May 11, 1943. J. W. WATSON ET AL 2,319,172

SPACING DEVICE FOR FRICTIONALLY OPPOSED BODIES

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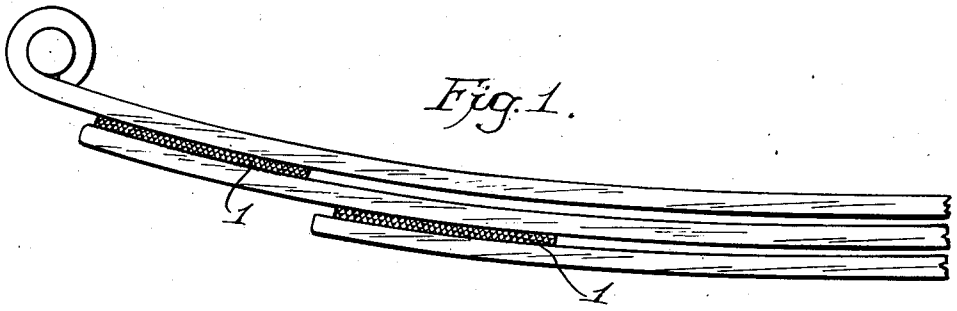



Fig. 1.

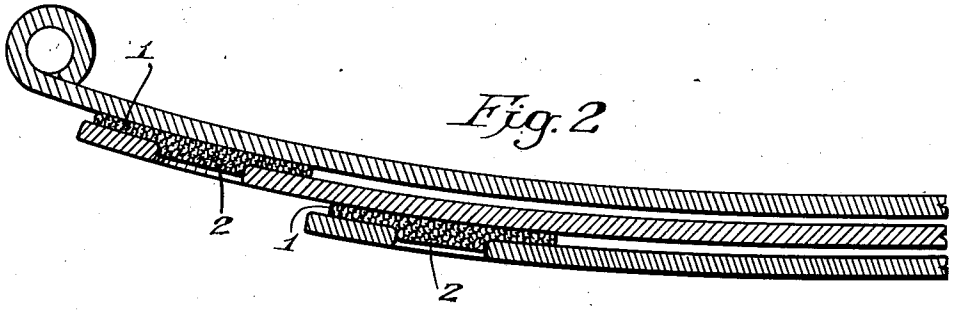



Fig. 2

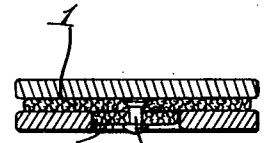



Fig. 3.

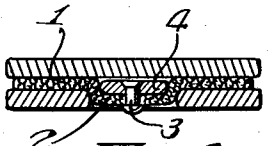



Fig. 4.

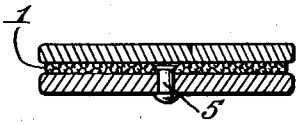



Fig. 5.

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2,319,172

## SPACING DEVICE FOR FRICTIONALLY OPPOSED BODIES

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4 Claims. (Cl. 267—47)

This invention relates to a device for spacing two bodies which are subjected to relative movements and pressure and, in particular, to a device for spacing the leaves of a multiple leaf spring, in order to provide smooth and silent action to relative movements of the said bodies or spring leaves.

A particular object of our invention is to provide a positive spacing of the spring leaves at their tip ends, for it is at the tip ends of each leaf that the greatest movements and highest pressures occur.

A further particular object of the invention is to provide a positive anchoring means to maintain the device, unfailingly, in its proper position with relation to the leaf end.

A further and also very particular object of the invention is to provide a spacing device of material which is sufficiently yieldable to permit it to readily conform with any unevenness of surface encountered in its contact with the leaves which it is spacing. This conformability and resulting snug and complete contact between the device and an adjacent leaf produces a firm seal against the entry therebetween of abrasives and other objectionable matter.

