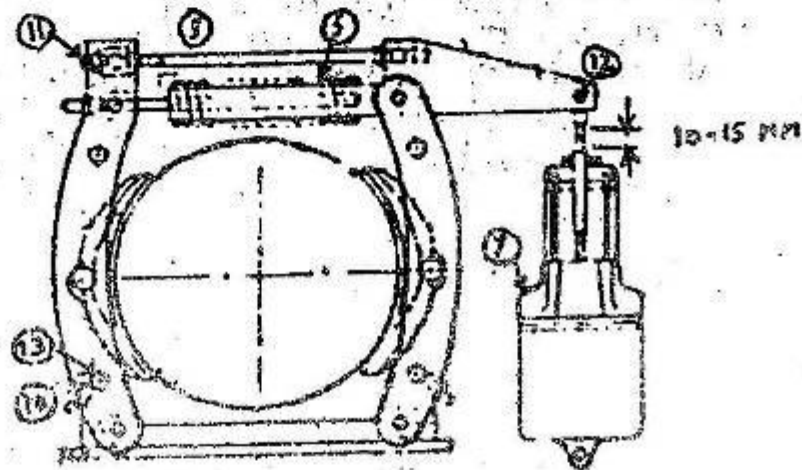


READING MATERIAL
ON
MAINTENANCE & ADJUSTMENT OF
THRUSRER & DC BRAKE



ROURKELA STEEL PLANT
HUMAN RESOURCE DEVELOPMENT CENTRE
READING MATERIAL

4.00 LECTURE CONTENT

The drives used in different type of machinery must in many cases be fitted with brakes. Their reliability and good functioning are of considerable importance if damage to property and fatal accidents are to be avoided. Different types of brakes used in our steel plants are :

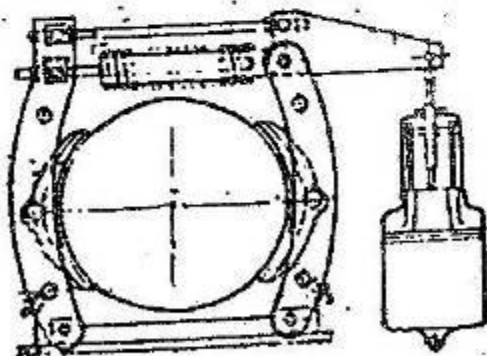
- * BAND BRAKES
- * DISC BRAKES
- * SHOE BRAKES

Double shoe brakes are in wide use in equipments like cranes, skip winches, scale cars etc.

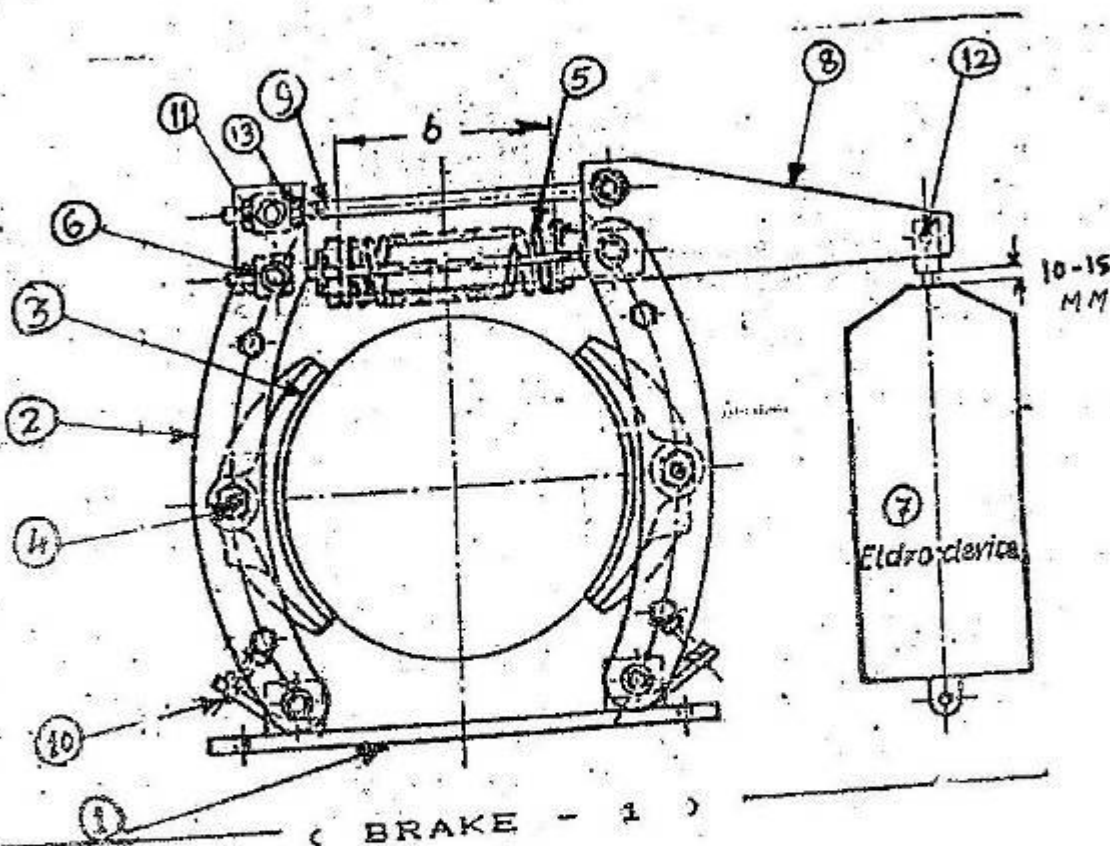
Special attention is required for maintenance and adjustment of brakes in the overhead cranes used for hoisting/ lowering of heavy loads.

