

Aug. 29, 1944.

W. H. FRANK

2,357,183

SWITCH

Filed Oct. 20, 1943.

2 Sheets-Sheet 1

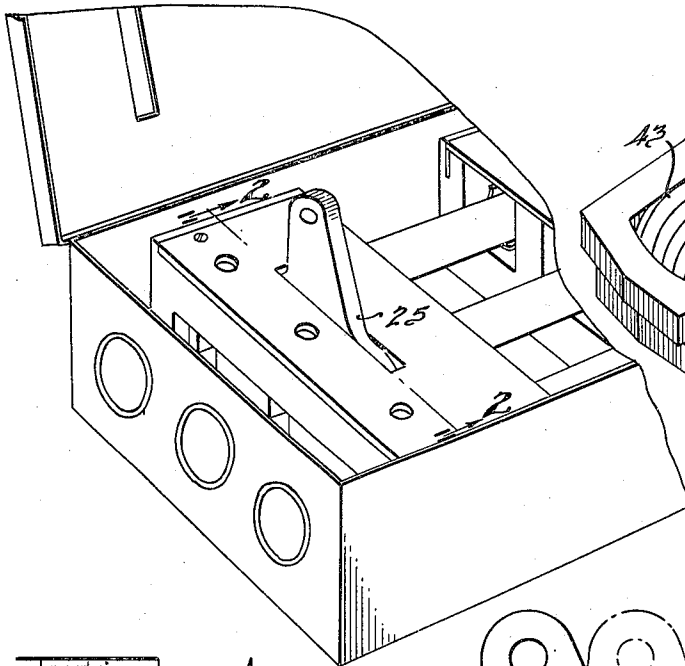


FIG. 1.

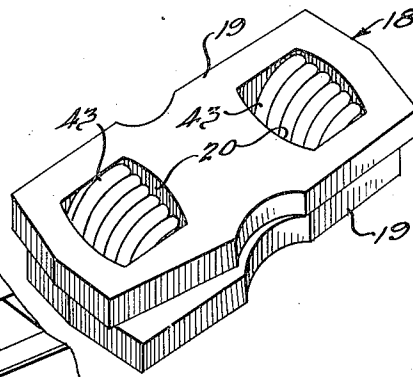


FIG. 2.

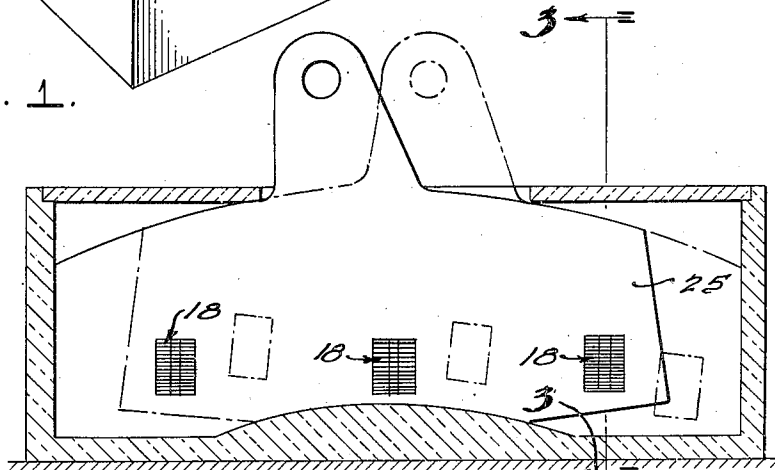


FIG. 3.

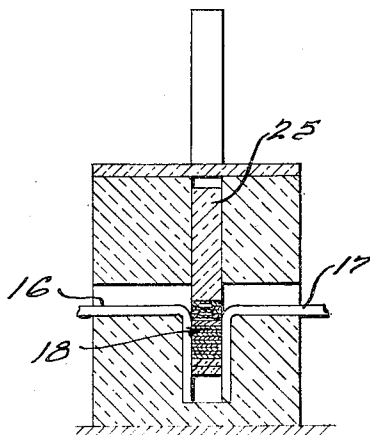


FIG. 4.

