May 30, 1950 B. E. HOUSE 2,509,643

BRAKE

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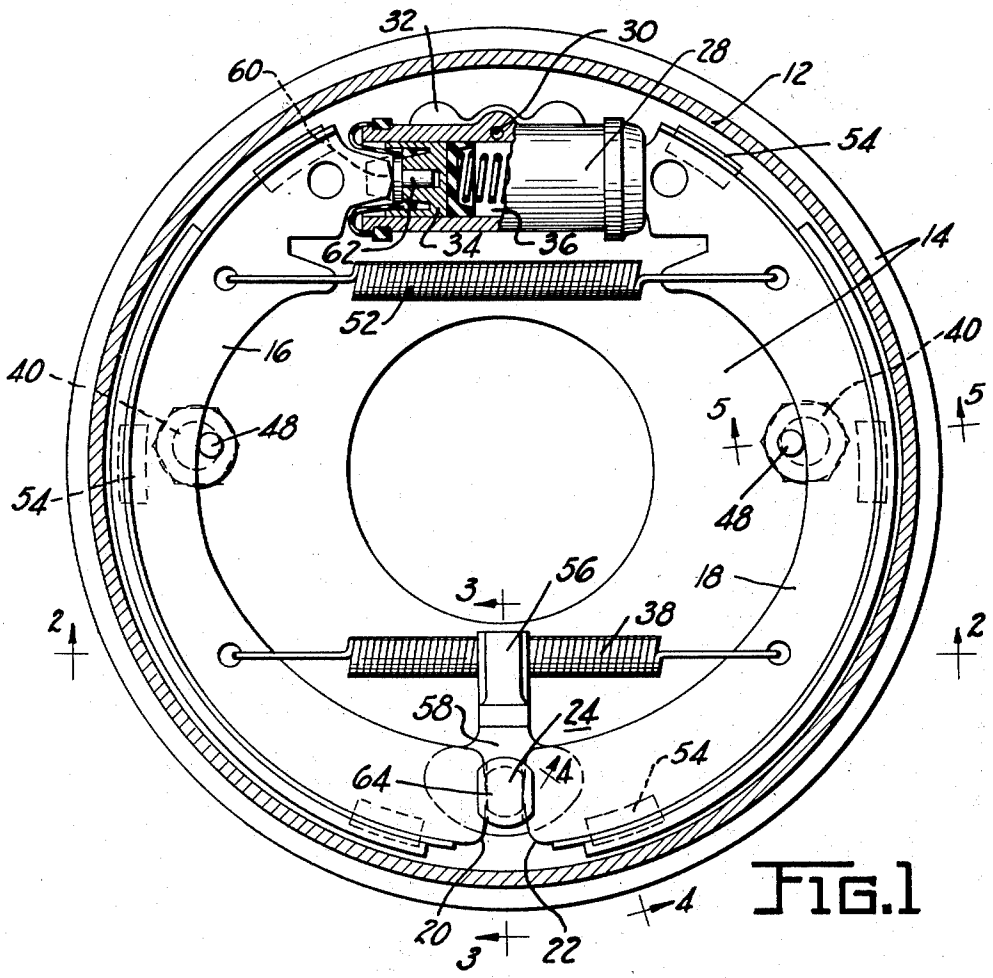


FIG. 1

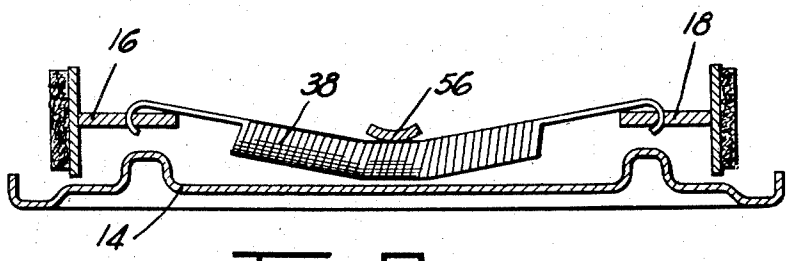


FIG. 2

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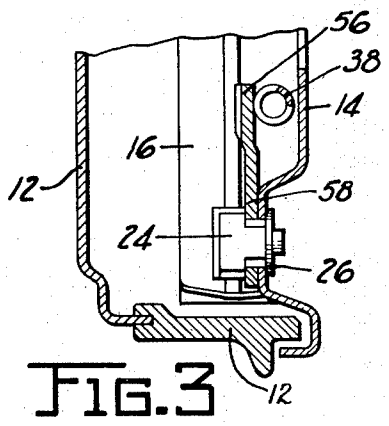


