Dec. 11, 1928. 1,694,756

C. R. SHORT

SUPPORT FOR INTERNAL COMBUSTION ENGINES WITH RUBBER CUSHIONS

Filed June 12, 1926

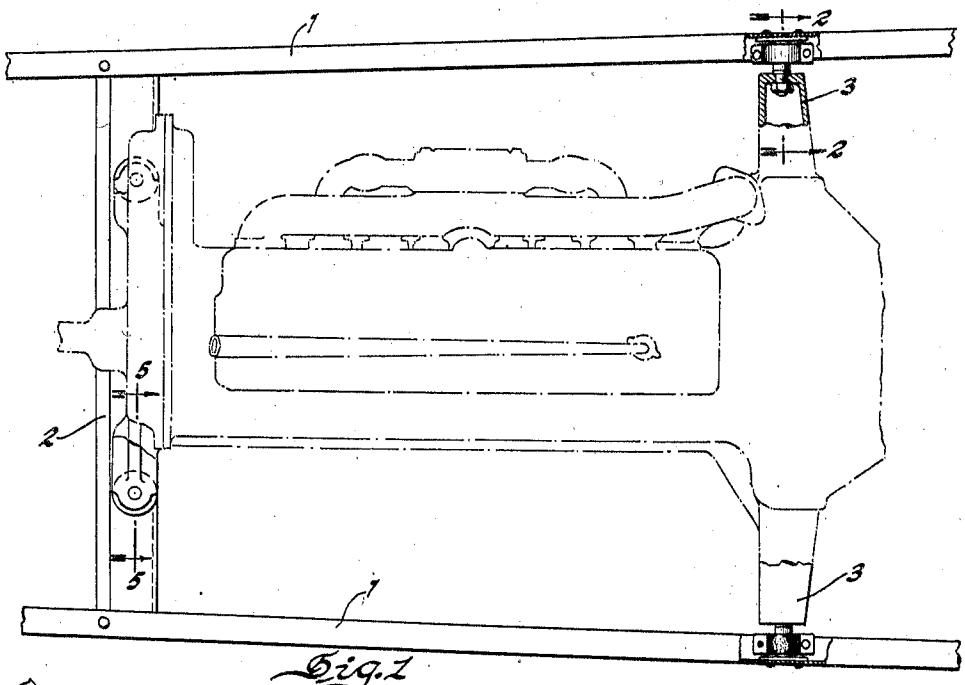



Fig. 1

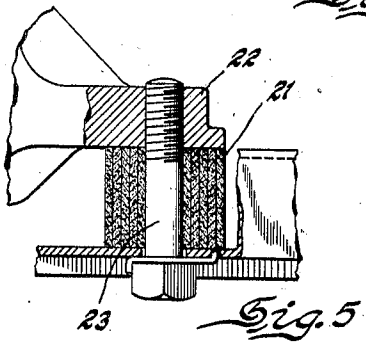



Fig. 5

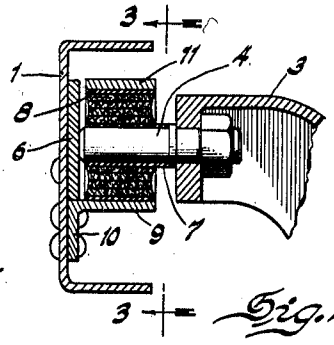



Fig. 2

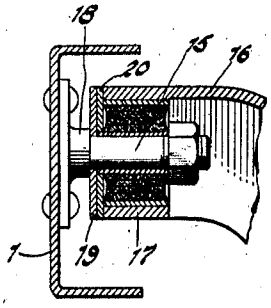



Fig. 4

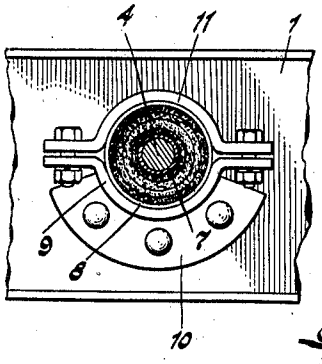



Fig. 3

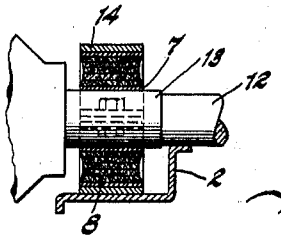



Fig. 6

Inventor
Charles R. Short

By Blackwood & Spencer & Hall

Attorneys

Patented Dec. 11, 1928. 1,694,756

# UNITED STATES PATENT OFFICE.

CHARLES R. SHORT, OF DAYTON, OHIO, ASSIGNOR TO GENERAL MOTORS RESEARCH CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

## SUPPORT FOR INTERNAL-COMBUSTION ENGINES WITH RUBBER CUSHIONS.

Application filed June 12, 1926. Serial No. 115,549.

