Jan. 10, 1956 J. H. PRATT 2,730,204

VEHICLE BRAKES

Filed Nov. 28, 1950 2 Sheets-Sheet 1

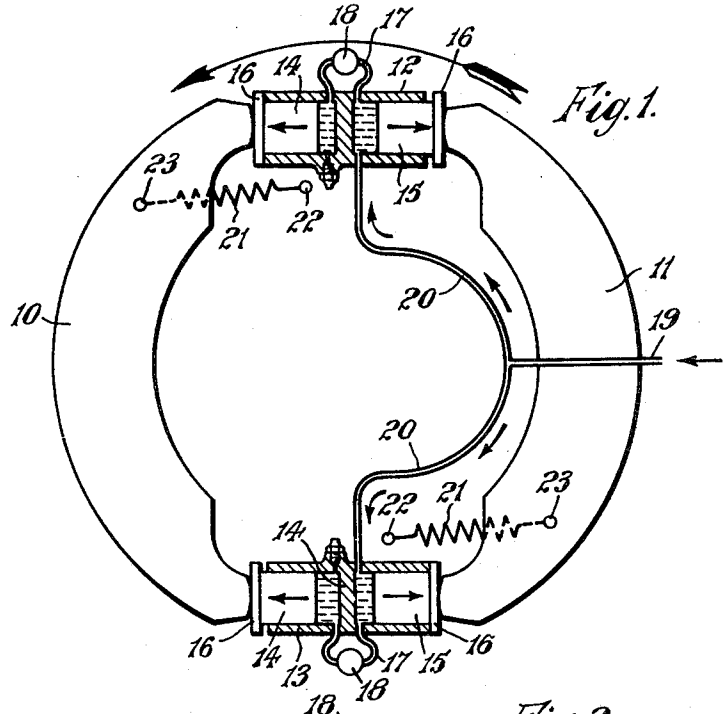


Fig. 1.

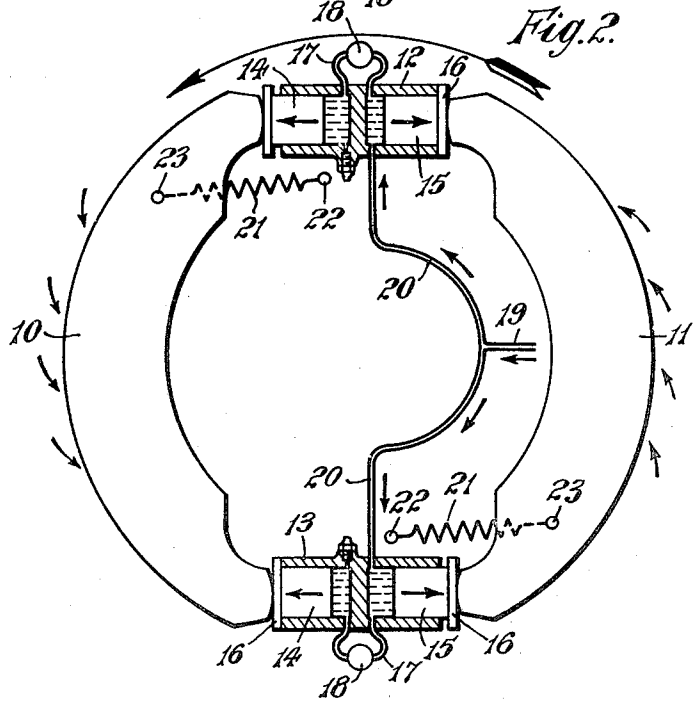


Fig. 2.

