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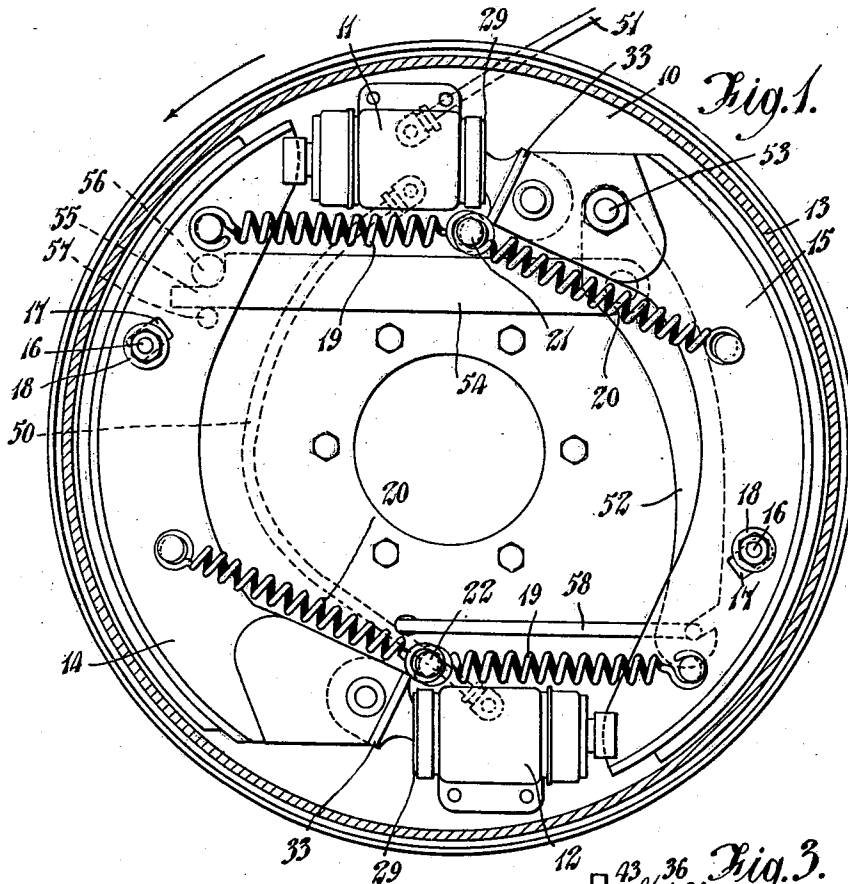
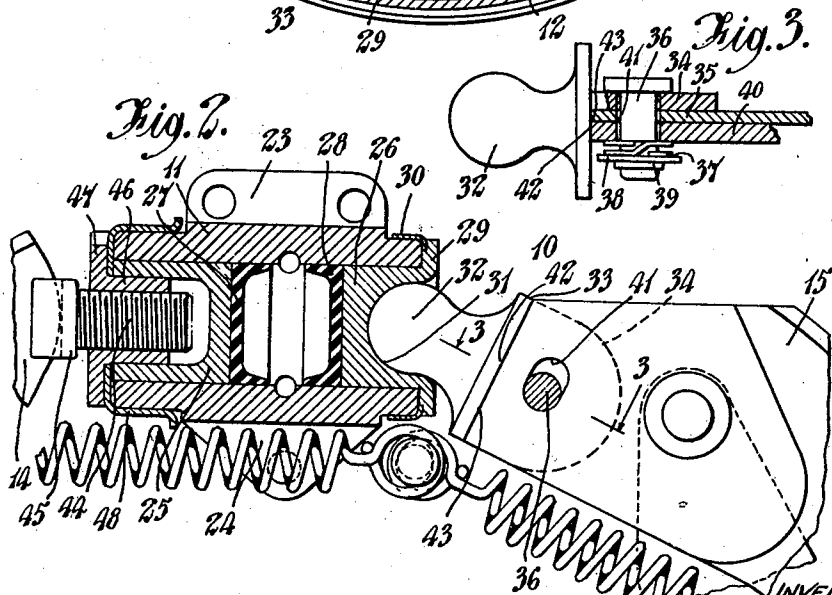
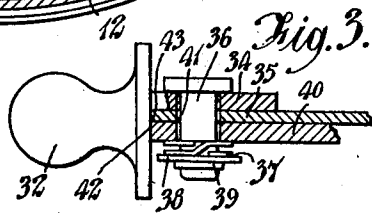
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2,218,201

