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TWIN SECTION HYDRAULIC CONTROL EITHER IN TANDEM OR IN PARALLEL FOR SINGLE OR MULTI SECTION COMPRESSED AIR DISTRIBUTOR

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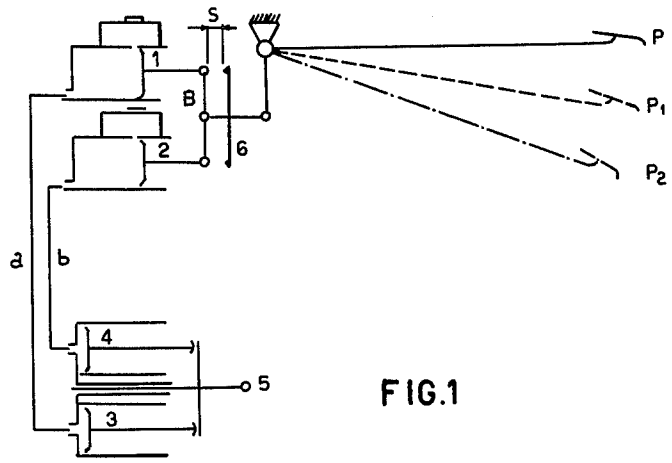

FIG.1

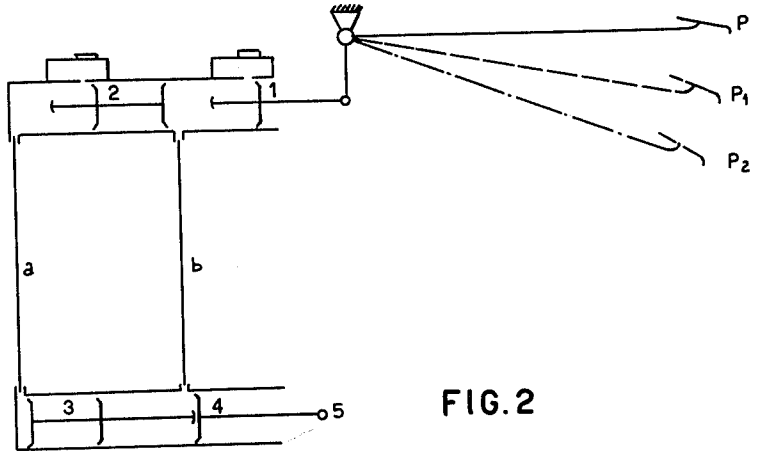

FIG.2

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TWIN SECTION HYDRAULIC CONTROL EITHER IN TANDEM OR IN PARALLEL FOR SINGLE OR MULTI SECTION COMPRESSED AIR DISTRIBUTOR

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1 Claim. (Cl. 60—54.5)

The present invention refers to a twin section hydraulic control, in tandem or in parallel for single or multi cylinder compressed air distributors, in which each of said sections functions as the "stand by" section to the other.

With this control, the eventual breakdown of one of the two sections, over and above not causing the slightest diminishment in the efficiency of the control, is also made aware to the vehicle driver by means of the manual device to which the control is linked up.

The object of the invention is substantially characterised by the fact that at least two hydraulic devices suited to the delivery of pressure transmission and also the same number of reception devices are respectively connected through inter independent pipes, and respectively connected up to an individual control device, and to one controlling element of the compressed air distributor by means of a balancing system, and in the event of a breakdown in one of the control sections, by means of abutment that by acting only on the hydraulic reception and transmission devices of the other section which is still intact, and thus rectifying the control device by means of a larger displacement than that normally used during normal operations, transmit to the compressed air distributor the same thrust as would be transmitted by the control under normal operating conditions.

In actual operating practice, the hydraulic pressure transmitting devices are pumps constituted by cylinders incorporating pistons, and said pistons are connected up to the control device by means of a balancing device system, and the amount of play of which is confined into limits by means of abutments: the control device may be a foot pedal lever or a hand lever.

The hydraulic reception devices are constituted by cylinders incorporating pistons, the rods of which operate unilaterally in the same direction either together or separately on one and the same movement element which can be a lever type push rod of the compressed air distributor: each control cylinder being connected to a corresponding reception cylinder or operating unit through a single pipe.