This invention relates to resilient mountings particularly applicable to engine and machine supports, automobile body mountings, spring shackles and the like.

One of the primary objects of the invention is to provide a simple and economical but efficient shock absorbing and sound insulating support, which will be easy to assemble, conducive to better engine operation in the case of motor mountings and unlikely to get out of repair.

A further object of the invention is to provide a cushioned mounting in which there will be no metal-to-metal contact, and one in which vibrations in all directions will be deadened and absorbed, thus freeing the main supporting frame of strains and resultant injuries.

One of the uses to which the invention is particularly applicable, is that of an automobile engine support wherein the motor vibrations as well as the stresses incident to travel over rough roads place the parts under constant strain, inducing breakage, and at times setting up disagreeable noises. Other uses of the invention will be quite obvious, but for purpose of illustration, the invention is shown in the drawing in connection with a motor mounting.

In the drawing, wherein like parts are indicated by similar reference characters, Figure 1 is a fragmentary top plan view of an automobile chassis frame showing in broken lines, a conventional engine mounted thereon.

Figure 2 is a transverse sectional view of the preferred embodiment of the mounting taken on line 2—2 of Figure 1.

Figure 3 is a longitudinal side elevation of the mounting looking in the direction of the arrows on section line 3—3 of Figure 2.

Figure 4 is a modified form of mounting shown in section.

Figure 5 is a section of a further modification taken on line 5—5 Figure 1.

Figure 6 is a transverse section of another modification of a form of mounting such as may be used on the front support in the case of the common three point motor suspension.

Referring to the drawing the longitudinal frame members are indicated at 1—1, connected at their front end by the cross member 2. The front end of the motor is shown supported on the frame member 2, while the rear of the motor has the lateral dependent projections or legs 3 supported in the longitudinal side members 1—1. Merely for illustrative purposes, the motor is shown suspended at four points, the front mountings being of the form shown in Figure 5, while the rear motor mountings are of the type shown in Figure 2. However, it is to be understood that any of the mountings shown may be employed at all the suspension points, except in the case of a three point suspension when the Figure 6 construction would be employed at the center front.

In Figures 2 and 3, the supported leg 3 has bolted thereto a stud 4 laterally projecting into close relation to the channeled main frame 1, but is prevented from contacting the frame by an insert or disc 6 of cushioning characteristics, such as cloth, wood, rubberized fabric, leather or the like which will serve as a side-thrust-receiver to take up lateral stresses and vibrations and also prevent contact of the stud and frame. About the stud 4 is frictionally fitted the bushing or bearing sleeve 7. This bushing 7 is coated with a hard rubber composition and a strip of rubber or other compressible composition is wound about the sleeve with a second layer of fabric or other suitable binder wound rather tightly about the rubber strip to slightly compress and support the rubber strip. Such winding of the two alternating strips continues thru a few convolutions sufficient to give the winding a body. When the desired diameter is reached, a coating of the hard rubber composition is applied, and the outer sleeve 8, which is of slightly smaller diameter than the body of rubber and fabric, is forced on the body, thereby placing the rubber under additional compression. The composition before mentioned hardens the adjacent strip of rubber at both the inner and outer peripheries leaving the intermediate portions comparatively soft. The initial compression of the rubber by the fabric wrapping and the outer band or sleeve 8 takes away from the soft rubber its excessive responsiveness to compres-

sion, making it of greater density to support the weight of the motor and yet leaves enough resiliency or cushioning proclivity to absorb the radial vibrations of the stud.

