Dec. 13, 1966 H. MEIER ETAL 3,291,952

SEALED CONTACT SET

Filed July 23, 1965

Fig. 1

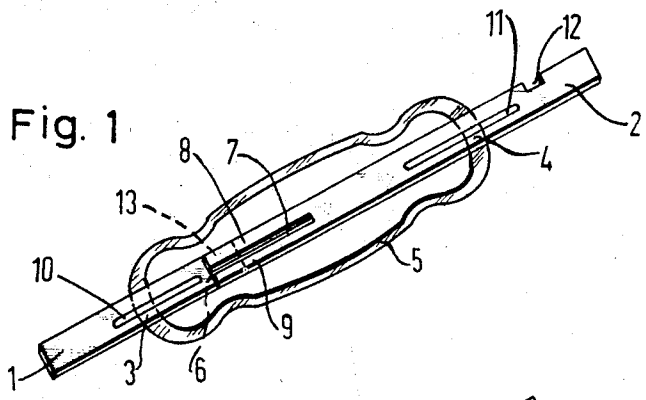

Fig. 2

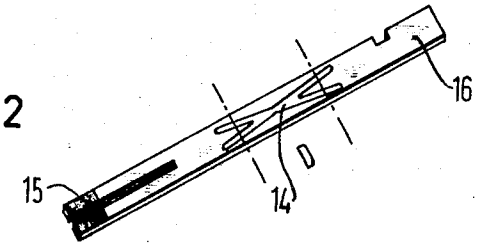

Fig. 3

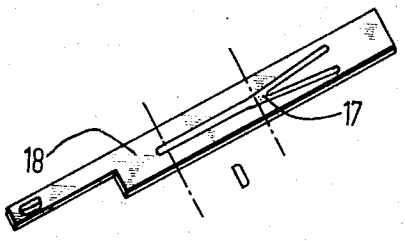

Fig. 4

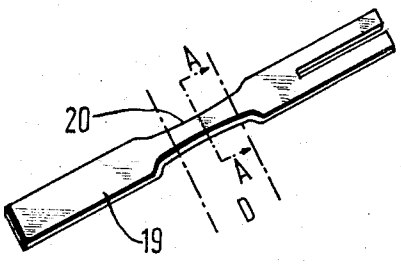

Fig. 5

United States Patent Office 3,291,952
Patented Dec. 13, 1966

3,291,952

SEALED CONTACT SET

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Filed July 23, 1965, Ser. No. 474,326
Claims priority, application Germany, Aug. 11, 1964, S 92,579
9 Claims. (Cl. 200—166)

This invention relates to sealed contact sets, and more particularly to an improvement in the type of switch contacts designed to be employed with magnetic relays and utilizing a set of reed-like contacts mounted in a protective tube.

The spring contacts of sealed contact sets at the present time are fabricated of round pieces of wire which are provided with tabs at their terminal ends, by a flattening operation. These tabs serve both as connection points and as contact points, opposite ends of each piece of wire being used for the two different purposes. In contrast to the usage of round wire pieces with flattened ends, the use of sealed contact sets having flat sheet metal strips which form the contact members, has also been suggested. Spring contacts of this kind have the distinct advantage that fabrication is considerably simplified, since only simple punching out of the spring contacts or reeds from sheet metal material is necessary. Moreover, with this design, it of course is not necessary to flatten out portions of the reed, and further a plating of a special material for contact purposes can be readily made at the points of contact. Finally, the flat material can be milled to exactly the correct dimensions, very readily, so that the operating characteristics of the contact sets may be maintained identical with various sets.

This invention concerns a sealed contact set having spring contacts fabricated of flat sheet metal strips, and has for its objective the design of a component which is mechanically robust and which has very narrow tolerances in operating values, even throughout large numbers of contact sets. This objective is achieved in accordance with the invention by providing the spring contacts with ribs or ridges shaped out of the sheet metal strips themselves, which ribs extend essentially perpendicularly to the plane of the flat reed contact and generally longitudinally of the reeds in the areas of the reeds adjacent the glass-to-metal seal between the protective enclosure and the reed. These ribs extend on at least one side of the contact reeds longitudinally of the reed past the reed sealing area into the enclosure itself, to a known extent such that the desired spring characteristics may readily be achieved in each instance.

