

J. HOFMANN.
PNEUMATIC SHOCK ABSORBER.
APPLICATION FILED JUNE 25, 1919.

1,354,482.

Patented Oct. 5, 1920.
2 SHEETS—SHEET 1.

Fig. 1.

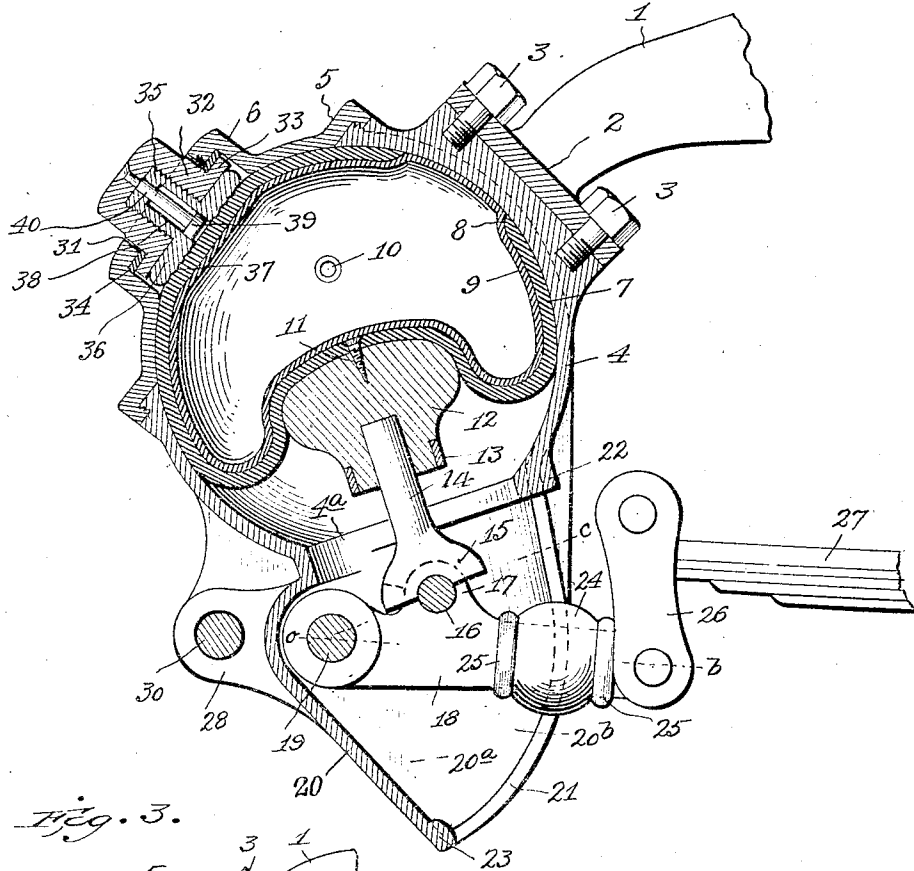
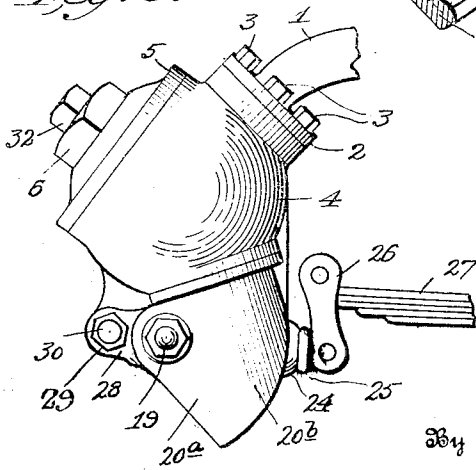


Fig. 3.



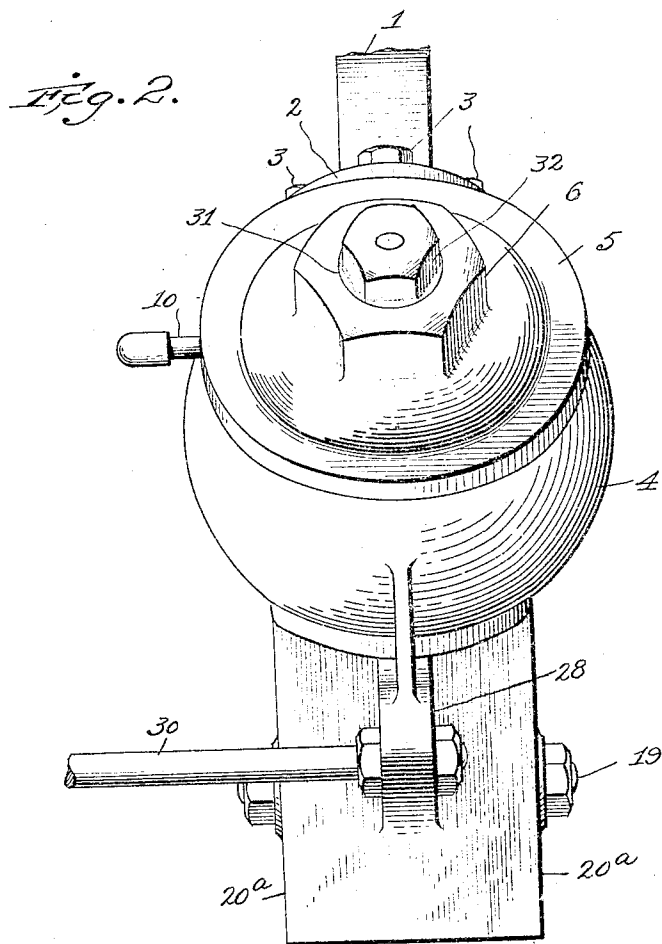
Inventor
Josef Hofmann
Henry Orth
Attorney