BRAKE

Filed June 3, 1939

2 Sheets-Sheet 1



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BRAKE

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2 Sheets-Sheet 2

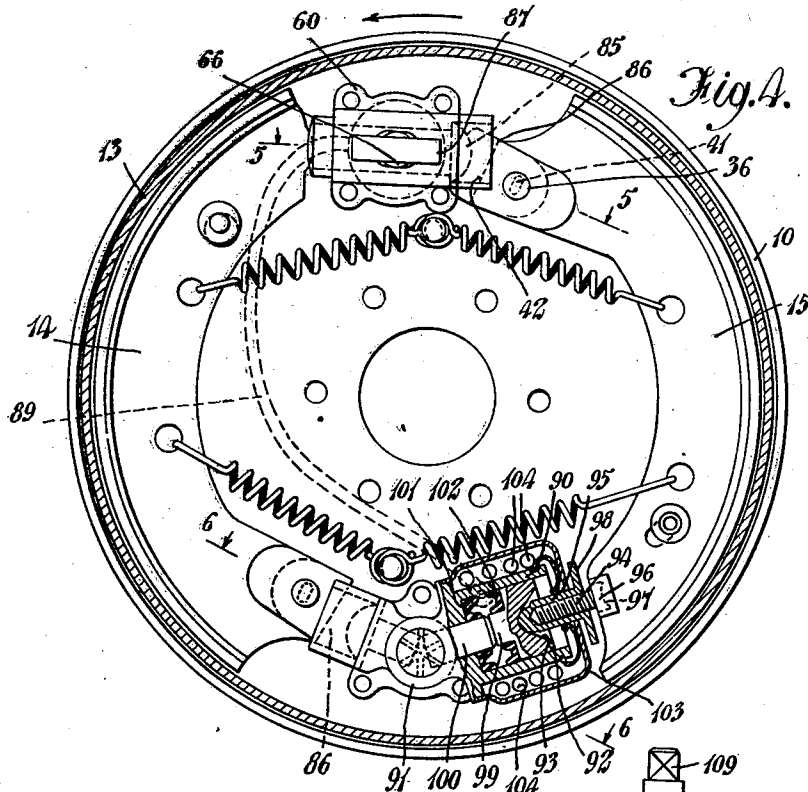


Fig. 5.

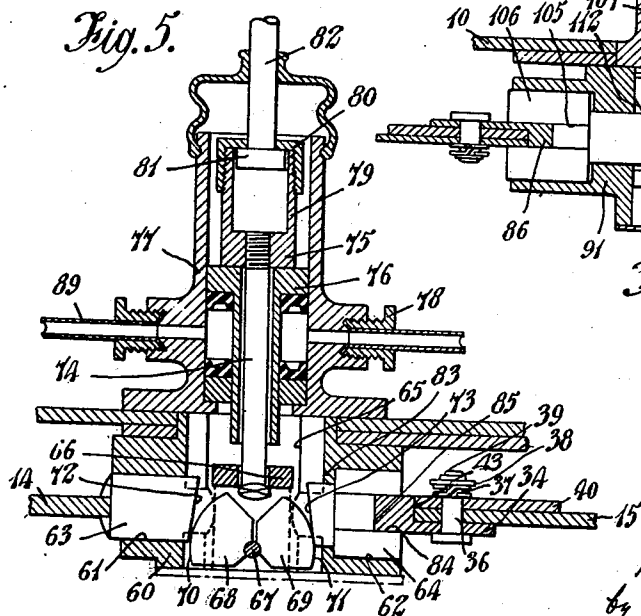
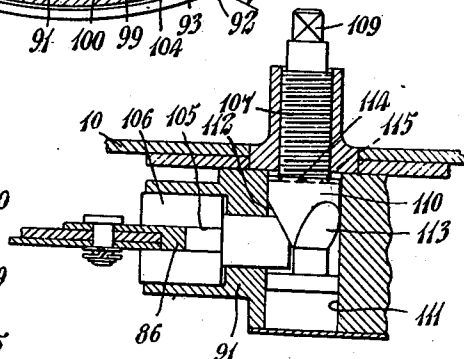