4.01 CONSTRUCTIONAL DETAILS

Given below is a very common type of brake assembly widely used in our plant.



In the fig. (Brake - 1) all components of a standard (RSN) brake assembly are shown.



- | | |
|-------------------------------|-------------------------|
| 1. BASE | 8. LEVER |
| 2. ARMS | 9. BRAKE ROD |
| 3. BRAKE SHOES | 10. STOP BOLTS |
| 4. THREADED PINS | 11. BRAKE ROD SCREW |
| 5. BRAKE SPRING | 12. STUD |
| 6. ADJUSTING BOLTS | 13. BRAKE ROD INNER NUT |
| 7. ELECTO-HYDRAULIC THRUSTER. | |

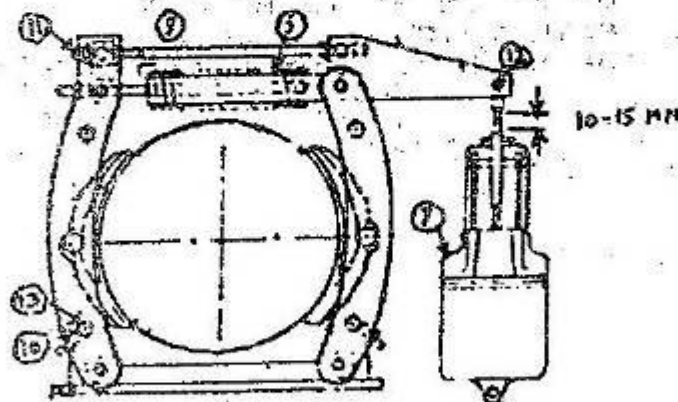
4.02 INITIAL ADJUSTMENT OF BRAKES

BEFORE ADJUSTMENT OF BRAKE ASSEMBLY MAKE SURE THAT :

- * Eldro is disengaged by removing the stud (12).
- * Brake spring (5) is completely released.
- * All moving parts of the brake assembly are thoroughly greased.

STEPS TO BE FOLLOWED FOR ADJUSTMENT:

1. Recouple the eldro device by inserting the stud (12).
2. Switch in the eldro device and run it in to its end position.



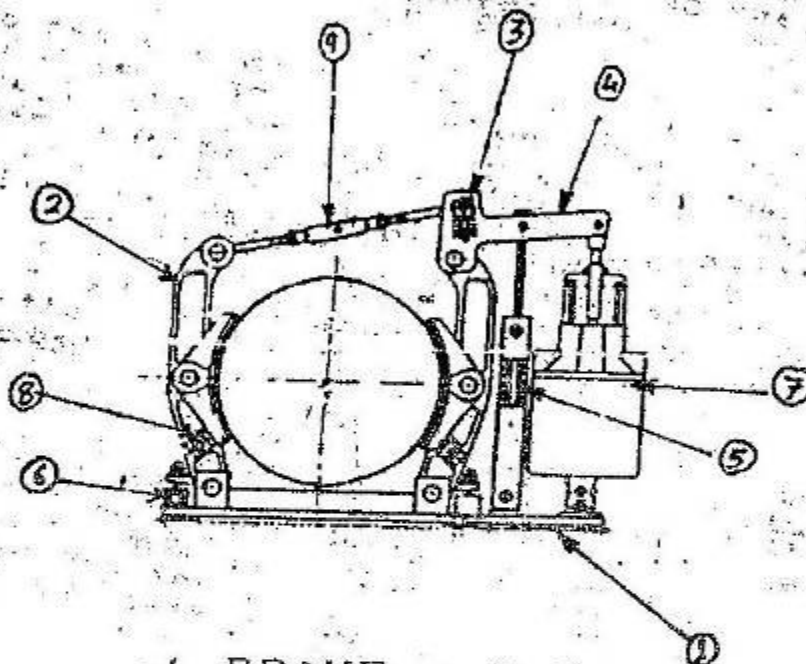
3. Adjust the stop bolts (10) to an extent that both brake blocks are lifted off the brake drum by 2 mm (approx).