FIG. 3

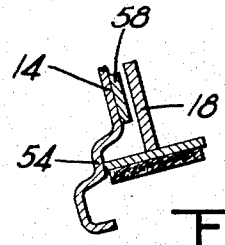


FIG. 4

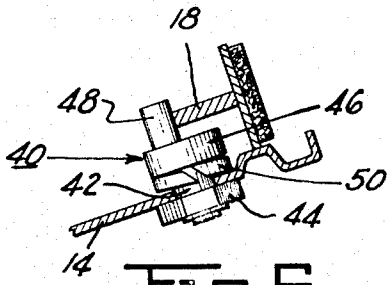


FIG. 5

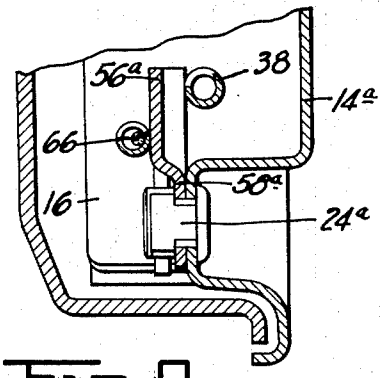


FIG. 8

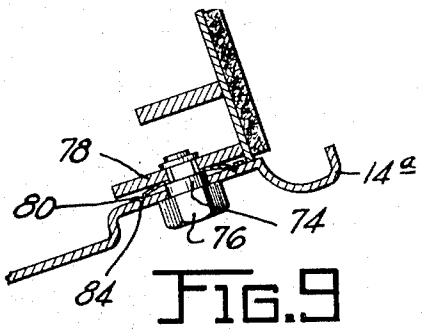


FIG. 9

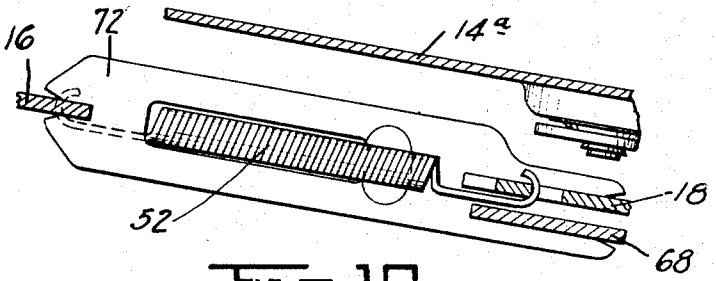


FIG. 10

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BRAKE

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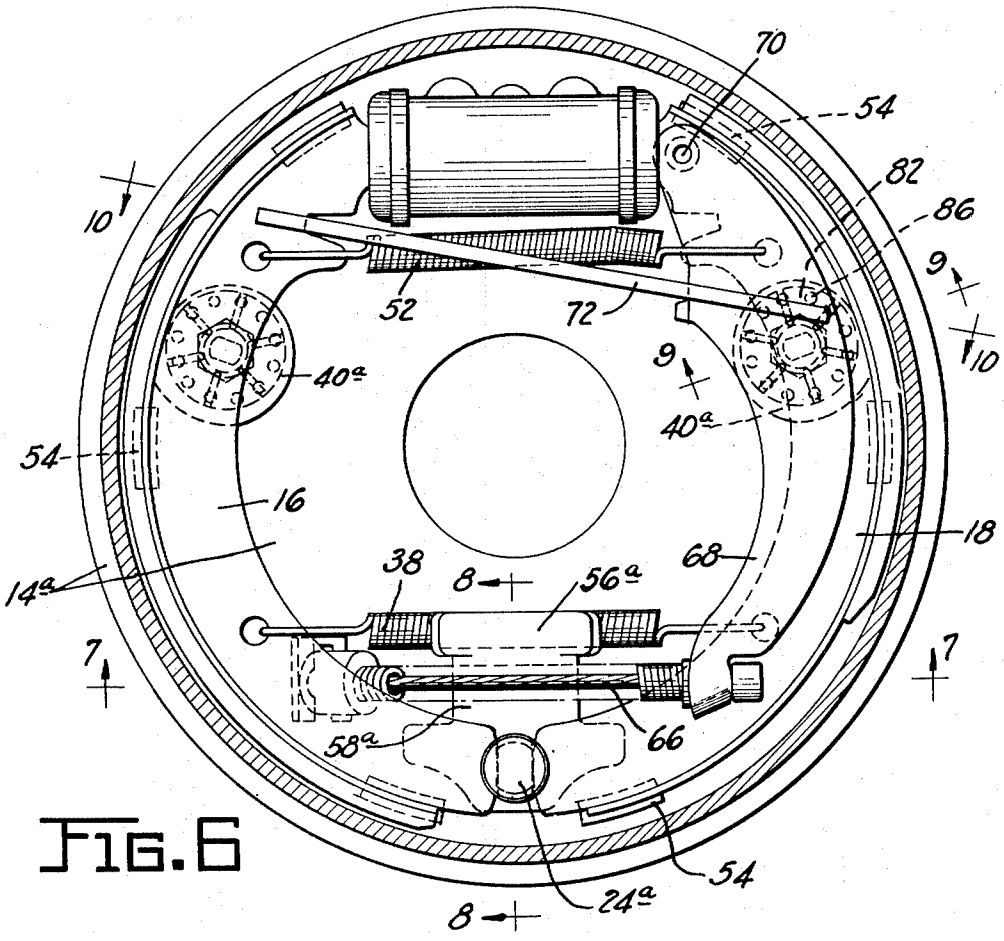


