Feb. 22, 1966 J. Z. NICOLAISEN 3,236,513

RUBBER SUPPORTS

Filed Feb. 13, 1964 2 Sheets-Sheet 1

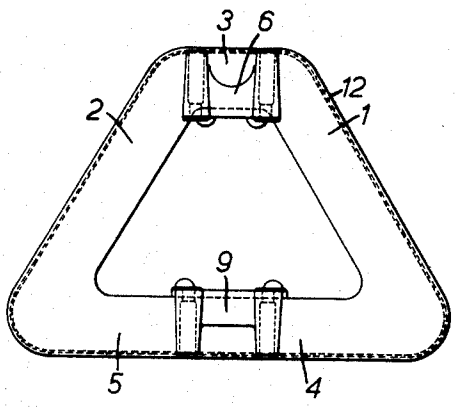


FIG. 1.

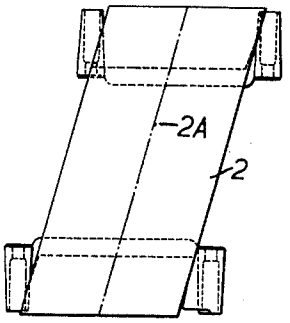


FIG. 2.

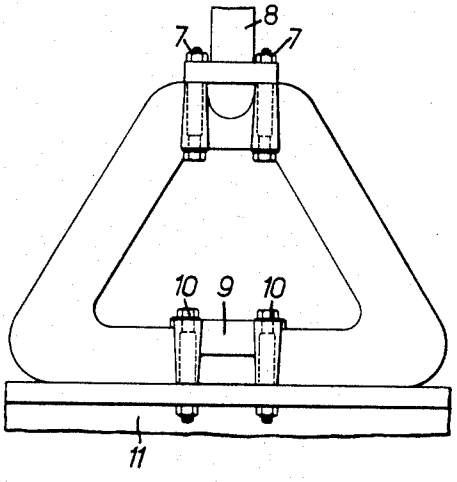


FIG. 3.

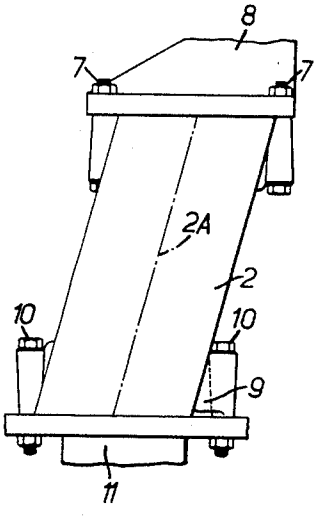


FIG. 4.

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Filed Feb. 13, 1964 2 Sheets-Sheet 2

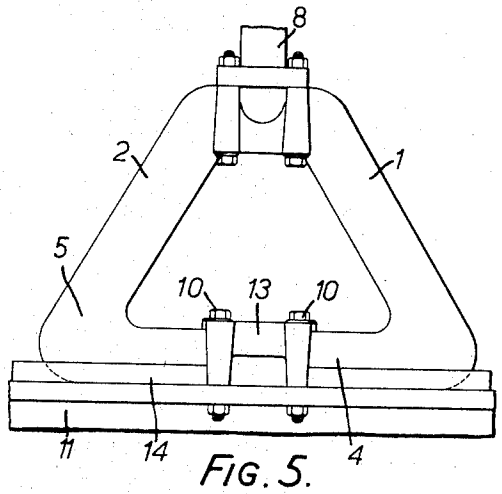


FIG. 5.

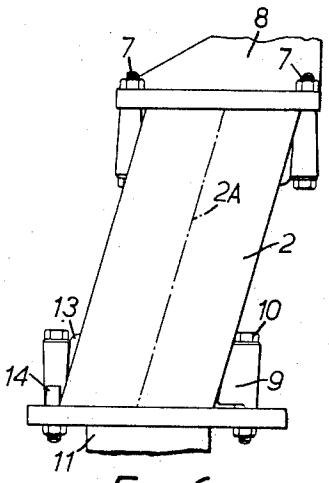


FIG. 6.

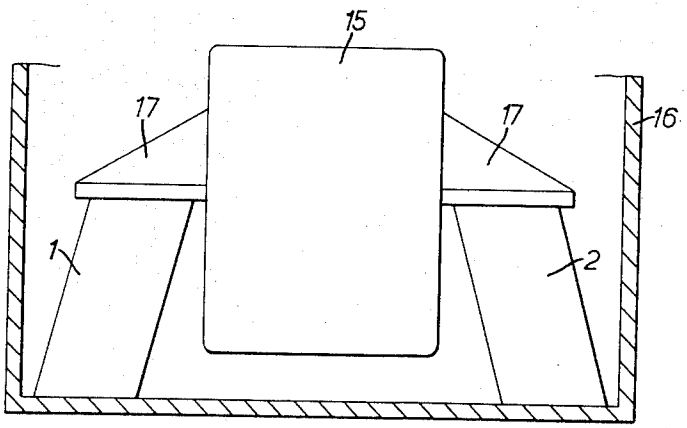


FIG. 7.