4. Un- screw the stop bolts (10) on the side of the eldro device to such an extent that a play of 0.5 mm exists between the bolt head (10) and stop bolt (13).
5. Secure both stop bolts (10) by counter nuts to ensure tight seat.
6. Switch off the eldro device for setting up the brake shoes.
7. Adjust brake rod screw (11) such that with switched off eldro device and applied brake blocks a slowing down path of at least 10 mm is attained

" AT ADVANCING SERVICE LIFE OF THE BRAKE ASSEMBLY THE SPACING GETS REDUCED ACCORDING TO THE WEAR OF THE BRAKE LINING, SO ADJUSTMENT OF BRAKE CORRESPONDING TO ACTUAL WEAR SHOULD BE CARRIED OUT IN SUCH A MANNER THAT A GAP OF 10-15 MM IS REGAINED AS SLOWING DOWN PATH. THIS IS TO BE DONE BY READJUSTMENT OF NUTS (11) ON BRAKE ROD (9). "

4.03 DIN STANDARD BRAKE:

A DIN standard design has been developed which is of robust construction and functionally meets all requirements of crane operation.



(BRAKE - 2)

The main parts of the assembly are :

- | | |
|---------------------|----------------------------|
| 1. Extended base | 6. Resilient stops |
| 2. Brake lever | 7. Eldro device |
| 3. Adjusting device | 8. Spring loaded stops |
| 4. Lever | 9. Brake rod (Turn buckle) |
| 5. Brake spring | |

The out standing features of this brake assembly are :

- * SIMPLE DESIGN
- * RELIABLE TORQUE ADJUSTMENT
- * EASY ONE POINT ADJUSTMENT FOR WEAR
- * USE OF INTERCHANGEABLE COMPONENTS

In the new type of brake assembly shown on previous page adjustment of wear is affected at only one point of the brake linkage. This facilitates proper and easy maintenance. Shortening of brake rod by means of turn buckle (9) causes the gallow of the thruster to be returned to its original position when wear has occurred on brake shoes. At the same time the brake spring is reset to its original position. So whenever the brake is re-adjusted the brake spring need not be tensioned seperately. The brake release movements are affected by resilient stops (8). The compression springs are so designed that readjustment is not necessary as long as wear is taking place. They can be given such an initial setting by set screws that the brake blocks are always uniformly released.

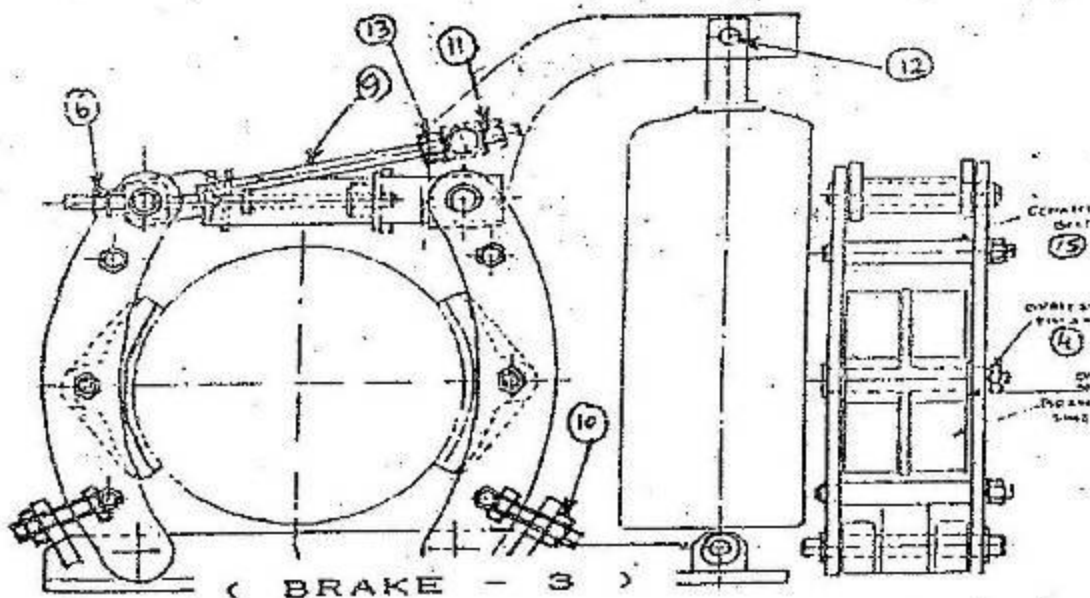
4.04 REPLACEMENT OF BRAKE SHOES IN STANDARD (RSN) BRAKE ASSEMBLY