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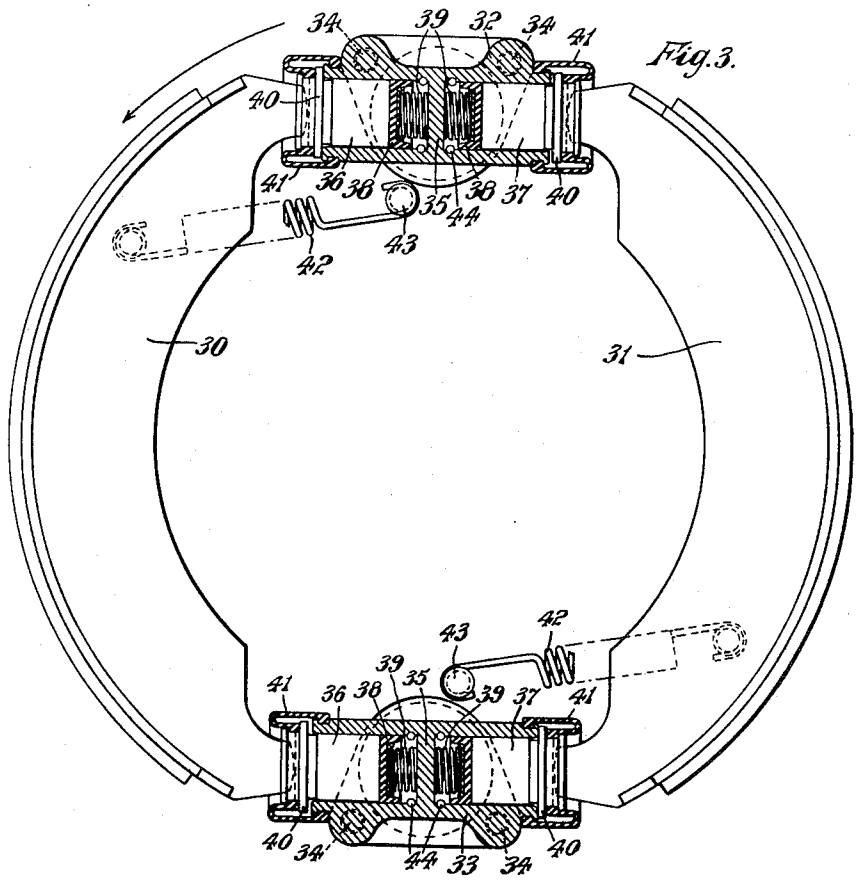


Fig. 3.

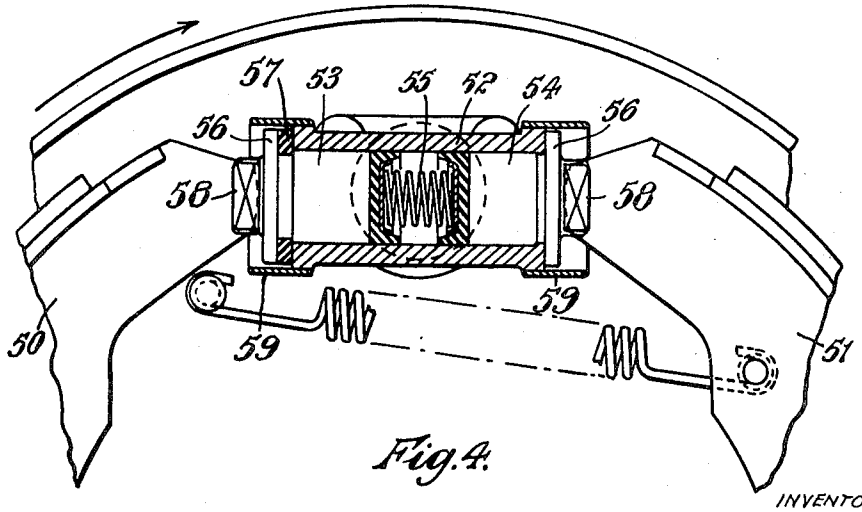


Fig. 4.

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United States Patent Office 2,730,204 Patented Jan. 10, 1956

2,730,204

VEHICLE BRAKES

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Application November 28, 1950, Serial No. 197,903

Claims priority, application Great Britain December 1, 1949

3 Claims. (Cl. 188—152)

This invention relates to improvements in vehicle brakes of the type in which opposed shoes carrying a friction lining are mounted within a rotatable drum and are adapted to be separated at one or each end to form them into engagement with the drum on application of the brake.

The invention is particularly applicable to a brake in which the shoes, as described in the specification of U. S. Patent No. 2,371,554, are not positively held out of contact with the drum when the brake is in the "off" position but are in light rubbing contact with the drum.

Although the effect of the light rubbing contact is usually negligible insofar as it affects performance, there may be a tendency for a leading shoe to be picked up by the drum to a certain extent and to offer appreciable resistance if the friction between the drum and lining increases for any reason.

According to the invention, in a brake having two opposed shoes mounted within a rotatable drum and having means for urging the shoes into light rubbing contact with the drum in the "off" position of the brake, means are provided between the shoes at each end for separating them to apply the brake and for taking the torque on the shoes, and the separating means and torque-taking means, which may be combined, are so arranged that in the "off" position of the brake both shoes act as trailing shoes, and when the brake is applied both shoes act as leading shoes.

