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SPRING MEMBER

Filed Oct. 18, 1926

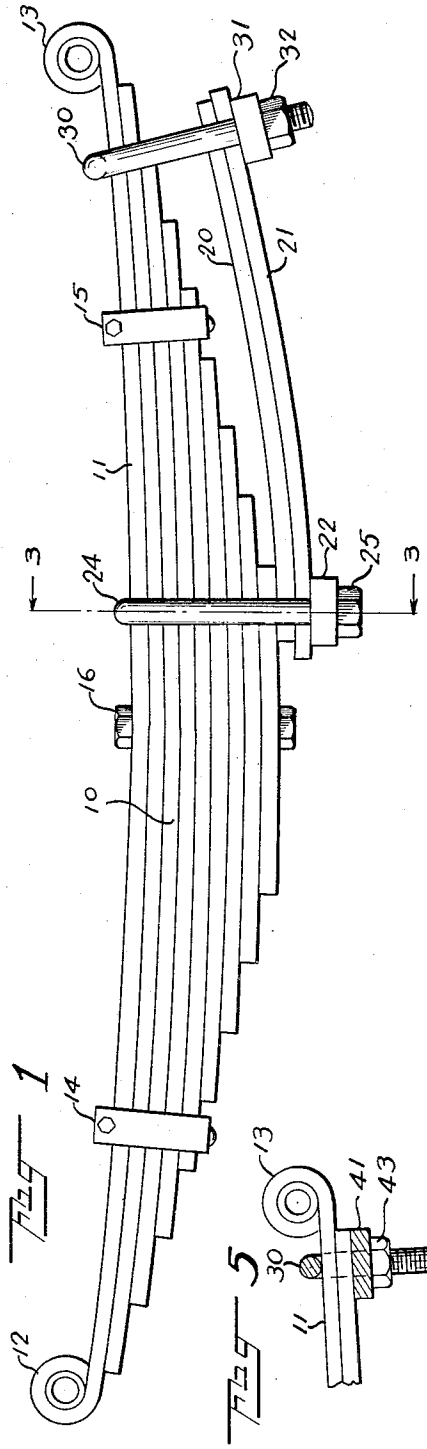

FIG 1

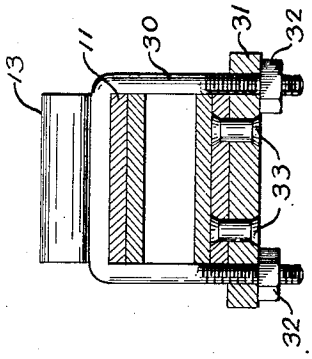

FIG 4

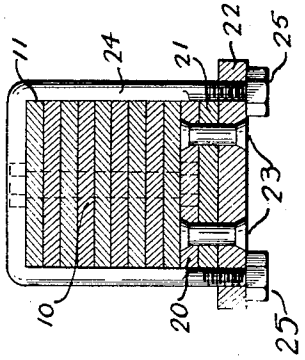

FIG 3

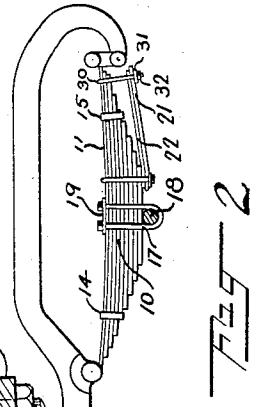

FIG 2

FIG 5

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UNITED STATES PATENT OFFICE

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SPRING MEMBER

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This invention relates to springs for absorbing shocks, and more particularly to an attachment for controlling the action of vehicle springs.

Vehicle springs of the semi-elliptic type have heretofore generally been designed to have practically the same properties in compression as in recoil. When such a spring is compressed in response to a road shock, the force is transmitted to the vehicle chassis in a manner determined by the characteristics and dimensions of the particular spring. As a general proposition it may be stated that a spring which responds readily to road shocks will readily transmit these shocks to the vehicle body. On the other hand, a spring which will not transmit shocks readily to the vehicle body will be sluggish in responding to road shocks. These springs have an added disadvantage, particularly when employed in connection with vehicles equipped with balloon tires, of going into vibration in synchronism with the vibrations transmitted by the tires thereby causing the chassis to oscillate in a disagreeable and possibly a dangerous manner until the synchronization is broken up by changing the speed of the vehicle, or in some other manner.

