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CONTROL DEVICE FOR HYDRAULIC BRAKES

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FIG. 1

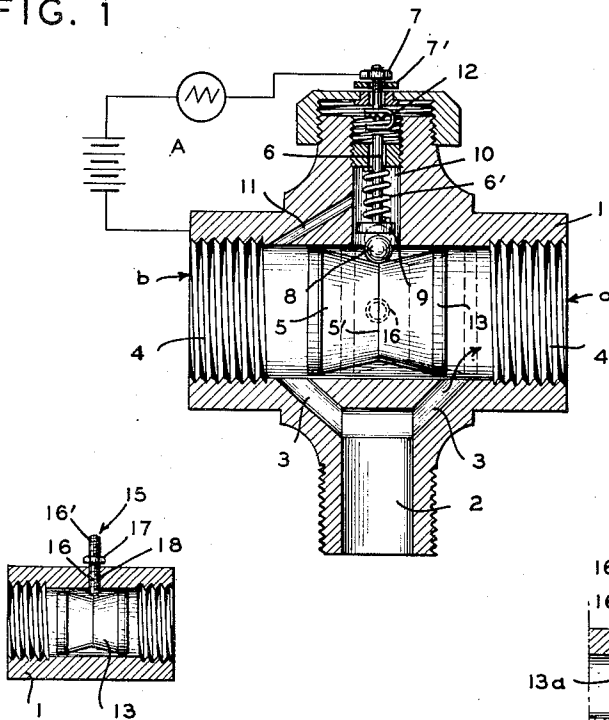


FIG. 3

FIG. 4

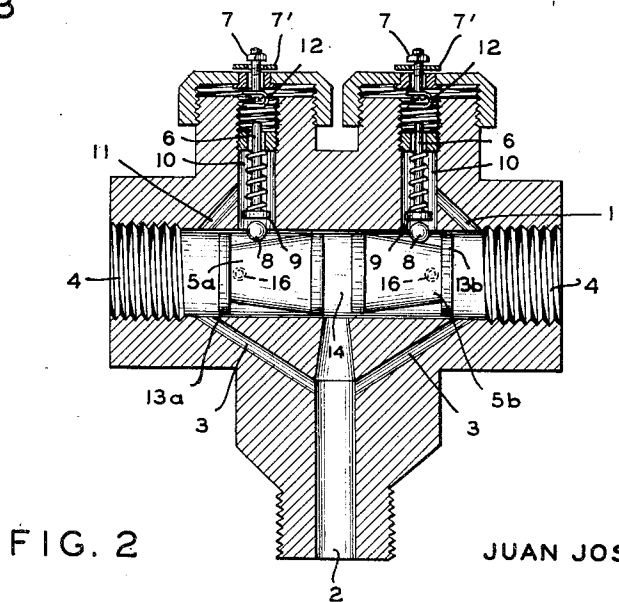


FIG. 2

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1

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CONTROL DEVICE FOR HYDRAULIC BRAKES

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The present invention refers to a control device for hydraulic brakes, its main object being to provide a combination of means and parts to avoid fluid losses in case of breakage of a distributing conduit of the system. It can be anticipated that this simple and cheaply built device will find an immediate and wide application in practice.

In present-day hydraulic brake systems, as applied to the great majority of automotive vehicles, it cannot be doubted that the braking mechanism under normal circumstances operates most efficiently and therefore deserves its popularity. The difficulties come up, however, in case of loss of hydraulic fluid, due to breakage of a conduit in the circuit or an eventual discharge due to un-tight unions, etc. In case of such a loss, the vehicle is left without brakes due to escape of the fluid operating same. This is a most dangerous situation and usually has serious consequences.

In order to overcome these difficulties, the device according to the present invention has been developed. Its particular features will be fully described in what follows.

