Dec. 27, 1932. G. F. YEVSEYEFF 1,892,198

CHASSIS SUPPORT

Filed Dec. 9, 1927 2 Sheets-Sheet 1

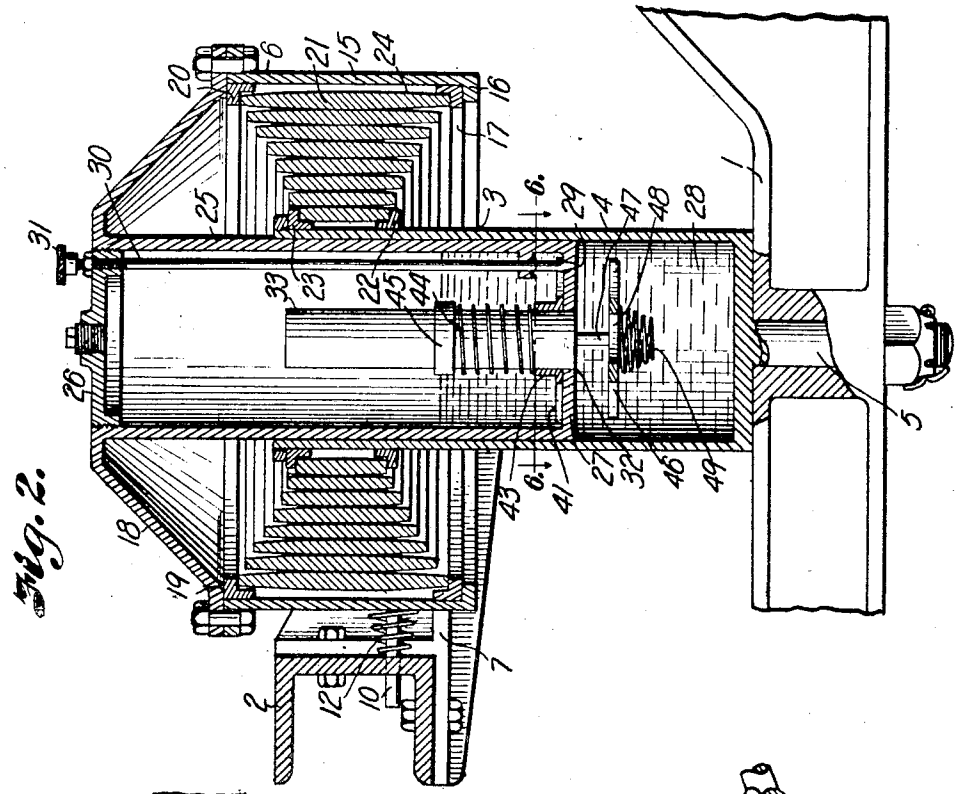


Fig. 2.

