March 9, 1971 R. E. NEUBER 3,568,310

HERMAPHRODITIC MULTI-CONTACT REED SWITCH

Original Filed March 14, 1968 2 Sheets-Sheet 1

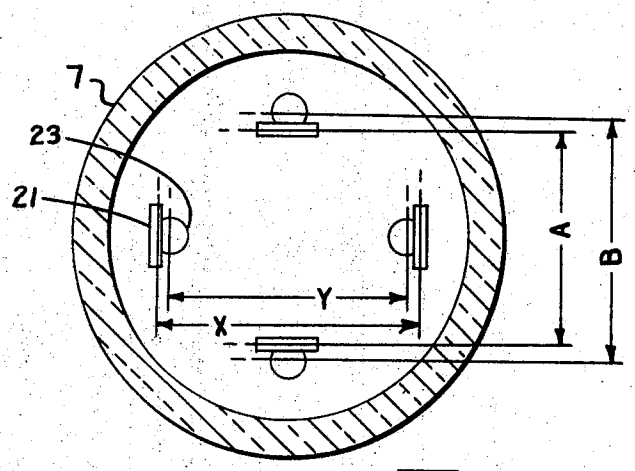


Fig. 2

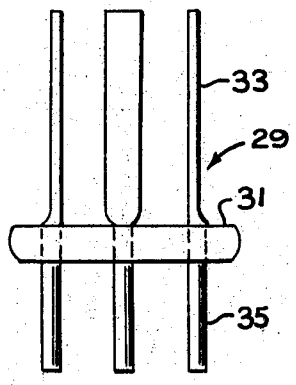


Fig. 3

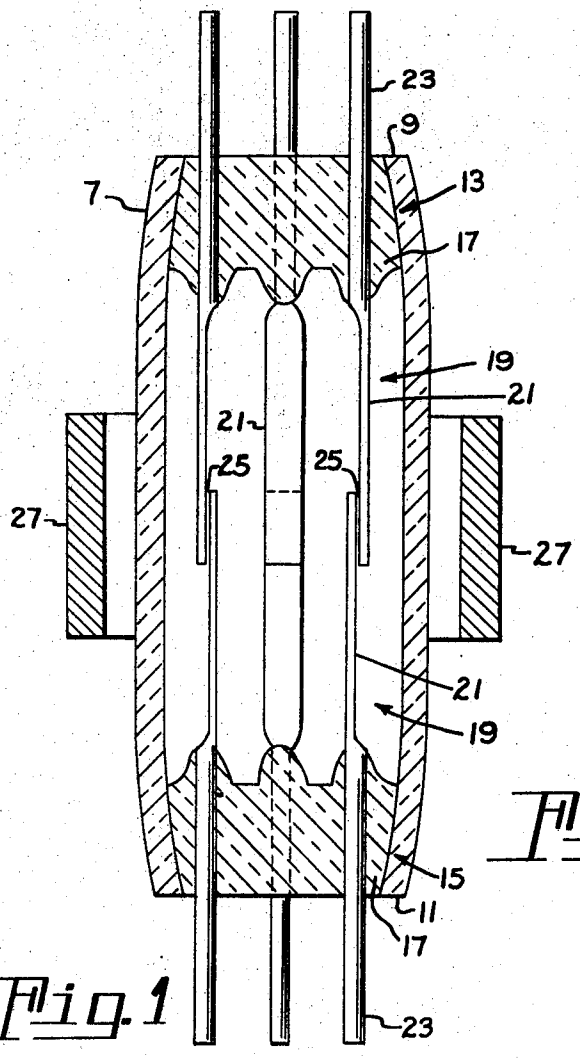


Fig. 1

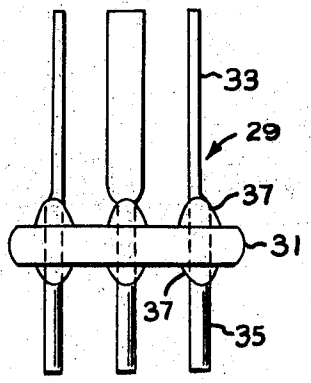


Fig. 4

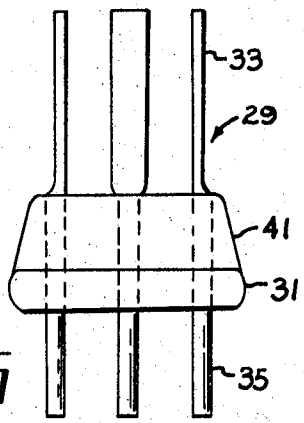


Fig. 5

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HERMAPHRODITIC MULTI-CONTACT REED SWITCH

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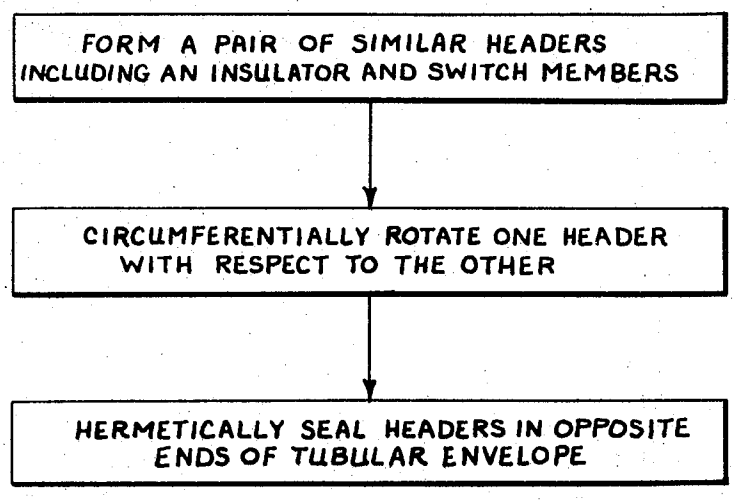


Fig. 6

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HERMAPHRODITIC MULTI-CONTACT REED SWITCH

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Original application Mar. 14, 1968, Ser. No. 713,216, now Patent No. 3,471,813, dated Oct. 7, 1969. Divided and this application Apr. 17, 1969, Ser. No. 816,990
Int. Cl. H01h 11/00
U.S. Cl. 29—622 2 Claims

ABSTRACT OF THE DISCLOSURE

A hermaphroditic multi-contact reed switch includes a tubular envelope having a pair of substantially identical headers sealed into the opposite ends and contains an inert atmosphere. Each of the headers includes a plurality of switch members having a magnetizable portion extending interiorly of the envelope and in longitudinally overlapping relationship with the magnetizable portion of the switch members of the opposite header. The longitudinal overlapping magnetizable portions of the matching switch members of the opposing headers have a desired gap therebetween which is dependent upon the circumferential displacement of one header with respect to the other.

CROSS-REFERENCE TO RELATED APPLICATION

This application is a division of S.N. 713,216, filed Mar. 14, 1968, now U.S. Pat. 3,471,813 which issued Oct. 7, 1969, and assigned to the assignee of the present invention.

BACKGROUND OF THE INVENTION

The prior art suggests numerous so-called "reed switches" wherein a pair of magnetizable contact members are disposed in overlapping spaced relationship within an envelope and activated by application of controllable magnetic field. Also, the prior art suggests numerous similar devices wherein a number of such contacting members are included within the same envelope.

Although many of the above-mentioned devices have provided excellent service in numerous applications, it has been found that there are certain applications wherein the known structure leaves something to be desired. More specifically, it has been found that known reed switch structures usually include switch members sealed into the ends of the envelope which tends to provide a non-uniform seal and a non-uniform spacing intermediate the magnetizable switch members. Also, such sealing techniques wherein glass-to-metal seals, for example, are employed require delicate controls to prevent oxidation of the metal switch members. Moreover, all of the switch members of the known multiple-contact devices are not concentric with respect to the envelope and to the energizing means surrounding the envelope which tends to cause a non-uniform magnetic field intensity insofar as a multiple-contact device is concerned.