304

J. HOFMANN.
PNEUMATIC SHOCK ABSORBER.
APPLICATION FILED JUNE 25, 1919.

1,354,482.

Patented Oct. 5, 1920.
2 SHEETS—SHEET 2.



By

Inventor
Josef Hofmann
Henry Orth
Attorney

UNITED STATES PATENT OFFICE.

JOSEF HOFMANN, OF BAUMAROCHE, SWITZERLAND.

PNEUMATIC SHOCK-ABSORBER.

1,354,482.

Specification of Letters Patent.

Patented Oct. 5, 1920.

Application filed June 25, 1919. Serial No. 306,652.

To all whom it may concern:

Be it known that I, JOSEF HOFMANN, a citizen of Poland, and resident of Baumaroche, Switzerland, have invented certain new and useful Improvements in Pneumatic Shock-Absorbers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to pneumatic shock absorbers of the general type shown in my Patent No. 1,179,182, dated April 11, 1916.

The object of this invention is to lighten the structure, eliminate the movement of the pneumatic cushion container and provide means for adjusting the air pressure in the pneumatic cushion without venting it or pumping air into it.

Referring to the drawings, in which like parts are similarly designated—

Figure 1 is a vertical section of my shock absorber.

Fig. 2 is a rear view thereof.

Fig. 3 is a side elevation on a smaller scale.

The body frame extension 1 is provided at its end with a plate 2, to which is bolted by bolts 3 the cushion container or casting 4 having an internal spherical surface, or nearly so. This casting 4 has an opening closed by a cover 5 having a threaded portion at its edges for screwing it into the casting 4, and a projecting boss 6 formed as a nut for the application of a spanner or wrench to screw and unscrew the cover 5 from the body portion or casting 4.

The outer casing 7 of fabric, has an opening 8 in it through which the rubber lining 9 is inserted. This rubber lining is provided with a short inflating tube 10 projecting through the casting 4 and provided with an inflating valve (not shown) the same as for pneumatic tires.

The outer casing 7 is secured by a screw 11 to a wooden plunger 12 provided with a ferrule 13 to prevent splitting. The plunger and its rod moves in an opening 4" in the lower portion of the spherical casting 4.

The upper end of the plunger rod 14 is inserted in the plunger 12 and has a bifurcated lower end 15 seating on a pin 16 in

a lug 17 on a lever 18 that is pivoted on a bolt 19 in an extension of the spherical body portion 4. The rear portion 20 of this extension is substantially rectangular in cross section and has flat side walls 20^a, while the front portion has cylindrical walls 20^b, as shown, and is provided with a slot 21 through which the lever 18 projects. The extension is provided with thickened portions 22 and 23, at the upper and lower edges of the slot to provide bumper surfaces for the rubber buffer 24 on lever 18.

The buffer, held between two heads 25, is formed in place and then vulcanized.

The end of lever 18 is pivoted to the lower end of a shackle 26, while the upper end of this shackle is pivoted to the end of the vehicle spring 27.

Projecting from the portion 20 of the casting extension is a lug 28 in which is secured by nuts 29 a brace rod 30 that extends to the shock absorber on the opposite side of the vehicle.

The nut-shaped portion 6 of cover 5 is hollow and has a cylindrical bore at 31 in which fits a nut 32 having a peripheral flange 33 for retaining a packing ring 34. The nut 32 has an internal threaded bore into which fits the threaded end 35 of a plunger 36 whose face 37 bearing against the outer casing 7 of the inflatable cushion is uneven or corrugated, so that when the cushion is inflated it will conform to these corrugations when it is engaged by the plunger and prevent the plunger from rotating during the rotation of nut 32.

The plunger has an internal smooth bore 38 in, which slides the head 39 of a pin 40 whose reduced end is riveted in the end of the nut 32, as shown.

It should be noted that normally the longitudinal axis $o-b$ of the lever is inclined below a horizontal, while the pivot 16 in line $o-c$ is angularly displaced above this axis. With such an arrangement the end of lever 18 at the shackle will move approximately in a straight line upward, while the pivot 16 moving along an arc whose radius is $o-16$ will have a rise at a decreasing rate owing to the arcuate path of pivot 16.