Fig. 6.



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UNITED STATES PATENT OFFICE

2,218,201

BRAKE

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18 Claims. (Cl. 188—152)

This invention relates to internal shoe drum brakes of the kind comprising a fixed support or back plate to which is attached a plurality of rigid arcuate shoes provided with spreading means whereby the shoes are moved outwards into contact with the internal surface of a rotating drum when the brake is applied.

It is the main object of the present invention to provide a relatively simple construction of brake in which each of the shoes acts in a leading sense when the drum is rotated in its normal direction.

A further object of the invention is to provide an improved form of shoe mounting which enables the anchored end of the shoe to pivot and also slide towards and away from the drum, preferably in the manner described and claimed in co-pending application Serial No. 180,362 filed on December 15, 1937.

The invention has as another object the provision of a brake which is particularly efficient in operation as both of the shoes act in a leading sense in the normal direction of drum rotation, and which incorporates a simple form of adjusting device adapted to take up wear in the usual shoe linings.

According to the invention a brake comprises a rotating drum, a fixed support, a braking element mounted upon said support, an applying element also mounted upon said support adjacent one end of the braking element, an intermediate member which is disposed between said elements to transfer force in compression from one to the other, and is connected with one element by a pivotal joint, and with the other element by a sliding joint enabling the adjacent end of the braking element to move towards and away from the drum, a second applying means being provided at the opposite end of said braking element, and a stop being provided in conjunction with the said applying element to enable it to act as an abutment for the braking element when the said second applying means is operative.

The invention is illustrated by way of example in the accompanying drawings in which

Figure 1 is a side elevation of a vehicle brake shown partly in section;

Figure 2 is a fragmentary sectional elevation of one of the actuating devices shown to an enlarged scale;

Figure 3 is a fragmentary sectional plan taken on the line 3—3 of Figure 2;

Figure 4 is a side elevation of a modified form of brake also partly in section.

Figure 5 is a sectional plan taken on the line 5—5 of Figure 4; and

Figure 6 is a fragmentary sectional plan of the adjusting mechanism taken on the line 6—6 of Figure 4.

In the brake shown in Figures 1 to 3 the fixed support comprises a sheet metal back plate 10 which is fitted at diametrically opposite points with a pair of hydraulic cylinders 11 and 12 arranged for spreading apart into contact with a rotating drum 13, a pair of rigid arcuate brake shoes 14 and 15. The shoes 14 and 15 are maintained in their proper relationship to the back plate 10 by means of studs 16 which extend from said back plate through slots 17 formed in the webs of the shoes, which latter are engaged by washers 18 carried by the studs. Each shoe is retracted by a pair of coiled tension springs 19 and 20, these being anchored to pins 21 and 22 upon the back plate 10 as shown.

