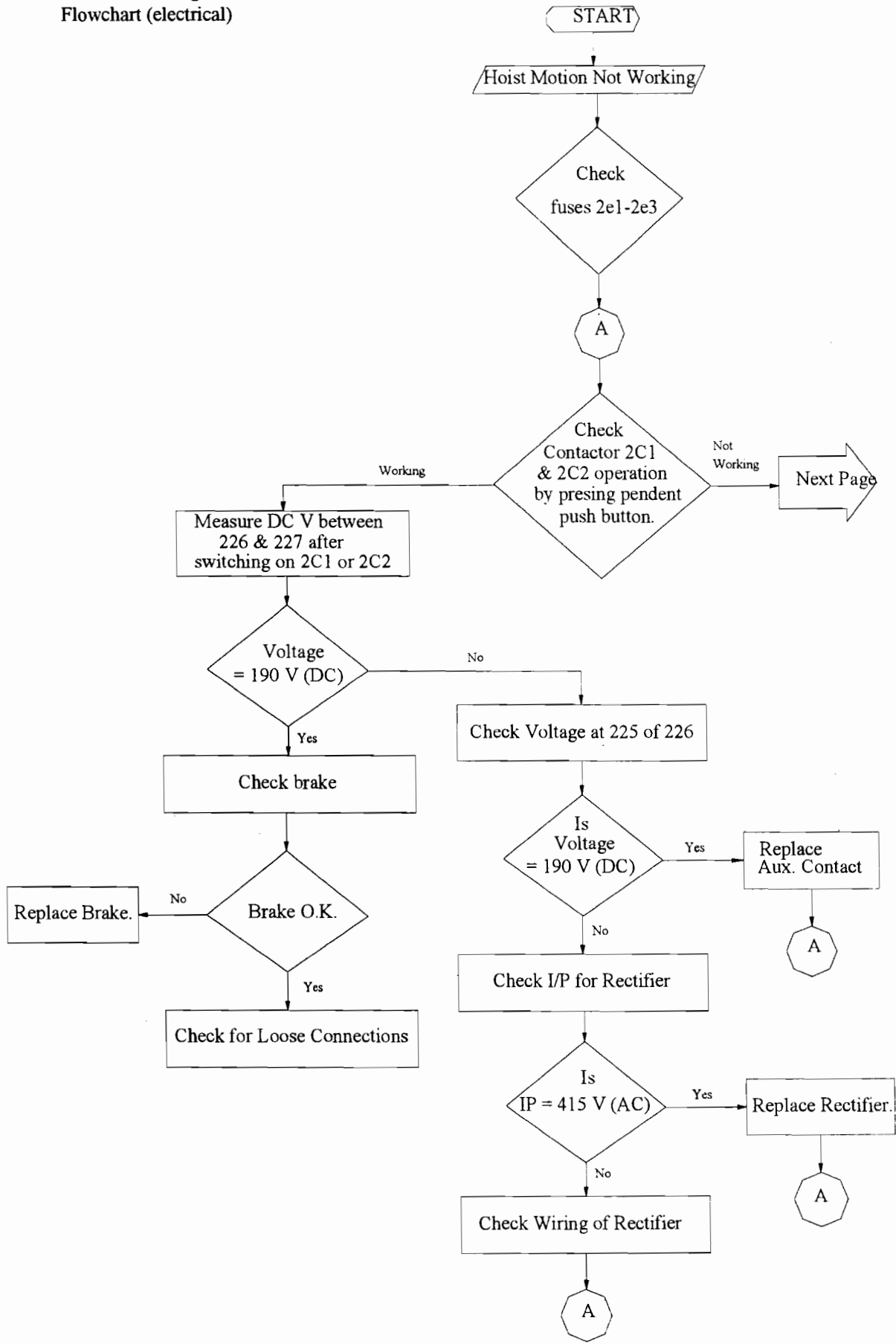
07	Scraping Noise	Fan rubbing fan covers Fan striking insulation Loose on bed plate.	Remove interference Clear fan. Tighten holding bolts.
08	Magnetic Noise	Air gap not uniform Loose bearings. Rotor unbalance	Check and correct bracket fits or bearings Correct or renew. Rebalance.

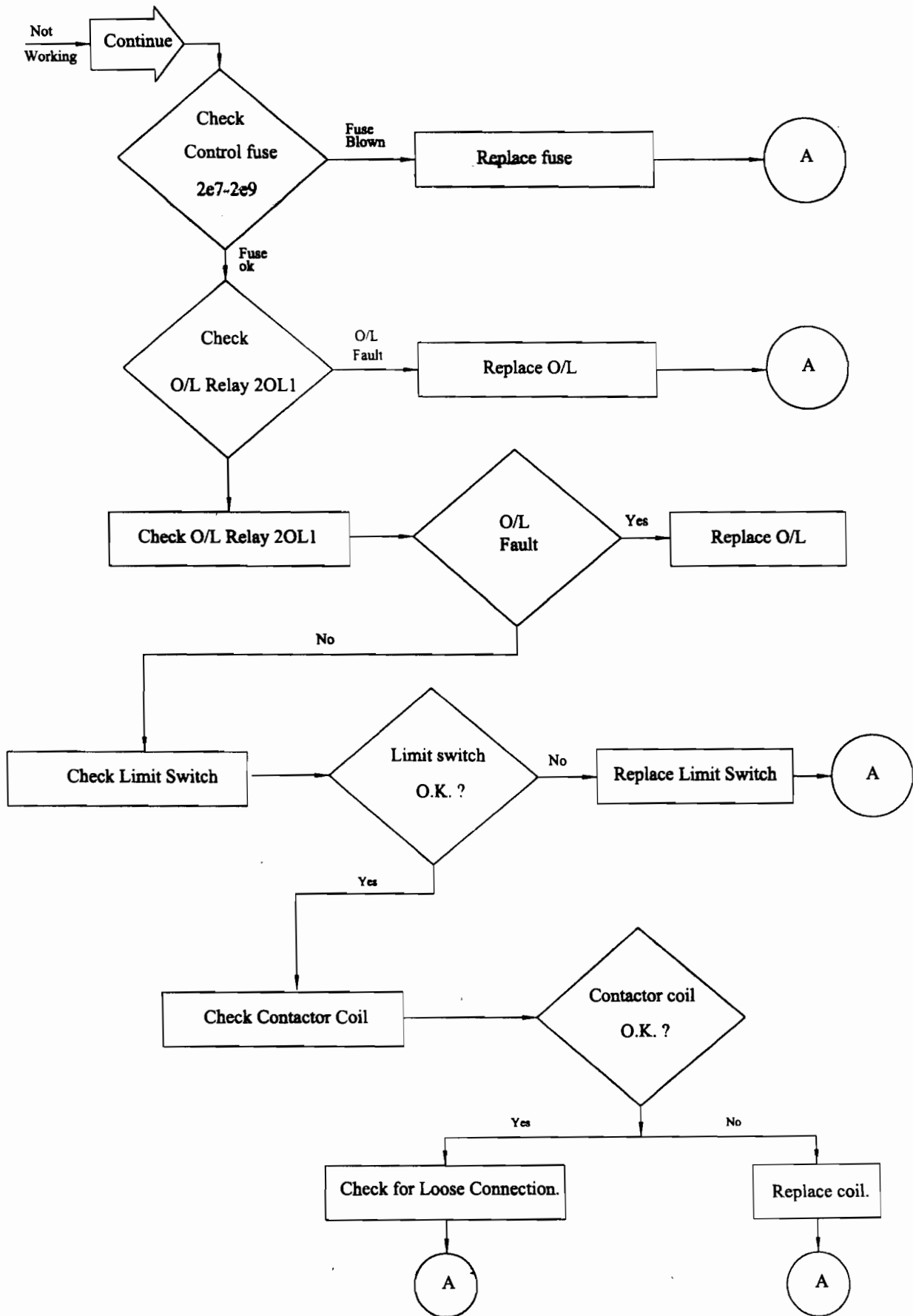
[C] BRAKE

S.NO	TROUBLE	PROBABLE CAUSES	REMEDY
01	Brake Fails to Open	Discontinuity/ under voltage in dc supply. Brake coil burnt	Check rectifier for an input of 415 v and output of 190 V DC. If input is OK but output is absent replace rectifier. If input voltage is less than specified voltage, correct the supply voltage. Check its continuity if short replace the coil.

Optional: Also we can provide solid state overload relays with single phasing & phase reversal protection in place of conventional thermal overload relays with in built single phasing protection.