When the air cushion 7, 9 is deflated, the buffer 24 engages the enlargement 22 and supports the vehicle body. The cover 5 can then be removed, and the outer case 7 can be pulled through the cover opening so that

the opening 8 in the outer case 7 will be exposed for the removal of the rubber sack 9, should replacement of the sack be necessary.

When the parts have been replaced, the sack 9 is inflated to such a degree that the lever 18 assumes the inclination shown about midway between the stops 22 and 23. The vehicle is then ready to support a normal load.

If the load is increased, it has heretofore been necessary to pump more air into the cushion. If the suspension was subsequently too stiff, it was necessary to vent some air from the cushions, and it required careful attention so as not to vent too much air and to keep the pressure in all the suspensions substantially equal.

To accomplish these ends without the use of a pump, and without venting the cushions, I have devised a simple mechanical structure.

After the cushions have been filled to normal and it is desired to stiffen the suspension for a load exceeding the initial load, it is simply necessary to turn the nut 32 with a spanner or wrench, thus screwing the plunger inward to indent the cushion and increase the air pressure. The plunger is prevented from turning by the corrugations or projections on its face engaging the cover 7. This decreases the initial volume of the cushion and additionally compresses the air in the cushion. The head 39 on pin 40 acts as a stop for the inward movement of the plunger and prevents the disengagement of the screw threads of the plunger and nut. Rotating the nut 32 in the opposite direction will permit the cushion to return to its initial volume and pressure.

I claim—

1. A shock absorber having a substantially spherical body portion communicating with a downward extension having a slot, a lever pivoted within said extension and projecting through said slot, said lever having a pivot, a buffer carried by said lever and operating in said slot, buffer stops at each end of said slot, a pneumatic cushion in said body portion, a plunger for said cushion, said plunger arranged on an angularly displaced pivot, and a shackle on the end of the lever for connecting it to a vehicle spring.

2. A shock absorber having a substantially spherical body portion communicating with a slotted downward extension substantially cylindrical at its front portion, a lever pivoted in the rear portion of said extension and extending through the slot in the cylindrical portion, the front wall of said cylindrical portion being curved with its center of curvature about at the pivot point of said lever, a pneumatic cushion in said body portion and a plunger for said cushion pivoted on said lever.

3. In a shock absorber, a substantially spherical body portion, a removable cover therefor, and a pneumatic cushion in said portion removable through the opening closed by said cover, said cushion comprising a casing having a permanent opening, and an inflatable member insertible within the casing through said permanent opening.

4. In a pneumatic shock absorber, a substantially spherical body portion open at its bottom, a pneumatic cushion within said body portion, means at one side of said body portion to connect it to the vehicle and a removable cover between the securing means and opening in the bottom, whereby the pneumatic cushions within said body portion may be replaced without disconnecting the body portion from the vehicle.

5. In a shock absorber having an inflatable pneumatic cushion, means to adjust the initial volume of the cushion by mechanical pressure and thereby adjust the pressure within the cushion.

6. In a shock absorber having an inflatable pneumatic cushion, adjustable means to indent the cushion to decrease its initial volume and thereby adjust the pressure within the cushion.

7. In a shock absorber having an inflatable pneumatic cushion, a container for said cushion, a removable cover for said container and means in said cover to vary the initial volume of the cushion.

8. In a shock absorber having an inflatable pneumatic cushion consisting of a flexible outer casing and an inner inflatable rubber lining; a plunger having a roughened surface for engaging the outer casing and means to adjust the plunger inward and outward to vary the initial volume of the cushion.

9. In a shock absorber having an inflatable pneumatic cushion; a plunger engaging said cushion for varying the initial volume of the cushion, said plunger having a threaded shank, a nut on said shank to adjust the plunger to and from the cushion, and a stop to prevent the disengagement of plunger and nut.

10. In a shock absorber, a substantially spherical casting having a pneumatic cushion therein, a cover for said casting, a rotatable nut mounted in said cover, a plunger having a threaded shank engaging the nut, said plunger having a central bore and a pin having one end secured in said nut and a head fitting said bore.

11. In a shock absorber, a substantially spherical body portion having an open bottom and an opening provided with a removable cover, a plunger passing through said open bottom, a lever pivoted to the body portion, a plunger rod pivoted on said lever, an outer pneumatic casing having an opening therein, and an inner pneumatic lining

removable when deflated through said opening in the outer casing and cover opening.

12. In a shock absorber, a pneumatic cushion device rigidly supported by a vehicle body frame, a pivoted lever inclined below a horizontal in its neutral position, a plunger for said device having a pivotal support on said lever above said horizontal and pivotal means for connecting the lever to a vehicle spring.

13. In a shock absorber, a pneumatic cushion device supported by the vehicle body frame, a lever to produce upon compression

of said cushion device progressively increasing leverage, and thereafter progressively decreasing leverage, a plunger for said device having pivotal support on said lever, offset from the axis thereof and arranged for progressive decreasing leverage under all normal conditions of compression and permitting upon abnormal amplitude of movement an initial increase of leverage.

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

JOSEF HOFMANN.