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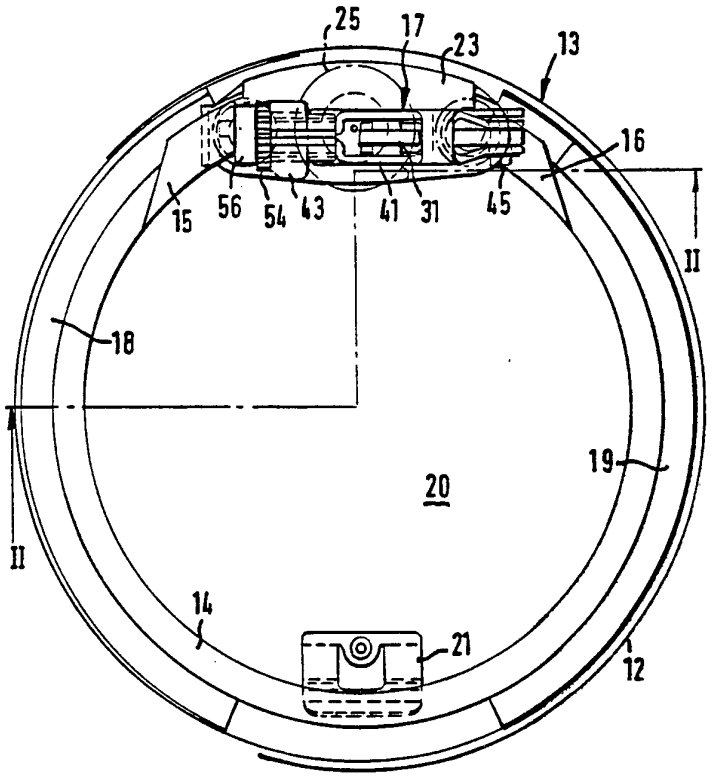
(54) Title: INTERNAL SHOE BRAKE WITH ADJUSTING DEVICE

(57) Abstract

An internal shoe brake (13) has a substantially circular brake shoe (14) mounted on a support (20, 23) and having a mechanical actuator (17) located between a pair of opposed ends (15, 16) of the shoe for moving the brake shoe ends apart to apply the brake. The actuator takes the form of a first lever (31) pivotted at one end (32) on the support (23, 33) and connected at its other end (35) with a brake operating means such as a cable (24). The one end (32) of the first lever contacts one shoe end (16) and a second lever (41) is pivotted on the first lever. The second lever is operatively connected with the other shoe end (15) via a brake shoe clearance adjuster means (50). The brake shoe clearance adjuster means may be manually operated or may be automatic.



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INTERNAL SHOE BRAKE WITH ADJUSTING DEVICE

This invention relates to internal show assemblies, in particular for vehicles, and which are of the type which utilise a single circular brake shoe.

In British patent 1 090 058 there is described an internal shoe brake having a substantially circular single brake shoe mounted on a support with a mechanical actuator located between a pair of opposed ends thereof, the actuator causing said brake shoe ends to move apart to apply the brake.

It is an object of the present invention to provide an internal shoe brake of the above type which includes a brake shoe wear compensation device.

Thus according to the present invention there is provided an internal shoe brake having a substantially circular brake shoe mounted on a support and having a mechanical actuator located between a pair of opposed ends of the shoe for moving said brake shoe ends apart to apply the brake, the brake being characterised in that the

actuator comprises a first lever pivotted at one end on the support and having an abutment surface thereon for contacting one shoe end and a brake operating means connected to the other end of the first lever; a second lever pivotted at its one end away from the said first lever on the support and having an abutment surface thereon operatively connected with the other shoe end, the other end of the second lever being pivotally connected to said one end of said first lever; and a brake shoe clearance adjuster means mounted on the support and located between said other shoe end and the abutment surface on the second lever to transmit loads from the actuator to said other shoe end.

The brake shoe clearance adjuster means may comprise a hollow sliding bush mounted on the support and having an internal screw thread and an abutment at one end for contact with the support, and a screw threaded tappet mounted in the bush, the tappet having a head portion abutting said other shoe end, the overall length of the adjuster means and hence the brake shoe clearance being adjustable by rotation of the bush.

The invention will be described by way of example and with reference to the accompanying drawings in which:-

Fig 1 is an elevation of an internal shoe brake according to the invention;

Fig 2 is a section in the II-II of fig 1;

Fig 3 is an elevation of the mounting block used in Fig 1 for supporting the adjuster means;

Fig 4 is a view of the adjuster means used in the brake of Fig 1;

Fig 5 is an elevation of an alternative mounting block and belt-operated adjuster arrangement;

Figs 6 & 7 are views on lines VI-VI and VII-VII respectively of Fig 5;

Fig 8 is a sectional view corresponding to Fig 6 of an alternative sealed arrangement, and

Fig 9 is a part sectional view, corresponding to Fig 2, of an alternative brake with an automatic adjuster.

