United States Patent

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[33] **Germany**
[31] **P 16 50 971.0**

[54] **LEAFSPRING**
10 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **267/50**
[51] **Int. Cl.** **F16f 1/24**
[50] **Field of Search** 269/50V

[56] **References Cited**
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ABSTRACT: A leafspring consists of two or more elongated superimposed leaves each having a surface facing the other. The leaves each have an end portion provided with an upwardly extending projection on which the underside of the next-higher leaf slidably rests. These projections are each provided with a downward depression the open side of which faces the underside of the leaf above, and lubricating material is accommodated in this depression so as to lubricate and facilitate the sliding movements between the projection and the superimposed leaf.

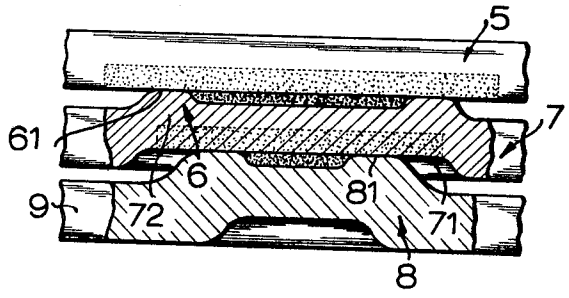


FIG.1

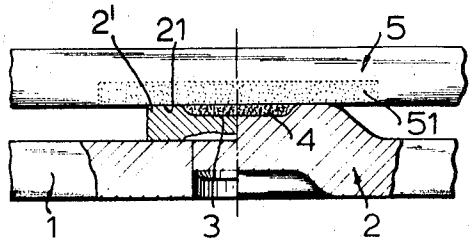


FIG.2

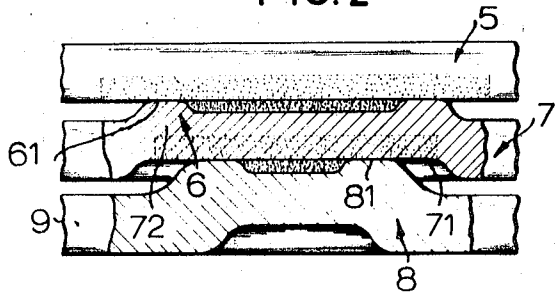
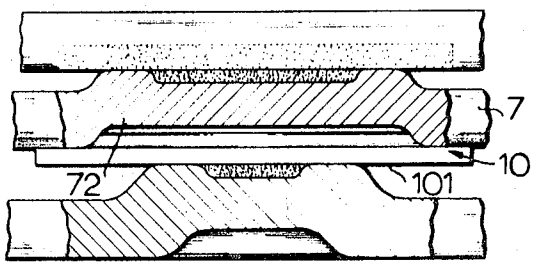


FIG.3



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LEAFSPRING

BACKGROUND OF THE INVENTION

The present invention relates to leafsprings in general, and more particularly to multiple-leaf type of leafsprings for motor vehicles.

In multiple-leaf type of leafsprings the leaves which are superimposed upon one another are also staggered in longitudinal direction so that the end portion of one leafspring abuts against and slides over the major surface of the next-adjacent leafspring. A stack of leaves is arranged and maintained together in a condition of superimposition, and the end portions of several leaves will rub against the respectively adjacent leaves. The resulting friction, particularly of the sharp edges of the end portions against the major surface of an adjacent leafspring, in conjunction with rust which may form between adjacent ones of the leafsprings, increases friction between adjacent leafsprings quite considerably beyond what is desirable. Furthermore, the position of the precise areas of contact between adjacent leafsprings, and the size of such areas, cannot be controlled in known constructions of this type.

Attempts have been made to reduce the friction by providing wire or wire-frame inserts between adjacent leafsprings which are positioned in grooves extending along the margins of the leaves over a substantial part or even the entire length of the latter. However, while this theoretically would be advantageous in providing the desired results, the expenses involved in manufacturing the inserts and the grooves and assembling the inserts in the grooves, make this solution economically impossible.

Other attempts have involved the interposition of elastic inserts between the individual leaves of a stack of such leaves which constitute a leafspring, and the inserts may be mushroomed-shaped disc bodies of polyurethane or other suitable material, or other special inserts of different configuration but serving the same purpose. In each of these cases, however, the expense of manufacturing the inserts and assembling them with the leaves has been relatively great, thus rendering the resulting leafspring uneconomical, and frequently the inserts themselves do not have a sufficient life.