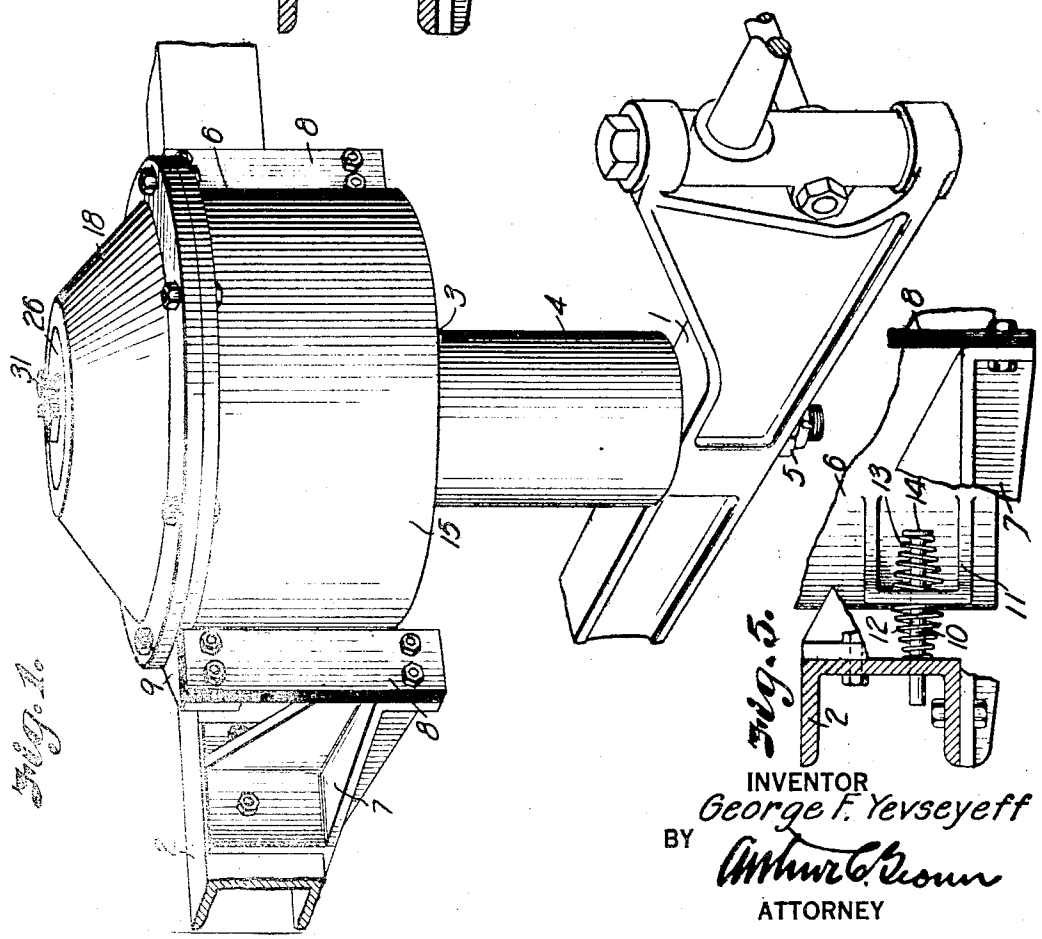


Fig. 1.

Fig. 5.

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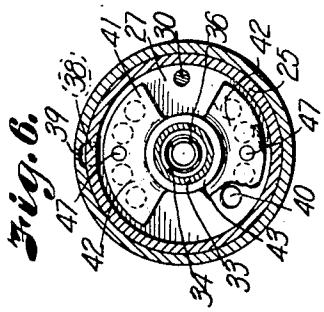


Fig. 6.

Fig. 4.