FIG. 6

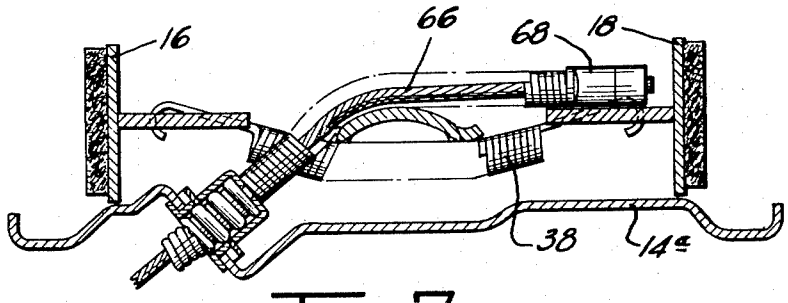


FIG. 7

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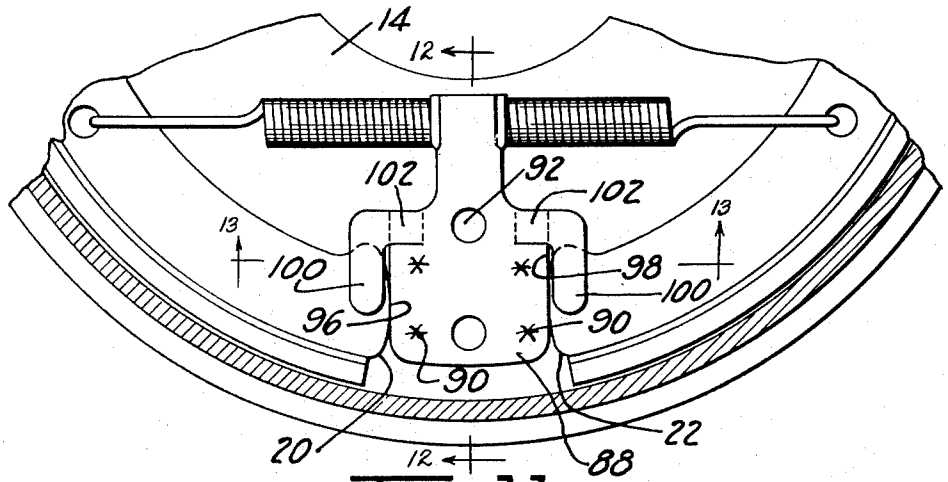


FIG. 11

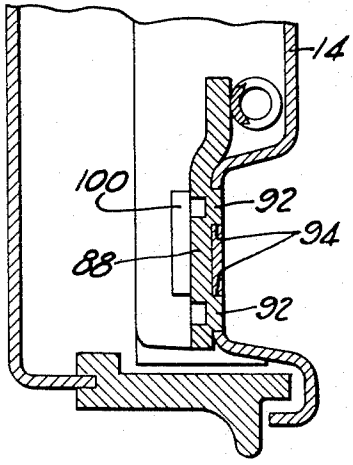


FIG. 12

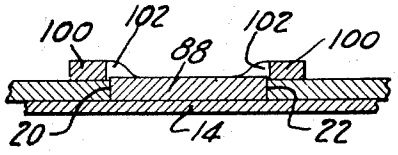


FIG. 13

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Patented May 30, 1950 2,509,643