ON NO ACCOUNT SHOULD BRAKE LINING BE ALLOWED TO WEAR OUT TO AN EXTENT THAT RIVETS BY WHICH THESE LININGS ARE FIXED ARE GRINDING ON THE BRAKE DRUMS.

NO GREASE OR OIL SHOULD TOUCH BRAKE LININGS OR THE BRAKE DRUMS

Given below are some important steps which must be followed in sequence while replacing worn out brake shoes.

Before starting the brake shoe changing work, lower the load if any to a safe position. Also the rope on the drum to be un wound leaving only 2-3 rounds of rope on the rope drum. It is important for safety of the individuals working on brakes. Some times the rope on rope drum gets un- wound because of its own weight.



- 1) After lowering the load loosen the out side nut (11) of brake rod (9) and take it out.
- 2) Spring nut (6) to be loosened and taken out.
- 3) Take out the eldro fixing stud (12).

- 4) Loosen the nuts of connecting pin (15) which connect side arms of the brake.
- 5) Loosen the stop bolts (10) and create a gap of about 3-5 mm.
- 6) Open out the brake shoe threaded pin nut (4) and take out the pin and the shoe to be replaced.

WHILE TAKING OUT THE PIN AND SHOES MAKE SURE TO COLLECT THE CUP SPRINGS FITTED WITH BRAKE SHOES.

- 7) Check the pin with new spare brake shoe to make sure that it is neither too tight nor too loose.
- 8) Fix the new /spare brake shoe with cup springs placed in correctly (wider side facing out side).
- 9) Fix the threaded pin nut (4) loosely.
- 10) Tighten the spring with the help of spring nut (8) to get the required compressed length (SEE THE CHART GIVEN BELOW)

BRAKE SIZE /
SPRING LENGTHS

BRAKE DRUM DIAMETER IN MM	SPRING LENGTH PRE-COMPRESSED IN MM	SPRING LENGTH (COMPRESSED) IN MM
φ 200	109	95/101
φ 250	133	112
φ 315	150	133/131/132
φ 400	208	229/215
φ 500	266	249
φ 630	352	304/297/290
φ 710	477	324/288/298

SAIL/CHRD/EM/BBS/91

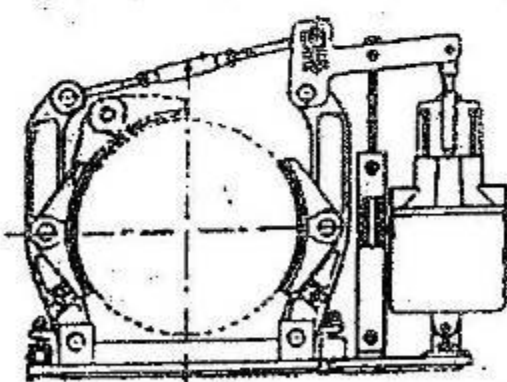
(BRAKE - 6)

BRAKE

- 11) Tighten the connecting pin nuts fully.
- 12) Tighten the brake shoe threaded pin nut fully.
- 13) Connect eldro device with stud (12).
- 14) Adjust the brake rod nut (11) to an extent that you get a gap of approx. 10-15 mm on eldro.
- 15) Tighten the inside check nut (13) of the brake rod (9).
- 16) Adjust the stop bolts (10) to have a gap of about 0.5 mm.
- 17) Test the brake for given load.
- 18) In case there is any slackness loosen inside nut of the brake rod and adjust the spring slightly.