With reference to figs 1 to 3 of the drawings there is illustrated an internal shoe brake of the type used in conjunction with a disc brake. A disc rotor 11 is mounted on a stub axle for rotation with the wheel in a well known manner (see fig 2). The internal cylindrical surface 12 of the rotor has a cylindrical braking surface formed thereon for engagement with a friction lining of an internal brake 13 for parking purposes.

The internal brake 13 comprises a single substantially circular brake shoe 14 having a pair of opposed brake shoe ends 15 and 16 between which a mechanical actuator 17 is located. The brake shoe has a pair of spaced arcuate linings 18, 19 thereon which in use contact the braking surface 12 for operation of the brake.

The brake shoe 14 and actuator 17 are mounted on a back plate 20 which is mounted onto a vehicle suspension component 22. The actuator 17 is mounted in a support block 23 which is bolted through the back plate 20 onto the suspension component 22 so that the mounting block 23 takes all the brake operating loads.

The brake shoe 14 is held to the back plate 20 by the actuator 17 and a hold down clip 21 located between the linings 18 and 19, diametrally opposite to the actuator 17. The actuator 17 is operated by a pull cable 24 which passes through an aperture 25 in the backplate and which reacts against the support block 23 to operate the actuator 17 to move the brake shoe ends 15 and 16 apart to apply the brake.

The actuator 17 is a two lever toggle mechanism. A

first inner lever 31 is pivoted at one end 32 on the support block 23 with an abutment surface 36 adjacent thereto contacting one brake shoe end 16 (or as shown on the head 33 of the bolt 34 securing the support block to the vehicle suspension). Cable 24 is attached to the other end 35 of the lever 31. A second outer double lever 41 is pivotted at its end 42, away from the first lever, on a raised portion 43 of the support block 23 and has an abutment surface 44 for contacting the other brake shoe end 15 adjacent thereto. The other end of lever 41 is pivotally connected by pin 45 to said one end portion of the first lever 31.

The raised portion 43 of the support block 23 has a cylindrical bore 51 (see fig 3) in which an adjuster means 50 (see fig 4) is slidably located. The adjuster means 50 comprises a bush 52 and a tappet 55. The bush 52 has an internal screw thread 53 and an abutment in the form of a raised collar 54 at one end with a ratchet formed thereon.

The tappet 55 has a head 56 for engaging said other end 15 of the brake shoe and a screw-threaded stem 57 which engages the screw thread 53 in the bush.

The bush 52 is arranged in the cylindrical bore 51

with the collar 54 adjacent the shoe end 15 so that, when the brake is in an inoperative condition, the shoe pull-off mechanism (pull springs or the resilience of the single shoe) pushes the collar 54 against the block 23.

The second lever 41 has a spigot 44a on its abutment surface 44 that locates in the screw-threaded centre of the bush 52. The arrangement being such that when a pull is effected on the cable 24, the first lever 31 pivots about its abutment 36 on the shoe end 16 and its one end 32 acts against the support block 23 (bolt head 33), simultaneously the movement of the other end 35 of the first lever 31 about said one end 32, effectively causes the pivot pin 45 to move towards the other brake shoe end 15. The movement of the pin 45 is transmitted to the second lever 41 which acts on the other shoe end 15 via the spigot 44a and the adjuster means 50 which is slideably mounted in the support block 23.

Cable 24 is operated by a hand lever mechanism (not shown) and is for parking purposes only. The pull on the cable 24 continues until both shoe ends 15 and 16 are thrust against the drum surface 12. In the event that the brake requires some adjustment

for wear compensation, or for other reasons, the adjustment is effected manually by rotating the collar 54 by engagement with the ratchet surface thereon by, for example, a screw driver. The rotation of the collar 54, and hence the bush 52, jacks out the tappet 55 to take up any excess clearances between the linings 18, 19 and the braking surface 12.

The method of rotating collar 54 may be made more convenient by the modified collar arrangement shown in figures 5 to 7 in which bush 52 (shown reversed left to right compared with figures 1 and 2) is mounted in bore 51 in support block 23. Collar 54 on bush 52 is provided with ratchet teeth 60 which engage teeth 61 an internally-toothed belt 62 part of which encircles collar 54 and is held in engagement with the teeth 60 by flange portion 65 of the support block.

Part 62A of the belt 62 projects from the back of the brake via an aperture 66 in the support block 23 and a corresponding aperture 67 in the back plate 20. As will be appreciated longitudinal displacement of part 62A of the belt (as indicated by arrows X in figure 6) causes rotation of collar 54 which jacks tappet 55 in or out of bush 52,

depending on the direction of rotation of collar 54, to adjust the brake lining clearances as previously described.

In a further modification shown in figure 8 the apertures 66 and 67 in the support block 23 and back plate 20 are sealed by a rubber sealing member 68 through which part 62A of the belt 62 extends. This arrangement prevents the ingress of dirt etc. via apertures 66 and 67. It will also be appreciated that belt 62 could be replaced with a chain or other endless loop member which engages appropriately shaped teeth or other drive formation on the bush 52.

In a still further modified form of brake in accordance with the present invention the various forms of manual adjuster 50 described above can be replaced by an automatic adjuster 70 shown in Figure 9.