UNITED STATES PATENT OFFICE

2,509,643

BRAKE

Bryan E. House, South Bend, Ind., assignor to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware

Application January 20, 1944, Serial No. 518,940

4 Claims. (Cl. 188—78)

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This invention relates to brakes, and more particularly to an internal expanding type of brake wherein two shoes are provided which are permanently anchored at the same side of the brake and which are moved into engagement with the brake drum by a device which spreads the unanchored ends of the shoes, this brake arrangement being commonly referred to as a "non-servo" brake.

The conventional "non-servo" brake has the adjacent anchored ends of the shoes pivoted on anchor pins journaled in the backing plate or support member. Near the unanchored ends of the shoes adjusting eccentrics or cams are provided which are adapted to move the shoes closer to the drum to compensate for lining wear. In order that the adjustment of the shoes provided by the eccentrics or cams near the unanchored ends of the shoes will not throw the shoes out of proper concentricity with the drum, the conventional "non-servo" brake is provided with anchors which are also adjustable, the part of the anchors which extends through the shoe webs usually being eccentric with respect to that part of the anchors which extends through the backing plate. Not only is this structure complicated and relatively expensive to manufacture, but, in addition, the procedure for adjusting the shoes is involved and tedious.

An object of the present invention is to provide a simplified brake of the "non-servo" type, reducing both the cost and weight of the complete brake assembly.

Another object of the present invention is to simplify the adjusting procedure required for adjusting the released position of the shoes of a "non-servo" brake.

Yet another object of the present invention is to provide a brake of the "non-servo" type wherein the shoes are allowed to center themselves during braking, thus preventing loss of effectiveness on the one hand and uncontrollability on the other.

Other objects and advantages of the present invention will become apparent during the course of the following description, reference being had therein to the accompanying drawings, in which:

Figure 1 is an elevational view of a brake assembly incorporating my invention, the braking flange of the brake drum being shown in section;

Figures 2, 3, 4 and 5 are sections taken on the lines 2—2, 3—3, 4—4, and 5—5, respectively, of Figure 1, the anchor of Figure 3, however, being shown from one side rather than in section;

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Figure 6 is an elevational view of a brake assembly showing a second embodiment of my invention;

Figures 7, 8, 9 and 10 are sections taken on the lines 7—7, 8—8, 9—9, and 10—10, respectively, of Figure 6;

Figure 11 is an elevational view, partially broken away, of a brake assembly showing a third embodiment of my invention; and

Figures 12 and 13 are sections taken on the lines 12—12, and 13—13, respectively, of Figure 11.

Referring first to the brake shown in Figures 1 to 5, inclusive, it comprises a rotatable brake drum having a cylindrical braking flange 12, a non-rotatable support member or backing plate 14 mounted on a non-rotating part of the vehicle, and two arcuate lined brake shoes 16 and 18 mounted in end-to-end relationship on the support member 14 and adapted to be expanded into engagement with the drum 12 in order to impede the rotation thereof, each of said brake shoes being substantially T-shaped in cross-section, the stem of the T being provided by the shoe web, and the head of the T being provided by the lined shoe rim.

The lower ends 20 and 22 of the shoes 16 and 18, respectively, are maintained in contact with the opposite sides of an anchor 24, which, in the present illustration, is fixed to the support member 14, as shown in Figure 3. The particular form of the anchor 24 is not material, except that its conformation must be such as to permit the ends of the shoes to slide radially along its sides, to assume the proper position with respect to the brake drum 12, particularly after adjustment. Furthermore, it is immaterial whether the anchor 24 be made integral with the backing plate or be fixed thereto. In the present case, the anchor is riveted to the backing plate, a sheared rivet head 26 being provided as illustrated in Figure 3. In the specification and claims, it is intended that the use of the term "anchor" refer to any element or elements having singly or collectively the functions of the single anchor 24. Thus two adjacent anchors might be provided, one for each shoe, without going beyond the scope of the present invention.