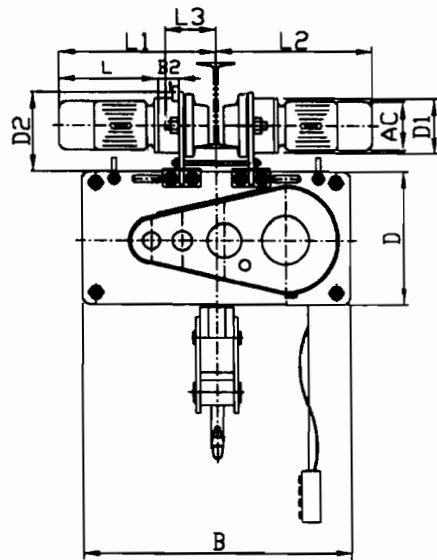
Trouble Shooting
Flowchart (electrical)



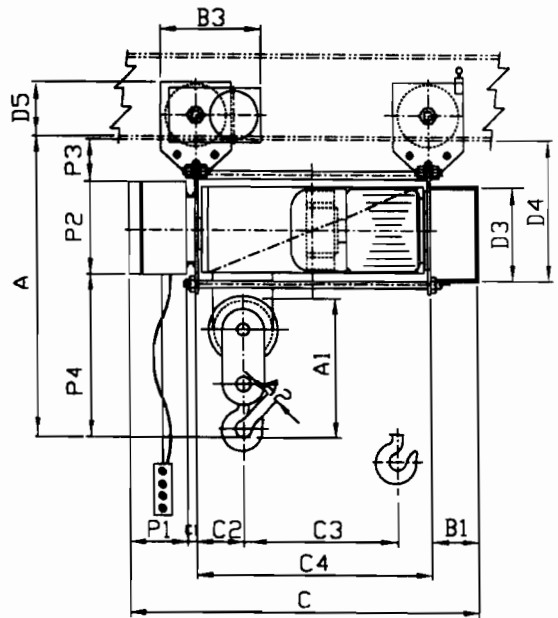


SWL (Kg)	250	500	1000	2000	3200	5000	6300	8000	10000	12500	15000	20000	25000
MODEL NO.	H1.25608	H1.50608	H1010308	H2020308	H2030308	H3050308	H3060308	H4080308	H4100308	H4120208	H4150208	H6200208	H6250108
ROPE REEVING SYSTEM	2/1	2/1	4/1	4/1	4/1	4/1	4/1	4/1	4/1	4/1	6/1	8/1	10/1
A	500	550	600	750	800	900	1000	1150	1250	1350	1400	1800	2000
A1	300	300	300	375	400	500	600	660	710	830	900	1070	1150
A2	26.5	26.5	31.5	37.5	42.5	53	53	67	75	85	95	106	118
AC	125	125	125	125	125	125	140	140	140	140	162	162	162
B	450	450	450	550	550	700	700	950	950	950	950	1250	1250
B1	80	80	80	100	100	122	122	156	156	156	156	180	180
B2	60	60	60	60	60	60	60	70	70	70	70	70	70
B3	250	250	250	250	250	280	280	280	280	280	280	280	280
C	780	780	980	1050	1050	1130	1130	1250	1250	1300	1500	1550	1700
C1	30	30	30	30	30	30	30	40	40	40	40	40	40
C2	115	115	115	125	140	160	160	180	230	250	250	350	350
C3	260	260	260	260	260	315	315	310	300	330	330	250	400
C4	660	660	660	660	660	760	760	810	810	810	900	950	950
D	280	280	280	315	315	380	380	500	500	500	500	650	650
D1	140	140	140	140	140	140	140	170	170	170	170	170	170
D2	180	180	180	180	180	180	180	225	240	240	240	240	240
D3	170	170	170	220	280	280	280	410	410	410	410	530	530
D4	340	340	340	380	440	440	560	560	560	560	710	710	2000
D5	100	100	100	100	120	120	120	160	160	160	160	160	190
L°	220	220	220	220	220	220	220	250	250	250	275	275	275
L1°	-	-	-	-	350	350	350	390	410	425	450	450	450
L2°	350	350	380	380	450	450	450	480	500	510	550	550	550
L3°	130	130	140	140	-	-	-	-	-	-	-	-	-
P1	200	200	200	200	200	200	200	200	200	200	200	250	250
P2	280	280	280	315	315	350	350	450	450	450	450	550	550
P3	40	40	40	45	45	45	45	50	50	50	50	60	60
P4	230	230	230	300	350	450	450	700	750	850	950	1100	1200
FLANGE SIZE	75-150	75-150	75-150	75-180	75-180	75-180	75-180	100-210	100-210	100-210	100-210	100-210	100-210