A further particular object of the invention is to construct the spacing device of material possessing a substantial balance between its static and dynamic coefficients of friction. Such balance is necessary in order to avoid to a satisfactory degree the spasmodic actions, vibrations and noises which would otherwise occur during relative movements between the spacing device and the leaf surface against which it coacts.

A further object of the invention is to provide a device constructed of such material as will not be detrimentally affected by water, oil or other elements with which it is likely to come in contact.

Referring to the drawing:

Figure 1 is an elevational, fragmentary view of a leaf spring, showing a portion of three leaves and two of the spacing devices in position therebetween;

Fig. 2 is a fragmentary longitudinal sectional view illustrating one means for positive anchorage of the device in accordance with our invention;

Fig. 3 is a transverse sectional elevation of two leaves and a spacing device showing a preferred form of construction for accomplishing the necessary positive anchorage of the device with relation to the end of a spring leaf;

Fig. 4 shows an alternate method of construction for providing the necessary anchorage means; and

Fig. 5 shows a still further modification for providing a positive anchorage.

Referring to the above illustrated examples of our invention, it will be noted that each of the devices has a localized area of increased thickness to provide a firm projection for interlocking, anchoring engagement with one of the spring leaves. In these preferred examples, the projection provided by the increased thickness is of a character to engage in a recess formed adjacent the tip end of the leaf.

Referring to Fig. 2, the spacing portion 1 of the device and the projecting portion 2 are formed integrally as, for example, if made of a textile fabric, during the weaving operation.

Referring to the construction of the spacing device shown in Figure 3, member 1 is the spacer proper, and member 2 is a projecting lug which may be constructed of the same material as the spacer proper, or may be constructed of any other material of suitable strength and enduring quality. The spacer proper and the lug are firmly attached together by means of a rivet 3, or by stapling, or by any other positive means.

Referring to Figure 4, the projecting portion 2 is made integral with the spacer portion 1, by forming in a suitable die. With this construction, it is preferred, in order to more positively maintain and preserve the shape of the projecting portion 2, to include button member 4, which is securely held in place by means of a rivet 3, or by stapling, or by other suitable means.

Referring to Figure 5, the spacing element 1 is held in positive relation with respect to the leaf end by means of one or more rivets 5, or by some such other suitably positive device, to prevent its displacement from between the leaves. In this device, the area of increased thickness is only that of the rivet area.

The holes or recesses shown in the spring leaves, as well as the cooperating lug or projecting portions 2 shown in Figures 2, 3 and 4, may be of round section; but it is preferred to make them of oval or other irregular section, in order to keep the spacers from turning and to thus maintain their proper alignment with relation to the spring leaves. This maintenance of proper alignment is important, if the spacer portion 1 is to be made square or rectangular, and such shape for the spacer portion is preferred over a spacer of round shape as greater area, and hence greater life, is provided at no extra cost.

A round hole in the spring leaf and a round projecting portion could be made to hold the device from turning by making the diameter of the projection somewhat larger than the hole diameter and forcing it into place. To insure maintenance of alignment of a square or rectangular spacing portion in the example of the device shown in Fig. 5, a snug fitting rivet may prove sufficient, but it is preferred to use more than one projecting rivet.

In the case of a multiple leaf spring, practi-

cally the entire imposed load is carried by the succeeding array of spring tips, one tip passing the load along to the next tip and so on along the line to the most remote tip. It is for this reason that oil or grease cannot be maintained at these high-pressure tip-end points of contact which is, of course, the only place where a lubricant is required. For this same reason, because the load is concentrated at the tip ends of each leaf, spacing devices are needed at these points and at these points only.

These spacing devices must be positively anchored adjacent the tip ends in order to maintain them there regardless of any and all normal and abnormal conditions to which they may be subjected in service and in the handling of the spring.

That the spacers be made of yieldable material is of utmost importance in order that the imposed load may readily "pad" them down to conform with any irregularities of the leaf surface and thus establish a snug-fitting and definite seal against the entry of foreign abrasives.

