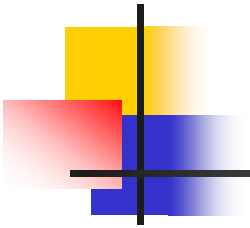
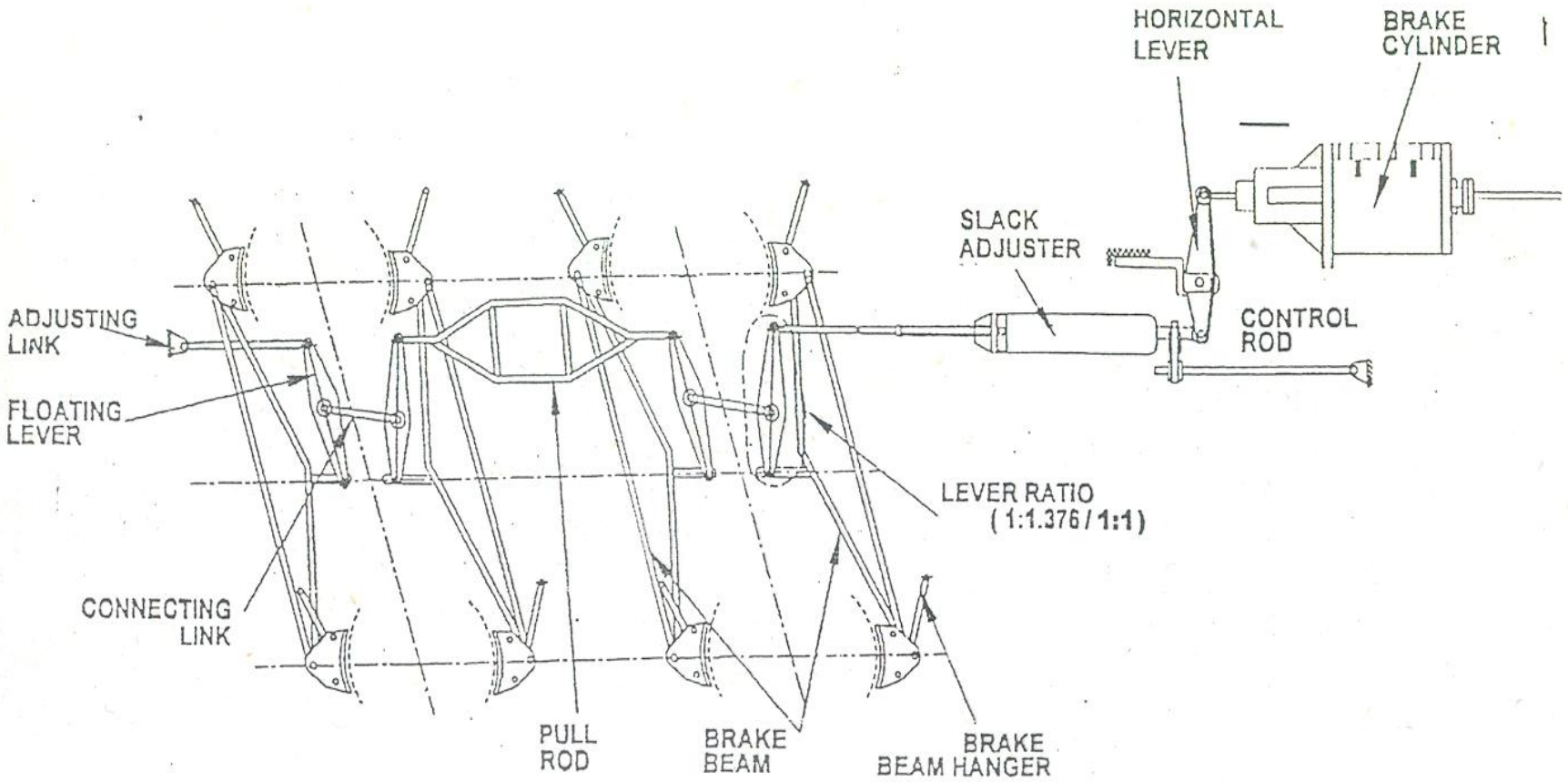