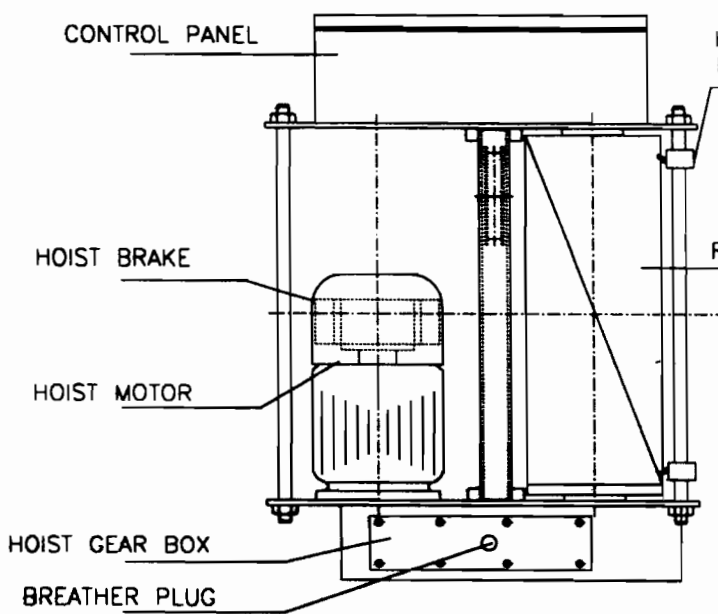
G.A. Drawing Dimensional Details



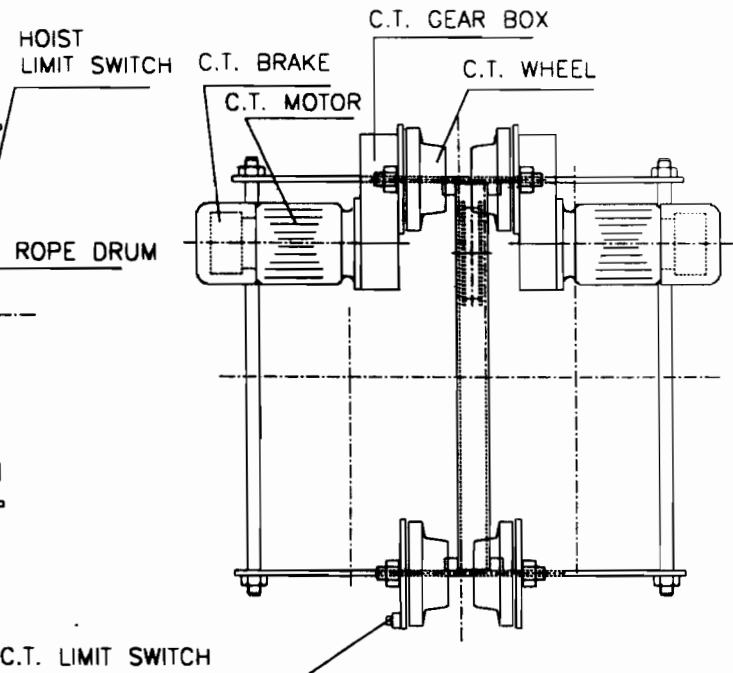
FRONT VIEW



SIDE VIEW

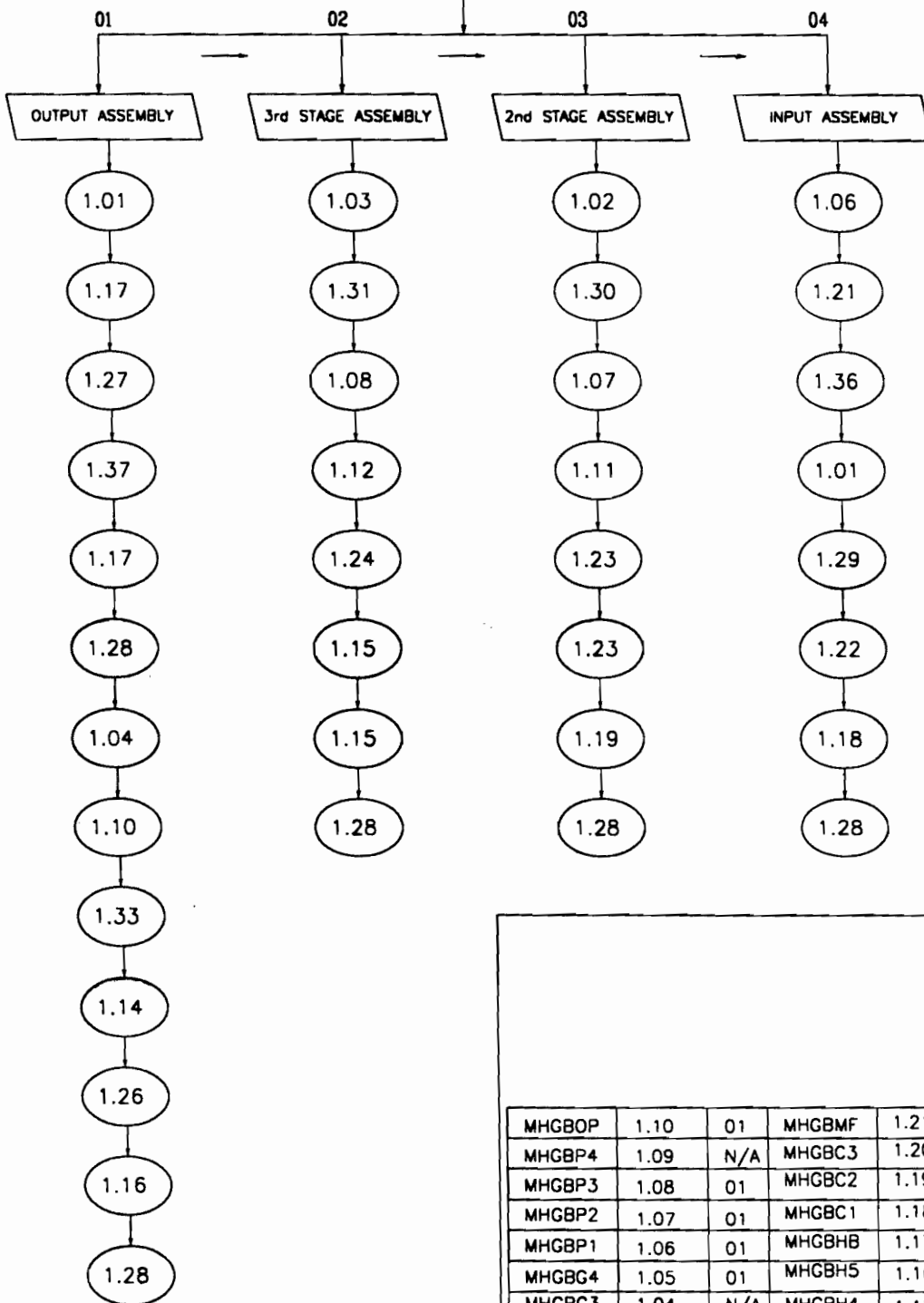


HOIST PLAN



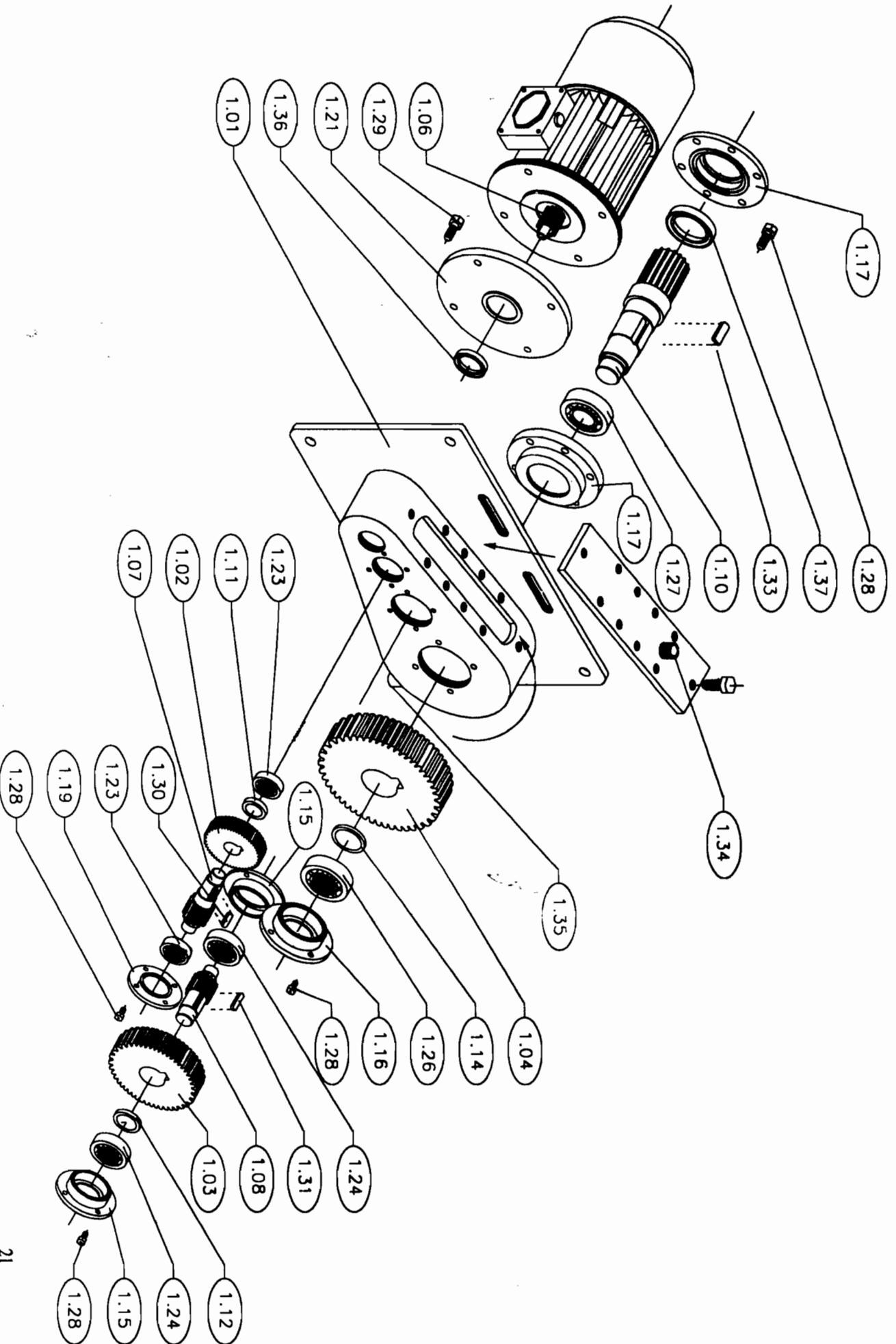
TROLLEY PLAN

ASSEMBLY FLOW CHART OF MAIN GEAR BOX



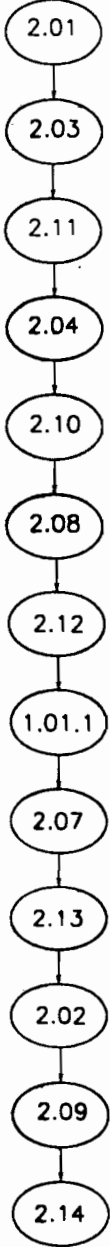
			MHGBMT	1.38	01			
			MHGB02	1.37	01			
			MHGB01	1.36	01			
			MHGBDP	1.35	01			
			MHGBBP	1.34	01			
			MHGBK5	1.33	02			
MHGBOP	1.10	01	MHGBMF	1.21	01	MHGBK4	1.32	N/A
MHGBP4	1.09	N/A	MHGB3	1.20	N/A	MHGBK3	1.31	01
MHGBP3	1.08	01	MHGB2	1.19	01	MHGBK2	1.30	01
MHGBP2	1.07	01	MHGB1	1.18	01	MHGBMB	1.29	04
MHGBP1	1.06	01	MHGBHB	1.17	01	MHGBSK	1.28	22
MHGBG4	1.05	01	MHGBH5	1.16	01	MHGBB6	1.27	01
MHGBG3	1.04	N/A	MHGBH4	1.15	02	MHGBB5	1.26	N/A
MHGBG2	1.03	01	MHGBS5	1.14	01	MHGBB4	1.25	N/A
MHGBG1	1.02	01	MHGBS4	1.13	N/A	MHGBB3	1.24	02
MHGBBD	1.01	01	MHGBS3	1.12	01	MGBB2	1.23	02
MHGBAY	1.0		MHGBS2	1.11	01	MHGBB1	1.22	01
PART CODE	PART NO.	QTY.	PART CODE	PART NO.	QTY.	PART CODE	PART NO.	QTY.
MANUFACTURED						BEARING + HARDWARE		