Both the control cylinders as well as the reception cylinders can be coupled up in tandem or in parallel, and the means used for displacement purposes in said control can be mechanical balancing elements or of the hydraulic pressure equilibrating type.

For purposes of example and not being limitative the attached drawing shows two different arrangements of the control which is the subject of the present invention.

FIGURE 1 is the layout of a two section hydraulic control in parallel for compressed air distributors.

FIGURE 2 is the layout of a two section hydraulic control in tandem also for compressed air distributors.

In the drawing: 1 and 2 indicate the pumps in the form of control cylinders suited to transmit the hydraulic pressure through pipes *a* and *b* to the reception cylinders or operating units 3 and 4 which in turn are connected by means of push rod 5 to the single or multi-section air distributor not shown in the drawing.

With reference to the FIGURE 1: the respective pistons of pumps 1 and 2 operating in parallel are connected up to the control lever P through a mechanical balancing device B having its oscillations limited by a rigid traverse 6, the extremities of which have a play S with respect to the balancing element itself.

The push as applied by the balancing element subdivides on two pistons 1 and 2 and acts, by means of pipes *a* and *b*, on the two plungers of the reception cylinders 3 and 4, which press in parallel the distributor push rod 5. The pedal displaces away from P to P1.

In case of breakdown of one of the sections, the play S is annulled at the side of the intact section and doubled at the other side, causing the pedal to be brought into position P_1 before it brings about the displacement of the piston of the pump of the intact section (1 or 2) and into the end of run position P_2.

The pressure in the intact section becomes double that of normal working conditions, and the reception piston (3 or 4) of the intact section push rod 5 of the distributor. In this manner the efficiency of the device remains intact, whilst the greater displacement of the foot pedal warns the driver of the breakdown which has occurred in one of the control sections.

In FIGURE 2, the hydraulic control comprises a couple of pumps 1, 2 linked up to the control units, and a couple of receiving cylinders operating on the compressed air distributor, both working in tandem, and hydraulically balanced within a range of displacement of the pistons in the respective cylinders and confined by unilateral abutments which are mobile with the pistons, the whole arranged in such a manner that under normal operating conditions, piston 1 of the pump, operated by the pedal, hydraulically pushes piston 2 of the pump. The pressure in the two sections remains in equilibrium, and therefore allows the receiver piston to remain still and on the other hand thrusts the receiving piston 4 which acts on the push rod 5 of the distributor. The foot pedal moves from position P to P_1.

In the case of a breakdown in section *a* piston 1 hydraulically pushes piston 2 to end of run, and therefore puts the liquid in section *b* under pressure pushing receiving piston 4 which operates push rod 5 of the distributor. The foot pedal moves from position P to P_2 and executing a displacement twice as much as that of normal.

In the case of a breakdown in section *b* piston 1 rests on piston 2 which hydraulically thrusts receiving piston 3 which on resting on the receiving piston 4, operates push rod 5 of the distributor. Also in this case the foot pedal moves from P to P_2.

The pressure in the pipes does not vary in any of the three cases which have been considered, and the major displacement of the foot pedal warns the vehicle driver of the breakdown which has occurred in one of the sections.

It is understood that variations may be brought to the arrangements described above in the construction of the invention, for example the control device under description can be constituted by an association of two pumps in tandem with two cylinders operating in parallel or vice versa without exiting from the scope of the invention.

I claim:

A hydraulic control device for actuating an air distributor of a pneumatic vehicle braking system comprising a first group of at least two cylinders having pistons working therein, an operating means kinematically connected to and actuating said pistons, a second group of at least two cylinders having pistons working therein, communicating means connecting one of said cylinders of said first group to one of said cylinders of said second group and connecting the other of said cylinders of said

first group to the other of said cylinders of said second group, means responsive to the unbalance of pressure of either of said cylinders of said first group and means kinematically connected to said responsive means for limiting and controlling the unbalance of said responsive means to enable the distributor to be operated in the case of emergency by the liquid under pressure of only one of said pistons of said first and second groups, said cylinders of said first and second groups being disposed in parallelism and said pistons of said first group being connected to a rocker arm, a control rod connected to said rocker arm and a crosspiece provided to limit the oscillation of said rocker arm, and said pistons of said cylinders of said second group being connected to a crosspiece which is connected to a push rod, said push rod adapted to be energized by either of said pistons of said second group, and said push rod being adapted to be connected to an air distributor.

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