Finally, attempts at providing lubricating agents between adjacent leaves of such leafspring to reduce the friction therebetween have also not been successful and no satisfactory solution to the problem exists until now.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to provide a novel leafspring which avoids the aforementioned disadvantages and has the advantages which have been characterized as desirable.

A further object of the invention is to provide such a leafspring wherein frictional resistance to sliding movement of adjacent leafspring-leaves relative to one another is significantly reduced.

An additional object of the invention is to provide a leafspring of the type in question wherein the location and the size of area in contact between adjacent ones of the leaves can be precisely predetermined in a simple and economical manner.

Further, it is a concomitant object of the invention to provide such a leafspring wherein all of the objects are accomplished and which has yet a satisfactory life expectancy.

In accordance with the above objects, and others which will become apparent hereafter, one feature of my invention resides in the provision of a leafspring which is particularly suitable for use in automotive vehicles, but is not limited thereto, and which has at least two elongated superimposed leaves each having a surface facing the other. At least the lowermost leaf has an end portion which is provided with an upwardly extending projection, and the uppermost leaf is slidably supported on this projection. Depression means is provided in the projection and has an open side facing the uppermost leaf, the body of lubricating material is accommodated in the depression means so as to lubricate and facilitate relative sliding movements between the projection and the uppermost leaf. The projections can be provided in a most simple manner by deforming the material of the end portions of the leaves in question so as to provide at one side of the end portion the projection and at the opposite side a corresponding recess. In this manner, also, the area of contact between adjacent leaves, namely the contact between the respective projection and the associated major surface of the next adjacent leaf, is precisely defined as to its location in the end portions and to the size of its area, and thus also the value of surface pressure is defined. Furthermore, the provision of the projections results in the desirable development of an air gap between the leaves at those areas thereof which are subjected to the higher requirements.

Stress transmission takes place through the upper edge of the projection so that the surface pressure is maintained within acceptable limits, and the fact that the recess means created in the projections is filled with lubricating agent assures that lubrication becomes directly dependent upon the wearing-off of material at the upper edge of the projection because, as material wears off, contact between the superimposed leafspring and the lubricating agent in the recess means takes place so that a new layer of lubricant is formed. Of course, the surface contact between the upper edge of the projection in which the recess means is formed and the major surface of the superimposed leaf with which the projection operates, assures a tight sealing of the recess means against the introduction of contaminants into the lubricating agent.

It is particularly advantageous in accordance with the invention if the lubricating agent of other-than-fluid consistency is utilized.

In embodiments where all of the end portions with their projections are vertically superimposed, the upper edge of each projection may be received in the corresponding depression provided in the superimposed end portion of the next-adjacent leafspring, and it is also within the concept of the invention to provide an insert in this depression against which the upper edge of the next-lower projection may abut.

Furthermore, the projections need not necessarily be of one piece with the end portions of the respective leaves. Rather, they can be separately secured to these end portions, for instance by a dished member which is suitably secured to the end portion. While this construction is somewhat more elaborate and expensive than the first-mentioned one, proper selection of the material for the dished member may obviate the need for a special surface treatment at the underside of the next-higher leaf with which the projection constituted by the dished member cooperates.

However, generally I prefer to avoid the possibility of material removal resulting from the sliding engagement of the superimposed leaves by surface hardening at least that portion of the respectively superimposed leaf with which the upper edge of the projection of the next-lower leaf comes into frictional sliding contact. This surface hardening does not decrease the lifetime of the leaves.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a somewhat diagrammatic fragmentary side elevation of a first embodiment of the invention;

FIG. 2 is a view similar to that of FIG. 1 but illustrating the second embodiment of the invention; and

FIG. 3 is a view similar to FIG. 1 but illustrating yet an additional embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing now the drawing in detail, and firstly the embodiment illustrated in FIG. 1, it will be seen that I have shown two superimposed leaves, the uppermost one of which is identified with reference numeral 5, and the lower one is identified with reference numeral 1. It is clearly visible that in the region of the end portion of the lower leaf 1 I have provided an upwardly extending projection 2 which is in turn formed with and surrounds a recess 3. I wish to point out that the projection can be provided by upwardly deforming the material of the end portion of the leafspring 1 of the leaf 1, but that also as illustrated at the left-hand side of FIG. 1, an end portion may be undeformed and may have inserted thereinto and suitably secured thereto a dished member 2' which then provides the recess 3. How this member 2' can be connected with the leafspring 1 is well known in the art and forms no part of the present invention.