OBJECTS AND SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide an improved hermaphroditic multi-contact reed switch. Another object of the invention is to provide an improved process for fabricating hermaphroditic multi-contact reed switches. Still another object of the invention is to enhance the uniformity of operation of a hermaphroditic multi-contact reed switch. A further object of the invention is to improve the hermetic sealing and reference level of the contacts within a hermaphroditic multi-contact reed switch. A still further object of the invention is to provide an enhanced supporting structure for the contacts of a hermaphroditic multi-contact reed switch.

These and other objects and advantages are achieved in one aspect of the invention by a hermaphroditic multi-contact reed switch having a pair of substantially identical headers each including an insulator support and a plurality of switch members embedded therein and extending therethrough. The headers are circumferentially displaced with respect to one another and sealed into opposite ends of a tubular envelope to provide a spaced longitudinal overlapping of the switch members which are activated by a magnetic field developing means surrounding the envelope.

The hermaphroditic multi-contact reed switch is constructed by a process which includes fabricating a pair of substantially identical headers, circumferentially rotating the headers with respect to one another, and hermetically sealing the headers into opposite ends of a tubular envelope.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a preferred embodiment of a hermaphroditic multi-contact reed switch;

FIG. 2 is a plan view of the embodiment of FIG. 1, and

FIGS. 3, 4 and 5 are embodiments of "headers" suitable for the embodiment of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For a better understanding of the present invention, together with other and further objects, advantages and capabilities thereof, reference is made to the following disclosure and accompanying drawings.

Referring to the drawings, FIG. 1 illustrates a hermaphroditic four-contact reed switch. The switch includes a tubular envelope **7** of a material such as glass and has a pair of opposite ends **9** and **11**. A pair of substantially similar headers, **13** and **15** are hermetically sealed into the opposite ends **9** and **11** of the envelope **7**.

The headers **13** and **15** each include an insulator support **17** such as glass, wherein a plurality of switch members **19** are embedded. The switch members **19** each include a magnetizable portion **21** which is flexible and of a material such as iron or a nickel-iron alloy and extends interiorly of the envelope **7**. Also, each of the switch members **19** includes a connector portion **23** extending exteriorly of the envelope **7** to provide an electrical connecting means.

Further, the longitudinal axis of each of the magnetizable portions **21** is displaced from the longitudinal axis of the connector portions **23** in a direction substantially normal to these longitudinal axes. Also, the displacement of each of the magnetizable portions **21** from the longitudinal axis of the connector portion **23** is substantially one-half the total desired gap **25** or distance intermediate a pair of magnetizable portions **21**.

In this particular embodiment, the four switch members **19** are spaced in quadrature as illustrated in the plan view of FIG. 2. These quadrature spaced switch members **19** form two diametrically opposing pairs with the magnetizable portions **21** of one pair formed such that the diametric distance X between the longitudinal axes thereof is greater than the diametric distance Y between the longitudinal axes of the connector portions **23**. The other pair is formed in an opposite fashion in that the diametric distance A between the longitudinal axes of the magnetizable portions **21** is less than the diametric distance B between the longitudinal axes of the connnector portions **23**.

As mentioned above, the headers **13** and **15** are hermetically sealed to opposite ends **9** and **11** of the envelope **7**, and provide a longitudinal overlapping of the magnetizable portion **21** of the switch members **19** extending interiorly of the envelope **7** from each of the headers **13**

and 15. Also, the headers 13 and 15 are in circumferentially displaced relationship with respect to one another to provide a desired gap 25 or distance intermediate each pair of longitudinally overlapping magnetizable portions 21. In this particular instance, the circumferential relationship is a quadrature relationship although it is obvious that other switch member forms and circumferential relationships are applicable and appropriate.

The pairs of magnetizable portions 21 forming each one of the gaps 25 are equi-distantly spaced from the circumference of the tubular envelope 7 and a magnetic field developing means 27 such as an electromagnet for instance, surrounds the tubular envelope 7. Thus, each pair of magnetizable portions 21 of the switch members 19 is equi-distantly spaced from the magnetic field developing means 27 and subjected to substantially the same magnetic field intensity.