The unanchored ends of the shoes are adapted to be spread apart into contact with the drum by means of the hydraulic actuator 28. It is preferred that the axis of said hydraulic actuator be on a substantially horizontal line, as shown, this being desirable in order to permit effective bleeding of the hydraulic fluid. The bleed open-

ing 30 is shown in Figure 1 at the top of the hydraulic actuator. Said actuator 28 is mounted on the support member 14 by means of a flange 32, and is provided with a pair of pistons 34 which are in contact with the ends of the shoes and which are urged apart by admission of hydraulic fluid under pressure to chamber 36 between the pistons.

Resilient means are provided for maintaining the lower ends of the shoes at all times in engagement with the anchor 24, said means conveniently being a spring 38 connected to and in tension between the shoes 16 and 18. The spring 38 is preferably located near the lower ends of the shoes.

An adjustor 40 is provided for each of the shoes. This adjustor may taken any one of numerous forms, one of which is illustrated in Figure 5. This adjustor has a stem 42 extending through an opening in the backing plate, a head 44 adapted to receive an adjusting tool, a flange 46, and an eccentric shaft or pin 48 in contact with the web of the shoe. Turning the head 44 causes the eccentric pin 48 to rotate about the axis of the shaft 42, thus varying the position of the shoe relative to the support member 14. In order to frictionally hold the adjustor 40 in adjusted position, a split ring lock washer 50 may be inserted between the flange 46 and the backing plate, the lock washer constantly attempting to resume its original helical form, and thereby creating friction to prevent undesired rotation of the shaft 42.

A return spring 52 is in tension between the shoes 16 and 18 near the upper ends thereof, the spring 52 being located between the adjustors and the upper ends of the shoes, whereas the spring 38 is located between the adjustors and the lower ends of the shoes. The arrangement of the springs must be such that the moment of the lower spring 38 about the adjustors is greater than the moment of the upper spring 52 about the adjustors. This may be attained in various ways: by providing a spring 38 which is stronger than the spring 52; by positioning the spring 38 farther from the eccentric pins 48 than the spring 52; or by locating the holes in the shoe webs into which the ends of the springs extend farther apart in the case of spring 38 than in the case of spring 52, thus giving a greater tension to the former spring. When the upper ends of the shoes are spread by admission of fluid under pressure to hydraulic actuator 28, the upper spring 52 is stretched considerably more than the lower spring 38. When the applying pressure is released, the spring 52 returns the shoes to released position, in which position they contact the adjustors 40.

The shoes 16 and 18 are maintained against vertical displacement by means of friction with the eccentric pins 48 and the anchor 24 caused by the force of the springs 38 and 52. Additional means may be provided for maintaining the vertical position of the shoes, as illustrated in Figures 2 and 4. In Figure 4 it will be seen that the rim of the shoe is in contact with a ledge 54 formed on the stamped backing plate 14. A plurality of these ledges 54 are provided on the backing plate, as shown by dotted lines in Figure 1. In the present illustration each shoe is held against three ledges in the backing plate. One of these ledges is located adjacent the respective adjustor 40, a second is located adjacent the anchor 24, and the third is located near the actuator 28. In order to hold the edges of

the shoes against these ledges, means are provided for exerting a force on the shoes in the direction of the backing plate. In the present illustration, referring to Figure 2, the spring 38 is so arranged as to have a force component acting downwardly in the direction of the backing plate. This is accomplished by utilizing an extension 56 on the anchor reinforcement plate 58 as a means for causing the deflection of the central portion of the spring 38. The anchor reinforcement plate 58 is secured between the anchor 24 and the backing plate 14, as shown in Figure 3.

The shoes are maintained in the proper lateral position not only by contact of the shoe rims with the backing plate ledges 54, but also by means of the slotted heads 60 (of inserts 62 in the hydraulic actuator pistons 34) which embrace the shoe ends, and by means of the enlarged head 64 of the anchor pin 24 which extends for a slight distance over the anchoring ends 20 and 22 of the shoes.

The shoe-engaging sides of anchor 24 are flat, and the ends 20 and 22 of the respective shoe webs are convexly-curved, in order that the shoes may roll on their anchored ends as they are "rocked," or "rotated," into engagement with the drum. Because of this curvature of the shoe webs at their anchoring ends, the drum-contacting end portions of the shoes adjacent the anchor move away from the drum as the upper ends of the shoes return to released position.