The recess 3 accommodates a body of lubricating material which advantageously is of other-than-fluid consistency, and which is identified with reference numeral 4. Such nonfluid lubricating material may for instance be lead, zinc, lubricating agents based on the molybdenum or wolfram disulfide groups and combinations thereof with synthetic plastics, soft-metal powders, graphite or the like. At least that area 51 of the superimposed leaf 5 which comes into abutting contact with the upper edge 21 of the projection 2 is surface hardened, as diagrammatically illustrated in FIG. 1.

The embodiment of FIG. 2 corresponds substantially to the one of FIG. 1, except that in place of the single lowermost leaf 1 I have here provided leaves 7 and 9, both of which are located below the uppermost leaf 5. The leaf 7 is provided with a projection 6 corresponding to the projection 2 in FIG. 2 and also filled within its recess with lubricating agent as before. The leaf 9 is provided with a projection 8 corresponding to projection 6 and similarly filled with lubricating agent in its depression. The projections 6 and 8 may both be provided by deforming the material of the respective leaves 7 and 9, as discussed earlier, or a separate dished member corresponding to the one identified with reference number 2' in FIG. 1 may be substituted as desired.

Surface hardening is again indicated diagrammatically as in the case of FIG. 1.

Unlike the embodiment of FIG. 1, however, the projection 8 of the lowermost leaf 9 extends into the depression provided at the underside of the leaf 7. Thus, in this embodiment, the upper edge 61 of the projection 6 on the leaf 7 abuts against the surface-hardened underside of the leaf 5, whereas the upper edge 81 of the projection 8 of the lowermost leaf 9 abuts against the surface-hardened underside of the leaf 7 within the confines of the depression provided at the underside of the leaf 7 in correspondence with the upwardly extending projection 6. The depression is identified with reference numeral 72 and its surface-hardened underside is identified with reference numeral 71.

In the embodiment of FIG. 3, finally, the illustrated construction is substantially similar to that of FIG. 2 with identical reference numerals identifying identical elements. In addition, however, I have provided in FIG. 3 an insert 10 extending across or being received in the depression 72 at the underside of the leaf 7. The insert 10 is surface hardened at its underside 101 and the upper edge 81 of the projection 8 of the leafspring 9 of the leaf 9 abuts and slides over the underside 101 of the insert 10.

It will be clear from what I have set forth and also from the drawing that my novel leafspring construction attains its purposes in a simple and economical manner, but also in a manner which is highly reliable.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a leafspring, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended.

I claim:

1. A leafspring, particularly for automotive vehicles, comprising at least two elongated superimposed leaves each having a surface facing but spaced from the other, at least the lower most leaf having an end portion provided with an upwardly extending projection and the uppermost leaf being slidably supported only on said projection; depression means provided in said projection and having an open side facing said uppermost leaf; and a body of lubricating material accommodated in said depression means so as to lubricate and facilitate relative sliding movements between said projection and said uppermost leaf with said surfaces remaining at least normally out of contact with one another.

2. A leafspring as defined in claim 1, wherein said lubricating material is of other-than-fluid consistency.

3. A leafspring as defined in claim 1, said uppermost leaf having a surface abutting against said projection and being surface-hardened at least in the region of abutment with said projection.

4. A leafspring as defined in claim 1, said projection being of one piece with said lowermost leaf.

5. A leafspring as defined in claim 1, said lowermost leaf comprising a substantially dish-shaped insert connected with said end portion and constituting said projection provided with said depression means.

6. A leafspring as defined in claim 1; further comprising at least one additional leaf corresponding to said lowermost leaf and having the latter superimposed thereupon, the projection of said additional leaf being located below said projection in said uppermost leaf; and wherein said uppermost leaf is provided in its underside facing said additional leaf and below said projection with an upward recess in which the projection of said additional leaf is slidably received.

7. A leafspring as defined in claim 6; further comprising an insert received and secured in said recess, the projection of said additional leaf abutting against and sliding on said insert.

8. A leafspring as defined in claim 7, said insert being surface-hardened at least in the region of abutment with the projection of said additional leaf.

9. A leafspring as defined in claim 2, wherein said lubricating material is selected from a group containing lead, zinc, molybdenum and wolfram disulfide lubricating agents, and combinations of such materials with synthetic plastics, powdered metals and graphite.

10. A leafspring as defined in claim 6, the material of said lowermost leaf being surface-hardened at least within the confines of said recess.