With prior sealed spring contact sets, the precise position of the sealing areas in which the glass casing engaged the contact reeds could not be held precisely at the proper position, and with the proper form, from one set to another, during manufacture of contact sets, particularly when glass fusing was involved in making the seal. As a result, the desired spring length could not be maintained constant, with obvious results in changing sensitivity of the contact sets. In contrast, with the rib provided by the present invention, the length of the spring portion of each contact member can be readily controlled with extreme accuracy, even though the seal is not itself so readily controlled. As a consequence, the operating characteristics of the contact set may readily be repeated from set to set, with very little tolerance.

Another advantage of the present invention is that the characteristics of the contact set may readily be varied without variation in the type of spring contacts employed. That is, if one spring contact set is to be of different operating characteristics from another, they may both

nevertheless be made with the same reed contacts, with the only difference therebetween being in the length and characteristic of the rib formed in the contact during the manufacturing process. The significance of this advantage is that the same manufacturing tools and machines can be employed, with the exception of the mechanism forming the ribs, so that the cost and complexity of the manufacturing process can be materially decreased.

Moreover, the pressed rib provided for by the invention enables close control over the operating time characteristics of the contact set, with that characteristic being changeable within rather wide limits, since the operating time is directly determined by the length of the portion of the rib which extends into the interior of the protective tube or enclosure. It will be appreciated that the time of operation of the contact set is of extreme importance when the set is to be employed, for instance, in a coordinate field or cross-point matrix, for telephone installations, since in such case the seizure possibility in dependence upon the time of operation, plays a major role in the performance of the system.

The ribs provided on the contact reeds protect the seal region against mechanical damage which can result through vibration of the contact reeds upon actuation thereof, but more particularly by reason of exposure of the outer portions of the spring contacts to mechanical loads during formation of electrical connections thereto. This imposition of mechanical loads occurs primarily during the soldering operation in which bending of the connection areas of the reeds is very difficult to avoid. The resulting stresses are intercepted by the ribs on the reeds if the ribs extend outwardly beyond the seal zone, as well as inwardly within the protective enclosure or tube. In such case, the mechanical stresses on the ends of the spring contacts lying outside of the enclosure do not affect the enclosure at all.

In a preferred embodiment of the invention, the rib on each spring contact or reed is formed as a stiffening corrugation or bead which is stamped out from the center part of the spring contact and extends parallel to the longitudinal axis thereof. In such case the rib has no sharp transition regions, so that a gas tight placement of the reed in the seal zone is more readily achieved, and in particular a more perfect flowage of the seal material, such as a pressure fused glass seal, is achieved.

The stiffening corrugation or bead may be formed of X or Y-shape in such fashion that the terminal portions of the forked end of the corrugation extend inwardly of the tube enclosure. This fork shape of the rib is of special advantage in conjunction with reed contact members which are provided with center slots extending longitudinally of the reeds, in order that the reeds may function essentially as double contact members. In such case the inside width between the distal ends of the fork portion of the rib is greater than the width of the slot itself, and thereby it is made certain that the two individual spring contacts have a certain torsion capability in the area of the slot, and a freedom of movement independent of each other, but nevertheless that the reed contact members move synchronously upon imposition of a positive actuating stroke.

Another embodiment of the invention employs a formation of the rib such that the sides of the sheet metal strip or reed are bent upwardly to change the flat profile of the reed into an essentially U-shaped profile. This configuration may be of particular advantage for connections to be made outside of the shield enclosure, inasmuch as the U-shaped, or a circular-shaped part, is well suited for reception of soldering material and connecting wire.

It has been indicated above that the actuating speed of the spring contacts can be controlled by change in the length of the ribs, inwardly of the seal between the en-

closure and the reed contact. Indeed, the portions of the rib which extend into the internal part of the enclosure can extend so far into the interior thereof, that the contact member remains essentially motionless during contact actuation. In such a construction of the rib, in accordance with the length of the spring contact, the duration of vibration of the spring contacts upon actuation thereof may be controlled, and thus the time of mechanical motion of the contacts can be determined beforehand in simple manner.

Finally, it is possible to provide for ready identification of contact sets of different characteristics, by provision of a notch, slot or the like in one or more of the contact members, in the portions thereof extending outside of the enclosure.

The invention will now be more fully described in conjunction with preferred embodiments thereof shown in the accompanying drawings.