By means of the controller for vehicle springs constructed in accordance with this invention the upward movement of the spring in recoil is retarded so that the shock transmitted to the vehicle chassis is considerably less than that received by the wheels. By retarding the movement in one direction the tendency of the spring to oscillate in synchronism with road shocks is reduced. The oscillations of the spring are broken up by causing it to have different natural periods of vibration in compression and expansion so that the tendency to oscillate at either of these frequencies is opposed by the spring being non-synchronous to that frequency in one-half its cycle of movement.

The present invention comprises a resilient member which may be rigidly attached to a chassis spring and placed in reverse compression with respect thereto so that a false load is applied to the spring by the controller for assisting the spring in downward movement but retarding it in recoil, whereby the full force of the impact is prevented from being exerted upon the chassis.

Although the novel features which are believed to be characteristic of this invention will be pointed out with particularity in the claims appended hereto, the invention itself as to its objects and advantages, the manner of its operation and the mode of its organization, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which:

Fig. 1 is an elevation of the controller applied to a semi-elliptic spring member;

Fig. 2 is an elevation of the spring assembly connected to a vehicle frame of conventional type;

Fig. 3 is a section taken on the line 3—3 of Fig. 1;

Fig. 4 is a section taken on the line 4—4 of Fig. 1; and

Fig. 5 shows a modified means for attaching the controller to the spring.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Referring to the drawings more in detail, the spring attachment constructed in accordance with this invention is illustrated as applied to a conventional type of semi-elliptic spring member 10 including an upper leaf 11 which is extended at its two ends to form knuckles 12 and 13 to facilitate connection to a vehicle chassis. A series of leaves of progressively decreasing length are connected to leaf 11 in the usual manner by means of bolt 16 which passes through the center of the entire assembly. The spring may be connected to a supporting member such as an axle in any well known manner. In the construction shown for purposes of illustration a U-bolt 17 is passed around axle 18 on either side of spring 10 and clamped to the spring by plate 19. Clips 14 and 15 surround certain of the leaves near their free ends and prevent separation thereof during recoil causing the va-

rious leaves to assist in preventing an excessive reverse movement of the spring.

The auxiliary controlling attachment comprises resilient leaves 20 and 21 which are attached at one end near the center portion of the main spring, the center portion being considered for convenience of description as the stationary portion of the main spring. The other end of leaves 20 and 21 are secured at or near the free end of the chassis spring in such manner that the two springs are held in reverse compression. As shown in the drawings, leaves 20 and 21 are attached to the main spring by means of clevis 24 and cross bar 22 at a point near that to which the vehicle axle is attached. Clevis 24 surrounds the main spring and extends through holes in cross bar 22, the latter being caused to firmly clamp leaves 20 and 21 to the main spring leaves by means of nuts 25 which are threaded upon the ends of clevis 24 passing through cross bar 22.

Leaves 20 and 21 are rigidly attached to cross bar 22 by means of rivets 23 which are passed through the various members. The free ends of leaves 20 and 21 are clamped to the free end of the main spring member 10 by means of clevis 30 which surrounds the main spring member, said clevis cooperating with cross bar 31 upon which leaves 20 and 21 rest. Clevis 30 passes through holes in cross bar 31 and is secured thereto by means of nuts 32 which are placed upon the threaded ends of the clevis.

Leaf 21 is secured to cross bar 31 by means of rivets 33 which pass through the two members. Leaf 20, and any additional leaves which it may be found necessary to employ, rest upon and are supported by leaf 21, but in order to provide for slippage during flexure and minimize friction, are not rigidly secured thereto at their free ends.

In attaching the controller to the main spring, clevis 24 is first securely clamped in position about the center portion of the spring as shown in Fig. 1. Clevis 30 is then passed around the free end of the main spring and tension applied thereto by tightening the nuts 32, thereby flexing the leaves of the controller and causing them to apply a force to the leaves of the main spring. The two springs are thus held in reverse compression, the extent of which may be controlled and regulated by adjusting the tension of clevis 30.

The controller applied as above described introduces a false load upon the main spring throughout the normal length of movement thereof and assists it in compression. The movement of the main spring in recoil is however retarded by the downward pull exerted by the controller and the rate of movement in recoil is decreased to such an extent that any heavy shock received by the wheels is not freely transmitted through the spring to the chassis as a sharp shock but is largely absorbed by the spring itself.

In the arrangement above described the compression resistance of the entire spring assembly is equal to that of the main spring plus that of the controller itself. The spring is therefore stiffened by the addition of the controller and the compression resistance increased. The controller increases the load which the main spring can carry, but by assisting the main spring in compression and retarding it in a recoil imparts properties thereto which would not be obtained by the use of a single spring of compression resistance equal to the sum of that of the main spring and controller.