AIR BRAKE SYSTEM

Types of Air Brake System

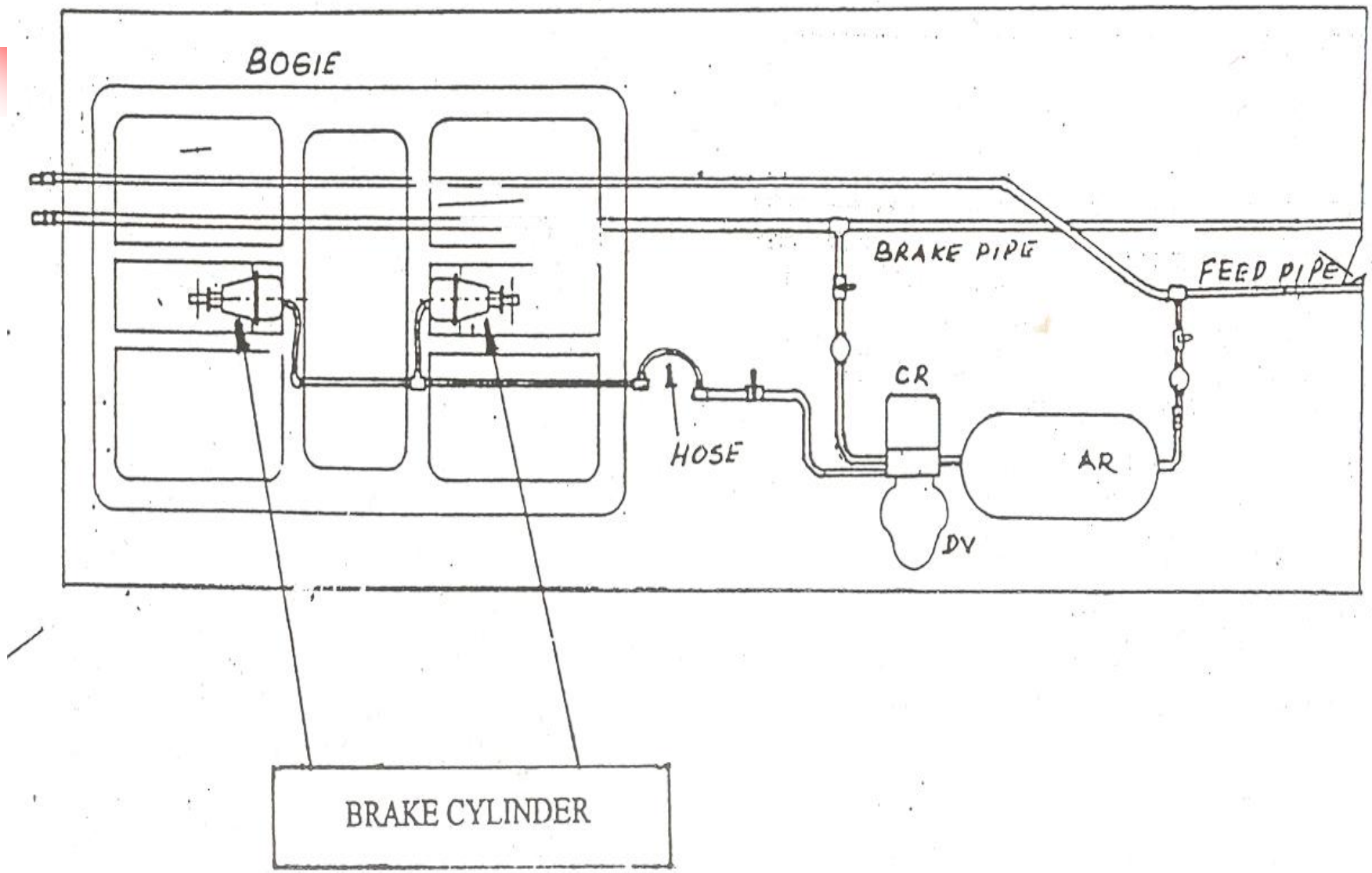
- **Coach Under frame Air Brake System**
- **Bogie Mounted Air Brake System (All new coaches- Since January 1999)**

