

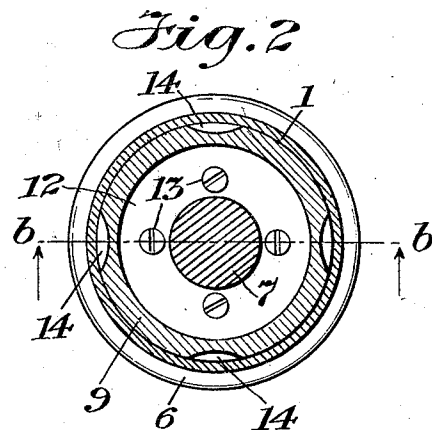
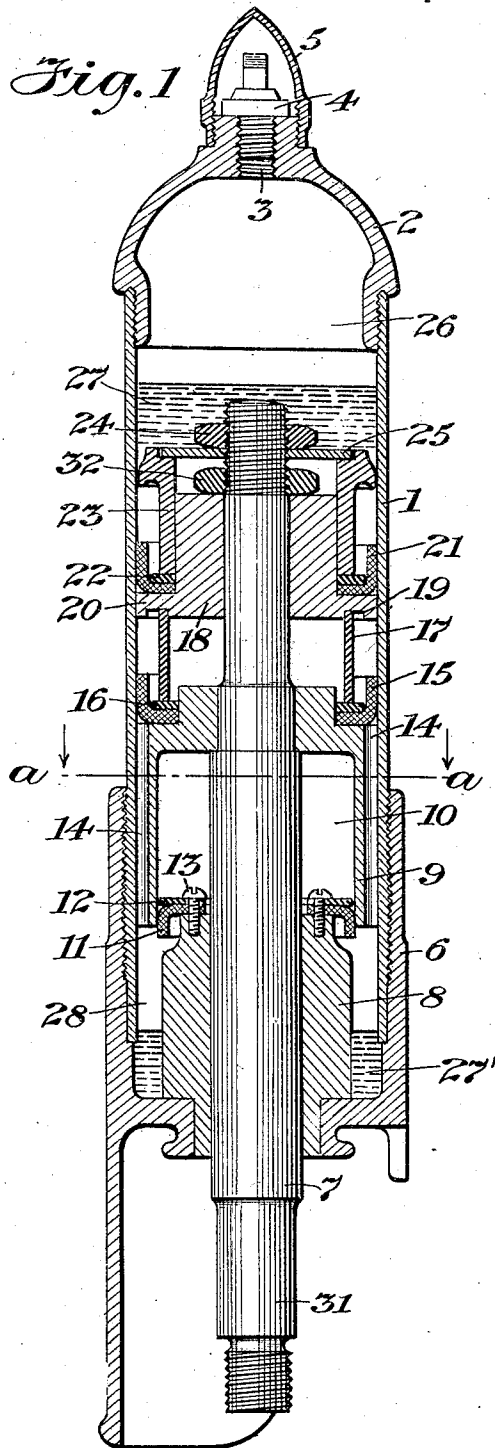
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J. J. McELROY

AIR SPRING DEVICE

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UNITED STATES PATENT OFFICE.

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AIR-SPRING DEVICE.

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My present invention relates to pneumatic cushions and particularly to air springs such as are used on vehicles to absorb shocks imparted from the roadway to the running gear. It relates more particularly to such a device in which a piston and cylinder which comprises the main parts thereof are oil sealed and in which the said piston acting within a certain portion of said cylinder serve as their own pump to automatically return such oil as leaks from the main cushion chamber back thereto.

In the device of my invention I provide a cylinder closed at the top and bottom with a piston therein connected to a rod passing through said bottom of the cylinder. This piston divides the cylinder into a main cushion chamber at the top in which is placed a quantity of oil for sealing the space between the contiguous surfaces of said piston and cylinder and air under pressure, and into a rebound and oil collecting chamber at the bottom. The lower part of the piston is shaped to contact substantially throughout the surface of any oil, which collects in said bottom chamber except where grooves cut in the cylindrical surface of said piston parallel with its axis connect with said lower chamber whereby when said piston exerts a pressure on said collected oil it will be forced upwardly through said grooves past cup washers carried by said piston and back into said cushion chamber. From same purpose I cut said oil return grooves in the cylinder wall from the desired distance.

It is therefore the purpose of my invention to provide a pneumatic cushion comprising a cylinder closed at the top and bottom with a piston therein and a piston rod passing through the bottom, said piston being provided with cup washers tending to hold oil placed in the upper chamber formed by said piston and cylinder so as to function on the down stroke as a pump to automatically return any oil which may have leaked from said cushion chamber past said cut washers.

It is further a purpose of my invention to

have said piston and cylinder formed at their bottoms to function as a rebound cushion chamber which acts to soften any violent reaction set up through the functioning of said main cushion chamber.

In the drawing which forms part of this application:

Fig. 1 is a vertical midsection looking in the direction of the arrows on line *b-b* of an air spring comprising a cylinder and piston which form a main compression chamber above the piston and a rebound chamber and return oil pump chamber below said piston.

Fig. 2 is a section along line *a-a* showing the relative areas of the part of the piston which acts to pump back stray oil and of the channels through which such oil is returned.