The device in question has been designed to be fitted in the hydraulic circuit of the braking system. It comprises a control means for the passage of hydraulic fluid towards two branches of the system. It includes at least one shutter, the purpose of which is to prevent the flow of liquid in case of loss due to discharge or any other cause in any one of the distributing branch conduits. Said shutter operates due to pressure differential, the device being completed by an alarm mechanism reacting to certain positions of the shutter.

In order that the present invention may be more clearly understood and readily put into practice, same will now be described with particular reference to attached drawing illustrating an embodiment preferred for descriptive purposes.

In the drawing:

Figure 1 is a diagrammatic sectional view of the device as generally applied in principle to the preferred illustrative embodiment;

Figure 2 is a view of another embodiment of the device;

Figure 3 diagrammatically shows a part of the device equipped with a means for securing the plunger of Figure 1;

Figure 4, likewise as Figure 3, is a diagrammatic representation of the same means, in this case adapted to the embodiment of Figure 2.

Like numerals represent like or similar parts throughout the several figures of the drawing.

In the embodiment shown in Figure 1, reference numeral 1 identifies the main body of the device, from the central portion of which a tubular body 2 is projected perpendicularly. This body 2 contains diagonal conduits 3, arranged symmetrically. The device according to the invention is provided with at least one diagonal conduit for each plunger section, said conduits discharging into central conduit 4 of said body 1.

2

Figure 1, furthermore, illustrates a shut-off member 5, such as a longitudinally displaceable plunger lodged in central conduit 4. The device, also, comprises a stem 6 and a spring 6'. This spring-actuated stem 6 can abut against contact 7 connected with an electric circuit A. This electrical circuit A provides the alarm signal advising as to conditions causing plunger displacement due to pressure differentials.

The plunger mentioned can be shaped as illustrated in the preferred embodiment, i. e., as a pair of truncated-cones joined by their minor bases so as to form a recess 5' serving to seat retention means 6—6', as will be detailed further on. It should be pointed out, nevertheless, that said plunger can consist of a cylindrical piece having a central circumferential throat serving the same purpose as recess 5'.

The displacement of aforementioned plungers controls the movement of said spring-actuated stem 6 by exerting pressure on a small metal ball 8 which is arranged to exert thrust against a flat head 9 attached to the bottom of stem 6. Thus, this spring-actuated stem and ball arrangement constitutes one of the blocking means for the plunger in question.

Another of the novel features of the valve arrangement according to this invention, resides in the fact that cavity 10 containing valve members 6 through 9 is connected with central conduit 4 by means of a narrow conduit 11, the purpose of which is to prevent any possible accumulation of fluid and in this manner to avoid eventual pressure differences brought about by such an accumulation.

Figure 1, finally, illustrates a spring finger 12 placed underneath contact 7 and in electrical connection therewith. The object of this finger is to close the circuit through contact with the free end of stem 6.

Supposing now that the device as described is adapted to the fluid pump outlet through conduit 2, when said pump operates the liquid is circulated through the bifurcated branch lines 3 (of which there is, as has been said, at least one for each plunger section), and acts upon the several mechanical parts of the braking system.

In case of loss of fluid taking place in section a, for example, the pressure in section b would be substantially greater than on the opposite side of the plunger. This difference of pressures, obliges plunger 5 to change its position from the one shown in full lines in the drawing to the one shown in dotted lines. In this latter position the plunger closes outlet a and conduit 3 of section b transmits the fluid pressure through its outlet towards part of the brake set-up.

Inasmuch as ball 8 of the valve group is lodged with some pressure in throat 5' of plunger 5, on displacement of the latter stem 6 is displaced upwards and engages contact finger 12 insulated at 7' but closing the circuit when both members engage, as shown at A in Figure 1.

If the loss of fluid take place in branch line b, plunger 5 would move in the opposite direction; one part of the braking arrangement is thus always in operating condition.

Foregoing operation is possible with a single plunger if same is of the type illustrated in Figure 1, or of a similar kind having a throat 5' in the middle portion of its body 5, such as an annular recess or groove, etc., in combination with a valve arrangement adequate for the purposes described.