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2 Sheets-Sheet 2

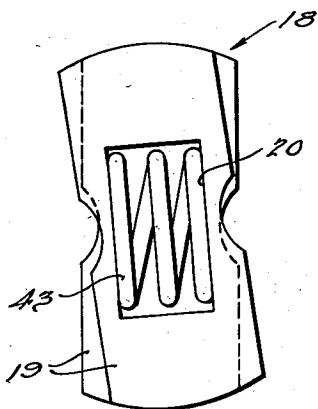


FIG. 4.

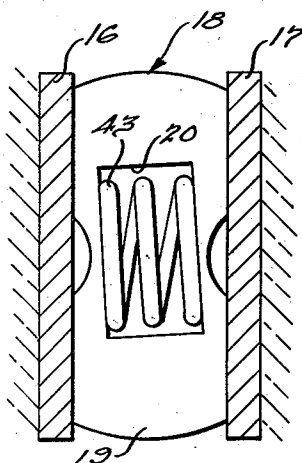


FIG. 5.

FIG. 6.

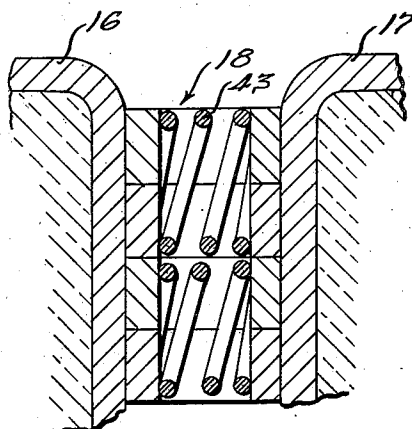
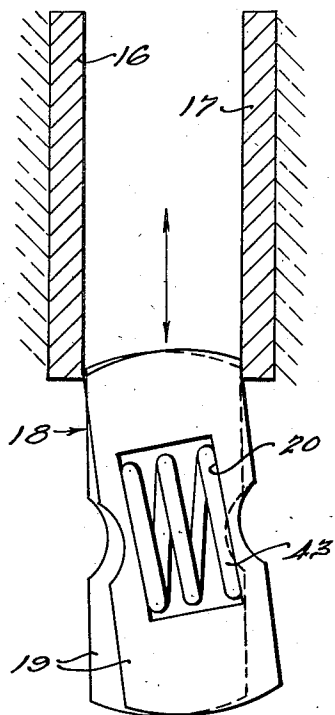


FIG. 7.

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2,357,183

SWITCH

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Application October 20, 1943, Serial No. 506,967

6 Claims. (Cl. 200—164)

This application relates to switches and discloses particularly a novel form of movable contact construction.

In a prior application, Serial No. 466,092 of William H. Frank, filed November 19, 1942, there is disclosed a switch having stationary contacts 16 and 17 between which slides a movable contact carrier plate of insulation 25 having a hole containing a movable contact 18 of U form whose sides are spring pressed outwardly by coil springs 43 to engage the stationary contacts with spring pressure.

This application relates generally to the type of switch disclosed in that application, but specifically aims to provide a novel form of movable contact, generally for the same purpose as the movable contact 18 of the switch of that application but specifically of different and superior form.

In most switches having relatively close stationary contacts bridged by a movable contact, the stationary contacts are relatively thin and flexible and the movable contact is relatively massive and rigid. An object of the invention hereof is to make the movable contact flexible and the stationary contacts rigid, while retaining the movable contact of substantial mass.

In switches of this character, contact engagement, while apparently spread over a surface area, is actually only a number of points. In most switches, the points are not predetermined, but rather the points of contact occur by accident, not always fortuitous, sometimes being at a minimum of only one point for each contact pair. In the switch hereof, the points of contact are predetermined, with at least two points of contact on each stationary contact.

For an understanding of the movable contact construction herein disclosed reference should be had to the appended drawings.

In these drawings,

Fig. 1 shows a switch having a movable contact carrier.

Fig. 2 is a section on line 2—2 of Fig. 1.

Fig. 3 is a section on line 3—3 of Fig. 2.

Fig. 4 shows a contact element.

Figs. 5-6 show the contact action.

Fig. 7 is an enlarged section view.

Fig. 8 shows a modification employing two springs for each pair of plates.

Referring to the drawings, it will be seen that these disclose stationary contacts 16 and 17 between which slides the movable contact carrier insulation plate 25 in holes of which are the movable contacts 18.