In the drawing the cylinder 1 is closed at its top by the dome 2 which is threaded to it. The opening 3 in said dome is closed by the air valve 4. The cap 5 screwed to said dome about the valve serves to protect the valve. The bottom of said cylinder 1 screws into the cup shaped bottom 6 through the center of which extends the piston rod 7. The bushing 8 seated in the central hole of said bottom 6 extends about said rod 6 to a considerable distance above the inner surface of said bottom. On a shoulder formed on said piston rod 7 fits the piston skirt 9 which depends downwardly about and spaced from said piston rod to form a chamber 10 of considerable volume therein. At about the midpoint of the stroke limits of the rod 7, the lower edge of said skirt 9 contacts with the downwardly turned cup washer 11 mounted on the upper end of said bushing 8 by the ring 12 and screws 13, whereby the boundary of said chamber 10, which is the recoil or rebound compression chamber, is completed. The inner vertical surface of the inner side of said skirt 9 is formed to make a sliding fit with the outside of said bushing 8 which is chambered at its upper outside edge to allow movement of said washer 11 when said skirt 9 moves past it. The outer surface of said skirt 9

makes a sliding fit with the inside surface of the cylinder 1. The grooves 14 extend along the outside surface of the skirt 9 throughout the length thereof and are in total cross-sectional area small in proportion to the area of the lower annular end of said skirt. An upwardly turned cup washer 15 is held on the top of said skirt 9 by the ring 16 and bears against the sides of the cylinder. The cylindrical ring 17 serves to space said skirt 9 from the piston follower 18 which rests on it and has formed in its lower surface an annular channel 19 of an inner diameter the same as that of said ring 17 whereby said ring 17 is positioned axially concentric in the said piston rod 7. The nut 32 threaded onto the end of the piston rod 7 serves to hold firmly in place said follower 18, ring 17, ring 16, washer 15, and skirt 9, said skirt 20 being held against said shoulder on the piston rod. Said follower 18 carries integrally therewith the annular flange 20 on which rests the upwardly extending cup washer 21 which presses against the inside wall of the cylinder 1 and is held down by the flat ring 22 which in turn is held down by the cylindrical piston head 23, which in turn is held firmly in place by the nut 24 threaded onto the end of the piston rod and bearing on the flat washer 25 which in turn bears on a spacing channel in the top of said head 23. Said head 23 for the greater portion of its length fits closely about the outside of follower 18, but at its upper end forms a bearing surface which makes a sliding fit with the inside of said cylinder 1. The upper or compression chamber 26 is provided with a quantity of oil 27 which serves to seal the contacting surfaces of the various parts of the piston and the cup washers. In the drawing there is shown as having leaked from the compression chamber the body of oil 27' in collecting chamber 28.

Proper air pressure in the compression chamber 26 is applied through the air valve 4.

The air spring is secured to a vehicle by means of suitable fittings not shown which connect respectively with the lower end 31 of the piston rod and said bottom cup 11.

In the use and operation of my device, chamber 26 is supplied with a quantity of oil for sealing the joint between the piston and the cylinder and air is pumped under pressure into said chamber 26 through said check valve 4. The cylinder in some suitable manner as through connection with cup 6 is mounted to the frame of an automobile, for instance, and the piston through the lower end 31 of the piston rod 7 is connected to the running gear thereof. Then any great bump or shock transmitted to said piston rod 7 from the roadway by way of the running gear is further transmitted through the piston to the air in the compression

chamber 26 which air by further compression as a result of said shock absorbs the shock and dissipates it thus preventing its transmission to the vehicle body.

In the movement of the piston in the cylinder a little oil usually escapes past the cup washers 15 and 21 and collects in said chamber 28. The bottom of skirt 9, however, has an area substantially that of the surface of the oil in said chamber 28, except for the channels 14, so that when a shock exerting force is relieved from chamber 26 and a consequent rebound occurs the skirt 9 moves into said chamber 28 and against the surface of oil 27' collected therein with considerable force with the consequence that said oil 27' or a part of it is forced upwardly through said channels 14 and past the cups 15 and 21 back into said chamber 26. When there is no oil in said chamber 28 or after it has been forced out, said bushing 8, operating as a piston in said chamber 10, serves to take and absorb the shock of the rebound.

What I claim is:

1. In an air spring, in combination, a substantially vertical cylinder closed at both ends, a piston in said cylinder connected to a piston rod passing through the bottom of said cylinder, oil and air above said piston under pressure, and means comprising a skirt on said piston for pumping back any oil which leaks from above said piston and collects below it, said skirt having a sliding fit with said cylinder and longitudinal grooves in the side of said skirt.

2. In an air spring, in combination, a substantially vertical cylinder closed at both ends, a piston in said cylinder dividing it into an upper compression chamber and a lower chamber, a piston rod connected to said piston and passing through the lower end thereof, oil and air under pressure in said upper chamber, upwardly extending cup washers about said piston and contacting with said cylinder, an annular skirt on said piston having a sliding fit with said cylinder and extending downwardly from the lowermost of said cupwashers and grooves from said washer to its lower edge, and a bushing about said piston rod cooperating with the said skirt to form a pump operable to return leaked and collected oil from the bottom of said lower chamber back past said cupwashers and to form with the interior of said piston a rebound compression chamber.

3. In an air spring, a substantially vertical cylinder closed at its top and bottom, a piston therein dividing said cylinder into an upper and a lower chamber, a piston rod connected to said piston and passing through the bottom of said cylinder, an annular skirt on said piston extending downwardly and making a sliding fit with said cylinder,

and a bushing about said piston rod extending upwardly from the bottom of the cylinder and making a sliding fit on its outside with the inside of said skirt, said skirt
5 and bushing serving when in registry to divide from said lower chamber an enclosed collecting and pumping chamber, channels in the annular surface of said skirt extend-

ing upwardly, oil and air under compression in said upper chamber, and upwardly extending annular cup washers between said piston and said cylinder. 10

In testimony whereof I hereto affix my signature.

JOHN J. McELROY.