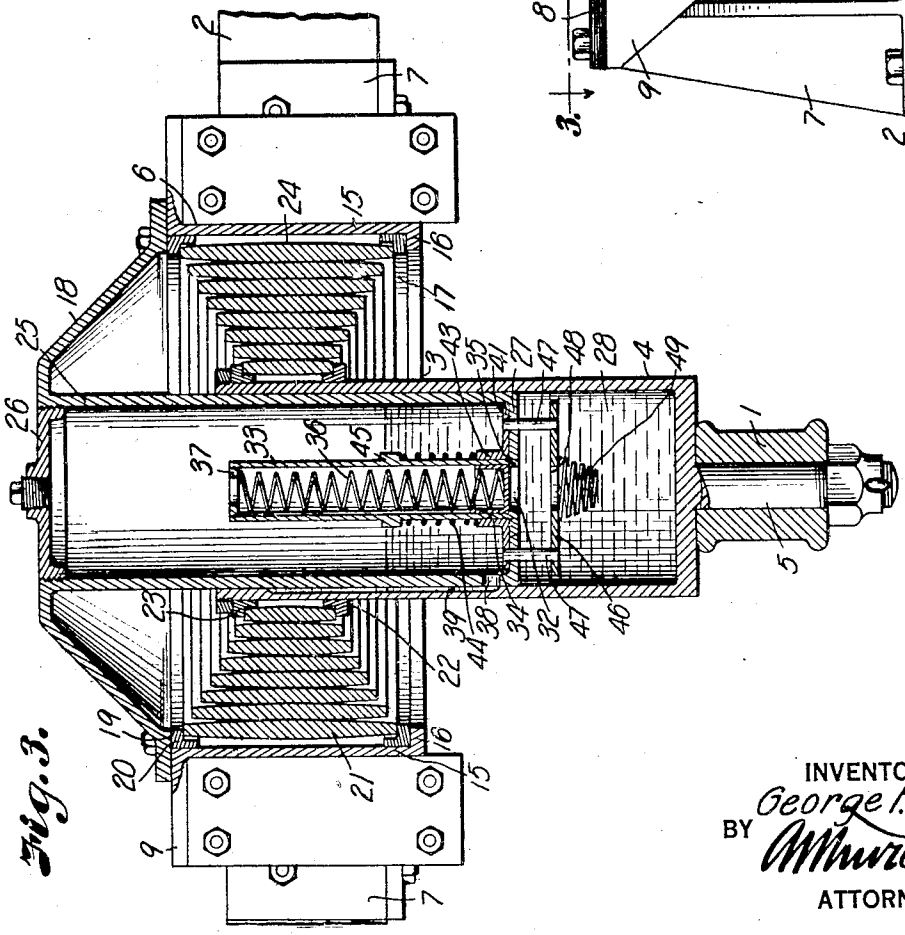


Fig. 3.

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UNITED STATES PATENT OFFICE

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CHASSIS SUPPORT

Application filed December 9, 1927. Serial No. 238,847.

My invention relates to vehicle springs and more particularly to shock absorbing devices, the principal object of the invention being to support a chassis from the running gear of a vehicle by means including shock absorbing and snubbing elements whereby the shock and stresses due to various movements of the chassis and running gear relative to each other are absorbed through the cooperation and interaction of the elements of a unit.

Further particular objects of the invention are to relieve and absorb lateral stresses on the chassis-supporting member, and to provide against binding of coil elements comprising resilient members of the support.

In accomplishing these and other objects of the invention I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of the device functionally attached to a frame member of an axle of an automobile.

Fig. 2 is a vertical cross section of the device on the line 2—2, Fig. 4.

Fig. 3 is a vertical section on the line 3—3, Fig. 4.

Fig. 4 is a plan view, a portion of a cover member being broken away to illustrate the position of the covered members.

Fig. 5 is a fragmentary view of the device illustrating in detail the spring elements for absorbing shock of lateral movement of the chassis in relation to the running gear.

Fig. 6 is a detail horizontal cross section taken on line 6—6, Fig. 2.

Referring in detail to the drawings:

1 designates an axle and 2 a frame member of an automobile. 3 designates generally my device including a tubular post 4 erected on and secured to the axle by a bolt 5, and a casing 6 supported by the post and engaged with the frame member 2 by means presently described, it being understood that a plurality of units 3 may be provided for an automobile, for supporting the chassis from the running gear. Extending laterally from the frame member 2 are brackets 7 to which are fixed upwardly extending flexible hangers 8, preferably comprising laminated elements, the upper ends of the hangers being secured to ears 9 extending laterally from the casing member 6 whereby the casing supports the frame and chassis. Pins 10 fixed in the frame and extending slidably through ears 11 on the casing, support springs 12 bearing against the frame and the ear and springs 13 bearing against the ear and the head 14 of the pin (Fig. 5) for cushioning lateral movement of the casing relative to the frame.

The casing 6 comprises a peripheral wall portion 15 having an internal lower peripheral flange 16 for seating an annulus 17 and a cover member 18 peripherally fixed to the wall having an annular seat 19 cooperating with the peripheral wall to retain a similar annulus 20, the annuli being adapted to receive and retain the outer convolution of a coiled element 21 comprising a spiral spring tapering inwardly, the inner terminal convolution thereof being engaged with annuli 22 and 23 secured to the upper end of the tubular post 4, whereby the post supports the casing and frame. The spring is preferably cambered vertically, as indicated at 24, the reduced upper and lower edges therefore permitting contraction of the spring without binding during relative vertical movement of the chassis and running gear.

A piston-like cylinder 25 comprising a plunger depends centrally from the cover 18 and is preferably integral therewith, and a filling plug 26 closes the upper end of the plunger and cover; the plunger extending into the tubular post 4 beyond the median point thereof, the bottom plate 27 of the plunger forming a movable upper wall of a liquid-containing chamber 28 comprising the lower end of the post.

An opening 29 in the bottom plate 27 of the

plunger provides communication between the chamber 28 and the interior of the plunger, and a needle valve 30 having an operable handle 31 exterior to the cover is provided for varying the effective area of the opening for regulating the passage of fluid between the chamber 28 and the interior of the plunger.