The construction of the cylinder 11 and the associated parts will be seen more clearly in Figure 2, the cylinder 12 being similar. The cylinder is formed with a pair of lugs 23 and 24 by which it is attached to the back plate 10, and it is fitted slidably with a pair of pistons 25 and 26 having cup washers 27 and 28 respectively. The piston 26 is formed with a radial flange 29 adapted to engage with the end of the cylinder 11 and act as an abutment for the shoe 15 when the drum 13 is rotated in an anti-clockwise direction as indicated by the arrow in Figure 1. A thin metal skirt 30 is fitted to the flange 29 and slides upon the outside of the cylinder 11 so as to prevent grit and other foreign matter from gaining access to the interior of the cylinder. At its centre the piston 29 is formed with a part-spherical recess or socket 31 which is adapted to receive in a pivotal manner the correspondingly shaped portion 32 of an intermediate member indicated at 33. A lug 34 forming part of said intermediate member is engaged by the web portion 35 of the shoe 15 as will be seen in Figure 3 and is held in contact therewith by a headed pin 36 fitted with a spring washer 37, a plain washer 38 and a clip 39. This end part of the shoe 15 is preferably strengthened by a reinforcing plate 40 which is also engaged by the pin 36 and serves as a seating for the spring washer 37. It will be seen from Figure 2 that the pin 36 passes through a slot 41 formed in the web 35 and reinforcing plate 40, and this enables the end surface 42 of the shoe to slide relative to a corresponding surface 43 formed upon the inter-

mediate member 33, this sliding movement being damped frictionally owing to the force exerted by the spring washer 37. It will be noted that the end surface 42 of the shoe 15 is so shaped that the line of sliding when produced passes to that side of the axis of the drum 13 remote from the shoe 15, and the inclination of this direction is preferably arranged in the manner described in co-pending application Serial No. 180,362 filed on December 15, 1937.

The piston 25 is connected with the shoe 14 through the medium of an adjusting device comprising a screw 44 having a slotted head 45 engaging the web of the shoe 14. The screw 44 is fitted with a nut 46 having a radial flange 47 adapted to be urged into contact with the piston 25 by the pull-off springs 19 and 20. A thin metal shield 48 is interposed between the flange 47 and the piston 25 and slides upon the exterior of the cylinder 11 in order to exclude water and dirt, the flange 47 conveniently being shaped with teeth so that it can easily be rotated to effect the adjustment of the shoe 14. It will be noted that the flange 47 and shield 48 are adapted to engage with the end of the cylinder 11, so that when the drum 13 is rotated in a clockwise direction the cylinder 11 constitutes an abutment or anchorage for the shoe 14.

The internal working spaces of the cylinders 11 and 12 are connected together by a pipe 50, and both are fed with pressure liquid through a pipe 51 leading to the cylinder 11. If the drum 13 is rotating in the normal direction shown by the arrow and pressure liquid is fed through the pipe 51, the pistons 25 and 26 in both cylinders 11 and 12 will be forced outwardly and will thus spread the shoes 14 and 15 into contact with the drum. The rotation of the latter, however, carries the shoes round in an anti-clockwise direction so that in each case the flange 29 of the piston 26 engages the end of the cylinder and constitutes an abutment for the shoe, both shoes acting in a leading sense and thus producing a large braking force. In moving towards and away from the drum 13 each of the shoes 14 and 15 normally moves pivotally about the centre of the part-spherical recess 31 in the piston 26 but the provision of the sliding surfaces 42 and 43 has the important effect of enabling the shoe to accommodate itself to the drum, and thus toe-grab and other forms of erratic action are avoided.

A mechanical operating device is included for use in parking or in emergency, and is of the known form comprising a lever 52 which is pivoted to the top part of the shoe 15 by a bolt 53 and carries a thrust link 54. The opposite end of this link is formed with a finger 55 adapted to slide between a pair of pegs 56 and 57 attached to the shoe 14. When the lower end of the lever 52 is pulled to the left by a tension cable 58, the upper ends of the shoes 14 and 15 are spread apart into contact with the drum 13 by means of the link 54 and their lower ends both receive support from the cylinder 12 which serves as an anchorage or abutment in each case. When the drum 13 is rotating in the normal direction the shoe 14 acts in a leading sense, and, due to the provision of the intermediate member 33 at its lower end, is able to accommodate itself freely to the surface of the drum and thus produce a relatively large braking force.