4.05 REPLACEMENT OF BRAKE SHOE IN DIN- STD. BRAKE ASSEMBLY :

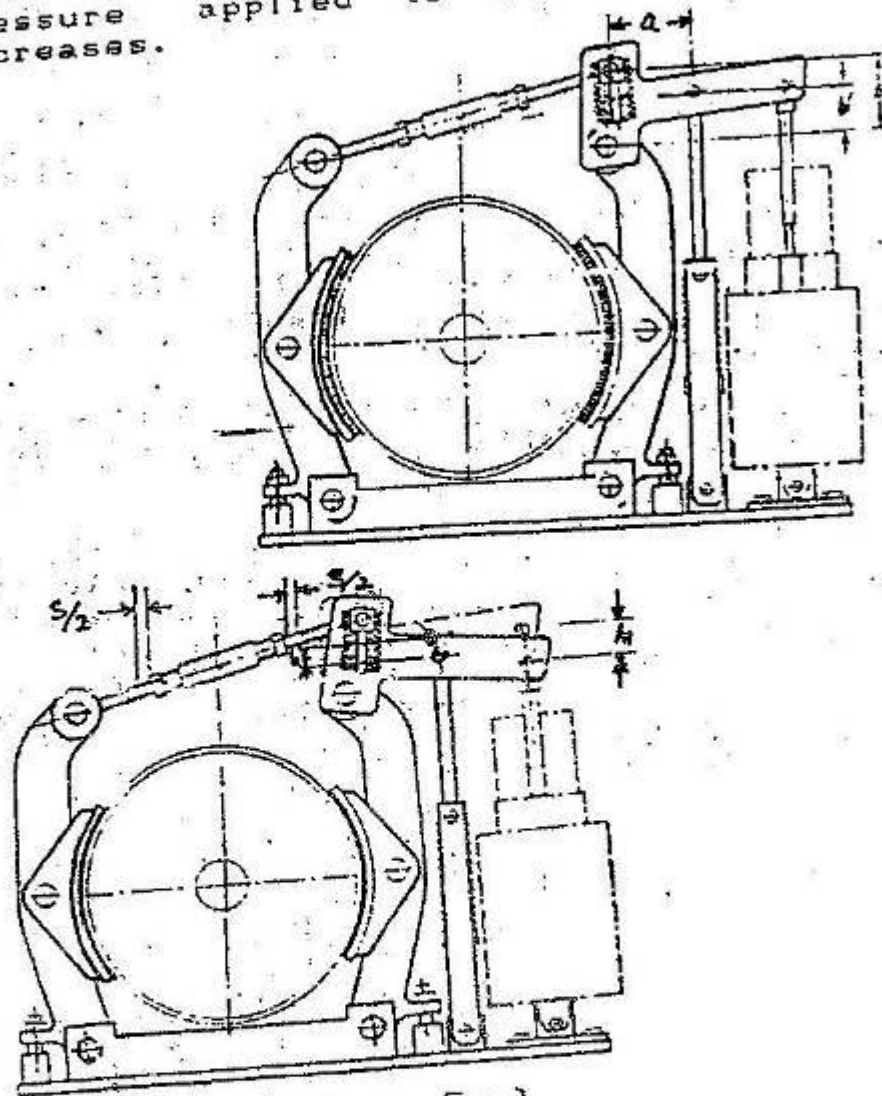
In DIN- standard brake assemblies wornout brake shoes can be replaced without opening the arms. As shown below, take out the brake shoe pin and shift the brake shoe to the top for taking it out. Similarly put the new shoe at the top and shift it down upto the brake pin position.



(BRAKE - 4)

4.06 ADJUSTMENT OF DIN- STD. BRAKES

As shown in fig. below, by adjusting the dimension from (b) to (b') the leverage increases from a/b to a/b' thus the pressure applied to the brake also increases.



(BRAKE - 5)

When brake linings are worn out, the turn buckle is turned and the pull rod shortened by (S). This lifts the brake release lever by (h1) and spring by (hf) to their original setting.

In case of an even lining wear automatic centering of brakes is achieved by spring loaded stops (8) holding the brake shoes.

PROCEDURE FOR INSTALLATION (REFER FIG)

1. Assemble the Brake Wheel on the motor shaft.
2. Back off the Pull Rod by loosening nut (1) about 1 inch.
3. Turn the bolt assembly (6) to lift the wedge assembly (7) at the top of the inner shoe (15).
4. Slide the brake into the place around the brake wheel and insert the bolt into the base mounting surface.
5. Loosen the holding screws (21) on both shoe levers leaving only a light grip.
6. Push the shoe levers (15) and (19) against the brake wheel and check whether the shoes fit evenly across the wheel face.
7. Adjust the base into the best position to get the most favorable fit of the shoes against the wheel face.
8. If the mounting surface is not flat or is not parallel to the shaft axis, shimming may be necessary. Tighten the holding bolts to hold the base firmly in place.
9. Remove packing against torque adjusting screw (13) & wires/ clamps from the top of the armature.
10. Tighten the pull rod nut (1) until the outer armature (10) and sounding pin (12) is flushed when pressed with hand.
11. Turn the screw (6) on the top of the inner shoe lever counterclockwise to move the wedge downwards until the inner armature (8) and sounding pin (12) is flushed when pressed with hand.
12. Tighten screws (21) on the shoes.
13. Connect the supply and operate the brake. Brake is installed.