Fixed to the bottom plate axially of a central opening 32 therein is a cylinder 33 extending upwardly in the plunger, and a piston 34 seated on an internal shelf 35 of the cylinder 33 is slidable in the cylinder and is restrained by a spring 36 bearing against an internal flange 37 at the upper end of the cylinder to yieldingly restrain the piston against pressure of liquid in the chamber 28 compressed by projection of the plunger into the tubular post. The upper end of the cylinder is open for free movement of air or oil from the cylinder when the piston rises.

A port 38 is provided in the wall of the plunger adjacent the bottom plate and a limited groove or channel 39 extends longitudinally of the inner wall of the tubular post normally communicating with the interior of the plunger through said port, and normally sealed from the chamber 27 of the post. Outward movement of the plunger relative to the port connects the groove with the chamber and permits flow of liquid through the groove and port between the plunger and the chamber.

The bottom plate of the plunger is further provided with ports 40 normally closed from above by a valve 41 comprising preferably sector-like radial leaves such as 42 having a tubular stem 43 slidable over the cylinder 33 and yieldingly retained in port-closing position by a spring 44 bearing against the stem 43 and collar 45 on said cylinder 33. A valve member 46 comprising preferably sector-like leaves similar to the members of the valve 41 and preferably spaced from the wall of the tubular post is supported by pins 47 slidable in apertures of the bottom plate and fixed in the leaves of said valve 41, the valve member 46 having a central opening 48 and a depending coil spring 49 fixed thereto axially of the opening, the valves 41 and 46 operating as a unit, the spacing of the leaves providing unobstructed space for liquid flowing through the opening 29 and for the operation of the needle valve.

Assuming an automobile to be equipped with a suitable number of the devices as described, the chassis is supported normally at rest by the casings from the flexible hangers and the casings are supported from the axles by the tubular posts and the spiral springs. When the automobile is moved any tendency of the chassis to move laterally relative to the running gear is relieved by the flexible suspending means which permit independent lateral movement, and cushioned by the coil springs bearing against the casings and the heads of the spring-supporting pins, the return of the chassis from displaced position being cushioned by the coil springs positioned between the casings and the frame members.

Vertical movement of the chassis relative to the running gear is yieldingly restrained both by the spiral springs and by liquid operating through the means illustrated. Ordinarily, in one of the units, the port controlled by the adjustable needle valve provides sufficient passageway for liquid from and to the chamber of the tubular post to cushion shocks. The groove in the tubular post and the related port of the plunger are provided to overcome possible hampering influence of a vacuum that may be created in the chamber 28 due to rising of the plunger when the chassis departs from the axle, such a situation resulting in the opening of communication between the plunger and chamber for passage of liquid from the plunger into the chamber to relieve the vacuum.

When the chassis drops toward the axle, the valves 41 and 46 rise against the resistance of the spring 44 and open the ports 40 to permit liquid to flow from the chamber 28 into the plunger. The pressure may be continued until the coil spring suspended from the valve 46 encounters the bottom of the tubular post as the plunger and tubular post approach the limit of their relative travel, whereupon the valve 46 closes the port 40 from below, and the liquid may move through the central opening of the valve 46 into the small cylinder 33 against the piston 34 to compress the spring 36, thus preventing and cushioning the jolt of contact of metal against metal.

It is apparent, therefore, that I have provided chassis-supporting springs including shock-absorbing and snubbing means whereby both the vertical and lateral shocks due to relative movements of the chassis and running gear in a plurality of directions, as well as the direct shocks transmitted from one member to the other, are cushioned and minimized, the various cushioning means cooperating for gradual absorption of shock and reaction for comfort of users and elimination of damaging vibration and wear on the equipment.

What I claim and desire to secure by Letters Patent is:

1. In a chassis-supporting device including a casing and casing-supporting means including a member reciprocable in the casing, vertically rigid and laterally resilient hangars fixed to the casing and chassis for supporting the chassis from the casing, and laterally cushioning means connected with the casing and the chassis.

2. In a device of the character described, a casing, a tubular plunger supported by the casing having a closed top and a perforate

bottom, a cylinder, means for yieldingly supporting the plunger in telescoping relation with the cylinder, and shock absorbing means provided in the plunger and the cylinder including valves operable upon excess yielding of said supporting means to open said perforations in the plunger bottom for passage of liquid between the plunger and the cylinder.