The movable contacts disclosed in Figs. 1-7 of the drawings consist basically of one or more units, each unit being a pair of plates 19 of contact material, such as copper. In each pair or unit, the two plates are preferably identical and each has a hole 20, offset or asymmetrically disposed with respect to the plate edges. In assembly, the holes in the two plates are aligned with the plates reversed, so that each two adjacent aligned holes form a seat for a coiled compression spring 43 which is arranged so that its axis is substantially perpendicular to the engaged surfaces or faces of the stationary contacts 16 and 17 and to the edges of the plates 19, which edges engage the faces of the stationary contacts, as the carrier is rocked back and forth, to present the movable contact to the stationary contacts, or withdraw the movable contact from the stationary contacts.

When the movable contact unit is at rest, remote from the stationary contacts, the bias of the spring 43 causes the plates, influenced by the spring, to rotate oppositely, scissors fashion, so that the transverse distance between two diagonally opposite edge portions of each plate, is greater than the width of the space between the stationary contacts. As the movable contact is caused to move into the space between the stationary contact, the plates are rotated, against that spring bias, in a direction to align with one another and so as to decrease the transverse distance from one diagonally opposite edge portion to another. Resistance to such alignment rotation of the plates is offered by the spring 43, and this provides the spring pressure of the movable contact unit.

In each pair or unit, the plates are preferably identical in form and can be manufactured very economically. Two such identical ones may be placed back to back so that if their holes align, their edges do not, and with their holes aligned they may be assembled quickly with respect to and around a coil spring 43, and such spring will hold the two plates of a pair in assembly, to form a unit.

It will be observed that the plates themselves carry the current and the springs are not relied upon for current carrying. The current will pass through the plates from one diagonally opposite edge portion to the other, without necessarily passing through the spring. However, in each pair of plates, the spring serves to potentialize the two plates of the pair electrically, insuring proper division and distribution of the current in these two plates and insuring equal voltage drop

across the plates in the event there is any tendency for inequality of current distribution or voltage drop. If considered desirable, the spring could be insulated from the plates in any suitable manner as by means of insulating bushings but at present there appears to be no necessity or advantage in so insulating the spring.

It will also be observed that when the movable contact is in full circuit closing position the current travels from one stationary contact to the other through a diagonal path through each contact plate. However, at the point of contact separation, that is to say when the movable contact is about to leave the stationary contacts, only one end of each plate engages the stationary contacts, only one end of each plate engages the stationary contacts and necessarily the current must be conducted through both plates of a pair and in some instances through the spring as well and the current must pass across the plane of division between the plates of a pair. It will thus be observed that the movable contact is of considerably less resistance when the contact is in the full circuit closing position than it is at the moment of contact separation, and this condition is desirable in switch action. However, it will be understood that such additional resistance, evidenced by the fact that the current may pass through the spring, and is required to go from one plate to the other in a pair, is not a condition of any long duration but exists only momentarily, i. e., at the moment of contact separation which is instantaneous in switches of this character, provided generally with quick make and quick break springs, and with fast moving contact carriers.

It will also be observed that the contact pressure at the moment of contact separation and contact engagement, is considerably less than that which exists when the contact is in the full circuit closing position. This is desirable in switches since contact pressure, though it should be great when the movable contact is in full closed position, should be as little as possible during the movement of contacts, in order to offer as little resistance as possible to movement of the moving carrier, which facilitates switch operation without in any way minimizing or reducing the contact pressure that exists when the contact is in full circuit closing position.

The foregoing relations may be varied as desired by varying the relative dimensions of the movable contact parts, by varying the location of the pressure springs, and by varying the positions and arrangements of the stationary contacts.

It will be observed that in the illustrations shown in Figs. 1-7 each movable contact is made up of a plurality of units or pairs of plates, with each of the separate pairs or units having a separate and independent pressure spring. The number of pairs or units utilized may be proportioned to the capacity of the switch, less pairs being used for a smaller capacity switch than for a larger one, but since all pairs or units may be identical in size and shape, economy of manufacture is facilitated.

While it has been found that best results are obtained by having two identical reversed plates for each pressure spring, and each unit, it is apparent that variations may be provided; for example, three plates to each pressure spring or unit, or two springs per pair of plates, or two springs and three plates per unit, etc. Inasmuch as one of the functions of the pressure

spring is to maintain itself and the plates which it biases in a sub-assembly or operative unit, it is contemplated to make up each movable contact of a large number of units, and each unit may be of two or more plates with its pressure spring or springs, but in the simplest embodiment two plates and only one spring are used for each unit. Fig. 8 shows a unit having two springs.

