June 8, 1965 G. WESSEL 3,188,426

MAKE BEFORE BREAK MAGNETICALLY-OPERATED REED-TYPE CONTACT

Filed Nov. 2, 1962 2 Sheets-Sheet 1

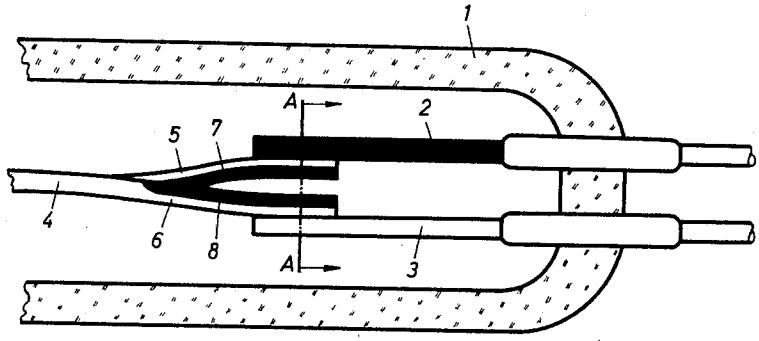

Fig.1

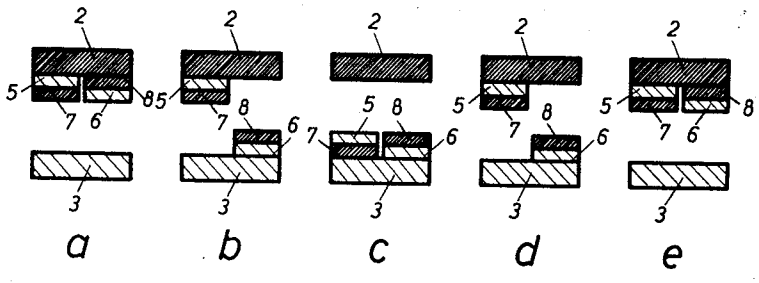

Fig.2

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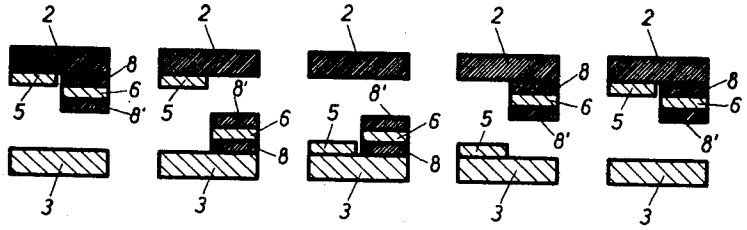

Fig.3

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1 Claim. (Cl. 200—87)

The invention relates to magnetically operated reed-type switchover contacts in which the resting position of the contact remains closed until after contact is made in the operated position.

Reed switchover contacts with such a transition are known per se. These known contacts are based on the conventional principle in which a magnetizable switch-over contact spring is arranged between a non-magnetizable break-contact piece and a magnetizable make-contact piece. Normally the switch-over contact spring rests on the break-contact piece. When such a contact is placed in a magnetic field, attraction powers occur between the magnetizable switch-over spring contact and the magnetizable make-contact piece. This causes a closing of the contact surface between the switch-over contact spring and the make-contact piece.

Transition in the known reed-type, switch-over contact is obtained because an elastic piece is provided at the make-contact piece which is attracted to the switch-over contact spring when excited by a magnetic field. The resetting force of the end-piece is less than the contact-making force of the switch-over contact spring with which the latter rests on the break-contact when in the unoperated position.

The switch-over contact spring has, at its movable end, a bridge representing the only part of the switch-over contact spring which is magnetizable. In parallel with the switch-over contact spring is a particularly rigid magnetic flux guide which comes close to the part designated as a bridge. After closure of the contact between the switch-over contact spring and the end of the make-contact piece, a magnetic flux occurs between the bridge and the magnetic flux guide for attracting the bridge while the end of the make-contact clings to the bridge. The contact is interrupted at the break-contact only after the making of the make-contact.

This arrangement described above is a construction completely different from the conventional reed contacts construction. Particularly reed switch-over contacts, of conventional design, require a special production technique due to their plurality of parts. For example, a known magnet-operated reed-type switch-over contact with transition consists of two blades, which in normal position rest on the break-contact. One blade is designed in such a way that it needs less excitation than the other one and which moves only when the reed is nearly fully magnetized. This arrangement, however, has the disadvantage that the pull-up and dropping values result solely from the different lengths of the individual springs separated by a slot. These values are not high enough to manufacture a properly working reed switch-over contact with transition.

An object of the invention is to create a reed switch-over contact with transition which can easily be produced and which operates with distinctly defined pull-up and dropping values. This is achieved by providing the known, slotted switch-over contact blade with both magnetic material and non-magnetic material. In the normal position of the slotted switch-over contact blade, on the break-contact spring of non-magnetic material, one blade half rests with the magnetic part of its contacts on the break

contact spring and the other blade half rests with its non-magnetic part on the break contact spring.