In the drawings,

FIG. 1 is a perspective simplified view of one form of reed sealed contact set constructed in accordance with the invention;

FIG. 2 is a perspective view of one of the reed contacts, in a different embodiment of the invention;

FIG. 3 is a perspective view of a reed contact forming a further modified embodiment of the invention;

FIG. 4 is a perspective view of a final modified embodiment of one of the reed contacts of the invention; and,

FIG. 5 is a sectional view taken along line A—A of FIG. 4.

In the embodiment of FIG. 1, two spring contact members, or reeds, of ferromagnetic material are designated **1** and **2** and extend from outside inwardly of a tube enclosure, usually of glass, designated **5**. The areas of contact between the reeds and the ends of the enclosure **5**, or the glass-to-metal seals are respectively shown at **3** and **4**. As indicated, the spring contact members are of different lengths and overlap inside of the tube enclosure, with an air passage **6** therebetween.

The longer contact member **2** is provided with a slot **7** which extends inwardly from the contact end thereof, to form a pair of contact tongues **8** and **9**, so that a double contact member is formed thereby. Each of the two spring contacts **2** and **3** has a corrugation-like projection or rib **10** and **11**, respectively, pressed out from the reed proper, and extending through the seal between the reed and the glass enclosure. It is evident that the effective spring length of the two spring contacts is determined only by the spacing between the end of the contact member within the tube, and the adjacent end of the rib or corrugation. Indeed, it is evident that the length and configuration of the fusion point at which the seal between the enclosure and the spring contact is made, has no effect on the effective spring length of the contact member.

The spring contact **2** is provided with a marking means by striking out a portion of the edge thereof to form a slot **12**. This identification facilitates correct placement of the contact springs, and simplifies automation of manufacturing steps.

Each of the contact springs is plated with a special contact material **13** in the area of desired contact therebetween, to provide for very low resistance engagement between the two contact members.

FIGS. 2–4 show three different embodiments of the ribs or ridges on the contact members. For example, FIG. 2 shows an X-shaped rib **14** on a spring contact **16** also provided with a plated layer **15**.

FIG. 3 shows the use of a Y-shaped rib **17** on a contact member **18**, with the contact member having a perforation for the reception of a connection wire, which is not shown.

Finally, FIGS. 4 and 5 show a ribbing configuration in which the initially flat contact member is bent out into an approximately U-shaped cross section in the area designated D in FIG. 4, as well as in FIGS. 2 and 3.

It will be evident that many minor changes could be made in the embodiment shown herein as illustrative of the invention. Consequently, the invention is not to be considered limited to the embodiment particularly illustrated, but rather only by the scope of the appended claims.

We claim:

1. In a sealed electrical contact set having a pair of flat contact members each with a substantial portion of its length extending within a protective enclosure, the other portions of the contact members extending outwardly of the enclosure, with a junction between each contact member and the enclosure and with the contact members having opposed contacting portions in the enclosure, the improvement comprising:

a stiffening rib on each contact member extending through its junction into the enclosure, each said rib being operative to prevent substantial flexure of the portion of its contact member in which it extends, so that the flexure characteristics of the contact members are determined by the distance between the ribs and the ends of the members, rather than by the characteristics of said junctions.

2. The apparatus of claim **1** in which each said rib is formed by a pressed-out portion of the contact member itself, which extends substantially perpendicularly to the plane of flatness thereof, with the rib extending longitudinally of the contact member.

3. The apparatus of claim **2** in which each rib extends outward of the enclosure by a substantial distance, so that mechanical stresses on the ends of the contact members outside of the enclosures do not affect the enclosures.

4. The apparatus of claim **3** in which the rib is of X-shape.

5. The apparatus of claim **3** in which the rib is of Y-shape, with the forked ends of the rib directed internally of the tube enclosure.

6. The apparatus of claim **3** in which at least the contact end portion of one of the contact members has a longitudinal slot therein dividing the contact member into two segments so that the contact member operates as a double contact spring, with the rib of forked shape in one of X and Y configuration, with the distance between the distal ends of the fork portion of the rib being greater than the width of the slot.

7. The apparatus of claim **3** in which the rib is formed by the bent-out side edges of the contact member, in one portion thereof.

8. The apparatus of claim **3** in which the ridge is a stiffening corrugation which inhibits flexure of the member and which extends inwardly of the enclosure to an extent such that the contact member remains essentially motionless upon contact actuation.

9. The apparatus of claim **3** in which one of the contact members is provided with an identifying notch external of the enclosure.

No references cited.

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