The present brake entirely eliminates the anchor pins provided at the lower ends of the shoes of the conventional "non-servo" brake. Whereas the shoes of the conventional "non-servo" brake are positively positioned by the anchor pins extending through the shoe webs, the brake of the present invention positions the shoes vertically by means of friction produced on the anchor 24, the adjustors 40, and the backing plate ledges 54, as fully described above. The present brakes requires fewer parts and is less costly than the conventional "non-servo," and it also has certain operating advantages thereover.

As mentioned above, in the conventional pivot-pin-anchor "non-servo" brake, the anchors are eccentric, and they, as well as the adjustors provided for the purpose, should be adjusted when the clearance of the brake shoes is changed. The adjustment procedure for the conventional "non-servo" brake is as follows. The eccentric anchors are first adjusted by means of a "feeler" or thickness gauge to give a certain clearance at the ends of the shoes adjacent the anchors. The eccentric adjustors near the unanchored ends of the shoes are then adjusted to give a certain clearance at the ends of the shoes adjacent the actuator. However, if, in adjusting the ends of the shoes near the actuator, the clearance at the ends of the shoes adjacent the anchors is made too small, the eccentric anchors will have to be readjusted to open up this clearance. Then it may be necessary to again adjust the eccentric adjustors provided at the unanchored ends of the shoes in order to give proper clearance there.

In adjusting the brake disclosed in this application, the procedure is quite simple. The adjustor shafts 42 are turned to adjust the positions of the eccentric pins, moving said pins until the shoes are tight in the drum. The adjustors are then backed off to give a free wheel. This simplified adjustment is made possible by

the fact that, should one end of either shoe come into contact with the drum before the other end of the same shoe, the shoe can find its position in the drum by sliding on the anchor 24. The present adjustment thereby eliminates the need for thickness gauges and also eliminates the necessity of putting holes in the drum through which the gauges are inserted.

The brake of Figures 6 to 10, inclusive, is similar in most respects to the brake of Figs. 1 to 5, inclusive. However, there are certain differences which should be pointed out. The shape of the anchor reinforcement plate 58*a* is somewhat different from the anchor reinforcement plate 58 of Figure 1. Plate 58*a*, like plate 58, is provided with an extension 56*a* which deflects the spring 38 and thereby holds the edges of the shoes against the backing plate ledges. However, the reinforcement plate in this case is also so formed as to provide a ramp for the parking brake operating cable 66, the arrangement being shown in Figure 7. The cable 66 is connected to the lower end (see Fig. 6) of a lever 68 which is pivoted at 70 on the shoe 18, and which is connected by means of a thrust link 72 with the shoe 16 (see Fig. 10). When the cable 66 is pulled to the left, as seen in Figures 6 or 7, the lever 68 and link 72 act to spread the unanchored ends of the shoes.

The adjustors 40*a*, shown best in Figures 6 and 9, are different from the adjustors of Figures 1 to 5 inclusive, and also are unlike any adjustors heretofore provided. A shaft 74, having a head 76 adapted to receive an adjusting tool and a cam 78 mounted thereon and in contact with the rim of the shoe, is prevented from slipping out of adjusted position by means of a spring washer 80 having a plurality of radially extending arms 82 which act as cantilever springs. Each of the arms 82 is provided with a detent 84 which is adapted to engage in one of the depressions 86 provided in the backing plate. The number of detents and backing plate depressions is a matter of choice. In the present illustration, I have provided a washer having six arms 82, each of which has one detent, and I have provided 12 depressions in the backing plate. The detents not only serve to properly maintain the shaft 74 in adjusted position, but also provide an indication as to the extent of adjustment, i. e. as the adjustor is backed off after the shoes are brought into contact with the drum, the movement can be judged by the number of times the detents coincide with the depressions in the backing plate.

Figures 11 to 13, inclusive, disclose a simplified, and therefore preferred, version of my improved brake. The cost is reduced by combining the functions of the anchor and the reinforcement plate in a single stamped member 88. This stamped member 88 may be spot welded or projection welded to the support member 14, as indicated by the plurality of welds 90 on the drawing. In order to help take the anchoring torque of the shoes, the member 88 is preferably formed with two or more nibs 92 which are adapted to fit into complementary openings 94 in the support member 14. The lower ends 20 and 22 of the shoes are adapted to anchor against the sides 96 and 98, respectively, of the member 88. In order to assist in retaining the shoes in the proper lateral position, a pair of downwardly extending projections 100 of the member 88 are arranged to overlie the ends of the respective shoes. The projections 100 are raised from the plane of the anchor portion of member 88 by bending the connecting portions 102 upwardly. This is seen quite clearly in Figures 12 and 13.