Due to this arrangement, the response and dropping values are exactly defined with a result such that the reed contacts with blades slotted into halves, more responsive to excitation by a magnetic field. One blade half with a smaller magnetic gap first moves towards a make-contact spring consisting of non-magnetic material where it makes an electrical contact. The other blade half with a larger magnetic gap still touches the break-contact. It is lifted from there only when the excitation increases, and then it contacts the make-contact spring. For dropping, exactly the same defined values apply without reversing the switch-over sequence of the individual contact blade halves.

The invention is now described with the aid of a drawing in which:

FIG. 1 shows a part of a reed switch-over contact, enlarged in scale and in operating position,

FIG. 2 (*a* to *e*) shows a section through the contacts of the reed switch according to FIG. 1, representing the different contact positions during operation, enlarged scale, and

FIG. 3 (*a* to *e*) shows a section through the contacts of another switch-over contact in which only one blade half is provided on either side alternately with a precious metal coating, representing the different contact positions during operation, enlarged scale.

In FIG. 1 a glass-sealed part of the reed contact is marked **1**. A break-contact spring **2** of non-magnetic material and a make-contact spring **3** of magnetic material is provided. On the opposite front side of **1** a switch-over contact spring **4** of magnetic material is mounted. The switch-over contact spring is positioned between the inner surfaces of contact springs **2** and **3**, and rests on non-operative condition with its two blade halves **5** and **6** separated by a slot, on the break-contact **2**. Both blade halves **5** and **6** are provided with non-magnetic material along the entire length of the slot, e.g., a contact material such as gold, silver and the like. The precious metal coating is applied in such a way, when the switch-over contact blade **4** is in the resting position on the break-contact spring **2**, one blade half **5** rests with its magnetic part on the break-contact spring **2** and the contact surface with the non-magnetic precious-metal coating **7** points towards the make-contact spring **3**. The other blade half **6** rests with its non-magnetic precious-metal coating **8** on the break-contact spring **2**, and the contact surface of magnetic material points towards the make-contact spring **3**. In FIG. 1 the moment of operation is represented in which one blade half **5** still rests on the break-contact **2** while the other blade half **6** already contacts the make-contact **3**.

FIG. 2 shows the position of the different contacts during their operation. They can be operated either by a variable magnetic field, e.g. a coil, or by a permanent magnet moved towards and away from the reed contact. Position *a* shows the unoperated position of the contacts. In this position the blade half **5** rests with its magnetic part on the break-contact **2** while the non-magnetic, precious-metal coated part **7** points towards the make-contact **3**. The other blade half rests with its precious-metal part **8** on the break-contact **2**, while the magnetic-material part points towards the make-contact **3**. FIG. 2*b* shows how, at reaching a certain magnetic circulation, the blade half **6**, having a smaller gap with respect to the make-contact **3**, is moved towards the make-contact **3**. An electrical connection is made at **6**, **3** while blade half **5** is still resting on the break-contact **2**. When the excitation increases, FIG. 2*c*, blade half **5** follows half **6**, interrupting its connection with the break-contact **2**. If the excitation drops by a

defined value the blade half 5 parts from the make-contact 3, because the precious-metal coating 7 on the blade half 5 acts like a separating strip. This establishes a contact with the break-contact 2 while the blade half 6 still sticks to the make-contact 3 due to the force of the magnetic field. If the excitation drops by another defined value, FIG. 2e, the spring resetting force of the switch-over contact blade 4 or of the blade half 6 exceeds the remaining residual magnetic force between contact blade 6 and the make contact 3, so that the blade half 6 returns to its resting position at the break-contact 2.

FIG. 3 shows another example for a switch-over contact with transition in which only one blade half, e.g. 6 is alternately provided with a precious-metal coating. If the blade halves 5 and 6 are operated as shown in FIG. 3*a* to *c* the blade is attracted as described and shown in FIG. 2*a* to *c*. Since, however, the blade half 5, consisting of magnetic material rests without precious-metal coating on the contact blade 3 the contact sequence is reversed for the dropping as compared with that of the pulling up, because an adhesive force exists between the blade half 5 and the make-contact 3.

The precious-metal coating can for both examples be applied either by plating or by galvanising whereby the parts not to be precious-metal coated are covered with a lacquer or similar material.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claim.

What is claimed is:

A reed type make before break contact assembly, comprising:

first and second spaced apart stationary contacts;

a bifurcated movable contact having first and second blades;

said first and second blades being mounted to move independently between the first and second stationary contacts and being normally biased so that said blades rest in contact with said first stationary contact;

said first blade including a magnetic part for contacting said first stationary contact;

said second blade including a first part made of conductive material to contact said first stationary contact and a second part made of magnetic material substantially coextensive to and in contact with said first part, to contact said second stationary contact;

said magnetic part of said second blade being spaced closer to said second stationary contact than the magnetic part of said first blade;

said relative spacing of the respective magnetic parts of said blades from said second stationary contact determining the order in which said blades will shift from contact with one stationary contact to the other in response to changing magnetic forces.

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