Coach Under frame Air Brake System



COACH UNDERFRAME BRAKE RIGGING

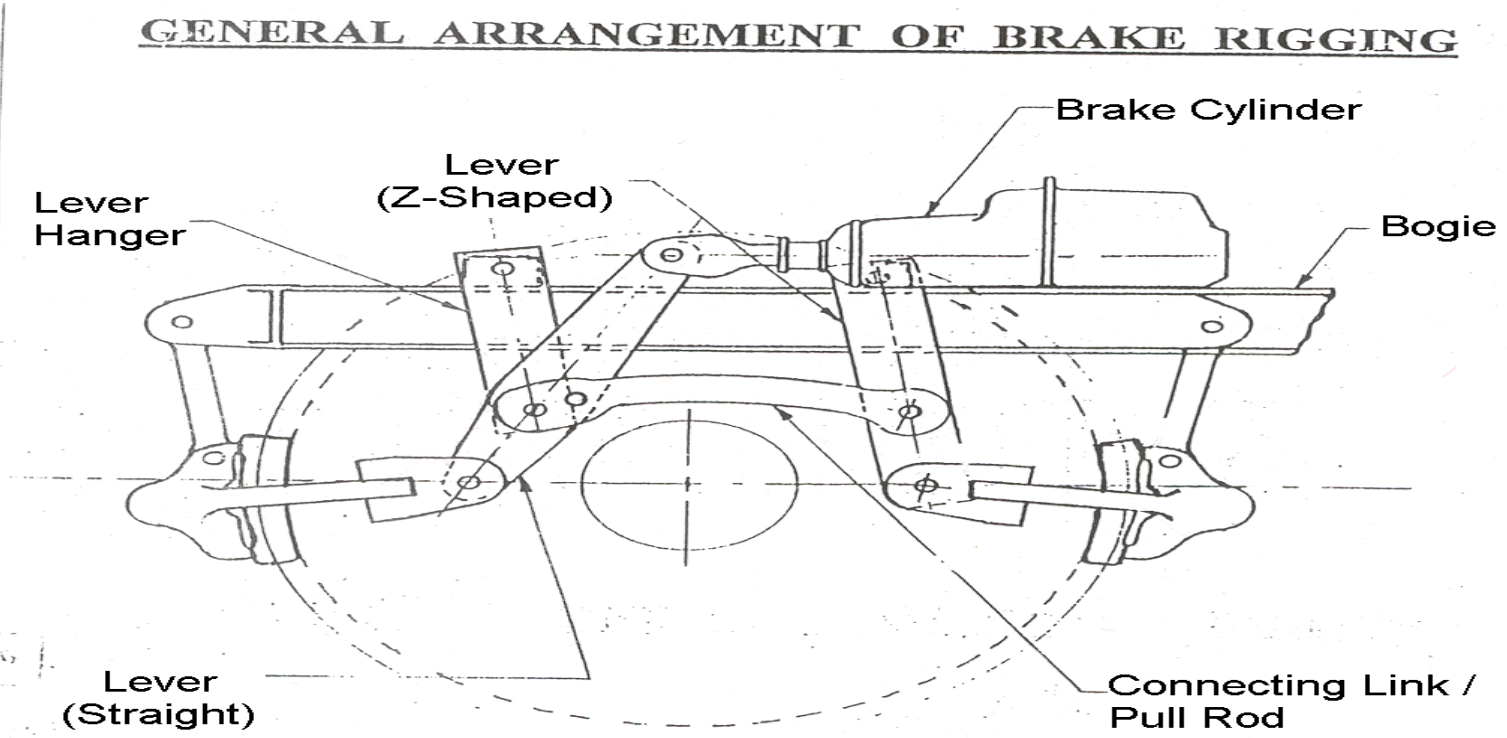
Bogie mounted air Brake System



Comparative chart of Conventional & BMBC Air Brake System

Comparative chart of Conventional & BMBC Air Brake System

Items	Conventional	BMBC
Weight reduction (as compared to conventional)	----------	492 Kg
Braking distance at 110 kmph with 18 coaches	905 m	800 m
No of pins and bushes	102	84
Brake block wear rate	3 cc/kwh	1.325 cc/kwh
Conversion cost from Vacuum brakes	Rs 102064/-	Rs 118001/-



Brake rigging of BMBC

Difference between SAB & Inbuilt Slack Adjuster of BMBC

Difference between SAB & Inbuilt Slack Adjuster of BMBC

SAB

- Take up and pay out the clearance between the wheel & brake block.
- The effective length of pull rod is decreased during take up the clearance.

Inbuilt Slack adjuster of BMBC

- Only take up the clearance between the wheel & brake block.
- The effective length of piston rod is increased during take up the clearance.

Difference between SAB & Inbuilt Slack Adjuster of BMBC

SAB

- It maintains a uniform piston stroke through out the formation.
- It does not require adjustment of piston stroke every trip.

Inbuilt Slack adjuster of BMBC

- The piston stroke of the cylinder is not uniform through out the formation and varies up to 60mm.
- Every trip the piston stroke require to be adjusted.

Difference between SAB & Inbuilt Slack Adjuster of BMBC

SAB

- Spindle is made up of triple start thread.
- To adjust the slack, the length of the pull rod is increased or decreased during forward stroke.

Inbuilt Slack adjuster of BMBC

- Adjusting screw (spindle) is made up of double start thread.
- To adjust the slack the length of the piston rod is increased during return stroke.

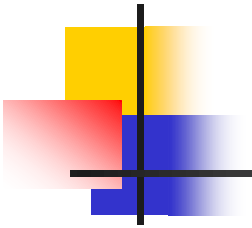
Difference between SAB & Inbuilt Slack Adjuster of BMBC

SAB

- When length of the pull rod increased manually the clearance between the wheel & brake block increases.

Inbuilt Slack adjuster of BMBC

- When the effective length of piston rod is increased manually, the clearance between the wheel & brake block decreases.



Necessity of Bogie Mounted Brake System (?)

Necessity (?)

- **The SAB slack adjuster used in the underframe mounted brake system has limited vendors.**

- **The total brake force is in the order of 100% of the tare weight and therefore the brake linkages are heavily loaded resulting in frequent maintenance demands on brake beam, brake head, brake gear pins and bushes.**

Necessity (?)

- **The brake pull rod is supported by spring loaded nylon rollers which wears out very fast. Thus it becomes inefficient unless the nylon rollers are changed regularly.**

- **Breakage of pull rod (of SAB) also occurs due to bending while negotiating the curves.**

Necessity (?)

- **The components like support brackets, pins and bushes, pull rod and support for pull rod provided on the under frame increases additional weight of the coach.**

- **Vibration of the pull rod during running cause rattling noise.**

Design Features of Bogie Mounted Brake Cylinder

Design Features of Bogie Mounted Brake Cylinder

- **External slack adjusters have been eliminated.Total four nos. of 8” (203.2 mm) size brake cylinders (two per bogie) are used in place of two 14” (355 mm) size under frame mounted brake cylinders in standard air brake.**

Design Features of Bogie Mounted Brake Cylinder

- **Each cylinder is provided with built-in single acting slack adjuster to take up the clearance automatically between wheel and brake block whenever the clearance increases due to wear on the brake block and the wheel and the maximum slack take-up is 305 mm.**

Design Features of Bogie Mounted Brake Cylinder

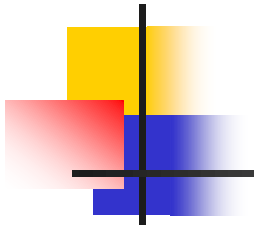
- These cylinders are mounted between central longitudinal members connecting the bogie transom and the headstock on either side.
- Each cylinder controls the braking of wheels of each axle. Piston stroke is 32 mm.
- Provided with less number of brake fittings, therefore, easy to maintain.

Design Features of Bogie Mounted Brake Cylinder

- **High friction ‘K’ type composite brake blocks are used, whose life is 5-6 times more than that of cast iron brake blocks.**
- **Unusual noise on run is completely eliminated.**
- **Use of curved pull rod with additional hole for manual adjustment of brake gear.**

Design Features of Bogie Mounted Brake Cylinder

- **The overall weight saving per coach is about 492 kg.**
- **Number of pins and bushes reduced from 102 to 84.**
- **Braking distance has come down from 905 mm to 800 mm.**



Working Principle of BMBC

Working Principle of BMBC

There is no change in the pneumatic system of the brake for bogie-mounted arrangement compared to underframe mounted brake. The system will respond to action of A-9 valve in similar fashion as in the case of standard air brake system during brake application and release.

or

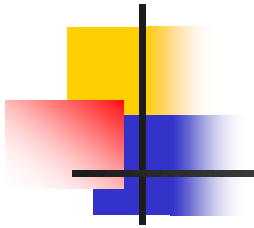
There is no change in the overall brake system in bogie mounted arrangement up to the action of DV.