Although particular embodiments of my invention have been described, it will be understood by those skilled in the art that the object of the invention may be attained by the use of constructions different in certain respects from those disclosed without departing from the underlying principles of the invention. I therefore desire by the following claims to include within the scope of my invention all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. In a brake including two shoes arranged in end to end relationship, a backing plate which supports the shoes and which is provided with a raised portion adjacent one end of the shoes, and a return spring connected in tension between the shoes to normally retain said shoes in released position; an anchor plate secured to the raised portion of the backing plate having its sides in contact with the edges of the shoes to receive the anchoring torque thereof, having projections overlying the anchoring ends of the shoes to retain said shoes in proper lateral position, and having an extension arranged to laterally deflect the return spring at a point intermediate the ends thereof, thereby causing said spring to exert a lateral force component urging the shoes toward the backing plate.

2. In a brake including two shoes arranged in end to end relationship, a backing plate which supports the shoes, and a return spring connected in tension between the shoes to normally retain said shoes in released position; an anchor member secured to the backing plate having its sides in contact with the ends of the shoes to receive the anchoring torque thereof, having projections overlying the anchoring ends of the shoes to retain said shoes in proper lateral position, and having an extension arranged to laterally deflect the return spring at a point intermediate the ends thereof, thereby causing said spring to exert a lateral force component urging the shoes toward the backing plate.

3. For use in cooperation with a rotatable drum, a brake comprising a nonrotatable support member, an anchor member carried by the support member having two spaced substantially radially extending flat shoe-anchoring surfaces, two brake shoes, each having a drum-engaging portion and a web portion, one end of which has a convexly-curved slidably engaging one of the flat surfaces of the anchor member, a hydraulic cylinder carried by the support member between the unanchored ends of the shoes, two pistons in the cylinder slidably engaging the unanchored ends of the respective shoes to rotate them on their curved anchor-engaging surfaces into engagement with the drum, both ends of both shoes being displaceable radially relative to the pistons and anchor member, respectively, to permit longitudinal self-centering movement of the shoes in the drum during either application or adjustment and to permit retention of the shoes in their centered positions after either application or adjustment, two adjustors, one acting on each of the shoes at a point remote from its anchored end to vary the shoe's released position angularly about the anchored end, a first spring means connected to the anchored ends of the shoes to retain the shoes in permanent engage-

ment with the anchor member, and a second spring means connected to the shoes intermediate the adjustors and the unanchored ends of the shoes to return the shoes to released position after their application to the drum, each spring means exerting its force solely along a line substantially perpendicular to an imaginary line connecting the opposite ends of either shoe to retain the shoes in centered position by means of the spring-developed friction between the shoes and other parts of the brake.

4. For use in cooperation with a rotatable drum, a brake comprising a nonrotatable support member providing thereon two spaced substantially radially extending flat shoe-anchoring surfaces, two brake shoes, each having a drum-engaging portion and a web portion, one end of which has a convexly-curved surface slidably engaging one of said anchoring surfaces, a hydraulic cylinder carried by the support member between the unanchored ends of the shoes, two pistons in the cylinder operatively engaging the unanchored ends of the respective shoes to rotate them on their curved anchor-engaging surfaces into engagement with the drum, both ends of both shoes being displaceable radially relative to the pistons and anchoring surfaces, respectively, to permit longitudinal self-centering movement of the shoes in the drum during either application or adjustment and to permit retention of the shoes in their centered positions after either application or adjustment, two adjustors, one acting on each of the shoes at a point remote from its anchored end to vary the shoe's released position angularly about the anchored end, a first spring means connected to the anchored ends of the shoes to retain the shoes in permanent engagement with the anchoring surfaces, and a second spring means connected to the shoes intermediate the adjustors and the unanchored ends of the shoes to return the shoes to released position after their application to the drum, each spring so exerting its force as to tend to retain the shoes in centered position.

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Certificate of Correction

Patent No. 2,509,643 May 30, 1950

BRYAN E. HOUSE

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 3, line 17, for the word "taken" read *take*; column 4, line 43, for "brakes" read *brake*; column 6, line 56, after "convexly-curved" insert *surface*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of October, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.