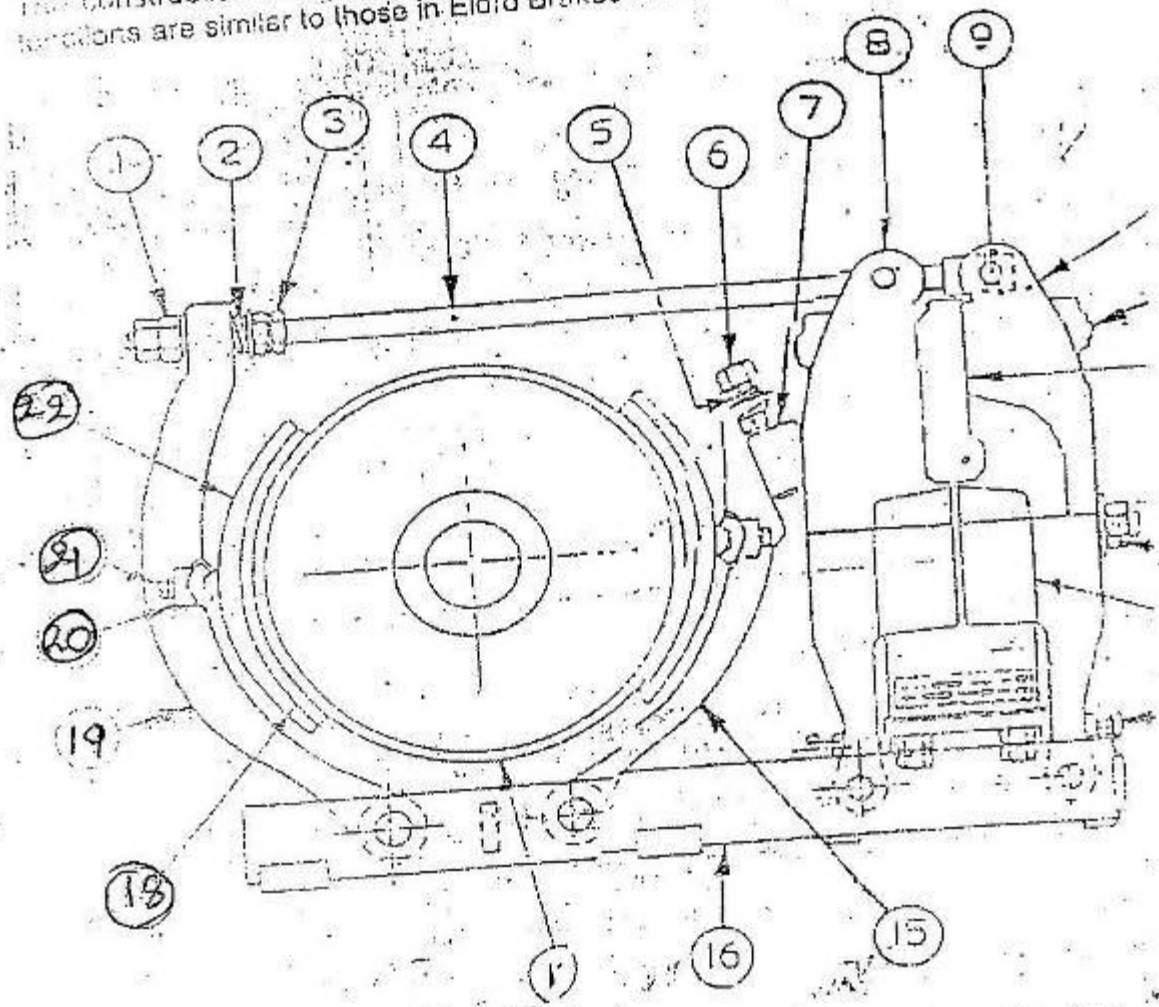
TORQUE ADJUSTMENT

Maximum torque is obtained by turning the torque adjuster (13) clockwise until the end inside is tight against the stop. Torque less than the maximum value is obtained by turning the torque adjuster (13) counterclockwise. Check the name plate of the brake and the table for the torque setting and the duty of the brake.