In the application of the invention to a brake of the kind described in the specification of U. S. Patent No. 2,371,554 the toe of each shoe in the "off" position of the brake engages with or fulcrums on a stationary abutment while the heel of the shoe is urged outwardly to hold the shoe in light rubbing contact with the drum, but on the application of the brake the shoe moves circumferentially with the drum and its heel then fulcrums on a stationary abutment while its toe is urged outwardly into engagement with the drum.

The principal advantages of having the shoes in light rubbing contact with the drum in the "off" position of the brake are that the shoes are automatically self-adjusting and that in the application of the brake none of the pedal movement is lost in taking up clearance between the shoes and the drum. In my improved brake that advantage is retained without the possible disadvantage of having at least one leading shoe in contact with the drum, and at the same time the brake when applied produces the same braking effort as a normal brake of the two-leading-shoe type.

Some practical embodiments of my invention are illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatic front elevation of a brake showing the shoes in the "off" position.

Figure 2 is a similar view showing the positions which the shoes assume when the brake is applied.

Figure 3 is a front elevation of a practical construction of brake.

Figure 4 is a fragmentary view of one actuating cylinder and the adjacent ends of the shoes showing a modification.

In the diagrammatic views, Figures 1 and 2, **10** and **11** are two opposed arcuate shoes which are adapted to be separated by opposed pistons in double-ended hydraulic wheel cylinders **12**, **13** mounted on the stationary back-plate of the brake between the opposite ends of the shoes.

The two ends of each cylinder are separated by a central partition so that in effect there are two opposed aligned cylinders in which work pistons **14**, **15**. A collar or shoulder **16** on the outer end of each piston is adapted to abut against the end of the cylinder to form a stop defining the inner limiting position of the piston.

The two ends of each cylinder on opposite sides of the partition are connected by a pipe **17** containing a metering valve **18** which limits the rate of flow of liquid through the pipe. Liquid is adapted to be forced under pressure from a conventional master cylinder (not shown) through a pipe **19** and branched pipes **20** into each cylinder behind the pistons **15**.

The cylinders and shoes are arranged within a rotatable drum of which the normal or forward direction of rotation is shown by the arrows in Figures 1 and 2. Tension springs **21** are connected between fixed anchorages **22** on the back-plate and anchorages **23** on the shoes adjacent to their leading or toe ends.

The line of action of each spring is substantially parallel to the axis of the cylinder and is such that it tends to force the piston with which the toe of the shoe engages into its cylinder, and the strength of the spring is sufficient to overcome a small residual pressure maintained in the pipe line and cylinders in the "off" position of the brake.

Thus, as shown in Figure 1, the piston **14** of the cylinder **12** is at the inner limit of its travel with its shoulder **16** against the end of the cylinder and the piston provides a stationary abutment for the toe of the shoe **10**. The other end or heel of the shoe is in engagement with the piston **14** of the cylinder **13** and as there is no other force acting on this end of the shoe the residual pressure in the hydraulic system forces this piston outwardly and urges the shoe into light rubbing contact with the drum, but as the toe of the shoe has a stationary abutment the shoe acts as a trailing shoe and the rotating drum tends to throw it off so that the effect of the rubbing contact is reduced to a minimum.

The other shoe **11** is in the same position, the toe of the shoe being in engagement with the piston **15** of the cylinder **13** which is at the inner limit of its travel, while the heel of the shoe is in engagement with the piston **15** of the cylinder **12** which is urged outwardly by the hydraulic pressure.

When the brake is applied by forcing liquid under pressure from the master cylinder into the wheel cylinders **12**, **13**, both pistons in each cylinder are urged outwardly with equal force. This force is sufficient to overcome the force exerted by the springs **21** so that the toe of each shoe is urged outwardly into engagement with the drum. Each shoe then moves circumferentially with the drum into the position shown in Figure 2, the piston **14** or **15** as the case may be with which the heel of the shoe engages being forced into its cylinder until the shoulder **16** on the piston engages the end of the cylinder and the piston becomes a stationary abutment for the shoe. The piston **15** or **14** in the other cylinder with which the toe of the shoe engages moves outwardly to follow the shoe and to continue to urge it into engagement with the drum so that the shoe functions as a normal leading shoe.

Immediately the pressure in the wheel cylinders is relieved by releasing the brake pedal the shoes automatically

return to their original positions shown in Figure 1 under the influence of the springs **21**.

In the change over in the position of the shoes from that shown in Figure 1 to that shown in Figure 2 some of the liquid in the cylinder **12** behind the piston **15** has to pass into the space behind the piston **14** and some of the liquid in the cylinder **13** behind the piston **14** has to pass into the space behind the piston **15**. The rate of flow of the liquid is controlled by the metering valves **18** so that the rate of movement of the pistons is controlled and does not take place rapidly enough to produce objectionable noise from the impact with the ends of the cylinders of the shoulders on the pistons which are forced inwardly by the heels of the shoes.

