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SPRING SHACKLE

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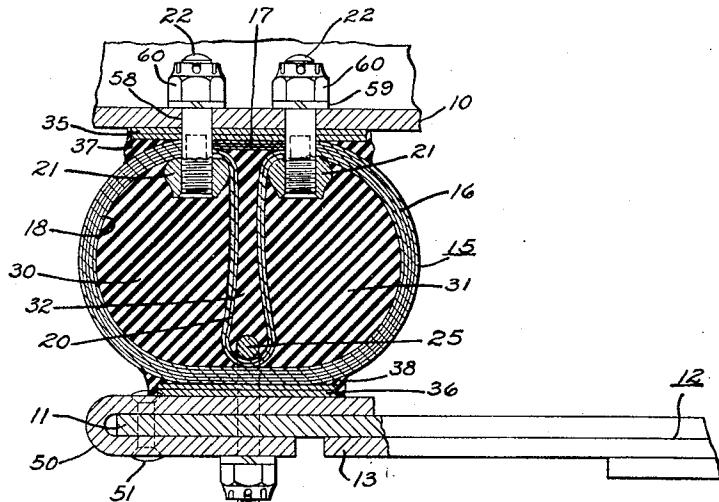


Fig. 1.

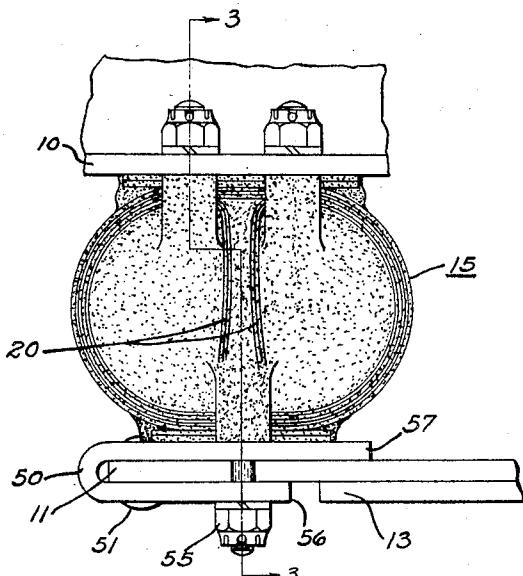


Fig. 2.

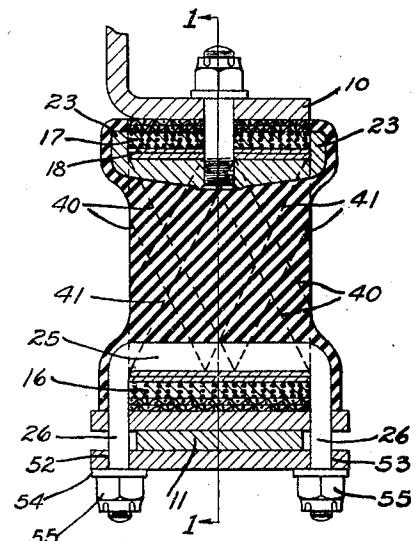


Fig. 3. Inventor  
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## UNITED STATES PATENT OFFICE.

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## SPRING SHACKLE.

Application filed April 30, 1927. Serial No. 187,836.

This invention relates to flexible couplings, especially such as are adapted for use as spring shackles on automobiles.

An object of this invention is to provide 5 an improved form of flexible coupling having improved efficiency in operation and longer life.

My copending application, Serial No. 185,707, filed April 22, 1927, discloses and 10 claims a shackle somewhat similar to that of the present application, however the present invention provides the following novel features: (1) The transverse flexible web or loop may be formed from the interior layers 15 of the flexible fabric casing; (2) the transverse web or loop is formed from strips of bias cut woven fabric with certain threads therein extending diagonally in both directions (when looking at a transverse section 20 through the shackle) and hence this web will greatly resist relative lateral movement between the parts connected thereby; (3) the transverse loop is of fewer plies than the outer flexible casing and is clamped in place 25 at one end by two spaced metal inserts, thereby facilitating the to and fro movement of the spring end; (4) the outer flexible casing is composed of a plurality of layers, the exterior layers being of cord fabric with peripherally extending cords while the interior layers are of woven fabric firmly bonded 30 by vulcanization to the cords of the cord fabric and thus prevent any separation or splitting of the cords of the cord fabric.

Another feature of this invention is the 35 method of fixing the molded unit to the spring end whereby the end of the spring leaf is pierced only beyond the point where the shackle load comes upon it.

Further objects and advantages of the 40 present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 illustrates a shackle built according to this invention mounted on the rear 45 end of the front spring of an automobile chassis. The vertical section is taken on line 1-1 of Fig. 3.

Fig. 2 is a side elevation of the shackle and its connected parts.

Fig. 3 is a transverse section taken on line

3-3 of Fig. 2, and shows by dotted lines 55 the direction of certain tension resisting threads in the flexible fabric web.

Similar reference characters refer to similar parts in all the views.