ELECTROMAGNETIC SHOE BRAKE

CONSTRUCTIONAL DETAIL

The constructional details, has been shown in the figure below. The parts and the functions are similar to those in Eldro Brakes except the Electro-magnetic device.



- | | |
|-------------------------|---------------------------|
| 1- LOCK NUT. | 13- TORQUE ADJUSTING NUT. |
| 2- COMPRESSION SPRING. | 14- COIL. |
| 3- LOCK NUT. | 15- SHOE LEVER (INNER) |
| 4- PULL ROD. | 16- BASE. |
| 5- SPRING. | 17- BRAKE WHEEL. |
| 6- WEDGE ADJUSTING BOLT | 18- SHOE LINING |
| 7- ADJUSTING WEDGE. | 19- SHOE LEVER (OUTER) |
| 8- ARMATURE (INNER). | 20- CLAMP. |
| 9- PIN | 21- CAP SCREW. |
| 10- ARMATURE (OUTER) | 22- SHOE COMPLETE |
| 11- DUST COVER | 23- ARMATURE SETTING NUT |
| 12- SOUNDING PIN. | |

Note that when the brake is properly adjusted for proper stroke, the torque adjuster washer face stands clear of the armature (10) surface. As the liner wears, the clearance decreases. If the adjustment is neglected, the brake operation becomes sluggish and when the torque adjuster washer touches the armature surface (10) the torque drops rapidly reaching zero when the clearance is used up. The clearance dimension is not a measurable value but depends upon proper adjustment of individual brake.

TABLE FOR TORQUE ADJUSTMENT

Sl. No	Brake size	Type of Brake	Duty	Rated torque Nm (lbf.ft)	Back of turn of Nut (13) from solid	
					Int/ 1hr	Cont/1 hr
1	8" / 200 mm	Shunt	Intermittent	135.6 (100)	0	-
			Continuous	101.7 (75)	-	2&1/6
		Series	1/2 Hour	135.6 (100)	0	-
			1 Hour	88.2 (65)	-	3
2	10" / 250 mm	Shunt	Intermittent	271.2 (200)	0	-
			Continuous	203.4 (150)	-	3&1/6
		Series	1/2 Hour	271.2 (200)	0	-
			1 Hour	176.3 (130)	-	4&1/6
3	13" / 300 mm	Shunt	Intermittent	745.7 (550)	0	-
			Continuous	542.3 (400)	-	2&1/3
		Series	1/2 Hour	745.7 (550)	0	-
			1 Hour	495 (365)	-	3&1/6
4	16" / 400 mm	Shunt	Intermittent	1355.8 (1000)	0	-
			Continuous	1017 (750)	-	2&1/6
		Series	1/2 Hour	1355.8 (1000)	0	-
			1 Hour	881.8 (630)	-	3&1/2
5	19" / 500 mm	Shunt	Intermittent	2711.6 (2000)	0	-
			Continuous	2033.7 (1500)	-	1&5/6
		Series	1/2 Hour	2711.6 (2000)	0	-
			1 Hour	1762.6 (1300)	-	2&2/3
6	23" / 600 mm	Shunt	Intermittent	5423.3 (4000)	0	-
			Continuous	4067.5 (3000)	-	2
		Series	1/2 Hour	5423.3 (4000)	0	-
			1 Hour	3525.2 (2600)	-	2&1/2

MAINTENANCEA. RENEWAL OF BRAKE SHOE LINING

1. Back off nut (1) on the pull rod (4) or turn the bolt (6) to lift the wedge to relieve the pressure between the chosen shoe and the wheel.
2. Remove screws (21) from the shoe which is to be taken out.
3. Slide out the shoes sideways.
4. After removing the old linings and nut/ bolts, clamp the new lining in such a way that it lies closely in the shoe.
5. Drill holes (different for different sizes of brakes) through the lining from the rear of the shoe.
6. Counterbore from the front of the lining and fit the bolts/ nuts.
7. When replacing the shoes, slide it into the grove and put it in the screws loosely.
8. Press the shoes against the wheel and tighten screws (21).
9. Readjust the brake.

B. READJUSTMENT OF BRAKE WHEN SHOE LININGS WEAR

Periodic checks should be made at the installation and when sounding pins (12) depress more than 1/64" (0.4 mm) below the surface of the armature, adjustments should be made to compensate for the wear of lining.

1. Tighten Nut (1) on the pull rod until the sounding pin in the outer armature flushes with the surface of the armature, when pressed in de-energised condition.
2. Turn the bolt (6) counterclockwise till the inner armature (8) and the sounding pin flushes within the surface in the de-energised condition.