In the practical design of brake shown in Figure 3, **30**, **31** are the shoes and **32**, **33** are the hydraulic wheel cylinders which are secured by bolts **34** to the stationary back-plate of the brake. Each cylinder is double-ended, the two ends being separated from each other by a partition **35**. The pistons **36**, **37** are provided at their inner ends with cup-shaped seals **38** and a spring **39** is arranged between each piston and the partition **35** to provide a constant outward thrust on the piston so that in this arrangement there need be no residual pressure in the hydraulic system when the brake is in the "off" position. Each piston has adjacent to its outer end an annular collar **40** adapted to engage the outer end of the cylinder to form a positive stop for the inward movement of the piston. The piston extends outwardly beyond the collar and is annularly grooved to receive one lip of a rubber boot **41** of which the other lip is received in an annuar groove on the cylinder and which serves to prevent the entry of dust or dirt into the cylinder. The end of the adjacent shoe web engages slidably in a slot or notch in the end of the piston parallel to the back-plate to locate the shoe laterally, the end of the web being curved and being adapted to rock and slide on the surface of the piston at the inner end of the slot or notch.

A tension spring **42** connects the toe end of each shoe to a fixed anchorage **43** on the back-plate to urge the piston with which that end engages into its cylinder when the brake is in the "off" position as shown in the drawing.

The operation of the brake is exactly the same as described above with reference to Figures 1 and 2.

To prevent noise caused by the pistons which are forced into the cylinders when the brake is applied, the cylinder spaces behind the pistons in each cylinder are connected by restricted passages of which the ends are shown at **44** or they may be connected by a small orifice in the partition **35**.

In the modification shown in Figure 4, **50**, **51** are the shoes and **52** is one of the double-ended wheel cylinders. In this arrangement there is no partition between the ends of the cylinders and the pistons **53**, **54** are urged apart by a single compression spring **55** between them. Each piston has a stop collar **56** adjacent to its outer end but on the piston **53**, which is urged into the cylinder by the shoe **50** when the brake is applied with the drum rotating in the normal or forward direction shown by the arrow, an annular washer **57** of fibre or other sound-deadening material is mounted between the collar and the end of the cylinder to cushion the inward movement of the piston and prevent metallic contact between the collar and the cylinder which might give rise to objectionable noise.

The collars **56** and the reduced outer ends **58** of the pistons which receive the ends of the shoe webs are protected by annular shrouds **59** mounted on and extending outwardly from the ends of the cylinders.

I claim:

1. A brake comprising a drum normally rotating in one direction, a stationary back-plate, opposed arcuate shoes mounted within the drum, diametrically opposed double-ended hydraulic wheel cylinders mounted on the back-plate between the ends of the shoes which engage with the pistons of said cylinders, stop means limiting the inward movement of each piston into its cylinder, means urging the pistons in each cylinder apart to hold the shoes in light rubbing contact with the drum in the "off" position of the brake, spring means urging the toe end of each shoe inwardly to force the piston with which it engages into its cylinder to the limit of its movement to provide a stationary abutment for that end of the shoe, each shoe on application of the brake being circumferentially movable with the drum to force the piston in the other cylinder with which the heel of the shoe engages into its cylinder to the limit of its travel, and means for cushioning the inward movement of said latter piston into its cylinder to prevent noise.

2. A brake as in claim 1 wherein said cushioning means comprises a stop collar on said piston and a washer of resilient material mounted on the piston between the stop collar and the end of the cylinder.

3. A brake comprising a drum normally rotating in one direction, a pair of opposed arcuate shoes floatingly mounted within said drum, a pair of abutments for the ends of each shoe so spaced as to permit a limited peripheral movement of said shoe, for each shoe a first means operatively connected to the toe end and a second means operatively connected to the heel end of the associated shoe to exercise predetermined forces tending to urge said ends into slight rubbing contact with said drum, a third resilient means for each shoe and operatively connected to the toe end portion thereof so as to counteract the force exercised by said first means and to urge said toe end out of contact with said drum and against its adjacent abutment, and a fourth means under the control of a user to apply additional forces to both shoe ends in the direction of said predetermined forces thereby to overcome the effect of said third means and to cause said toe ends to bear against said drum, whereby each shoe being a trailing shoe in the "off" position of the brake will be urged by the drum friction against its heel end abutment and become a leading shoe when said additional forces are applied.

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