In this arrangement the automatic adjuster 70 is of the form described and claimed in the Applicant's co-pending Application No EP-A-0 388 057 comprising a first end member in the form of a tappet 71 which engages shoe end 15, an intermediate member 72 which is screw-threaded to tappet 71 at 73, and a second end member 74 which is a sliding fit on the

intermediate member 72. A sleeve 75 surrounds the intermediate member 72 and is axially located thereon by a circlip 76.

Intermediate member 72 is provided with ratchet wheel teeth 77 which are engaged by a pawl 78 formed on a leaf spring 79. The ends 80 and 81 of spring 79 are supported on undercut formations 82 and 83 on sleeve 75 and second end member 74. Spigot 44a on second lever 41 engages in the free end of the bore 84 in second end member 74 which receives intermediate member 72. Sleeve 75 is provided with a stepped end flange 85 which is held in a support tube 86 mounted in a bore 87 in support 23.

With the brake shoe clearance correctly adjusted and the brake in a released condition spring 79 is in a relaxed condition and a clearance 'x' is established between spigot 44a and the adjacent end of intermediate member 72 with abutment surface 44 on lever 41 in contact with second end member 74.

When the brake is applied abutment surface 44 presses on end member 74 and the initial movement of lever 41 closes the clearance 'x' so that spigot 44a contacts the end of intermediate member 72.

Further movement of lever 41 pushes the intermediate member 72 and tappet 71 to move shoe end 15 and apply the brake.

The initial movement of lever 41 which closes gap 'x' compresses spring 79 causing it to bow and thus moving pawl 78 generally in direction Y. The spring and pawl characteristics are arranged to be such that the amount of movement of pawl 78 in direction Y which takes place during the movement of second end member 74 through clearance x is just insufficient to cause pawl 78 to engage the next ratchet wheel tooth 77 so that when the brake is released the adjuster 70 again returns to the position shown in Figure 9.

As the brake shoe clearance increases the clearance between the spigot 44a and the end of the intermediate member 72 increases to a value greater than 'x' so that on the next brake application a greater bowing of the spring 79 occurs which produces sufficient movement of pawl 78 in direction Y to cause the pawl to ride up the ratchet teeth 77 sufficiently to engage behind the next ratchet tooth. Thus when the brake is released the spring un-bows moving the pawl 78 in the opposite direction to arrow Y whilst engaged behind

its new ratchet tooth. This causes intermediate member 72 to rotate relative to tappet 71 so that tappet 71 is jacked out of the intermediate member toward shoe end 15 by an amount dependent on screw-thread 73 and the pawl/pawl teeth dimensions. Thus the adjuster 70 provides automatic adjustment of brake shoe clearance throughout the life of the shoe.

CLAIMS

1. An internal shoe brake (13) having a substantially circular brake shoe (14) mounted on a support (20,23) and having a mechanical actuator (17) located between a pair of opposed ends (15,16) of the shoe for moving said brake shoe ends apart to apply the brake, the brake being characterised in that the actuator comprises a first lever (31) pivotted at one end (32) on the support (23,33) and having an abutment surface (36) thereon for contacting one shoe end (16), and a brake operating means (24) connected to the other end (35) of the first lever (31); a second lever (41) pivotted at its one end (42) away from the said first lever (31) on the support (23,43) and having an abutment surface (44) thereon operatively connected with the other shoe end (15), the other end of the second lever (41) being pivotally connected (45) to said one end (32) of said first lever (31); and a brake shoe clearance adjuster means (50) mounted on the support (23) and located between said other shoe end (15) and the abutment surface (44) on the second lever (41)

to transmit loads from the actuator (17) to said other shoe end (15).

2. A brake as claimed in claim 1, characterised in that the abutment surface (44) on said second lever (41) includes a spigot (44a) which engages with a location aperture (53) in the adjuster means (50).

3. A brake as claimed in claim 1 and claim 2 characterised in that the brake shoe clearance adjuster means (50) comprises a hollow sliding bush (52) mounted on the support (23) and having an internal screw thread (53) and an abutment (54) at one end for contact with the support, and a screw-threaded tappet (55) mounted in the bush, the tappet (55) having a head portion (56) abutting said other shoe end (15) the overall length of the adjuster means and hence the brake shoe clearance being adjustable by rotation of the bush (52).

4. A brake as claimed in claims 2 and 3 characterised in that the other end of the hollow bush (52) receives the spigot (44a) formed on the abutment surface (44) of the second lever (41).

5. A brake as claimed in claim 3 or claim 4 characterised in the bush (52) is provided with drive formations (60) engaged by complementary drive formations (61) on a manually operated adjuster member (62) part of which projects (62A) externally from the brake, movement (X) of the adjuster member (62) causing rotation of the bush (52) via the interengaging drive formations (60,61) to adjust the brake shoe clearance.