Brake Application

Compressed air is admitted to brake cylinder between piston and cylinder body forces the piston trunk assembly to move outward against the force of release spring. The brake force is transmitted through the trunion body, adjusting screw, adjusting tube, cross head, brake rigging and finally to the brake blocks.

Brake Release

When the compressed air from brake cylinder is vented the release spring moves the piston trunk sub-assembly to release piston. As soon as the piston stroke exceeds (32 mm) during return stroke the adjustment (in built-in one way slack adjuster) takes place.



Manual Adjustment of BMBC

Manual Adjustment

A red paint mark on the adjusting tube sub-assembly indicates that the piston unit has extended over its full range and requires re-setting. The design of the brake-rigging unit is done in such a way that range of slack adjuster covers the life of brake blocks so that re-setting and replacing brake blocks will be done at the same time.

Procedure of Manual Adjustment

- **Disengage the cross head from the adjusting tube, by pulling the latch.**
- **Turn the adjusting tube clockwise to decrease the length of the adjusting tube (Effective length of piston rod).**
- **After replacing the brake blocks, apply to brake and check the piston strokes.**

Procedure of Manual Adjustment

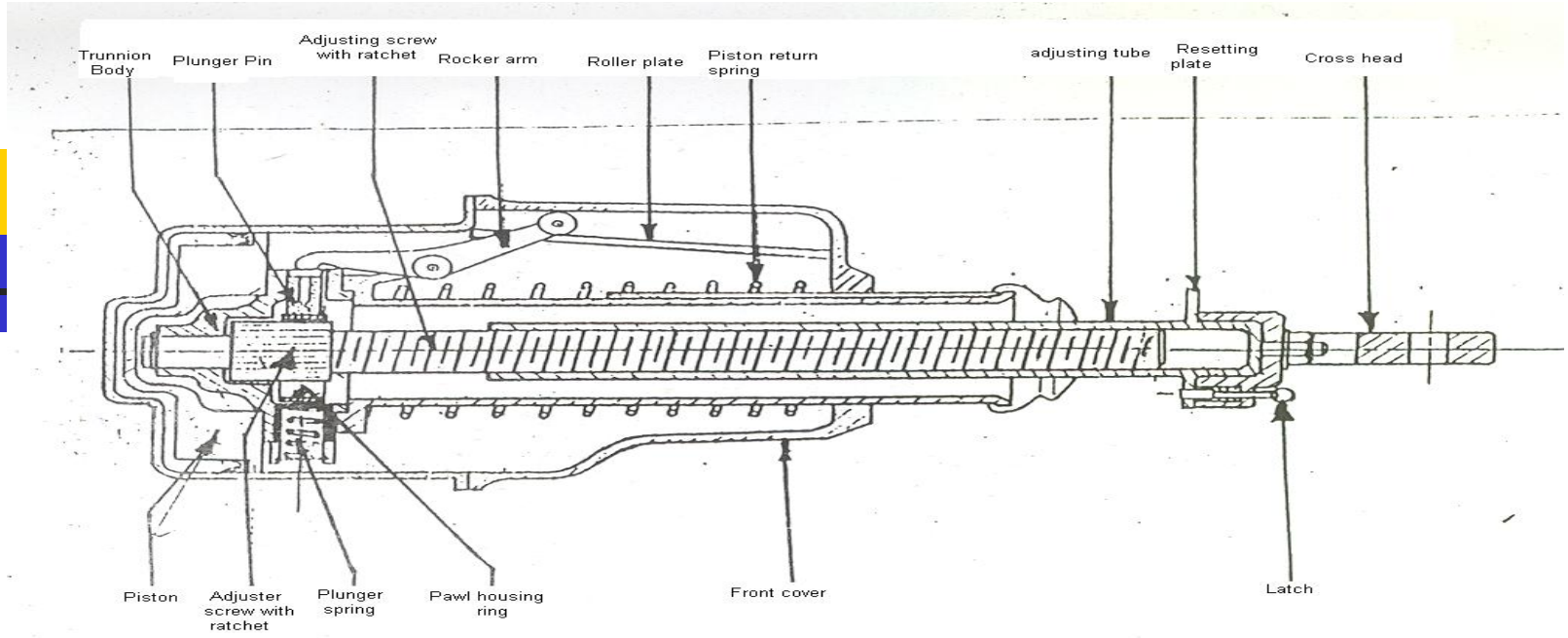
- **If piston stroke is correct, engage the cross head with the resetting plate by releasing the latch.**

- **If the piston stroke is less, decrease the length of adjusting tube to increase to clearance between wheel and brake block.**