Details Of Main Gear Box



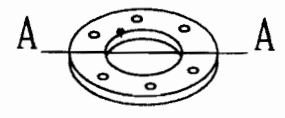
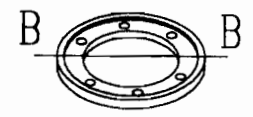
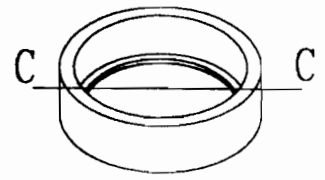
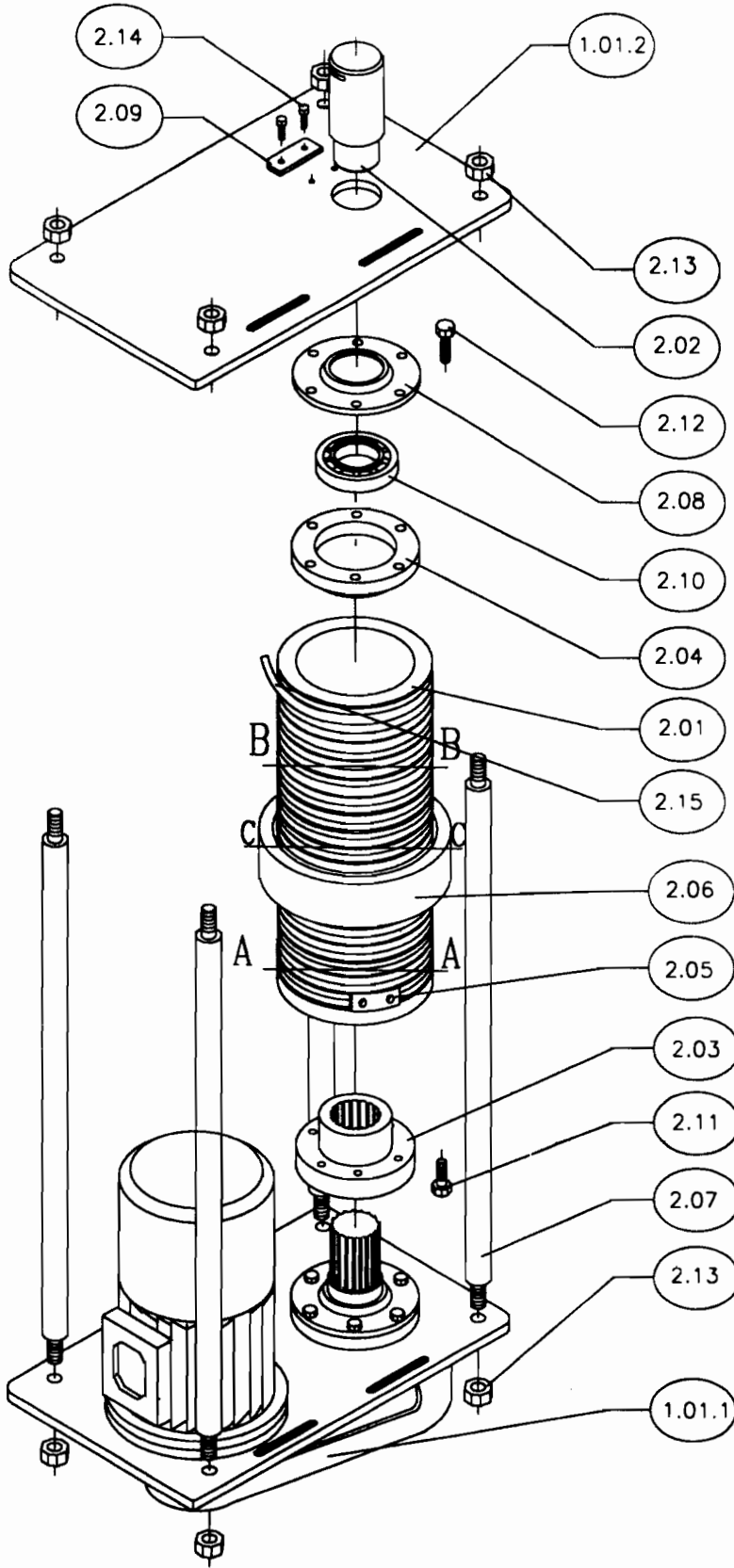
ASSEMBLY FLOW CHART OF WIRE ROPE DRUM

DRUM ASSEMBLY

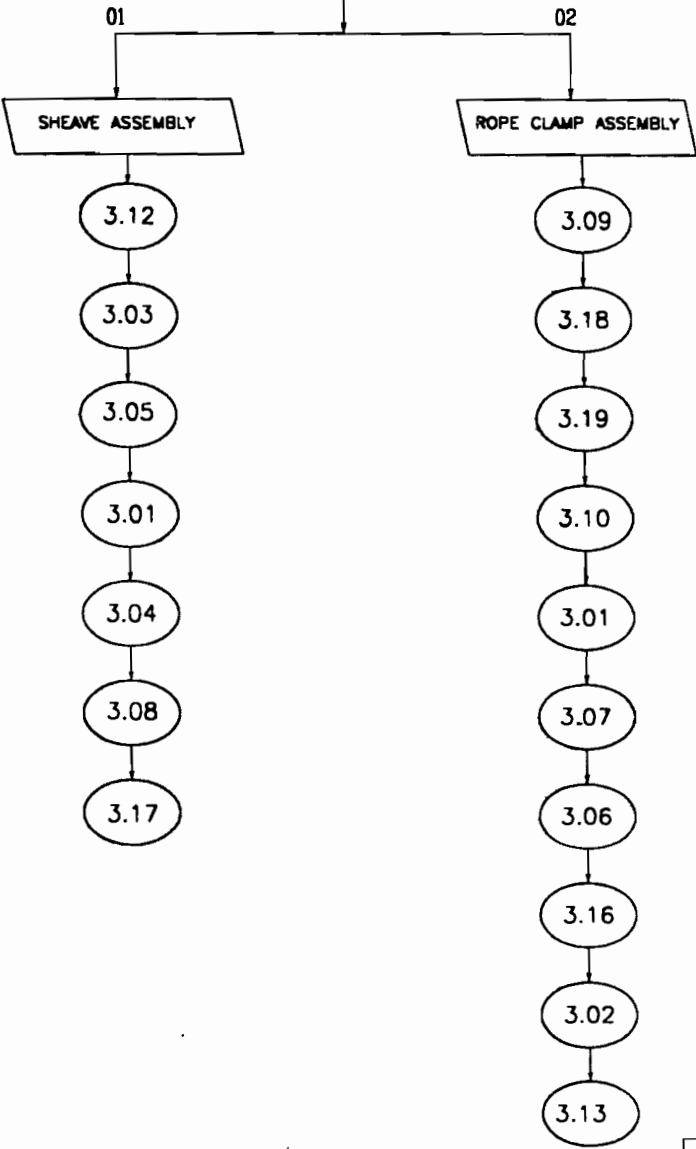


			MHDALP	2.09	01
			MHDAHC	2.08	01
			MHDATR	2.07	04
			MHDARG	2.06	01
MHDAWR	2.15	01	MHDARC	2.05	02
MHDALB	2.14	02	MHDABH	2.04	01
MHDATN	2.13	08	MHDADC	2.03	01
MHDAHB	2.12	06	MHDADP	2.02	01
MHDACB	2.11	06	MHDARD	2.01	01
MHDABG	2.10	01	MHDA	2.0	
LOCATION CODE	PART NO.	QTY.	LOCATION CODE	PART NO.	QTY.
BEARING + HARDWARE			MANUFACTURED		