Numerals 10 and 11 designate the two relatively movable members connected by the shackle, 10 being the chassis side rail or fitting rigidly secured thereto, and 11 the projecting end of the long leaf of spring 12. The molded unit, designated in its entirety 60 by 15, comprises a flexible cylindrically shaped rubberized fabric casing 16 of several layers, the outer layers 17 of which are preferably of rubberized cord fabric with the substantially non-extensible cords there- 65 of running in a peripheral direction around the casing.

The inner layers 18 (two in number as illustrated) are formed as clearly shown in Fig. 1 so that they form a transverse loop 70 20 extending across the central portion of casing 16. The molded in situ metal clamping inserts 21 have shanks 22 which project outwardly through suitable apertures in layers 17 and 18, as clearly shown. These inserts 21 preferably have lugs 23 on the lateral 75 ends thereof to more securely clamp casing 16 in place and prevent any possibility of the edges of casing 16 slipping laterally from under the insert. The molded in situ clamping 80 insert 25 is in the form of a U-bolt looped around casing 16 and loop 20 and having its two shanks 26 projecting outwardly.

In the manufacture of the molded unit 15, the inner layers 18 preferably are first 90 wrapped up from a long strip of the desired rubberized fabric into a form which may only slightly resemble the final form thereof as shown in Fig. 1. This first form of the layers 18, being quite flexible, is then easily 95 shaped to the form shown in Fig. 1 and held by suitable means while the outer layers 17 are wrapped from a long strip of rubberized cord fabric thereupon. The holes for the shanks 22 are then cut and the two clamping 100 inserts 21 inserted in place from the inside of the fabric casing. The U-bolt insert 25 is also inserted in place from the inside of loop 20 in an obvious manner.

Unvulcanized rubber material in plastic 105 form is then inserted in place to fill the interior spaces 30, 31, and 32, as will be readily understood by those skilled in the art. This

rubber material is of such composition that when the molded unit comes from the vulcanizing mold the rubber blocks 30, 31, 32 will be of elastic rubber of the desired softness 5 such as to permit easy rolling distortion of unit 15 but still capable of sustaining the load upon the shackle without excessive bulging out at the lateral sides thereof. The elastic rubber is of course firmly bonded by vulcanization to casing 16 and both webs of loop 20 and this tends to limit the lateral bulging of the elastic rubber when under compression. Preferably there are integrally molded upon the above described unit the relatively 10 stiff rubberized fabric seats 35 and 36 and the wedge-shaped spaces between these seats and casing 16 are filled with very soft elastic rubber 37 and 38 molded in place. This molded unit 15 is vulcanized as a whole in a 15 suitable vulcanizing mold, the desired softness or hardness of the rubber in the various portions thereof being obtained by the amount of sulphur and accelerator in the unvulcanized compound used in said various 20 portions.

So far in this description, the layers 18 and loop 20 have been described simply as of rubberized fabric material. Preferably layers 18 and loop 20 are wrapped up from a 25 long strip of square woven fabric cut on a bias at such an angle that the main tension resisting threads thereof extend approximately as shown by the dotted lines 40 in Fig. 3. Of course in the return bend of loop 30 20 these same main threads extend diagonally in the opposed direction as shown by the dotted lines 41. Preferably alternate layers 35 of the layers 18 are reversed so that they have the main tension threads therein crossing each other at opposed angles corresponding 40 to the crossing of dotted lines 40 and 41 in Fig. 3. It is thus seen that the flexible loop 20 will highly resist any relative lateral movement between member 10 and the 45 spring end 11 since by such lateral movement in either direction a wide band of tension resisting threads will be put under direct tension. In other words, the angularity of the threads 40 and 41 greatly increases the strength of these threads in loop 50 20 in resisting relative lateral movement between the chassis frame and spring end 11. Also this same angularity of the main threads in the layers 18 of casing 16 serves to firmly bind the peripheral cords of the outer layer 55 17 together so as to avoid splitting apart of the peripheral cords, especially under relative lateral movement between 10 and 11.

The assembling in place of the completed 60 molded unit 15 upon spring leaf 11 and member 10 will now be described. A U-shaped metal seat member 50 of slightly greater width than unit 15 is slipped over the projecting end of leaf 11 and fixed thereto by 65 one or more (preferably two) rivets 51 which

pierce leaf 11 adjacent the tip thereof so that the bending strength of leaf 11 will not be reduced by the holes for rivets 51. Unit 15 can now be fixed in place upon the seat 50 by passing the two shanks 26 of U-bolt 25 70 through holes 52 and 53 through the laterally projecting portions of seat 50 (as clearly shown in Fig. 3) and applying the lock washers 54 and nuts 55. By tightening the nuts 55 the lower end of loop 20, and the lower 75 portion of casing 16 are firmly clamped down upon the seat 50. Preferably the lower plate 56 of U-shaped seat 50 is cut off shorter than the upper plate 57 thereof in order to permit the second leaf 13 of spring 12 to 80 extend under plate 57 and so reinforce the long leaf 11.