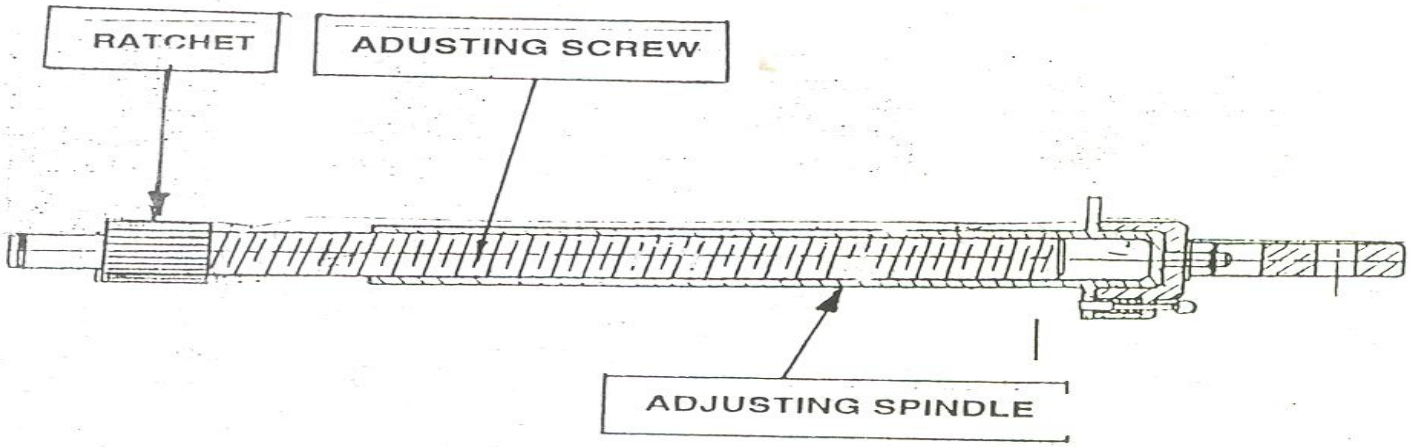
Procedure of Manual Adjustment

- **If the piston stroke is more, increase the length of adjusting tube to decrease the clearance between wheel and brake block.**

- **After adjusting the piston stroke, ensure the cross head is locked with adjusting tube with the latch.**



Components of Bogie Mounted Brake Cylinder



Functions of Main Parts

Functions of Main Parts
Adjusting Screw

- **The function of adjusting screw is to move the adjusting tube forward to increase the effective length of the piston rod automatically or to decrease the effective length of the piston rod manually.**

- **The adjusting screw is connected with a ratchet and forms a single unit. The adjusting screw is provided with a pitch of 1/8" (3.15 mm). The ratchet is provided with 18 teeth.**

Functions of Main Parts
Adjusting Screw

- **When the adjusting screw completes one full rotation it makes adjusting tube to move forward or backward by 2X3.15 mm = 6.30 mm.**

- **If the ratchet is moved/rotated by one tooth, the adjusting screw is rotated by 360 degree/18 =20 degree, which in turn moves the adjusting tube outward/inward by 6.30/18 mm = 0.33 mm (1/72 “).**

- **From the above, it is clear that to move the adjusting tube forward automatically by 1”, it requires 72 return strokes.**

Functions of Main Parts
Rocker Arm

- **The rocker arm is fitted with piston head by means of shackles and it moves along with the piston head.**

- **The roller end of the rocker arm slides over the roller plate and the other end of the rocker arm rests on the pawl housing through plunger pin.**

Functions of Main Parts
Rocker Plate

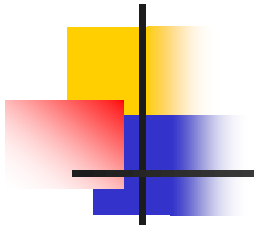
The roller plate is fixed at an angle with the front cover by means of bolts. The function of roller plate is to displace the pawl housing vertically when the rocker arm moves horizontally. It converts the linear displacement of rocker arm into vertical displacement of pawl housing.

Functions of Main Parts
Pawl-Housing Ring

- **The pawl-housing ring is pivoted with the pivot pin of turnion body at one end and the other end of the pawl housing ring moves/turns freely. A spring-loaded pawl is housed at the free end of the pawl housing. At the bottom of the pawl housing a spring loaded plunger / sleeve is kept between the turnion body and the pawl housing to move the pawl housing upward during forward stroke. At the top, a plunger is kept between the rocker arm and the pawl-housing ring to move the pawl housing downward during return stroke.**

Functions of Main Parts
Pawl-Housing Ring

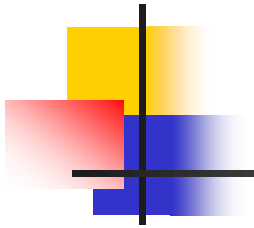
- **The function of the pawl housing and the pawl is to move /turn the ratchet by one tooth whenever the piston stroke exceeds 60 mm to increase the effective length of the piston during return stroke.**