Referring back to the headers 13 and 15, FIGS. 3, 4, and 5 illustrate several suitable embodiments. In FIG. 3 a plurality of switch members 29 are embedded in and pass through an insulator 31 such as glass. Each of the switch members 29 has a magnetizable portion 33 and a connector portion 35 which extend outwardly in opposite directions from the insulator 31. Also, the magnetizable portion 33, which is both magnetic and flexible, is formed such that the insulator 31 serves as a rigid and uniform base whereon the cantilevered magnetizable portion 33 bends.

FIG. 4 is a structure somewhat similar to FIG. 2. Herein, each of the switch members 29 has beads 37 of the same material as the insulator 31 bonded to the insulator 31 and surrounding, supporting and sealed to both the magnetizable and connector portions 33 and 35 respectively. Also, a tubular exhaust stem 39 is affixed to the insulator 31 in a manner well known in the art to provide a means for replacing the atmosphere of the device with desired inert atmosphere.

Also, FIG. 5 illustrates a plurality of switch members 29 sealed into and passing through an insulator 31 and a button 41 bonded thereto. In this instance, the button 41 not only enhances the rigidity and sealing of the switch members 29 but also serves to protect the seal intermediate the switch members 29 and insulator 31 from thermal shock upon application of heat, soldering for instance, to the switch members 29.

As to the construction of a hermaphroditic multi-contact reed switch, reference is made to the flow chart of FIG. 6. Therein, a plurality of similar headers are fabricated by sealing a plurality of switch members including magnetizable and connector portions into an insulator. Obviously, the switch members are preferably of the preformed variety but may be formed after embedment in the insulator. Also, the formed switch members are readily adapted to both spacing adjustment and cleaning after having been sealed into the insulator.

Then a pair of the headers are circumferentially rotated with respect to one another to provide a desired gap intermediate associated pairs of magnetizable portions. This pair of headers is hermetically sealed to opposite ends of a tubular envelope which, in the preferred embodiment, involves a glass-to-glass sealing technique and a relatively small distortion of the envelope to provide contact thereof with the headers. Moreover, the atmosphere within the envelope may then be replaced by a dry inert atmosphere utilizing an exhaust tube in a manner well-known in the art.

Thus, there has been provided a unique hermaphroditic

multi-contact reed switch having numerous advantages over other known reed switches. The multi-contact switch is volumetrically efficient as compared with single-contact devices providing a consequent reduction in cost per contact. Also, the "header-type" construction lends itself to the formation of a rigid and uniform support whereon the flexible magnetizable portion of the switch members is dependent. Further, the "header-type" construction provides individual sealing of the switch members to the headers and hermetic sealing of the headers to the envelope which not only permits cleaning and adjustment of the switch members but also a relatively small distortion of the envelope wherein the headers are hermetically sealed.

Additionally, the "header-type" construction facilitates circumferential displacement of the headers with respect to one another prior to sealing and enhances compensation for distortion of the switch members due to handling and transfer during fabrication.

Moreover, the hermaphroditic form of the "header-type" construction is economical of apparatus, time, and inventory of parts.

While there has been shown and described what is at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention as defined by the appended claims.

I claim:

1. A hermaphroditic multi-contact reed switch fabricating process comprising the steps of:

forming a pair of substantially similar headers, each header having an insulator with four switch members identically arranged thereabout and embedded therein and extending therethrough, said switch members being spaced in quadrature relationship forming two diametrically opposing pairs, one of said pairs having a larger diametrical spacing than the other;

aligning and overlapping opposing pairs of switch members having different diametrical spacings by juxtaposing the headers with respect to each other; and

hermetically sealing said pair of headers in opposite ends of a tubular envelope to provide a longitudinal overlapping of the switch members of said pair of headers, whereby said overlapping switch members have gaps therebetween and said gaps are disposed a uniform radial distance from said envelope circumference.

2. The fabricating process of claim 1 including the step of replacing the atmosphere or said envelope with a dry and inert atmosphere.

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U.S. Cl. X.R.

29—25.16, 630; 65—59