The sides of the rubber and fabric body are concaved and open, so that when the rubber, is compressed by the vibration or strain, ample space is provided for displacement of the rubber. The respective concavities are so arranged that the greatest depth occurs at the medial soft rubber portion, where the greatest displacement occurs. The sides of the body are thus gradually deepened proportionately to the increasing compressibility of the rubber layers. Upon compression of the cushioning body, the lessening of the rubber density toward the medial layers will result in the central soft layers being compressed to a greater degree than the outer and inner peripheral hard layers, such relative displacement filling the concavity proportionately. As a general rule, the displaced rubber will not extend beyond the sides of the annular rim sleeve 8, but ample space is provided on each side in order that upon excessive compression, the rubber may be unrestrained.

This vibration dampening body is carried in a housing anchored on the main frame, and consists of the supporting bracket 9, having a dependent flange 10 secured by bolts or otherwise, to the web of the channeled frame 1. The semi-circular plate 11, bolted to the support 9, holds the body in place.

In Figure 6 is shown the same type of cushion mounting as applied to the central front support in a three point motor suspension construction. In this case the starting crank 12 extends into the engine thru the housing 13 and the housing is supported in the bearing sleeve 7 of the cushion mounting. The mounting in turn is carried upon the front transverse frame member 2, in a suitable housing 14.

Figure 4 is a modification of the Figure 2 construction, wherein the stud 15 is carried by the main frame and the motor supporting leg 16 has an annular ring 17 at its end into which the stud extends. Between the ring 17 and stud 15 is mounted the cushioning element before described. The stud 15 has at one end the shoulder 18 against which the annular plate 19 rests, and supported by the plate is the side-thrust-receiver 20 for the leg 16, corresponding with that shown at 6 in Figure 2.

In some instances it may be desirable to use the cushioning element in the form shown in Figure 5, in which case the courses of the rubber and fabric strips are in a vertical plane. The cushioning element 21 is made up of the spirally wound alternating strips of rubber and fabric with the hard rubber coating on the interior and exterior in the same manner as the cushion in Figure 2. The motor bracket arm or leg 22 rests on the top of the layers and is fastened to the frame by means of the threaded stud 23, and the cushion 21 receives the down thrust as well as the lateral vibrations.

While the invention has been described in more or less detail, there is no intention to limit it to the exact form shown, but obvious modifications may be employed without departing from the spirit or scope of the invention as set forth in the appended claims.

Having described my invention I claim:

1. The combination with a supporting member and a supported member, of a cushioned support therebetween including a spiral course of compressible material, and a like course of fabric wound upon and alternating with succeeding convolutions and partially compressing the material of the first mentioned course.

2. The combination with a supporting frame having a casing thereon, and a supported body provided with a dependent leg, of a cushioning element, consisting of a fabric strip and an elastic strip spirally wound one on the other in alternate courses throughout succeeding convolutions, and carried by said casing, into which the leg axially projects for dampening of radial shock.

3. The combination with a main supporting frame and a supported body, of a casing carried by the main frame, a dependent leg on the supported body, a cushioned mounting in said casing for the dependent leg including a bearing bushing for the leg, alternate courses of an elastic material and a binder therefor, wound spirally on one another thruout successive convolutions about said bearing and a peripheral retainer ring for said courses.

4. A cushioned support of the character described, consisting of a bushing sleeve to receive a supported member, a hard rubber composition upon the exterior of said sleeve, spirally wound alternating courses of soft rubber and fabric about said hard rubber, a second hard rubber composition on the outside diameter of said alternate courses, and a peripheral protective sleeve for the mass, slightly compressing and limiting the deflection of the rubber.

5. The combination with a main supporting frame, and a supported body, of a casing carried by the frame, a dependent leg on the supported body, a cushioned mounting in said casing for the leg comprising a spiral strip of elastic material and a binder strip wound under tension on succeeding convolutions of said elastic strip to absorb radial vibrations and a second cushioning element at the end of the leg to absorb lateral vibration.

6. The combination with a supporting member and a supported member, of a vibration absorbing element interposed therebetween including a plurality of alternate

courses of rubber and fabric, the outer courses of rubber being relatively harder than the medial courses.

7. In a device of the character described a cushion supporting element, consisting of a spirally wound strip of rubber, the inner and outer convolutions being of more density than the intermediate convolutions, and the intermediate convolutions being of relatively less width than the inner and outer convolutions, to compensate for the difference in density of the convolutions.

In testimony whereof I affix my signature.

CHARLES R. SHORT.