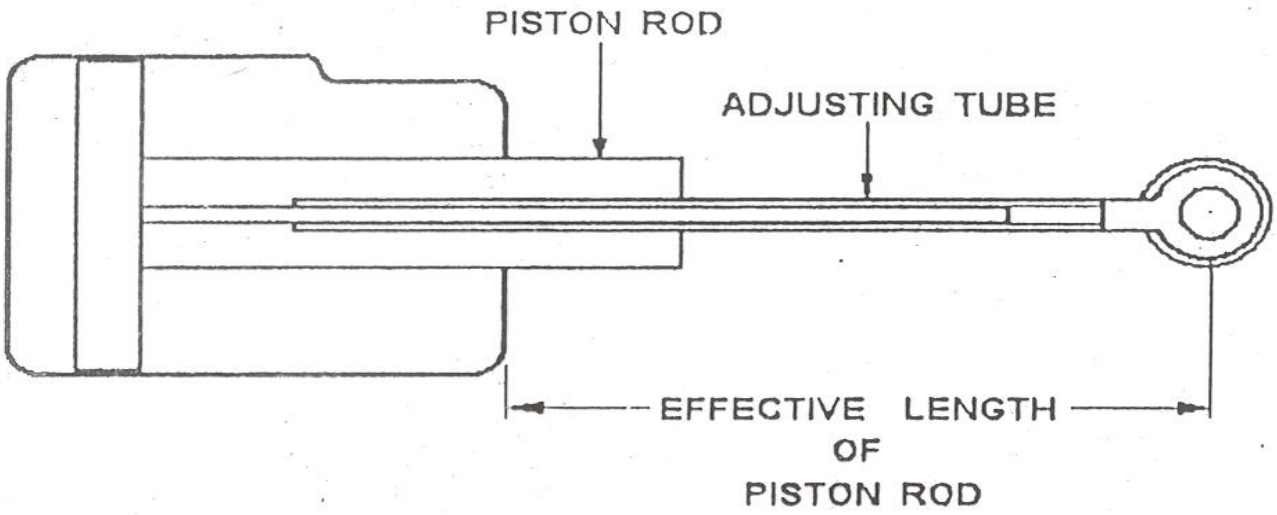
Slack Take – up Action

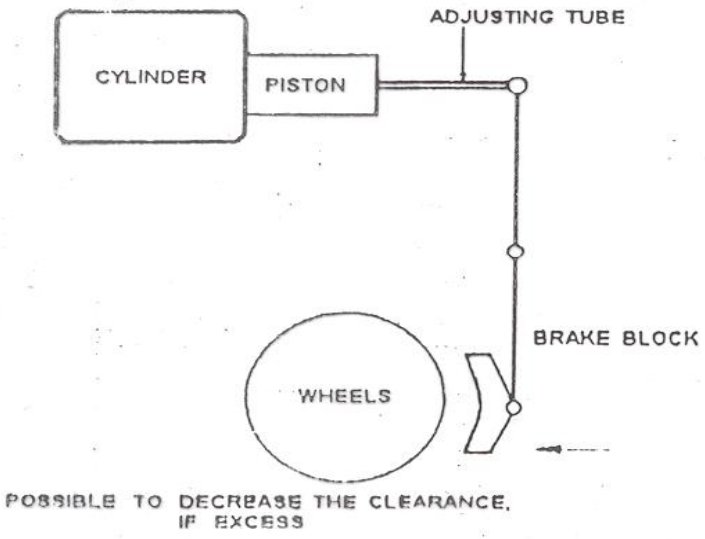
Slack Take – up Action

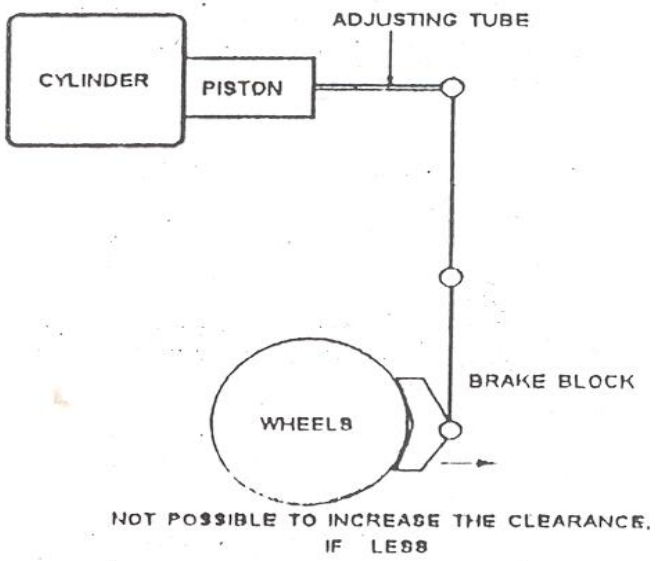
Piston stroke exceeds a predetermined value (on account of wear of either brake block or wheel or both), a ratchet with adjusting screw fitted insides the cylinder turns thereby increasing the effective length of the piton rod AUTOMATICALLY.