Details Of Wire Rope Drum Assembly

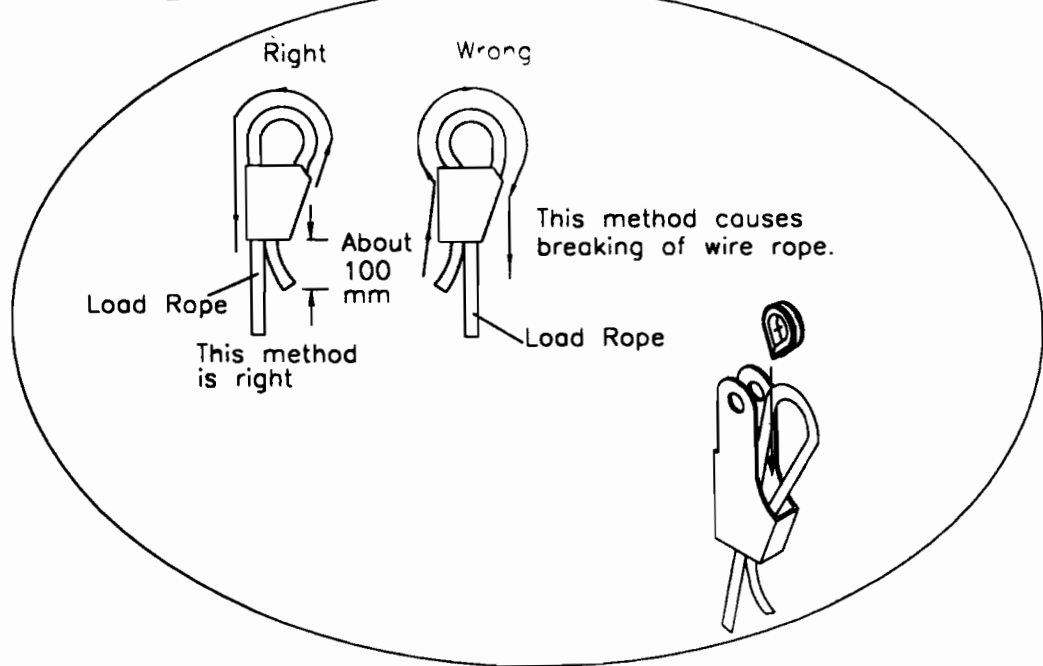
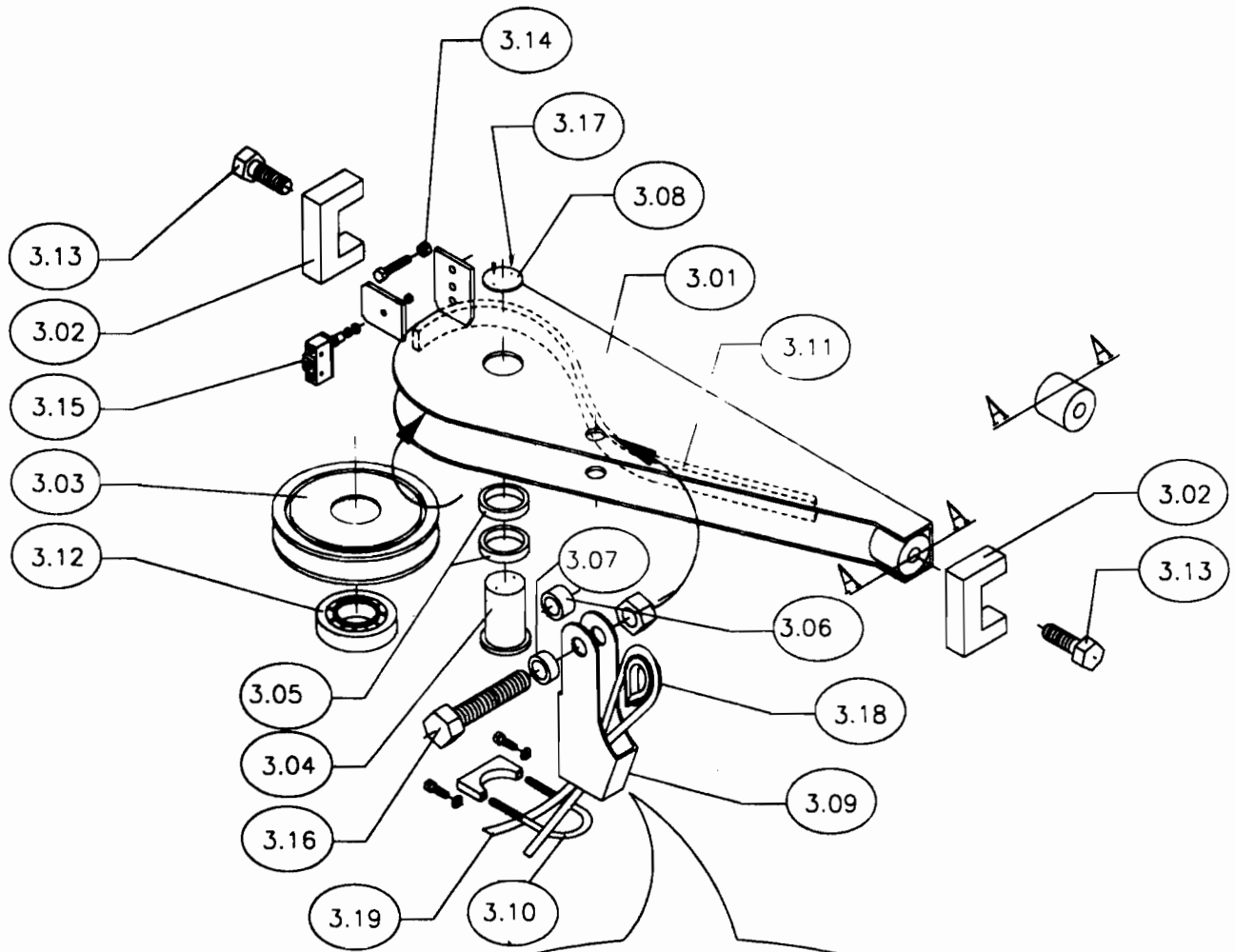


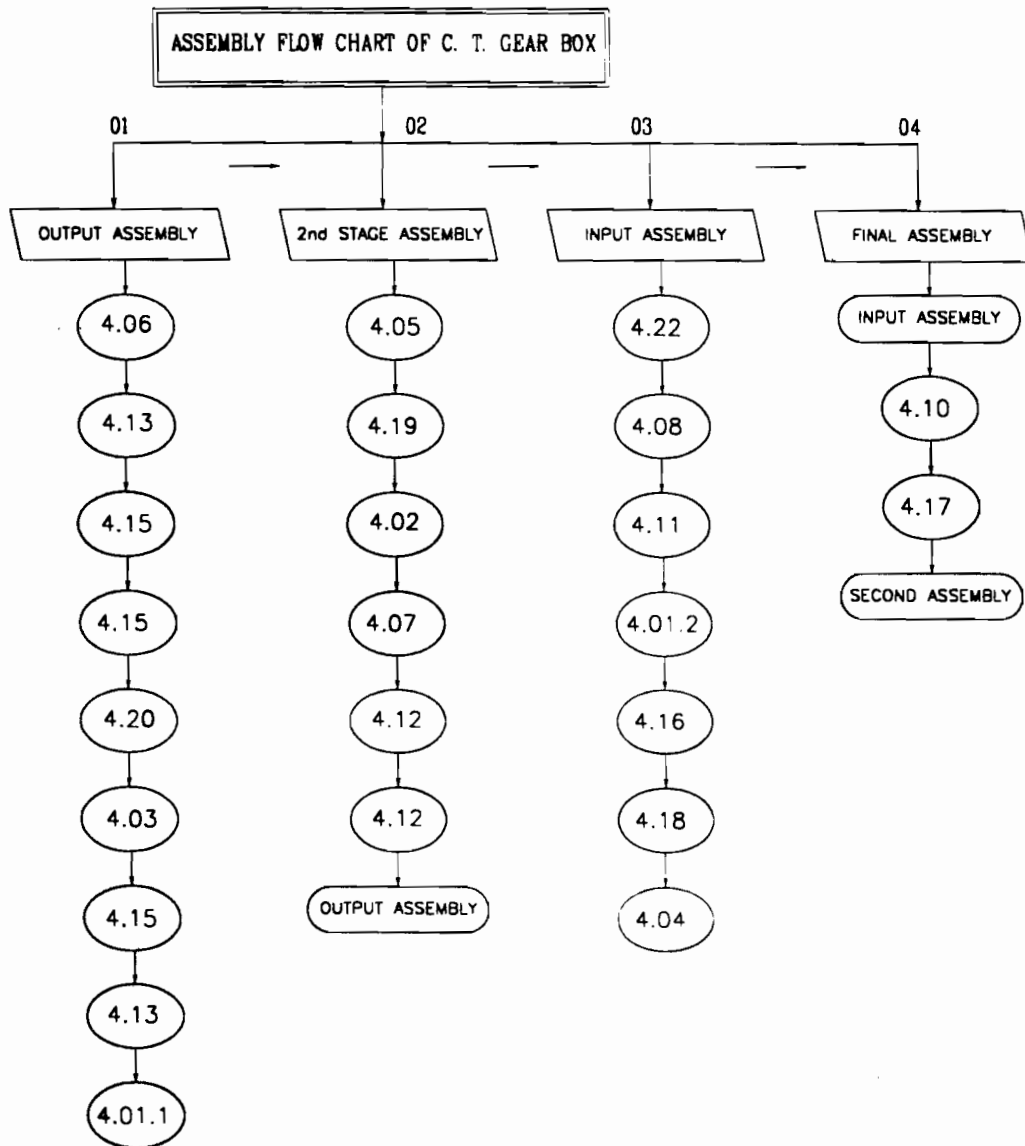
ASSEMBLY FLOW CHART OF EQUALISING BRACKET