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3,236,513

RUBBER SUPPORTS

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Claims priority, application Great Britain, Feb. 14, 1963, 6,089/63
6 Claims. (Cl. 267—1)

This invention relates to resilient supports of the kind forming the subject of the present applicant's U.S. Pat. No. 3,109,639 and is concerned with an improvement in or modification of that form of such supports in which the resilient element formed of rubber or other flexible resilient material comprises two strut-like parts and is of generally triangular form with the two strut-like parts forming the two sides of the triangle and joined at the apex either directly or by a bridge-piece and inwardly extending parts extending from the outer ends of the two strut-like parts to constitute the third side (herein referred to as the base) of the triangle. In such constructions the triangular element is formed and arranged so as to be secured at the apex of the triangle to one of the two parts to be connected by the resilient support while the base of the triangular element is arranged to be connected to the other of such two parts at a point intermediate in its length, conveniently at, or over an area adjacent to, the centre of its length. For convenience herein, such resilient supports will be referred to as triangular resilient supports.

In the forms of such triangular resilient support particularly described and illustrated in the complete specification of the above application, the lower surface of the inwardly extending part or parts constituting the base of the triangle lies in a plane at right angles to the plane in which the longitudinal centre lines of the two-strut-like parts lie while the inner ends of the two strut-like parts are joined by a part, the upper surface of which also lies approximately in a plane parallel to the plane in which lies the lower surface of the base.

In a triangular resilient support according to the present invention, the plane in which the longitudinal centre lines of the two strut-like parts lie is inclined to the plane in which lies the lower surface of the base of the triangular resilient element. Moreover, where the inner ends of the two strut-like parts are connected by a part having an upper surface as above referred to, this upper surface also preferably but not necessarily lies approximately in a plane parallel to the plane in which the lower surface of the base lies.

The resilient element of a resilient support according to the invention may be moulded as a unit or according to a further feature of the invention, may be formed by moulding a tubular element of the appropriate generaly triangular cross-section and cutting it into sections in planes inclined appropriately to the plane in which the underside of the "base" of the triangular cross-section lies.

In any event, clamping members similar to the clamping members **7** and **14** in the construction shown in FIGURES 1, 2 and 3 of the drawings of the complete specification of U.S. Pat. No. 3,109,639 may be employed in conjunction with resilient elements according to the present invention. Further, with the present invention, there may be provided on or secured to the member in engagement with which the lower surface of the base of the resilient element lies, a rib extending along the side of the base adjacent to the obtuse angle formed between the plane in which the under-surface of the base lies and the inclined plane in which the longitudinal

centre lines of the strut-like parts lie for the purpose of preventing movement of the base relatively to the surface on which it bears, due to compression in the strut-like parts during use.

In some cases where desirable, the resilient elements of resilient supports according to the invention may have incorporated in them or applied to them layers of fabric, plastic or other relatively inextensible material, such layers being provided for example in or adjacent to the outer surfaces of the resilient element to limit stretch of the parts of the element or for other purposes.

Two constructions according to the invention and one way of using such constructions are illustrated by way of example in the accompanying drawings, in which:

FIGURE 1 is a side elevation of one construction of resilient support according to the invention;

FIGURE 2 is an end elevation of the support shown in FIGURE 1;

FIGURE 3 is a similar view to FIGURE 1 showing the support connected respectively to a supporting member and a part to be supported;

FIGURE 4 is a similar view to FIGURE 2, showing the support connected to two members as in FIGURE 3;

FIGURE 5 is a similar view to FIGURE 3 showing a modified construction according to the invention;

FIGURE 6 is an end elevation of the construction shown in FIGURE 5, and

FIGURE 7 is a diagrammatic view showing one arrangement of supports according to the invention showing how a load may be supported by such supports according to the invention.

In the construction of support shown in FIGURES 1, 2, 3 and 4, the support itself comprises a resilient element in the form of a unitary body of rubber of generally triangular shape consisting of two substantially straight strut-like parts **1** and **2** forming two sides of the triangle and joined at the apex by a part **3**, and two inwardly extending parts **4** and **5** which lie in the same mean plane as one another, are integral with one another and together form the base of the triangle. There is associated with the part **3** a clamping member **6** by which this part, as shown in FIGURES 3 and 4, can be clamped by means of bolts **7** to a part **8** to be supported, while there is associated with the parts **4** and **5** a clamping member **9** similar to the clamping member **8** by which the centre part of the base of the triangle constituted by the parts **4** and **5** can be clamped, as also shown in FIGURES 3 and 4, by means of bolts **10** to a supporting part shown at **11** against the upper surface of which the lower surfaces of the parts **4** and **5** normally bear as shown.