In the brake shown in Figures 4 to 6 the back plate 10 is again provided with two shoes 14 and 15, the upper ends of which are, however, spread apart by an actuating means of a mechanical

nature. This actuating means comprises a body 60 which is bored at 61 and 62 for the slidable reception of plungers 63 and 64 respectively. The body 60 is also formed with a passageway 65 which extends in a direction at right angles to the plane of the back plate 10 and which accommodates with considerable lateral play a bifurcated member 66. This member is fitted with a pin 67 which forms the pivot for a pair of sector-shaped members 68 and 69 having curved surfaces 70 and 71 arranged to roll upon oblique cam surfaces 72 and 73 respectively upon the plungers 63 and 64. The bifurcated member is operated by a tension rod 74 fitted with a collar 75 adapted to cooperate with a hydraulic piston 76. The latter is mounted slidably within a cylinder 77 having an inlet connection 78 leading to any convenient source of pressure liquid, so that when the piston 76 is moved a pull is exerted upon the tension rod 74 and the consequent movement of the bifurcated member 66 causes the sector-shaped members 68 and 69 to spread apart the shoes 14 and 15 through the medium of the plungers 63 and 64. The collar 75 is formed with a tubular extension 79 having a cap 80 cooperating with a head 81 upon the tension rod 82 of a mechanical brake rigging. This rigging is normally connected with the usual hand brake lever (not shown), which latter can thus be used for applying the brake shoes 14 and 15 during parking or in an emergency.

The plunger 64 is as shown in Figure 5 arranged to engage a shoulder 83 in the body 60 so that it can serve as an abutment or anchorage for the brake shoe 15, said plunger being formed with a groove 84 having a convex bottom of semi-circular shape as indicated at 85 in Figure 4. This groove is engaged by a correspondingly shaped part of an intermediate member 86, which latter in consequence is capable of moving pivotally about a centre shown at 87. The intermediate member 86 is formed with a lug 34 as in the previous example, this being held in sliding frictional engagement with the web of the brake shoe 15 by means of a pin 36, spring washer 37, plain washer 38 and circlip 39. As before, the end surface 42 of the shoe 15 is arranged to slide against a wall 43 formed upon the intermediate member 86. The surface 42 is again inclined so that the direction of sliding, if produced, would pass to that side of the axis of the brake drum 13 remote from the shoe 15, the pin 36 of course being arranged to pass through a slot 41 formed in the web of the shoe 15 and also through a reinforcing plate 40 secured thereto.

From the cylinder 77 a pipe connection 89 leads to a motor cylinder 90 secured to the back plate 10 at the lower end of the brake shoe 15. This cylinder, which is formed in one with the body 91 of an adjuster device, contains a slidable piston 92 formed with a substantially conical recess 93 whereby it engages with an adjustable thrust device comprising a screw 94 and a nut element 95. The screw is formed with a head 96 which is slotted to interengage with a notched portion 97 at the lower end of the shoe 15, while the nut element 95 is provided with a flange 98 whereby the length of the thrust device 94, 95 can be adjusted during the assembly of the brake. The piston 92 is formed with a spigot 99 which is adapted to engage with a thrust element 100 extending slidably through the bottom of the cylinder 90, packing cups 101 and 102 being fitted to prevent leakage of liquid. The cylinder 90 is enclosed within a thin metal cas-