The two upper shanks 22 are passed through suitably spaced holes 58 in member 10 and the lock washers 59 and nuts 60 applied thereto. By tightening nuts 60 the upper end of loop 20 and the upper portion of casing 16 are firmly clamped upon member 10. Preferably the holes 58 are so located relative to the spring end 11 that the 90 unit 15 will be substantially in the position shown in Fig. 1 when spring 12 is deflected downward by the average normal load thereupon.

In operation, the flexible casing 16 retains 95 the soft elastic rubber therein in shape to withstand the compression load thereupon, but permits the spring end 11 to move to and fro by a rolling distortion of unit 15 upon the stiff fabric seats 35 and 36. Such rolling distortion is not materially resisted by the flexible loop 20 which will swing to and fro with the end 11 and which is slightly extensible in a vertical direction due to the angularity of the threads, as described above. 100 On severe rebounds, the loop 20 will yielding take the tension load on the shackle. However the chief function of loop 20 is to resist relative lateral movement or "side sway" as described hereinabove and prevent 110 the molded unit 15 from lying over on its side.

While the form of embodiment of the present invention as herein disclosed, constitutes 115 a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An extension shackle connecting two 120 relatively movable members, said shackle comprising: a flexible rubberized fabric casing vulcanized upon an interior elastic rubber block, means for fixing opposite portions of said casing to said movable members respectively, and a flexible transverse loop of rubberized fabric extending through said rubber block and secured to said movable members respectively, said rubberized fabric loop being formed from strips of bias cut fabric whereby diagonally extending threads 125 130

in one web of said loop extend at substantially equal and opposite angles in the other web of said loop.

2. An extension shackle connecting two

5 relatively movable members, said shackle comprising: a flexible rubberized fabric casing vulcanized upon an interior elastic rubber block, means for fixing opposite portions of said casing to said movable members respectively, and a flexible transverse loop of 10 rubberized fabric extending through said rubber block and secured to said movable members respectively, said rubberized fabric loop having a plurality of plies of bias cut 15 fabric, some of said plies having threads extending transversely diagonally in one direction and other of said plies having threads extending transversely diagonally in the other direction.

20 3. An extension shackle connecting two relatively movable members, said shackle comprising: a flexible rubberized fabric casing vulcanized upon an interior elastic rubber block, means for fixing opposite portions 25 of said casing to said movable members respectively, and a transverse flexible rubberized fabric web extending through said rubber block, said web having a plurality of plies of bias cut fabric, some of said plies having 30 threads extending transversely diagonally in one direction and other of said plies having threads extending transversely diagonally in the opposed direction.

4. An extension shackle connecting two 35 relatively movable members, said shackle comprising: a flexible rubberized fabric casing vulcanized upon an interior elastic rubber block, means for fixing opposite portions of said casing to said movable members respectively, and a transverse rubberized fabric 40 web extending through said rubber block and fixed to said movable members respectively, said web being of bias cut woven fabric having a plurality of threads fixed to the 45 upper movable member on the right side and to the lower movable member on the left side of the vertical center line of a transverse section through said shackle, and a plurality of threads similarly but oppositely fixed to said 50 movable members.

5. An extension shackle connecting two relatively movable members, said shackle comprising: a flexible fabric casing of several layers vulcanized upon interior elastic rubber 55 material, the inside layer of said casing hav-

ing a loop therein extending transversely through said elastic rubber, the opposite ends of said loop being fixed to said movable members respectively.

6. An extension shackle connecting two 60 relatively movable members, said shackle comprising: a flexible fabric casing of several layers vulcanized upon interior elastic rubber material, an interior layer of said casing being formed from a bias cut strip of woven 65 fabric and having a loop therein extending transversely through said elastic rubber and fixed at its opposite ends to said movable members respectively.

7. An extension shackle connecting two 70 relatively movable members, said shackle comprising: a flexible fabric casing of several layers vulcanized upon interior elastic rubber material, an interior layer of said casing being formed from a bias cut strip of woven 75 fabric and having a loop therein extending transversely through said elastic rubber and fixed at its opposite ends to said movable members respectively, and an exterior layer of said casing being formed from cord fabric 80 having the substantially non-extensible cords thereof extending peripherally of said casing.

8. An extension shackle connecting two relatively movable members, said shackle comprising: a flexible fabric casing of several 85 layers vulcanized upon interior elastic rubber material, and means for fixing opposite portions of said casing to said movable members respectively, an interior layer of said casing 90 being formed from woven fabric and an exterior layer thereof being formed from cord fabric having the substantially non-extensible cords extending peripherally of said casing.

9. An extension shackle connecting two 95 relatively movable members, said shackle comprising: a flexible fabric casing of several layers vulcanized upon interior elastic rubber material, and means for fixing opposite portions of said casing to said movable members 100 respectively, some of the layers of said casing being of cord fabric and having the non-extensible cords thereof extending peripherally of said casing, while at least one of said layers is of bias cut woven fabric whereby to 105 securely bond the peripheral cords together laterally.

In testimony whereof I hereto affix my signature.

RALPH H. CHILTON.