As will be apparent from FIGURES 2 and 4, the longitudinal centre lines **2A** of the parts **1** and **2** when viewed in end elevation are inclined at an angle in the same direction to the lower faces of the parts **4** and **5**, the upper face of the parts **4** and **5** and the lower face of the part **3** being parallel to one another. Thus in end elevation each of the strut-like parts **1** and **2** appears as a non-rectangular parallelogram.

In some cases the resilient rubber element **1, 2, 3, 4, 5**, may have embedded in its outer surface fabric or other flexible substantially inextensible material as indicated at **12**, for the purpose of increasing the load capacity of the resilient support for given dimensions, and/or to enable the dimensions for carrying a given load to be reduced and/or otherwise to modify the characteristics of the support.

In the modification shown in FIGURES 5 and 6 the form of the resilient element **1, 2, 3, 4, 5** is the same as in the construction shown in FIGURES 1 to 4, and corresponding parts have therefore been given the same reference numerals. In the construction shown in FIG-

URES 5 and 6, however, instead of the simple clamping member shown at **9** in FIGURES 1, 2, 3 and 4, a clamping member as shown at **13** is provided which is of the same general form as the clamping member **9** except that it carries a rib or bar as indicated at **14**, which extends along one side of the base **4**, **5** of the triangular resilient element so as to constitute a longitudinal abutment resisting sliding of the parts **4**, **5** laterally, to the left in FIGURE 6, across the surface of the supporting member **11** under the action of compressive loads in the strut-like parts **1** and **2**.

FIGURE 7 indicates diagrammatically how a load, shown generally at **15**, may be supported in a packing case or other container, indicated at **16**, by a number of resilient supports according to the invention, the reference numeral **17** representing two supporting plates rigidly secured to the load **15** for engagement by the resilient supports according to the invention, which in this figure have been given for convenience the reference numerals **1** and **2** since the parts of the two supports which appear would be equivalent to the parts **1** and **2** of the support shown in FIGURES 1 and 2.

In a typical case two or more of supports **1** or **2** would be disclosed along each side of the load **15** at longitudinally spaced points and it will be apparent that when the load is supported by a manner of supports arranged in this way, the strut-like parts **1** and **2** of the supports will be in compression and support the load in the appropriate position substantially accurately during static conditions. Moreover, as regards small vibrational downward forces in the vertical direction, the strut-like parts **1** and **2** will strongly resist relative movement between the case **16** and the load **15**, but in the case of a shock load in the downward vertical direction, if it be sufficient to bend the strut-like parts, the force required to bend them further, once they have started to bend, progressively diminishes with increasing bending so that they provide a high resistance to movement of the load within the casing under static conditions and for smaller vibratory loads while providing a relatively "soft" support of shock loads above some predetermined violence are encountered. It will also be seen that the resilient supports provide readily determined degrees of resilience respectively in the longitudinal direction, i.e. the direction parallel to the "bases" of the triangular resilient elements and in the upward vertical direction which put the strut-like parts in tension, as in triangular resilient supports as hitherto proposed, while as regards lateral forces tending to move the load **15** sideways in the arrangement shown in FIGURE 7, it will be apparent that the particular construction of the resilient members in supports according to the invention provides a degree of "triangulation." That is to say the fact that the parts **1** and **2** slope inwards towards the load **15** enables the strut-like parts of the supports to act to some degree as compression struts resisting such lateral movement as well as acting as struts resisting downward vertical movement.

What I claim as my invention and desire to secure by Letters Patent is:

1. A resilient support including a resilient supporting element formed of rubber or other flexible resilient material and comprising two straight strut-like parts extending at a angle to one another and joined at their inner ends, inwardly extending parts formed integral with the strut-like parts and extending inwards towards one another from the outer ends of the strut-like parts with their outer faces lying in a common plane, whereby the resilient element is of generally triangular form with the strut-like parts constituting the sides of the triangle and the inwardly extending parts constituting the base of the triangle, and the junction of the strut-like parts, the apex of the triangle, and first and second connecting means for connection of the said resilient element respectively to the two members it is to connect at positions on said resilient element located respectively at the apex of the triangle and in an area of the inwardly extending parts displaced from the outer ends, the longitudinal centre lines of the two strut-like parts lying in a plane which is inclined to the said common plane in which the outer surfaces of the said inwardly extending parts lie.

2. A resilient support as claimed in claim **1**, in which the outer surface of the junction between the inner ends of the two strut-like parts lies in a plane approximately parallel to said common plane in which the outer faces of the inwardly extending parts lie.

3. A resilient support as claimed in claim **2**, in which the inner ends of the inwardly extending parts of the resilient element are united to one another.

4. A resilient support as claimed in claim **3** in which said connecting means include a longitudinal abutment extending along that side of the base of the resilient element which is more remote from the junction of the inwardly extending parts.

5. A resilient support as claimed in claim **1** in which said connecting means include a longitudinal abutment extending along that side of the base of the resilient element which is more remote from the junction of the inwardly extending parts.

6. A resilient support as claimed in claim **1** including at least one layer of flexible relatively inextensible material incorporated in said resilient element and extending longitudinally of the said strut-like parts.

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