6. A brake as claimed in claim 5 characterised in that circumferentially spaced drive formations (60) are formed on the bush (52), and the adjuster member comprises an endless loop (62) part of which is in encircling engagement with the drive formations (60) on the bush (52) and part (62A) of which projects from the brake, the brake shoe clearance being adjusted by longitudinal displacement (X) of the projecting part (62A) of the endless loop to rotate the bush (52).

7. A brake as claimed in claim 6 characterised in that the projecting part (62A) of the endless loop (62) projects from the brake via an aperture (66,67) in the support (23,20).

8. A brake as claimed in claim 7 characterised in that the aperture (66,67) in the support (23,20) is sealed by a sealing member (68) through which the endless loop (62) projects.

9. A brake as claimed in any one of claims 6 to 8 characterised in that the endless loop (62) is an internally toothed belt or a chain which engages circumferentially spaced teeth (60) on the bush (52).

10. A brake according to claims 1 and 2 characterised in that the adjuster means comprises an automatic brake shoe clearance adjuster (70).

11. A brake according to claim 10 characterised in that the automatic brake shoe clearance adjuster (70) comprises three co-axial members (71, 72, 74), a first end member (71) interconnected with an intermediate member (72) via interengaging thread formations (73) and a second end member (74) slideably interconnected with the intermediate member and free to rotate relative thereto, the first (71) and second (74) end members being operative connected with said other shoe end

(15) and the second lever abutment surface (44) respectively, a sleeve member (75) rotateably mounted on and axially fixed relative to the intermediate member (72), a toothed ratchet wheel (77) mounted on the intermediate member for rotation therewith at a location between the second end member (74) and the sleeve (75), and a leaf spring (79) acting between the second end member (74) and the sleeve (75), said spring having a pawl formation (78) which engages the ratchet wheel (77) such that relative movement above a predetermined level between the second end member (74) and the intermediate member (72) causes the spring to bow sufficiently to engage behind the next ratchet wheel tooth and hence rotate the intermediate member (72) relative to the first end member (71) on release of the brake.

12. An internal shoe brake as claimed in any one of claims 1 to 11 characterised in that the brake operating means (24) comprises a cable connected to the other end (35) of the first lever (31) for pulling the first lever towards the support (23).

13. A disc brake including a brake disc (11) having a central drum portion (12) characterised in that an internal shoe brake (13) as claimed in any one of claims 1 to 12 is mounted in said drum portion (12).

14. A brake wear adjuster mechanism in which a first screw threaded member (52) is rotated relative to a second co-operating screw-threaded member (55) to change the effective length of the first and second members thus adjusting the released position of an associated braking member (14) to compensate for wear, the mechanism being characterised in that the first screw-threaded member (52) is provided with drive formations (60) engaged by complementary drive formations (61) on a manually-operated adjuster member (62) part (62A) of which projects externally from the associated brake, movement (X) of the projecting part (62A) of the adjuster member (62) causing rotation of the first screw-threaded adjustment member (52) via the interengaging drive formations (60,61) to compensate form wear of the associated braking member (14).

15. A brake wear adjuster mechanism as claimed in claim 14 characterised in that the adjuster member comprises an endless loop (62) part of which encircles and engages the drive formations (60) on the first screw-threaded adjustment member (52) and part (62A) of which projects from the associated brake, longitudinal displacement (X) of the projecting part (62A) of the endless loop (62) rotating the first adjustment member (52).

16. A brake wear adjuster mechanism as claimed in claim 15 characterised in that the endless loop (62) is an internally toothed belt or a chain which engages circumferentially spaced teeth (60) on the first adjustment member.

17. An internal shoe brake constructed and arranged substantially as hereinbefore described with reference to and as shown in figures 1 to 4 or 5 to 8 or 9 of the accompanying drawings.