On the other hand, the embodiment shown in Figure 1 has a series of advantages which can be defined in the following manner: The device is highly sensitive to small differences in pressure and readily commences operation, due to the fact that the generatrices of plunger 5, complementing the action of ball 8, totally cancels

out any friction effect that could be brought about by pressure exerted by spring-actuated stem 6.

If, in the case of an hydraulic brake, a small amount of air becomes entrained in the lines, as a consequence of which the plunger would show a tendency to move slightly to one side, said plunger, due to its design and the cooperative thrust exerted by ball 8, would centralize its position by itself.

The special shape of plunger 5 has the important advantage that when a loss of pressure takes place towards end a, for example, of conduit 4, the plunger will move in the direction indicated by the arrow, gradually closing the corresponding conduit 3 by means of its cylindrical edge 13 and, as said plunger continues on its course, up to the position indicated in broken lines, the pressure fluid flowing through said conduit, once the latter is again uncovered, will exert a thrust against the conical surface of the plunger, as shown by the corresponding arrows. This provides a considerable increase in power acting thereon, at the precise moment in which spring-actuated stem (6—6'), by means of ball 8, is engaging finger 12, thus assuring a perfect closure of the electric circuit (A). The alarm circuit is thus completed and at the same time a stronger and more effective closure of the plunger is brought about.

If thus desired, said plunger 5 can be made of Duralumin, which will considerably reduce its weight. Closing action of such a plunger will therefore be instantaneous, due to reduced inertia opposing its displacement.

Due to its small size and weight, this device can be placed anywhere without losing any of its efficiency as a safety valve.

The modified embodiment of Figure 2 consists in the fact that single plunger 5 of the first example, has been replaced by two truncated-cone shaped pistons 5a and 5b. These two plungers are opposed by their major bases and limited at both bases by narrow cylindrical portions 13a and 13b. Between the two plates thus formed, a chamber 14 is normally provided, each of said plungers being engaged by ball 8 at the end of spring-actuated stem 10.

Inasmuch as plungers 5a and 5b can at no time engage one another, due to their relative positions, chamber 14 has a certain minimum width. Under these conditions, the pressure of fluid entering the chamber and exerting force against the opposite bases of the plungers, will equal the pressure applied to the minor bases thereof, at least one conduit 3 per plunger being provided for that purpose. Normally, therefore, the plungers remain in a balanced position.

As regards operation of this embodiment, abstracting from the natural consequences of structural differences, same is identical to that of the device according to Figure 1.

An important complement to this device consists in the provision of means capable of permitting the purging of the brake lines. These means are illustrated in Figures 3 and 4, the former corresponding to the embodiment of Figure 1 and the latter to that of Figure 2.

This purge means, as can be seen, consists of a blocking member for plungers 5—5a—5b. According to the example of Figure 3, the blocking member is a simple screw 15 divided into two portions: a long one 16 and a short one 16', passing through a head 17 which serves as adjusting nut and as cover, as will be explained.

The purpose of this screw and nut, which is identical for both examples shown, is to immobilize the respective plunger when the operator contemplates purging the brake pipe lines. In that case, the longer section 16 is screwed through a threaded orifice 18 provided for the purpose and coinciding, in the example illustrated by Figures 1 and 3, with the plane of the minor bases of the truncated-cone shaped plunger 5.

In these conditions, said section 16 engages the plunger and exerts pressure against same. The plunger, conse-

quently, cannot move and the purging of the line can be proceeded with in the well known manner, i. e., actuating the brake pedal and pump. As regards short section 16', the object of same is to close the threaded orifice 18, which is finally covered tightly and hermetically by nut 17. The small length of said section 16' prevents it from engaging the plunger and preventing its operation.

In the case of the embodiment of Figures 2 and 4, the blocking member is the same but the position and aperture of orifice 18' must be coincident with the internal portion of flange 13a—13b of the corresponding plunger, in such a manner that the end of stem 16 serves as a stop for said part.