3. In a hydraulic snubbing device, a liquid-containing tubular post, a tubular plunger slidable in the post and having a bottom plate provided with a central opening, a tube mounted on the plate concentrically of the opening and having an open upper end, a plug slidable in the tube, and means engaged with the tube for yieldingly restraining the plug against liquid pressed into the tube upon telescoping of the plunger and cylinder.

4. In a chassis-supporting device for automobiles, a liquid-receiving plunger supporting the frame of the automobile having a bottom plate provided with ports, a liquid-containing cylinder fixed to the axle of the automobile, means supporting the plunger from the cylinder, the plunger being slidable in the cylinder, a valve normally closing said ports, and means connected with the plunger for yieldingly holding said valve in port-closing position.

5. In a chassis-supporting device for automobiles, a liquid-receiving tubular plunger, a liquid-containing cylinder slidable over the plunger, means supporting the plunger from the cylinder, plural valved means of communication between the plunger and the cylinder, and means connected with the plunger yieldingly restraining said valves in stepped degrees to control movement of liquid between the plunger and the cylinder at various stages of movement of the plunger relative to the cylinder.

6. In a frame-supporting device for automobiles, a liquid-receiving plunger supporting the frame provided with ports, a liquid-containing cylinder fixed to the axle of the automobile, means for supporting the plunger from the cylinder, the plunger being slidable in the cylinder, a valve normally closing said ports, means connected with the plunger for yieldingly holding said valve in port-closing position, a valve in the cylinder operable upon sliding of the plunger in the cylinder and connected with said first named valve whereby said cylinder valve moves said first named valve.

7. In a shock-absorbing device for automobiles, a liquid-receiving plunger, a liquid-containing cylinder slidably related to the plunger, means having ports providing plunger and cylinder chambers, means supported by the plunger and operable upon relative movement of the plunger and cylinder to control said ports, and resilient means fixed to said port-control means engageable with the cylinder to cushion said plunger in port-closing position of said port-control means.

8. In combination with a chassis support, a shock-absorbing device for automobiles comprising a liquid-receiving plunger connected with the frame of the automobile and having a bottom plate provided with a port and pin-receiving openings, a liquid-containing cylinder connected with the axle of the automobile, the plunger being slidable in the cylinder, a valve comprising sector-like leaves normally seated on the bottom plate for closing said ports from above, means connected with the plunger for yieldingly holding said valve in port-closing position, a valve in the cylinder, provided with pins extending through said openings and fixed in said first named valve for moving said first named valve from port-closing position under pressure of liquid due to sliding of the plunger in the cylinder, and a spring fixed to the second named valve for cushioning the engagement of the same with the bottom of the cylinder in port-closing position.

9. A device of the character described including a fluid containing cylinder having an open end, and a hollow plunger reciprocable in the cylinder having a closed end normally positioned at an intermediate point in the cylinder, said closed end having a valved port for movement of fluid between the cylinder and the plunger, the plunger having a side port adjacent said closed end, and the cylinder having an internal groove extending toward the open end thereof from an intermediate point therein adapted to afford communication through said port between the plunger and the cylinder when the closed end of the plunger moves from normal position toward the open end of the cylinder.

10. In a device of the character described including a casing having a cylindrical wall, a spring arranged in flat coil form coaxially with said wall and having oppositely cambered inner and outer faces and an outer convolution fixed to said cylindrical wall, a post having an upper end portion fixed to the inner convolution of the spring and movable along the axis of the casing wall in opposite directions to move the convolutions of the spring in opposite directions, and means regulating movement of said post to regulate movement of the spring.

11. A chassis support including a casing having a cylindrical wall connected to the chassis and a cylinder depending in the casing coaxially with said wall, a normally flat coil spring having an outer convolution fixed to said wall and decreasing in width from the outer to the inner convolution of said spring, a tubular post slidable on said cylinder and having an upper end portion fixed to the inner convolution of the spring and normally spaced from opposite ends of the cylinder, the several convolutions of said

spring having oppositely cambered inner and outer faces and median portions movable past the median portions of adjacent convolutions to permit the post to slide on the cylinder in opposite directions toward the ends of the cylinder, and hydraulic means in the cylinder for regulating movement of the post to control movement of said convolutions of the spring.

In testimony whereof I affix my signature.

GEORGE F. YEVSEYEFF.