			MHEQRC	3.11	01
			MHEQUC	3.10	01
			MHEQFC	3.09	01
			MHEQLP	3.08	01
MHEQRP	3.19	01	MHEQS3	3.07	01
MHEQRE	3.18	01	MHEQS2	3.06	01
MHEQLB	3.17	02	MHEQS1	3.05	02
MHEQBN	3.16	01	MHEQSP	3.04	01
MHEQLS	3.15	01	MHEQSH	3.03	01
MHEQBB	3.14	02	MHEQBH	3.02	01
MHEQRB	3.13	02	MHEQBK	3.01	01
MHEQBG	3.12	01	MHEQ	3.0	
LOCATION CODE	PART NO.	QTY.	LOCATION CODE	PART NO.	QTY.
BEARING + HARDWARE			MANUFACTURED		

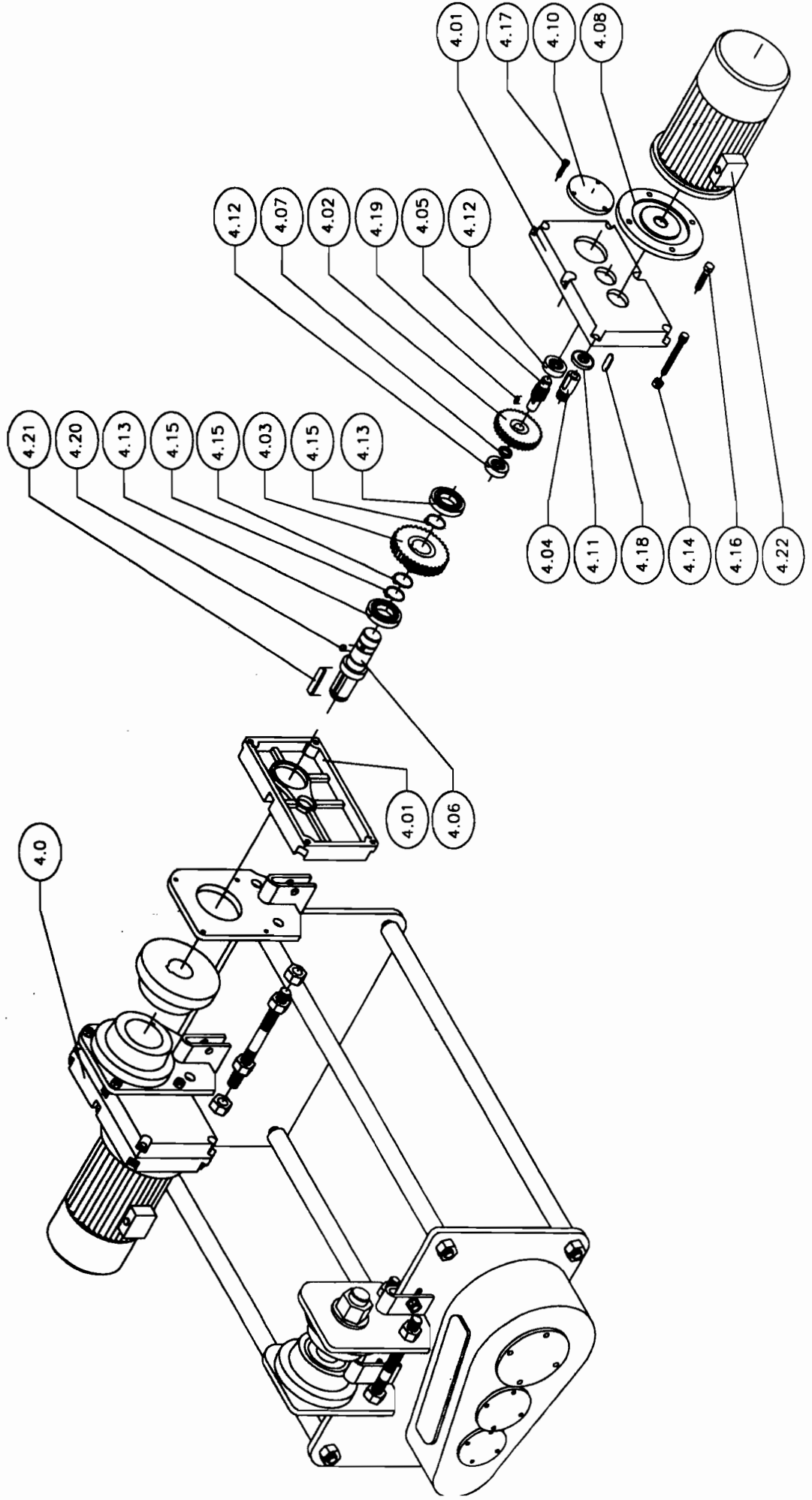
Details Of Equalising Assembly



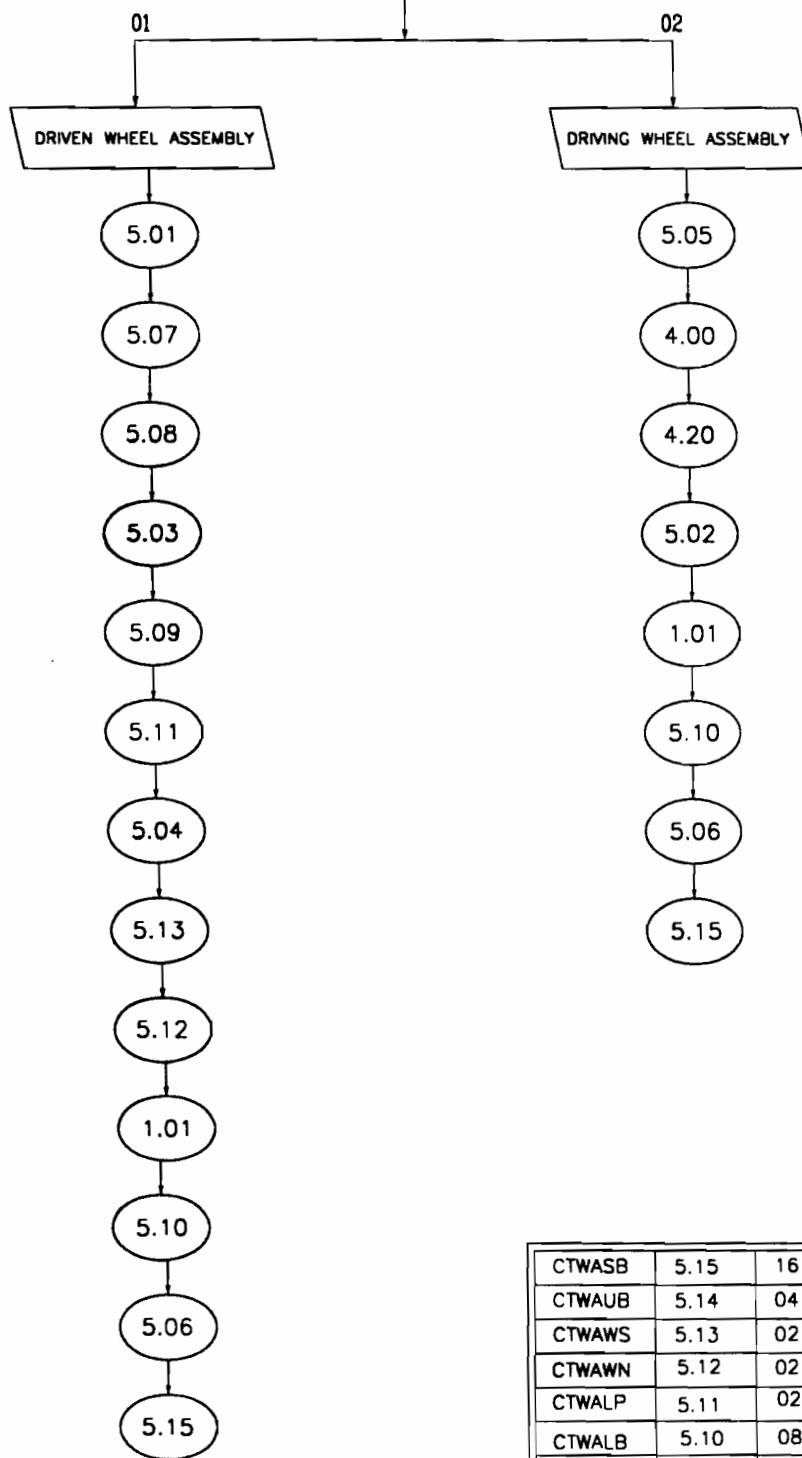


CTGBMO	4.22	01			
CTGBOK	4.21	01			
CTGBK3	4.20	01	CTGBCO	4.10	02
CTGBK2	4.19	01	CTGBMF	4.08	01
CTGBK1	4.18	01	CTGBSR	4.07	01
CTGBCS	4.17	18	CTGBOP	4.06	01
CTGBFB	4.16	04	CTGBP2	4.05	01
CTGBCR	4.15	03	CTGBP1	4.04	01
CTGBNB	4.14	06	CTBG2	4.03	01
CTGBOB	4.13	02	CTBG1	4.02	01
CTGBB2	4.12	02	CTGBBD	4.01	01
CTGBOS	4.11	01	CTGB	4.0	
LOCATION CODE	PART NO.	QTY.	LOCATION CODE	PART NO.	QTY.
BEARING + HARDWARE			MANUFACTURED		