The invention, as herein explained and illustrated, may be clearly understood and further explanations will not be required by those versed in the art.

Inasmuch as this invention has been described and illustrated with particular reference to preferred embodiments which are to be taken as examples not restricting the invention in any sense, the full scope of the latter will now be defined in the following claims.

I claim:

1. A control device for hydraulic brakes comprising a body to be inserted in the hydraulic circuit, said body containing a fluid feed inlet and a central conduit transverse thereto and having outlets at the extremities thereof, said central conduit having a center space and said body having diagonal unobstructed conduits communicating between said feed inlet and said central conduit at either side of said center space, said center space containing at least one shutter member, resiliently mounted cam means bearing against said shutter member, said shutter member being maintained in said center space by equality of pressure on either side of said member and by said resiliently mounted cam means, said shutter member being formed with a cylindrical flange on at least one outer extremity thereof, said cylindrical flange being narrower than said diagonal conduits so that the force causing displacement of said shutter member is increased when said cylindrical flange reaches the outer end of said diagonal conduit.

2. A control device for hydraulic brakes as recited in claim 1 in which the outer faces of said shutter member are planar.

3. A control device for hydraulic brakes as recited in claim 1 in which said resiliently mounted cam means is positioned in a cavity communicating with the center space of said central conduit separate from said feed inlet.

4. A control device for hydraulic brakes as recited in claim 3 in which means are provided to effect communication between said cavity and said central conduit outside of said center space.

5. A control device for hydraulic brakes comprising a body to be inserted in the hydraulic circuit, said body containing a fluid feed inlet and a central conduit transverse thereto and having outlets at the extremities thereof, said central conduit having a center space and said body having diagonal unobstructed conduits communicating between said feed inlet and said central conduit at either side of said center space, said center space containing at least one shutter member, resiliently mounted cam means bearing against said shutter member, said shutter member being maintained in said center space by equality of pressure on either side of said member and by said resiliently mounted cam means, said shutter member comprising a pair of spaced truncated cone-shaped parts arranged with their major bases facing one another, the space therebetween communicating with said feed inlet.

6. A control device for hydraulic brakes as recited in claim 5 in which each of said truncated cone-shaped parts is operatively engaged by resiliently mounted cam means.

7. A control device for hydraulic brakes comprising

5

a body to be inserted in the hydraulic circuit, said body containing a fluid feed inlet and a central conduit transverse thereto and having outlets at the extremities thereof, said central conduit having a center space and said body having diagonal unobstructed conduits communicating between said feed inlet and said central conduit at either side of said center space, said center space containing at least one shutter member, resiliently mounted cam means bearing against said shutter member, said shutter member being maintained in said center space by equality of pressure on either side of said member and by said resiliently mounted cam means, said resiliently mounted cam means comprising a spring-urged plunger, said plunger being connected to a stem, which stem is connected with an electric alarm circuit which is energized when the spring pressure is overcome by transverse displacement of said shutter member.

8. A control device for hydraulic brakes as recited in claim 7 in which said cam means is a ball placed between said plunger and said shutter member.

9. A control device for hydraulic brakes as recited in claim 7 in which a spring finger is positioned between the upper end of said stem and a contact button connected with said electric alarm circuit.

10. A control device for hydraulic brakes comprising a body to be inserted in the hydraulic circuit, said body containing a fluid feed inlet and a central conduit transverse thereto and having outlets at the extremities thereof, said central conduit having a center space and said body

6

having conduits communicating between said feed inlet and said central conduit at either side of said center space, said center space containing at least one shutter member, resiliently mounted cam means bearing against said shutter member, said shutter member being maintained in said center space by equality of pressure on either side of said member and by said resiliently mounted cam means, said resiliently mounted cam means being positioned in a cavity communicating with the center space of said central conduit separate from said feed inlet, said resiliently mounted cam means comprising a spring-urged plunger, said plunger being connected to a stem, which stem is connected with an electric alarm circuit which is energized when the spring pressure is overcome by transverse displacement of said shutter member.

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