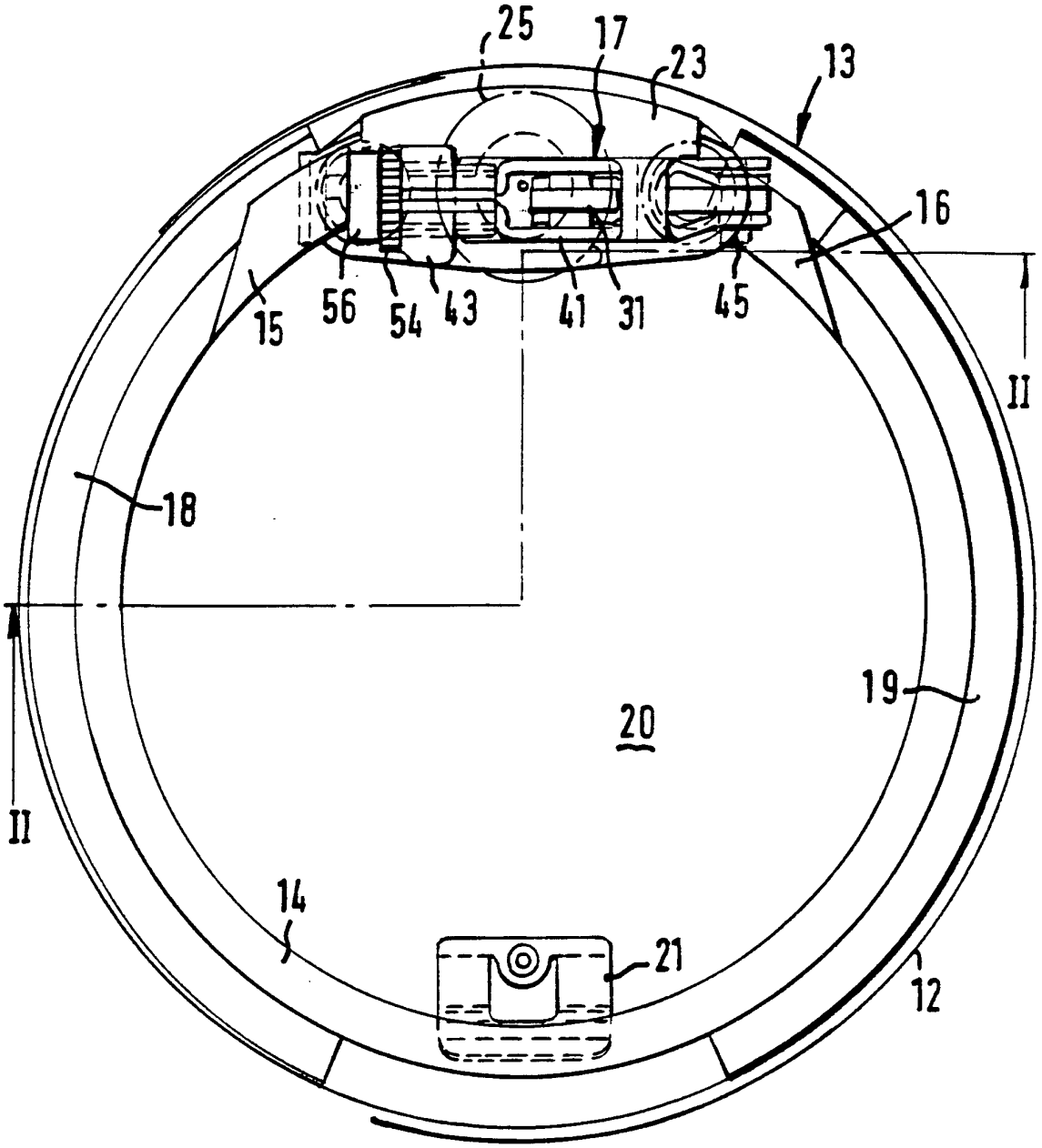

FIG.1

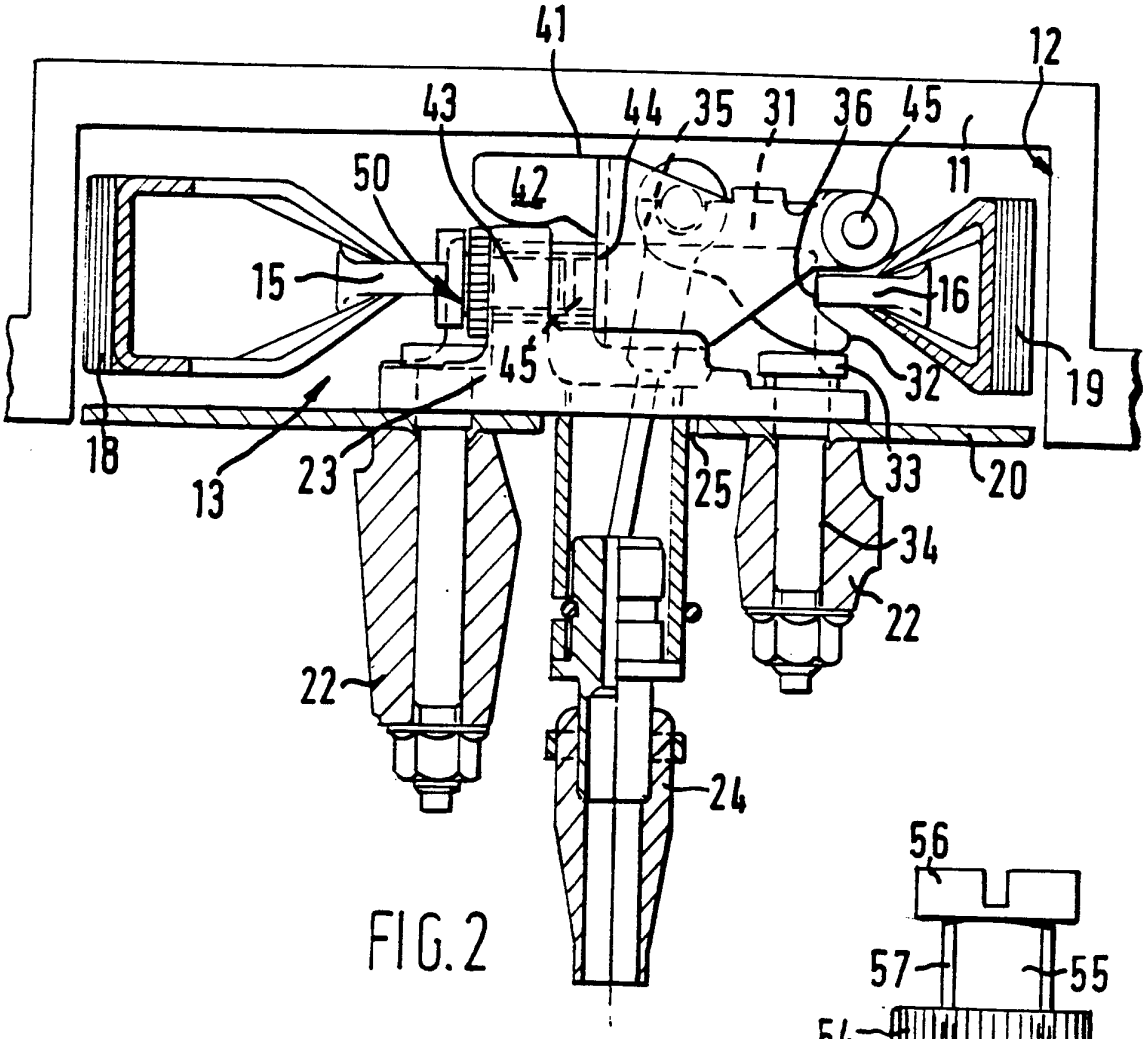

FIG. 2

FIG. 4

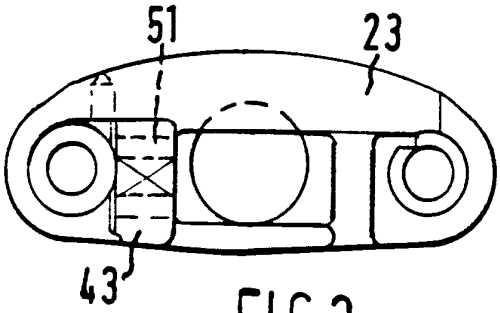

FIG. 3

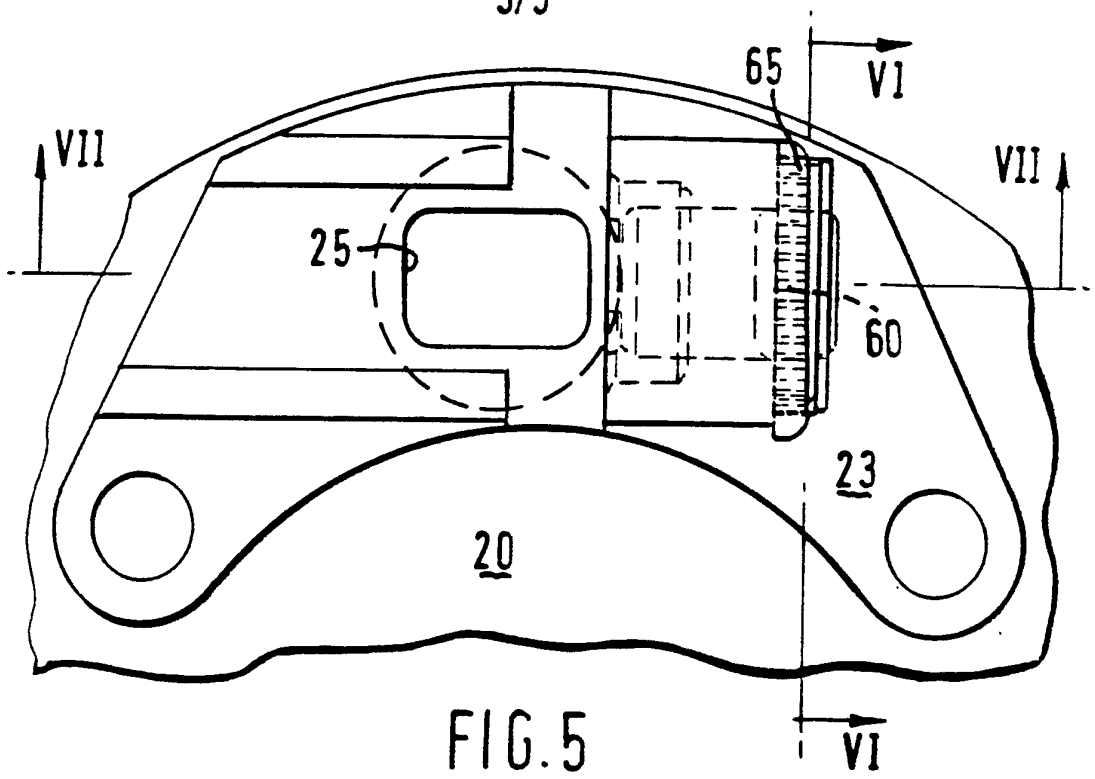

FIG.5

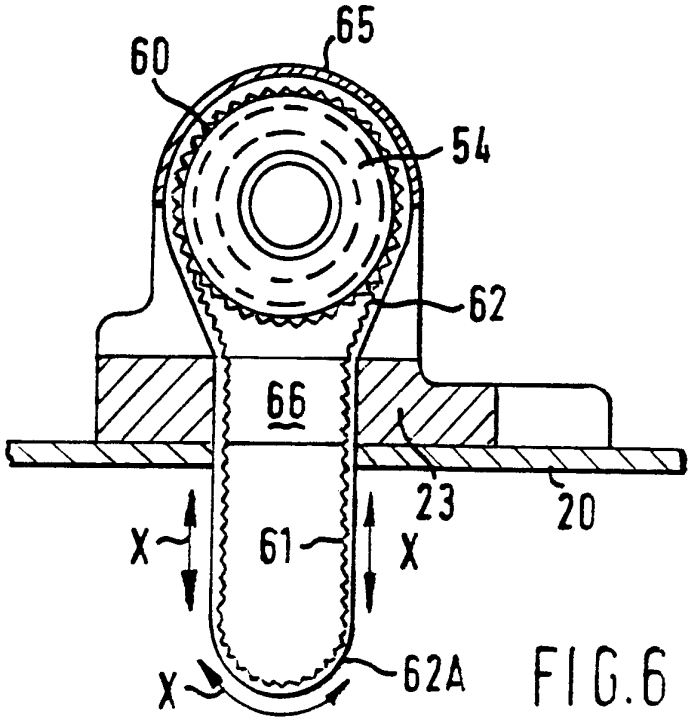

FIG.6

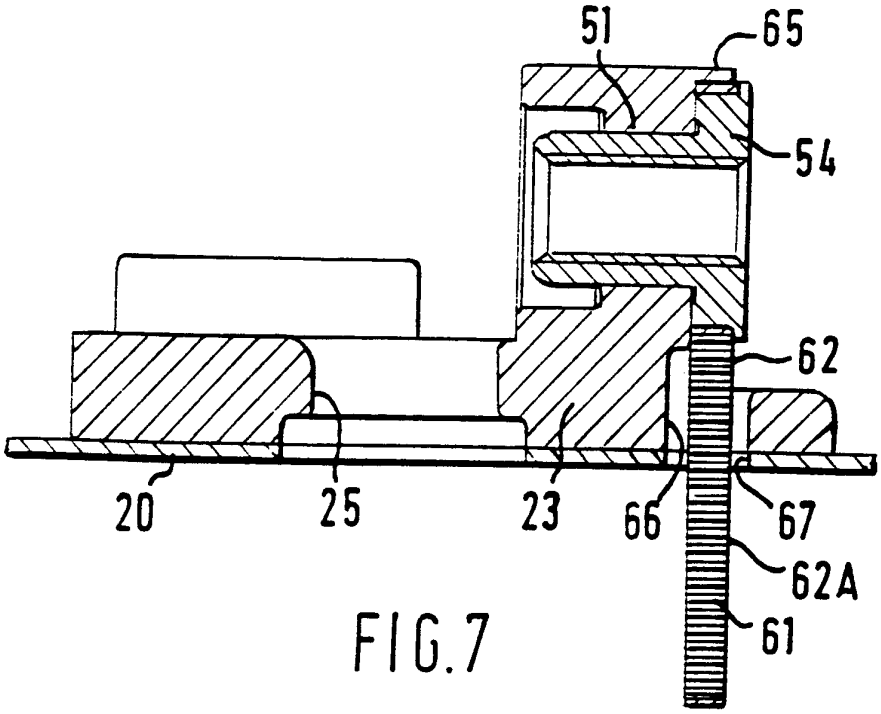

FIG.7

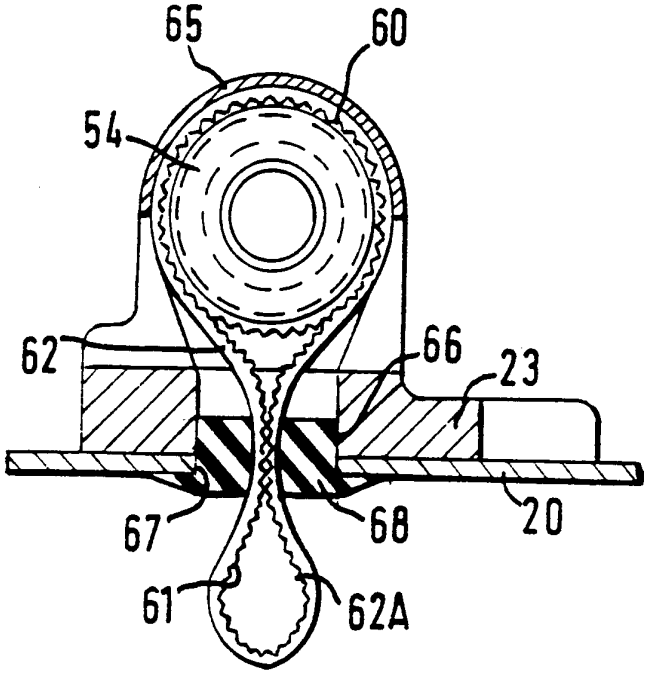

FIG.8

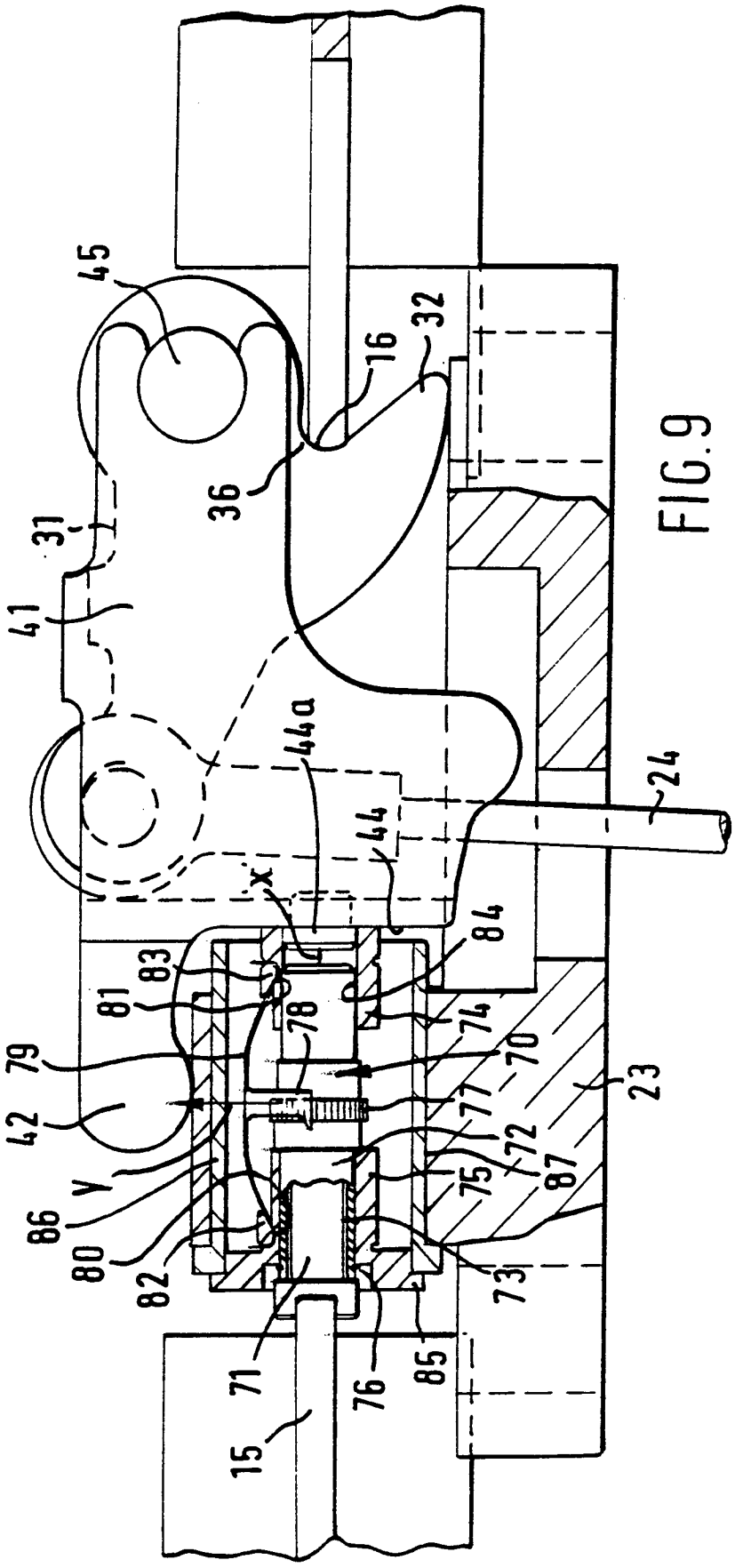
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FIG.9

INTERNATIONAL SEARCH REPORT

Interr nal Application No
PCT/GB 93/02347

A. CLASSIFICATION OF SUBJECT MATTER

F 16 D 65/46,F 16 D 51/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F 16 D 65/00,F 16 D 51/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP, A1, 0 482 430 (KNOTT GMBH) 29 April 1992 (29.04.92), fig. 1-9. --	1,3,12
A	EP, A1, 0 388 057 (AUTOMOTIVE PRODUCTS PLC.) 19 September 1990 (19.09.90), fig. 4. --	1
A	DE, A, 2 158 044 (ALFRED TEVES GMBH) 24 May 1973 (24.05.73), fig. 1-4. --	1
A	GB, A, 2 225 069 (DAIMLER-BENZ AG) 23 May 1990 (23.05.90), fig. 1-5.	1

☐ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
11 January 1994	[illegible]

Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to clain. No.
A	GB, A, 1 090 058 (ALFRED TEVES KG) 08 November 1967 (08.11.67), fig. 1c.	1

ANHANG — ANNEX — ANNEXE

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

to the International Search Report to the International Patent Application No.

au rapport de recherche international relatif à la demande de brevet international n°

PCT/GB 93/02347 SAE 81523

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

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In Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
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