Various other features than the compression resistance must be considered in analyzing the riding quality of springs. A short spring for example will act more quickly than a long spring having the same compression resistance, and will transmit a sharper shock to the vehicle chassis. The addition of the controller above described has an effect similar to that of altering the length of the spring. By assisting the downward movement of the main spring the addition of the controller is equivalent to shortening the chassis spring and by retarding the upward movement in recoil the controller introduces properties similar to lengthening the main spring. The ultimate result of the above two features is to allow a road shock transmitted through the wheels to the spring to quickly compress the latter and then to cause the spring to have a slower action in recoil, minimizing the shock transmitted to the chassis.

The spring assembly having different characteristics in compression and recoil will not fall into synchronism with road shocks as the spring will have no pronounced natural period of vibration. The addition of the controller constructed in accordance with this invention produces the equivalent of a short spring in compression and a long spring in recoil. Since the above springs have different natural periods of vibration the spring as a whole will not oscillate in synchronism to shocks of either frequency. The controller therefore effectively damps oscillations at any frequency encountered in driving. This feature is particularly important in vehicles equipped with balloon tires which at certain speeds transmit road shocks of increasing amplitude to the vehicle chassis causing disagreeable vibration of the chassis until the synchronism is broken up. Such types of vehicles when equipped with the above described controller have been found to possess no disagreeable natural period of vibration and are not forced into oscillation by road shocks.

The adjustment of the force applied by the controller to the main spring is extremely critical in certain cases as a very small change

in the relative compresson of the two springs causes a marked difference in the riding quality of the chassis. The controller should be carefully designed to have the proper compression resistance to cooperate with the particular spring and chassis to which it is to be attached.

It has been found that by providing leaves of certain standard widths corresponding to that of the chassis springs and by providing a range of adjustment of the tension of the clevis surrounding the free ends of the spring, a few standard sizes may be employed, and, when installed, may be properly adjusted to cooperate with the majority of the springs now in use on pleasure automobile chassis.

Should the amount of flexure of the chassis spring be sufficiently great to cause the controller leaves to pass through their free or inert point, the controller attached as disclosed in Fig. 1 would cease to exert a force upon the main spring. Should such be the case the controller may be attached as shown in Fig. 5 by the addition of cross bars 40 and 41 which are held against the controller and the main spring respectively by nuts 42 and 43.

In adjusting the controller attached in this manner, care must be taken not to rigidly clamp leaves 20 and 21 between cross bars 31 and 40 but to leave the adjustment sufficiently loose so that the movement of the leaves may take place as the spring is flexed. Cross bar 41 should be loosely engaged by the main spring member for the same reason. By the construction shown in Fig. 5, after the controller has reached its free or inert point due to compression of the main spring, upon continued downward movement, leaves 20 and 21 will be moved in the same direction as the main spring, and will oppose further movement.

The system disclosed in Fig. 5 need be employed only in case the extent of movement of the main spring is such that the controller moves past its free point. The particular means for adjusting the controller to the main spring is shown by way of illustration only and any other suitable means for connecting the leaves of the two springs together and applying reverse compression thereto may be employed if desired.

The above conception of the theory of operation of the controller has been presented to more clearly set forth the invention, but is not intended as a limitation thereon.

While we have shown and described and have pointed out in the annexed claims certain novel features of the invention, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In combination with a vehicle chassis, a semi-elliptic spring member attached thereto, said member being connected to a stationary member at its mid-point and to said chassis at its end points, an auxiliary leaf spring, a cross member riveted to one end of said leaf spring, a clevis surrounding said main spring substantially at its center position and passing through said cross member, means for maintaining said clevis under tension whereby said spring member and auxiliary spring are rigidly connected together, a second crossbar at the other end of said auxiliary spring rigidly connected to the lowermost auxiliary leaf member, a clevis surrounding said main spring at its free end and passing through said second crossbar, and a pair of threaded members for applying tension to the said last mentioned clevis whereby the auxiliary spring may be maintained in reverse compression with respect to the spring member.

2. An auxiliary spring member comprising a plurality of spring leaves, a cross member at each end thereof, one of said cross members being rigidly connected to each of the said spring leaves, the other of the said cross members being rigidly connected to the adjacent spring leaf, a main semi-elliptic spring, a clevis passing through one of said cross members for rigidly attaching said auxiliary spring to said main spring, a clevis passing through the other of said cross members and adapted to co-operate with the main spring whereby each of said springs is held under compression and within normal range of movement of the main spring which is assisted in movement in one direction by the auxiliary spring and impeded in movement in the other direction thereby.

In testimony whereof we have hereunto set our hands.

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