Details Of C. T. Gear Box

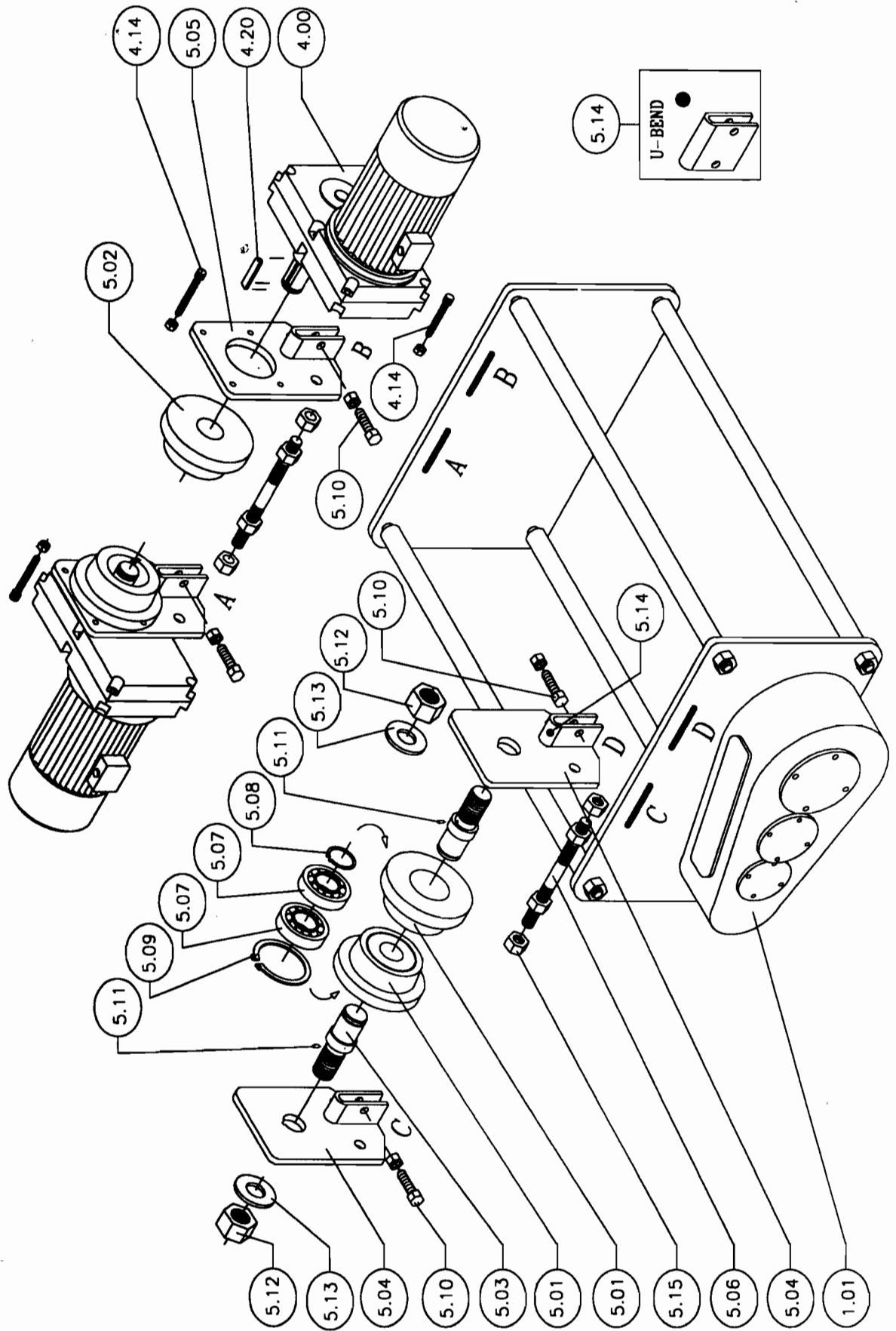


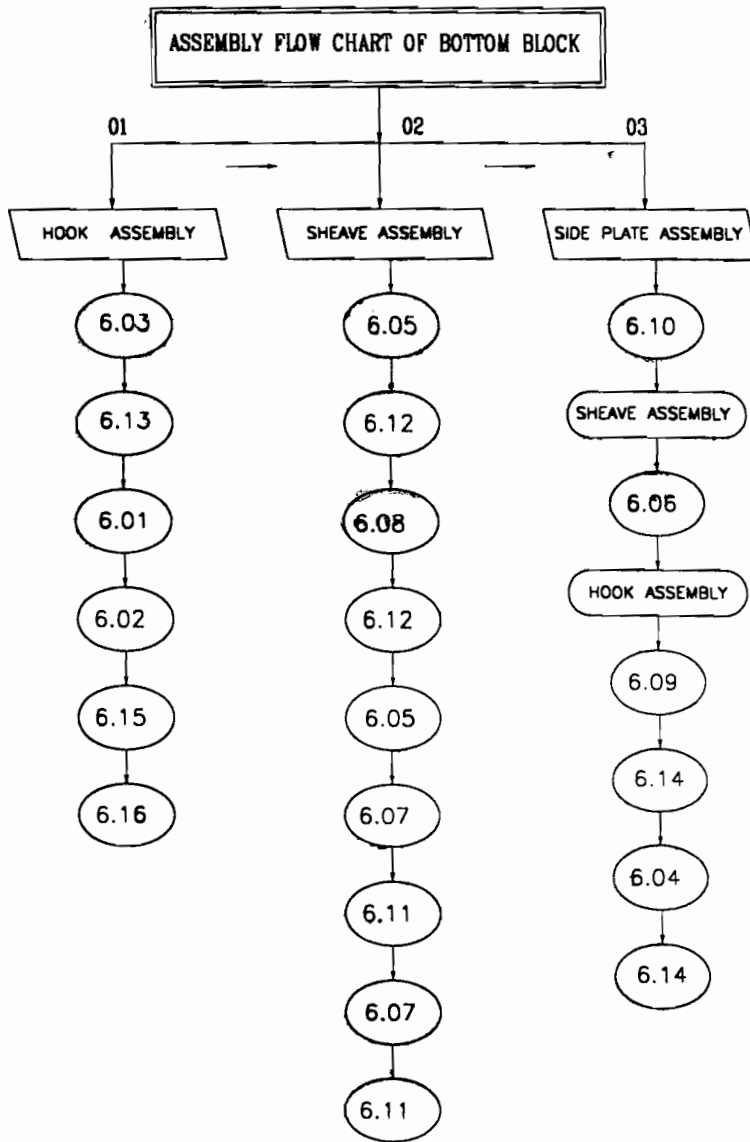
ASSEMBLY FLOW CHART OF C. T. WHEEL



CTWASB	5.15	16			
CTWAUB	5.14	04			
CTWAWS	5.13	02	CTWAST	5.06	04
CTWAWN	5.12	02	CTWAP2	5.05	02
CTWALP	5.11	02	CTWAP1	5.04	02
CTWALB	5.10	08	CTWAWP	5.03	02
CTWAC2	5.09	02	CTWAW2	5.02	02
CTWAC1	5.08	02	CTWAW1	5.01	02
CTWABG	5.07	04	CTWA	5.0	
PART CODE	PART NO.	QTY.	PART CODE	PART NO.	QTY.
BEARING + HARDWARE			MANUFACTURED		