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ing 103 secured to the back plate 10, which latter is formed with holes indicated at 104 in order that cold air from the atmosphere may circulate around the cylinder 90 and prevent the latter from becoming unduly heated when the brake is working. The lower end of the brake shoe 14 is constructed similarly to the upper end of the shoe 15 so as to be capable of sliding towards and away from the drum as well as pivoting. The concavely curved part of the intermediate member 86, however, engages with a slot 105 formed in a plunger member 106 which slides radially within the body 91, the bottom of the slot 105 being convex so as to serve as a pivotal mounting for the intermediate member 86. The body 91 of the adjusting device is fitted with a screw 107 having a squared end 109 disposed outside the back plate 10, said screw being arranged to push forwardly a plunger 110 which is slidable within a bore 111 in said body 91. This plunger is formed with a pair of oblique cam surfaces 112 and 113 against which the inner parts of the plunger 106 and the thrust element 100 bear. Thus, as the screw 107 is advanced the plunger 106 and thrust element 100 are moved apart, and consequently the "off" clearance between the brake shoes 14 and 15 and the drum 13 is reduced. In order to facilitate the adjustment a diametral ridge 114 is formed across the end of the screw 107, and engages in succession with a plurality of grooves 115 formed in the adjacent end of the plunger 110. The normal rotation for the brake illustrated is in an anti-clockwise direction and when pressure liquid is supplied through the connection 78 the upper ends of the brake shoes 14 and 15 are both urged into contact with the drum 13. At the same time the pressure liquid entering the cylinder 90 urges the lower end of the shoe 15 outwardly, with the result that the plunger 64 abuts against the shoulder 83 and both shoes act in a leading sense. Each of said shoes moreover is capable of moving pivotally and slidably towards and away from the drum so that efficient braking is ensured. When the brake is applied hydraulically while the drum is rotating in a clockwise direction the shoe 15 is again enabled to act in a leading sense, owing to the fact that the drum rotation causes the spigot 99 upon the piston 92 in the motor cylinder to engage with the thrust element 100, the plunger 64 being forced outwardly by the corresponding sector-shaped member 69. It will be appreciated that when the tension rod 82 of the mechanical brake rigging is used to apply the brake the upper ends of the shoes 14 and 15 are spread apart and the brake acts in the customary manner with one shoe operating in the leading sense and the other in a trailing sense. It will be understood that the examples which have been described are regarded merely as illustrating the improved form of brake, and various modifications may be made in the construction without departing from the invention.

What I claim is:

1. A brake comprising a rotating drum, a fixed support, a braking element mounted upon said support, an applying element also mounted upon said support adjacent one end of the braking element, an intermediate member which is disposed between said elements to transfer force in compression from one to the other, and is connected with one element by a pivotal joint, and with the other element by a sliding joint having

cooperating plane surfaces enabling the adjacent end of the braking element to move in a selected plane towards and away from the drum, a second applying means being provided at the opposite end of said braking element, and a stop being provided in conjunction with the said applying element to enable it to act as an abutment for the braking element when the said second applying means is operative.

2. A brake comprising a rotating drum, a fixed support, a rigid arcuate shoe, and an actuating device at each end of said shoe, either one of which devices is adapted to move the shoe into engagement with the drum, one of said actuating means comprising an applying element, an intermediate member which is pivotally connected with the applying element and is connected slidably with the shoe so as to permit the shoe to slide in a selected plane towards and away from the drum, and a stop which arrests the movement of the applying member so as to act as an anchorage for the shoe.

3. In a brake, a shoe-applying device comprising a housing, a plunger slidable therein, an intermediate member connected pivotally with the plunger, an abutment on the intermediate member engaging slidably with the corresponding surface on the shoe, said shoe surface lying in a direction which when extended passes to that side of the drum axis remote from the shoe, and means positively connecting the intermediate member with the shoe so as to allow said relative sliding movement.

4. In a brake, a shoe-applying device comprising a housing, a plunger slidable therein, an intermediate member, a ball and socket joint connecting the intermediate member with the plunger, an abutment on the intermediate member engaging slidably with a corresponding surface on the shoe, said shoe surface lying in a direction which when extended passes to that side of the drum axis remote from the shoe, and means positively connecting the intermediate member with the shoe so as to allow the said relative sliding movement.

5. In a brake, a shoe-applying device comprising a housing, a plunger slidable therein, an intermediate member connected pivotally with the plunger, an abutment on the intermediate member engaging slidably with a corresponding surface on the shoe, said shoe surface lying in a direction which when extended passes to that side of the drum axis remote from the shoe, a pin and slot connection joining the intermediate member to the shoe so as to permit the relative sliding movement, and a frictional device acting to resist said relative sliding movement.