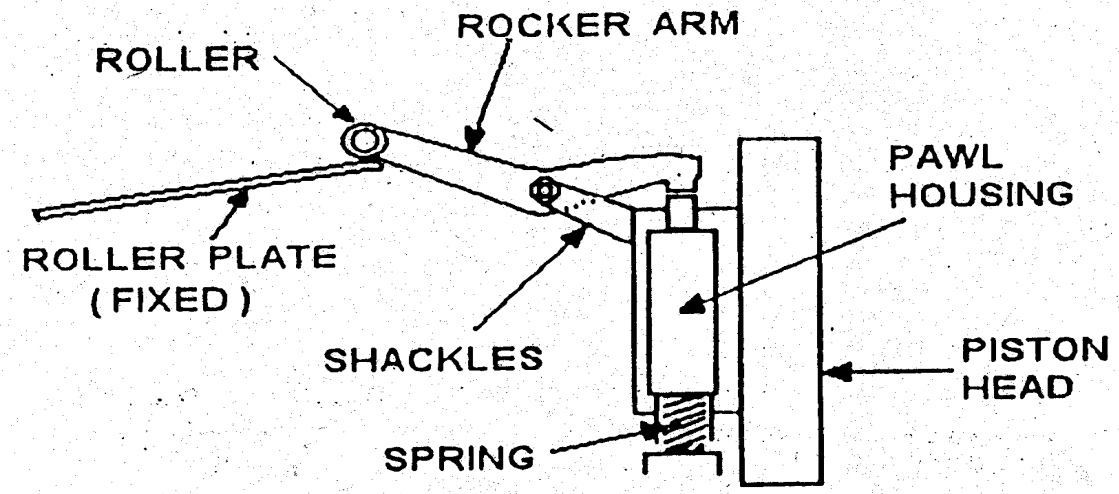


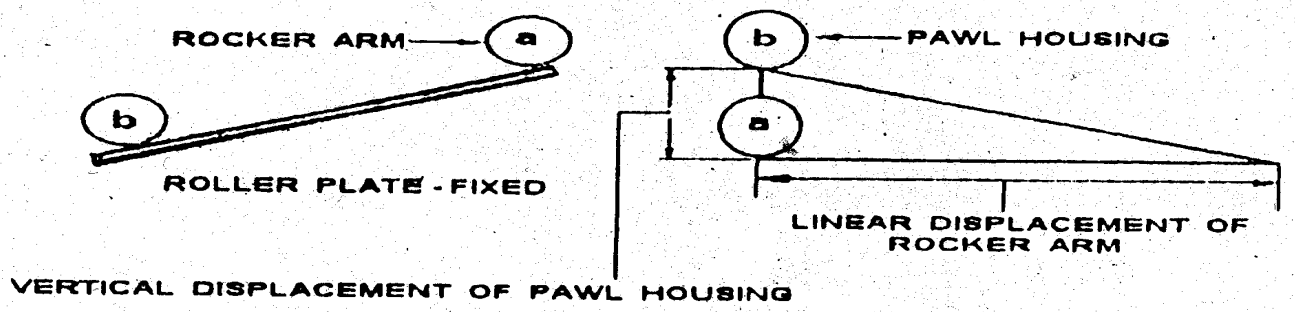
How does the Effective length of Piston Rod increase automatically ?