C. RENEWAL OF COIL

The brake coil can be replaced without removing the brake wheel but the brake will require readjustment.

1. Reduce the brake torque to minimum i.e. turn the torque nut anti-clockwise till it stops moving.
2. Take out the spring pin and back off the nut (13).
3. Remove the nut (1) and lift the pull rod.
4. Take the wedge (7) upwards to a maximum with the help of bolt (6) so that there is maximum clearance between wheel and inner shoe.
5. Take out the inner shoe.
6. Remove the holding screws of the coil.
7. Push the outer armature outward and the inner armature inward.
8. Remove the old coil and replace the new coil.
9. Put the holding screws of the coil.
10. Push the torque adjusting screw assembly in inner armature and then push both inner and outer armature back to original position.
11. Replace the inner shoe assembly.
12. Reset the brake with reference to sounding pins.
13. Replace washer nut and spring pin on torque adjusting screw assembly (13).
14. Set the torque.

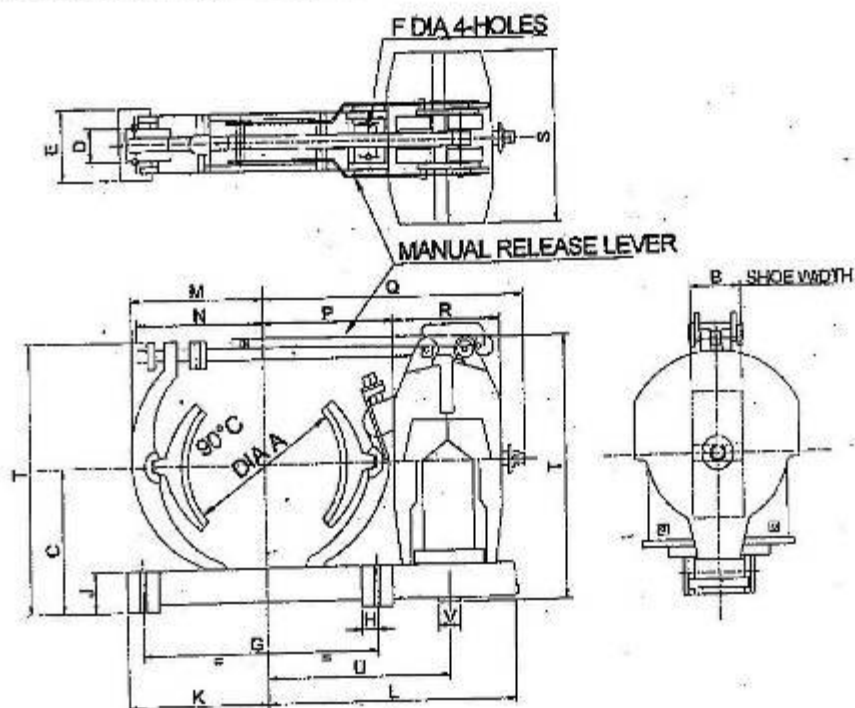
MANUAL RELEASE ATTACHMENT

The brakes are electrically released and spring set to achieve fail safe operation i.e. in the event of power failure, the brake applies automatically eliminating the risk of potential damage. However, in certain applications, on power failures, it may be necessary to release the brake manually for a short time. The manual release attachment is used for this purpose.

In rare cases, it may happen that the outer brake shoe does not release fully when the manual release is used. Under such circumstances, it will be necessary to do the following adjustments.

[6]

1. Operate the manual release until the inner shoe is clear of the drum.
2. Adjust the inner armature setting screw such that the movement of inner armature is stopped at this stage.
3. Further lifting the manual release handle should release the outer shoe since at this stage the outer armature is now permitted to move.
4. Satisfactory release of brake is now achieved.
5. After doing this setting, ensure that normal operation has not been impaired anyway by the change in setting, by operating the brake electrically a few times on resumption of power.



BRAKE TYPE	DRUM DIA. mm	MAX. RATED TORQUE (Kg.M) mm
KCH-200	200	13.8
KCH-300	300	76.0
KCH-400	400	138.3

CODE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KCH-200	200	80	170	60	121	17.4	350	19	50	194	406	166	164	209	417	181	242	338	298.4	38
KCH-300	300	140	240	80	165	22.2	500	25	68	275	514	239	238	284	524	216	331	480	390	38
KCH-400	400	165.1	320	90	184	25	540	25	57	195	538	311	305	315	656	216	381	590	419	38