6. In a brake, a shoe-applying device comprising a housing, a plunger slidable therein, an intermediate member, a ball and socket joint connecting the intermediate member with the plunger, an abutment on the intermediate member engaging slidably with a corresponding surface on the shoe, said shoe surface lying in a direction which when extended passes to that side of the drum axis remote from the shoe, a pin and slot connection joining the intermediate member to the shoe so as to permit the relative sliding movement, and a frictional device acting to resist said relative sliding movement.

7. In a brake, a shoe-applying device comprising a housing, a plunger slidable therein, an intermediate member, a substantially spherical head formed on said intermediate member, a socket formed in the plunger and containing the

head to allow universal movement of the intermediate member, an abutment on the intermediate member engaging slidably with a corresponding surface on the shoe, said shoe surface lying in a direction which when extended passes to that side of the drum axis remote from the shoe, and means positively connecting the intermediate member with the shoe so as to allow the said relative sliding movement.

8. A brake comprising a rotating drum, a fixed support, a pair of actuating devices at opposite parts of the support, a pair of rigid arcuate shoes arranged between the actuating devices so as to be moved thereby into contact with the drum, each of said actuating devices comprising a housing, a pair of plungers mounted slidably therein, an intermediate member interposed between a shoe end and the corresponding plunger, a pivotal connection between the intermediate member and the plunger, and a sliding joint between the intermediate member and the shoe, the sliding being such that it is directed to that side of the drum axis remote from the shoe in question, and a stop for each plunger in the corresponding housing enabling the said plunger to act as an abutment for its shoe.

9. A brake comprising a rotating drum, a fixed support, a pair of actuating devices at opposite parts of the support, a pair of rigid arcuate shoes arranged between the actuating devices so as to be moved thereby into contact with the drum, each of said actuating devices comprising a housing, a pair of plungers mounted slidably therein, an intermediate member interposed between the shoe end and the corresponding plunger, a pivotal connection between the intermediate member and the plunger, a ledge formed in the intermediate member and engaged slidably by the shoe end, a pin and slot connection holding the intermediate member upon the shoe so as to permit the shoe to slide upon the intermediate member with its end abutting against the wall of the ledge, and a stop for each plunger in the corresponding housing enabling the said plunger to act as an abutment for its shoe.

10. A brake comprising a rotating drum, a fixed support, a pair of actuating devices at opposite parts of the support, a pair of rigid arcuate shoes arranged between the actuating devices so as to be moved thereby into contact with the drum, each of said actuating devices comprising a housing, a pair of plungers mounted slidably therein, an intermediate member interposed between a shoe end in the corresponding plunger, a pivotal connection between the intermediate member and the plunger, a ledge formed in the intermediate member and engaged slidably by the shoe end, a pin and slot connection holding the intermediate member upon the shoe so as to permit the shoe to slide upon the intermediate member with its end abutting against the wall of the ledge, means for frictionally gripping the shoe and intermediate member together so that normal applying movement of the shoe takes place about the pivot of the intermediate member, and a stop for each plunger in the corresponding housing enabling the said plunger to act as an abutment for its shoe.

11. A brake comprising a rotating drum, a fixed support, a pair of rigid arcuate brake shoes, an actuating device arranged to spread apart adjacent ends of said shoes into engagement with the drum, an anchorage between the other ends of said shoes and engaged directly by one thereof, a hydraulic motor cylinder interposed between

the anchorage and the end of the other shoe, hydraulic means which operate the actuating device and are connected with the motor cylinder so that both are fed in common, and an intermediate member which is interposed between the opposite end of said other shoe and the actuating device, said intermediate member being connected pivotally with the actuating device and being coupled with the said other shoe so as to allow the latter to slide towards and away from the drum.