While the spring means shown is of the coiled compression spring type, other types of springs or resilient means may as readily be used; resilient material, rather than springs, might also be used to provide the pressure of the springs here shown.

It may also be found desirable to provide insulating separators between the various units of a contact assembly and in this way to provide some units only for permanent contact without arcing and other units as the arcing units.

Now having described the contact construction herein disclosed, reference should be had to the claims which follow.

I claim:

1. For bridging two stationary contacts, a movable contact mounted to slide between them comprising a plate arranged so that its edges only engage the stationary contacts, and spring means arranged to bias the plate to rotate so that diagonally opposite edge portions of the plate are spring pressed against both stationary contacts when the movable contact is at rest between the stationary contacts, but, when the movable contact is at rest away from the stationary contacts, the transverse distance between the said two diagonally opposite edge portions of the plate is greater than the space between the stationary contacts.

2. For bridging two stationary contacts, a movable contact mounted to slide between them comprising a plurality of plates arranged face to face and across the space between the stationary contacts so that their edges only engage the stationary contacts, and spring means for holding the plates in assembly and arranged to bias them to rotate in opposite directions, scissors fashion, so that diagonally opposite edge portions of each plate are spring pressed against both stationary contacts when the movable contact is at rest between the contacts, but, when the movable contact is at rest away from the stationary contacts, the transverse distance between the said two diagonally opposite edge portions of each plate is greater than the space between the stationary contacts.

3. For bridging two stationary contacts, a movable contact mounted to slide between them comprising a plurality of plates arranged face to face and across the space between the stationary contacts so that their edges only engage the stationary contacts, and spring means for holding the plates in assembly and arranged to bias them to rotate in opposite directions, scissors fashion, so that diagonally opposite edge portions of each plate are spring pressed against both stationary contacts when the movable contact is at rest between the contacts, but, when the movable contact is at rest away from the stationary contacts, the transverse distance between the said two diagonally opposite edge portions of each plate is greater than the space between the stationary contacts, the plates having aligned holes in which the spring means for such plates is located and seated, the friction fit of the spring means and of the walls of the holes serving to maintain the

several plates and their spring means in assembly and under spring bias.

4. For bridging two stationary contacts, a movable contact mounted to slide between them comprising a plurality of plates arranged face to face and across the space between the stationary contacts so that their edges only engage the stationary contacts, and spring means for holding the plates in assembly and arranged to bias them to rotate in opposite directions, scissors fashion, so that diagonally opposite edge portions of each plate are spring pressed against both stationary contacts when the movable contact is at rest between the contacts, but, when the movable contact is at rest away from the stationary contacts, the transverse distance between the said two diagonally opposite edge portions of each plate is greater than the space between the stationary contacts, the plates being arranged in separate pairs, each pair having separate and independent spring means.

5. For bridging two stationary contacts, a movable contact mounted to slide between them comprising a plurality of plates arranged face to face and across the space between the stationary contacts so that their edges only engage the stationary contacts, and spring means for holding the plates in assembly and arranged to bias them to rotate in opposite directions, scissors fashion, so that diagonally opposite edge portions of each plate are spring pressed against both stationary contacts when the movable contact

is at rest between the contacts, but, when the movable contact is at rest away from the stationary contacts, the transverse distance between the said two diagonally opposite edge portions of each plate is greater than the space between the stationary contacts, the plates having aligned holes in which the spring means for such plates is located and seated, the friction fit of the spring means and of the walls of the holes serving to maintain the several plates and their spring means in assembly and under spring bias, the plates being arranged in separate pairs, each pair having separate and independent spring means.

6. For bridging two stationary contacts, a movable contact mounted to slide between them, comprising a pair of plates arranged face to face and across the space between the stationary contacts so that their edges only engage the stationary contacts, and spring means for holding the plates in assembly and arranged to bias them to rotate in opposite directions, scissors fashion, so that diagonally opposite edge portions of each plate are spring pressed against both stationary contacts when the movable contact is at rest between the contacts, but, when the movable contact is at rest away from the stationary contacts, the transverse distance between the said two diagonally opposite edge portions of each plate is greater than the space between the stationary contacts.

WILLIAM H. FRANK.