As to the coefficient of friction of the material of which the spacers are made, quite a bit will depend upon the particular duty which the spring or other mechanism is to perform. In certain duties a very low coefficient of friction might be most desirable. In other duties variously higher coefficients of friction might be desired. Nothing here, therefore, can be said about any given coefficient of friction or hence any given compound. In any case, however, we here wish to emphasize that the static coefficient of friction and the dynamic coefficient of friction should be the same, should be balanced, or at least sufficiently balanced to avoid setting up objectionable spasmodic actions, vibrations and noises.

Also, the material, of which the spacing device is constructed, must be proof against detrimental action of water or oil or other elements with which it is likely to come in contact. For certain indoor duties this factor might not be important. Most certainly, however, this factor is important in spacers for use in automobile springs.

From the foregoing it will be apparent that a successful workable spacing device for leaf spring duty must combine all five of the factors as here set forth as the objects of this invention.

A preferred material for this spacer duty, and one which has amply proven itself in service as highly satisfactory for duty in automobile springs, is a woven cotton fabric impregnated with a compound comprising calcium stearate, a suitable solvent for same, such as stearic acid, and suitable plasticizers. The important ingredient in this case, because it provides the necessary balance between static and dynamic coefficients of friction, is the calcium stearate. In this connection, reference may be made to U. S. Patent No. 1,845,096, granted to Robert F. Nowalk on February 16, 1932. With the calcium stearate as the medium for balancing the static and dynamic coefficients, numberless compounds can be made to provide such frictional coefficients as may be best suited for different duties and conditions. In place of a woven cotton fabric as the matrix, excellent results have also been obtained by impregnating suitably porous papers. The cotton fabric, however, is preferred at the moment as it seems to make possible a somewhat more sturdy and long-lived spacing device.

Equipped with spacer devices as here set forth, it becomes unnecessary to cover or "boot" the spring. The yieldable and self-sealing nature of the spacers provides all the protection necessary against abrasive action and wear. If desired, short, thin metal spacers may be positioned between the leaves at the centre of the spring and held in position by the centre bolt. Thus there would be no interleaf rubbing contact and, therefore, no water, grit or grime could interfere with the smooth and silent action of the spring. Tests have demonstrated that grit or other matter, when dry, simply blows right on through between the spaced leaves. Ample tests have also demonstrated that if grit and grime are carried in between the leaves and lodged there in the form of muddy water or mud, this matter will shake out or get blown out immediately the moisture evaporates and the foreign matter becomes dry. Not only, therefore, may the cost of spring covers be avoided, but also a better job is had without them because the most efficient of spring covers still permits the entry of foreign matter and then acts to imprison and accumulate it.

While we have here illustrated and described our invention more specifically as applied to use in connection with a leaf spring, it should be understood that we do not limit ourselves to this specific use of the invention as it is quite apparent that this novel combination is equally well adapted for use as a spacing means in numerous other mechanisms wherein two bodies are subjected to relative movements and pressure and wherein long-lived, smooth and silent action is desired.

We claim:

1. For positionment between two frictionally opposed members for controlling the friction therebetween, an impregnated fibrous spacing device provided with an integral, drawn and preformed projection for anchoring said device with relation to one of said members, said projection having its wall portions substantially at right angles to said device.

2. For positionment between two frictionally opposed members for controlling the friction therebetween, an impregnated fibrous spacing device provided with an integral, preformed boss portion for anchoring said device with relation to one of said members, said boss portion being reinforced by means to strengthen it against collapse.

3. For positionment between two frictionally opposed members for controlling the friction therebetween, an impregnated textile fabric spacing device provided with an integral, drawn and preformed projection for anchoring said device with relation to one of said members, said projection having its wall portions substantially at right angles to said device.

4. For positionment between two frictionally opposed members for controlling the friction therebetween, an impregnated textile fabric spacing device provided with an integral, preformed boss portion for anchoring said device with relation to one of said members, said boss portion being reinforced by means to strengthen it against collapse.

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