12. A brake comprising a rotating drum, a fixed support, a pair of rigid arcuate brake shoes, an actuating device arranged to spread apart adjacent ends of said shoes into engagement with the drum, an anchorage between the other ends of said shoes and engaged directly by one thereof, a hydraulic motor cylinder interposed between the anchorage and the end of the other shoe, hydraulic means which operate the actuating device and are connected with the motor cylinder so that both are fed in common, and an intermediate member which is interposed between the opposite end of the said other shoe and the actuating device, said intermediate member being connected with the actuating device by a pivotal joint, and having a surface which is engaged slidably by the end of the shoe so that the latter is enabled to slide towards and away from the drum, said surface being so inclined that if extended it passes to that side of the drum centre remote from the shoe in question.

13. A brake comprising a rotating drum, a fixed support, a pair of rigid arcuate brake shoes, an actuating device arranged to spread apart adjacent ends of said shoes into engagement with the drum, an anchorage between the other ends of said shoes and engaged directly by one thereof, a hydraulic motor cylinder interposed between the anchorage and the end of the other shoe, hydraulic means which operate the actuating device and are connected with the motor cylinder so that both are fed in common, a thrust-transmitting connection in the motor cylinder adapted to provide a wholly mechanical thrust connection between the anchorage and the said other shoe when the motor cylinder occupies its minimum length, and an intermediate member which is interposed between the opposite end of the said other shoe and the actuating device, said intermediate member being connected pivotally with the actuating device and being coupled with the said other shoe so as to allow the latter to slide towards and away from the drum.

14. A brake as claimed in claim 11 in which the anchorage comprises a body attached to the fixed support, an adjusting screw mounted in said body, a plunger slidable in the body under the action of the screw but being free rotationally therefrom, a pair of push rods arranged to engage at their inner ends with oblique surfaces on the plunger, while their outer ends are in operative connection with the brake shoes and are moved apart as the plunger is advanced by the screw.

15. A brake comprising a rotating drum, a fixed support, a braking element for cooperation with the drum, means for actuating one end of the element, mounting means for the other end of the braking element, said mounting means comprising a member pivotally mounted on the support at a point spaced from the end of the element and capable of transmitting force in compression, a connection between the pivotally

mounted member and the braking element including abutting plane surfaces capable of sliding movement for permitting the end of the element to move in a selected plane toward the drum during brake application, and means carried solely by the element and member for positively maintaining the surfaces in cooperative relation and for also establishing a friction resistance to their relative movement in the selected plane

16. A brake comprising a rotating drum, a fixed support, a braking element for cooperation with the drum, means for actuating one end of the element, mounting means for the other end of the braking element, said mounting means comprising a member pivotally mounted on the support at a point spaced from the end of the element and having a portion overlapping said end, said member and braking element being provided with cooperating plane surfaces in abutting relation and capable of relative movement to permit the end of the element to move in a selected plane toward the drum during brake application, and cooperating means between the element and the overlapping portion of the member for positively maintaining the plane surfaces in cooperative position with each other yet permitting their relative movement in the selected plane.

17. A brake comprising a rotating drum, a fixed support, a braking element for cooperation with the drum, means for actuating one end of the element, mounting means for the other end of the braking element, said mounting means comprising a member pivotally mounted on the

support at a point spaced from the end of the element and having a portion overlapping said end, said member and braking element being provided with cooperating plane surfaces in abutting relation and capable of relative movement to permit the end of the element to move in a selected plane toward the drum during brake application, and a pin and slot connection between the element and the member for maintaining the plane surfaces in engagement with each other.

18. A brake comprising a rotatable drum, a fixed support, a rigid braking element extending over substantially 180 degrees of the drum for cooperation therewith, means carried by the support and positioned adjacent one end of the element for actuating said element, and mounting means for the other end of the braking element, said mounting means comprising a member pivotally mounted on the support and capable of transmitting force in compression, said member and the said mounted end of the braking element being provided with abutting plane surfaces which are so related with respect to the drum that the braking element can move in a selected plane toward the drum during brake application without a wedging action, means for preventing disengagement of the abutting surfaces by a relative lateral movement between the pivoted member and the braking element, and spring means for establishing a frictional resistance to movement of the braking element relative to the pivoted member in the selected plane.

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