Details Of C. T. Wheel Assembly

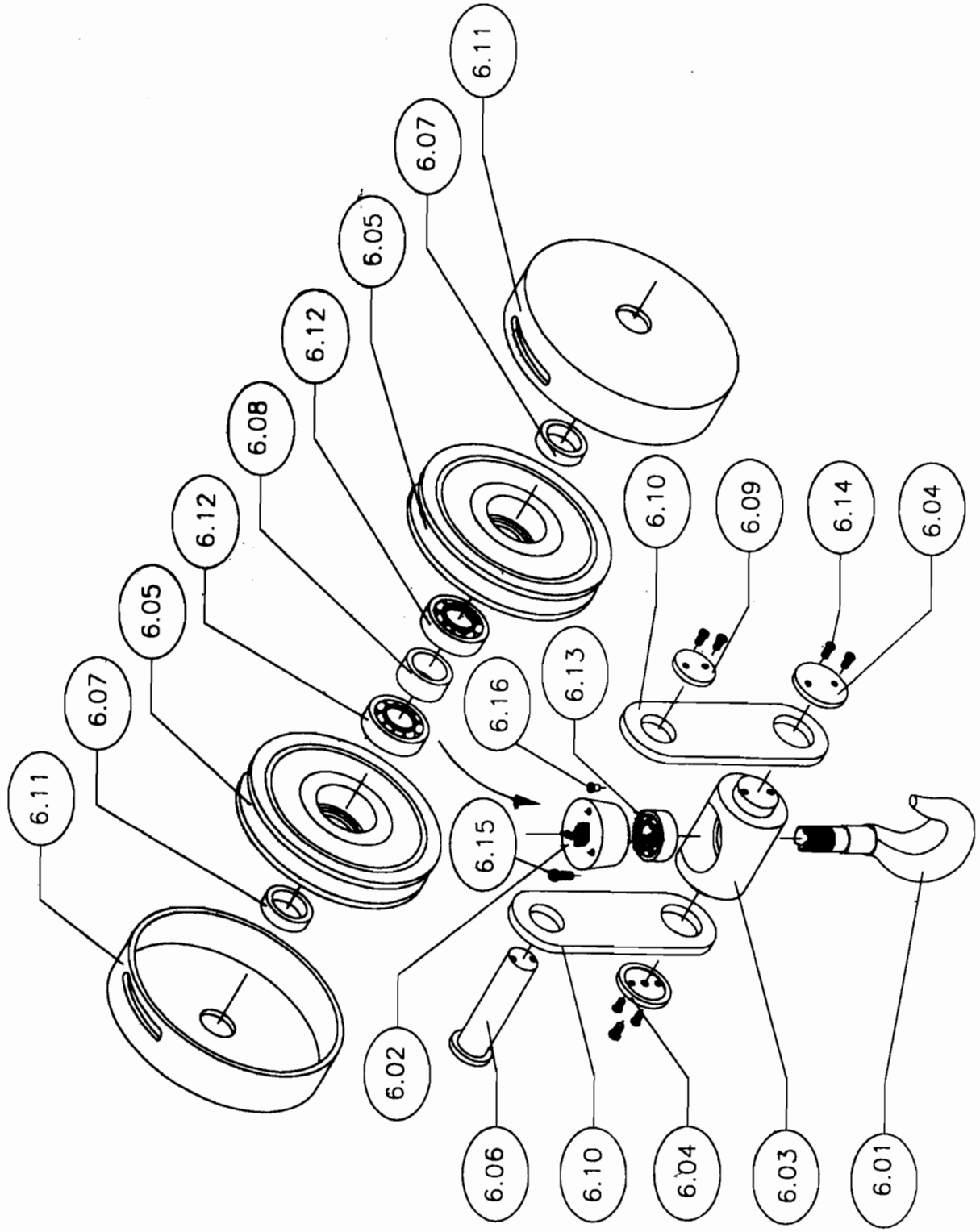


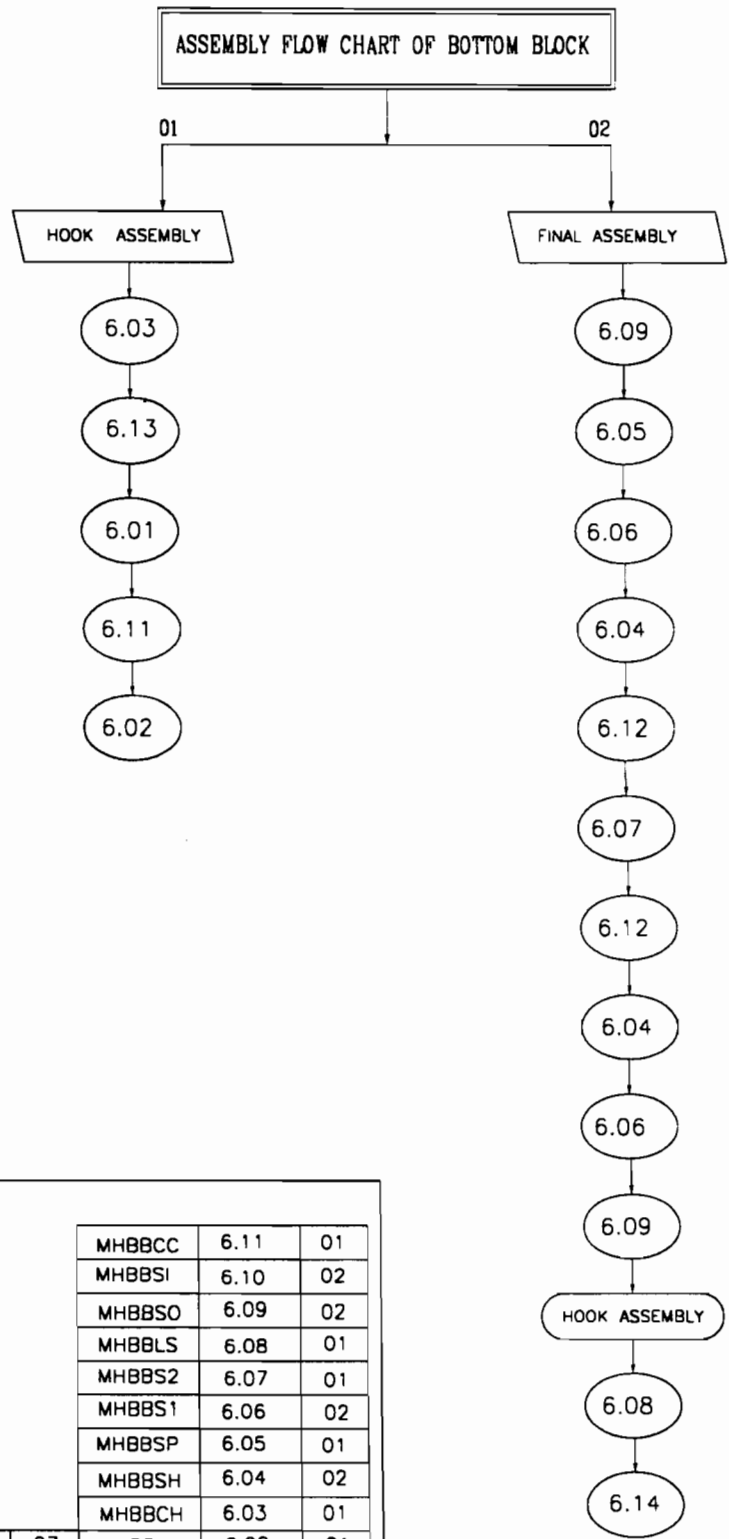


			MHBBSI	6.11	02
			MHBBSO	6.10	02
			MHBBLS	6.09	01
			MHBB2	6.08	01
			MHBB1	6.07	02
			MHBBSP	6.06	01
			MHBBSH	6.05	02
MHBBHC	6.16	03	MHBBLC	6.04	02
MHBBHB	6.15	02	MHBBCH	6.03	01
MHBBSC	6.14	12	MHBBHN	6.02	01
MHBBCB	6.13	01	MHBBHK	6.01	01
MHBB2	6.12	02	MHBB	6.0	
PART CODE	PART NO.	QTY.	PART CODE	PART NO.	QTY.
BEARING + HARDWARE			MANUFACTURED		

Details Of Bottom Block

(> 5 TON)





			MHBBC	6.11	01
			MHBBSI	6.10	02
			MHBBSO	6.09	02
			MHBBL5	6.08	01
			MHBBS2	6.07	01
			MHBBS1	6.06	02
			MHBBSH	6.04	02
			MHBBSCH	6.03	01
MHBBS	6.14	07	MHBHBN	6.02	01
MHBBCB	6.13	01	MHBHKB	6.01	01
MHBBSB	6.12	02	MHBB	6.0	
LOCATION CODE	PART NO.	QTY.	LOCATION CODE	PART NO.	QTY.
BEARING + HARDWARE			MANUFACTURED		

Details Of Bottom Block (< 5 TON)