PISTON ROD
ADJUSTING TUBE
EFFECTIVE LENGTH
OF
PISTON ROD


ADJUSTING TUBE
CYLINDER
PISTON
BRAKE BLOCK
WHEELS
POSSIBLE TO DECREASE THE CLEARANCE,
IF EXCESS

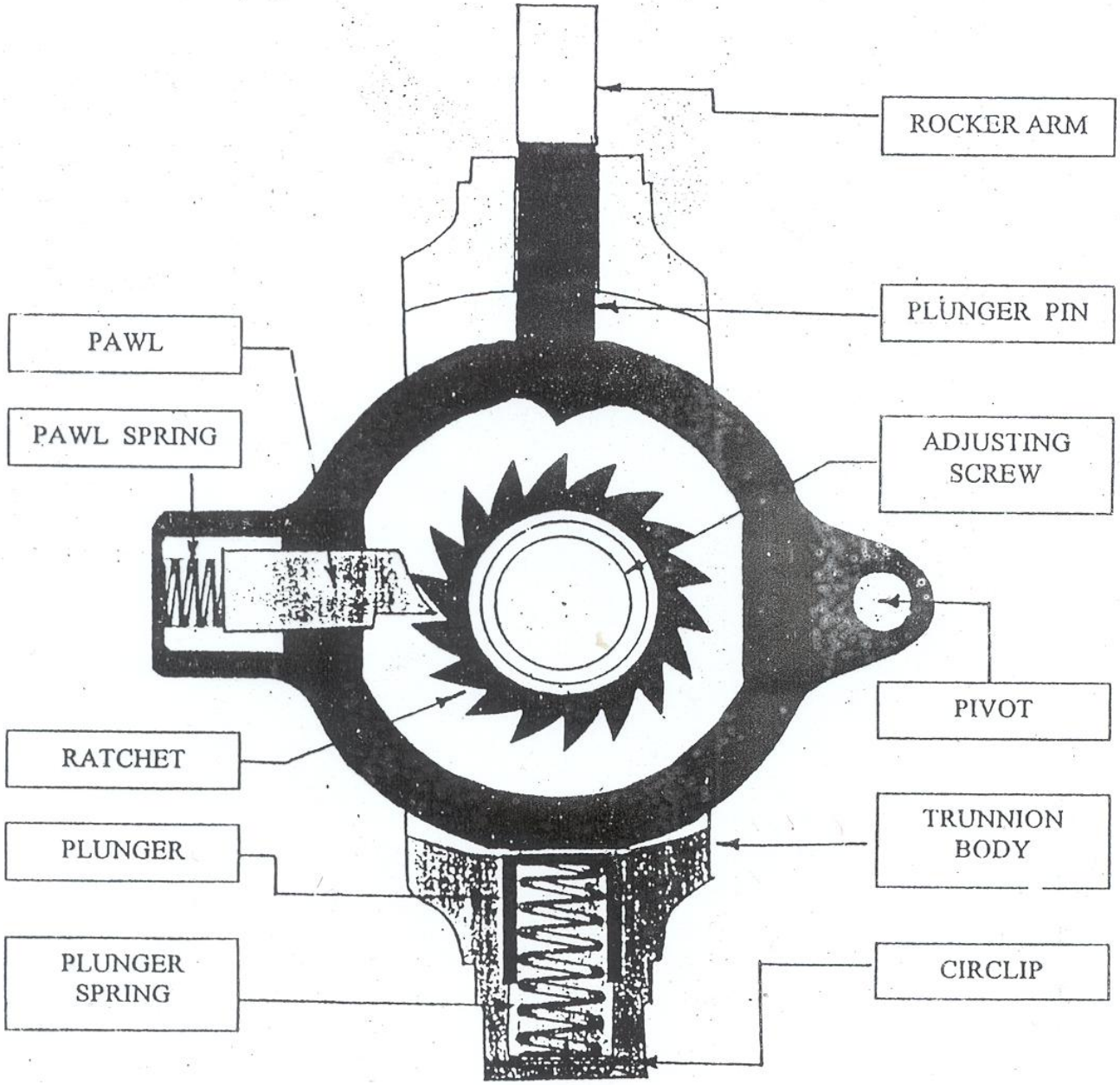

ADJUSTING TUBE
CYLINDER
PISTON
BRAKE BLOCK
WHEELS
NOT POSSIBLE TO INCREASE THE CLEARANCE,
IF LESS



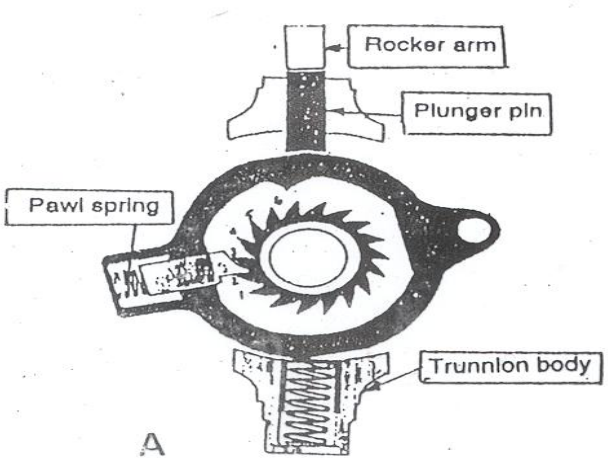


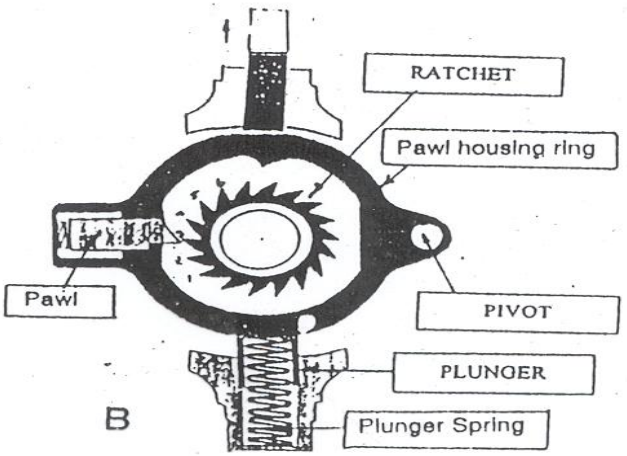
a. POSITION OF ROCKER ARM & PAWL HOUSING IN RELEASED POSITION.

b. POSITION OF ROCKER ARM & PAWL HOUSING IN APPLIED POSITION.


ROCKER ARM
PLUNGER PIN
PAWL
PAWL SPRING
ADJUSTING SCREW
PIVOT
RATCHET
PLUNGER
TRUNNION BODY
PLUNGER SPRING
CIRCLIP

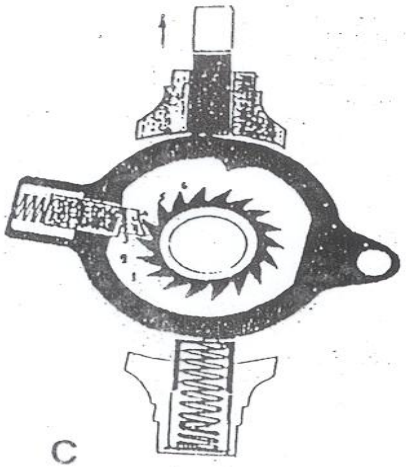
WORKING OF INBUILT / SLACK ADJUSTER:

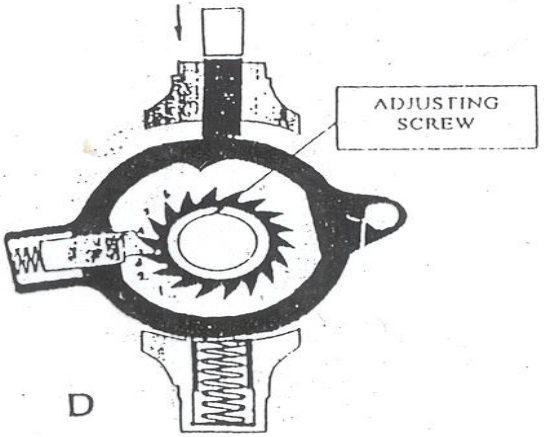




A. POSITION OF PAWL & RATCHET, WHEN THE BRAKE IS IN RELEASED POSITION

B. POSITION OF PAWL & RATCHET, WHEN THE PISTON STROKE IS WITH IN 60mm





C. POSITION OF PAWL & RATCHET, WHEN THE PISTON STROKE EXCEEDS 60mm. DURING FORWARD STROKE.

D. POSITION OF PAWL & RATCHET, AT THE END OF RETURN STROKE.

Maintenance Instructions of BMBC

Maintenance Instructions of BMBC

- **Ensure high friction composition brake block (K-type) be used.**
- **Do not mix up the levers used in the brake gear for AC & Non-AC coaches in storing.**
- **Do not mix up the curved profile pull rods used in the brake gear for AC & Non-AC coaches in storing.**

Maintenance Instructions of BMBC

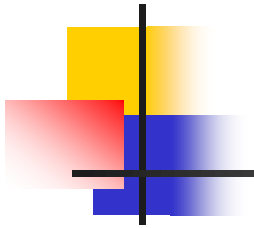
- **Use extreme holes of the curved profile pull rods for the assembly of brake gear for the wheel diameter up to 839 mm.**

- **Use inside adjacent hole of the curved profile pull rods for the assembly of brake gear for the wheel diameter below 839 mm. In addition, provide 38 mm packing plate at the axle box to maintain buffer height.**

Maintenance Instructions of BMBC

- **Replace all brake blocks those fitted with the part of the wheel set when RED MARK provided on the adjusting tube of the corresponding brake cylinder is visible.**

- **Replace the brake blocks as wear in each block reaches the IDENTFICATION MARK of condemnation.**



THANK YOU