Sept. 25, 1962 A. R. LUCAS 3,055,999

MAGNETIC SWITCH OF THE SNAP ACTING TYPE

Filed May 2, 1961

3 Sheets-Sheet 1

Fig. 1

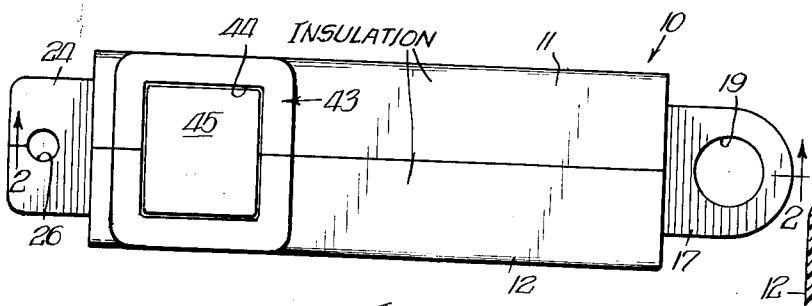



Fig. 4

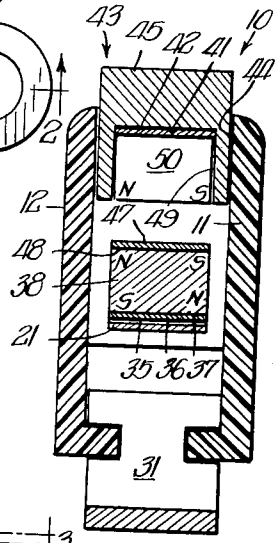


Fig. 2

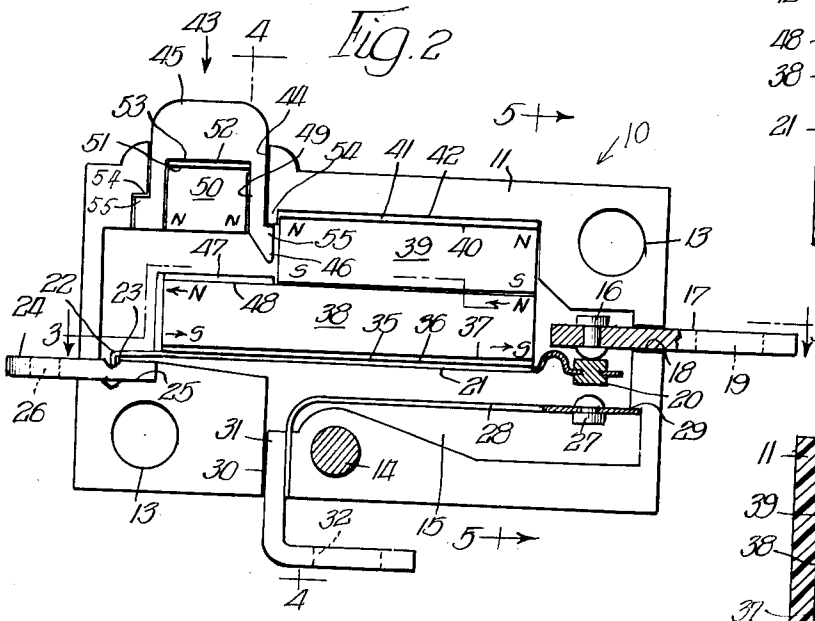


Fig. 5

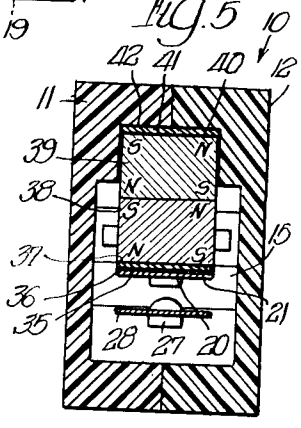
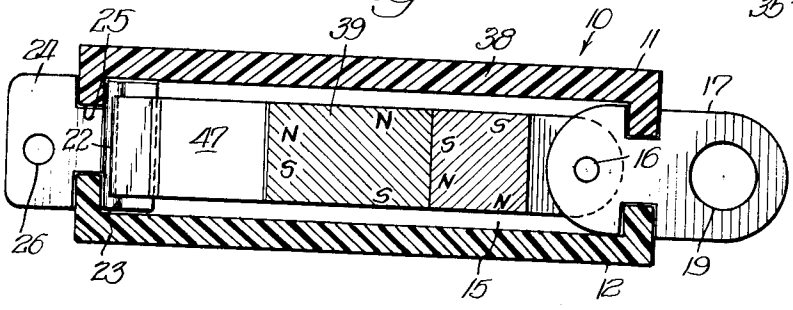


Fig. 3



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Fig. 6

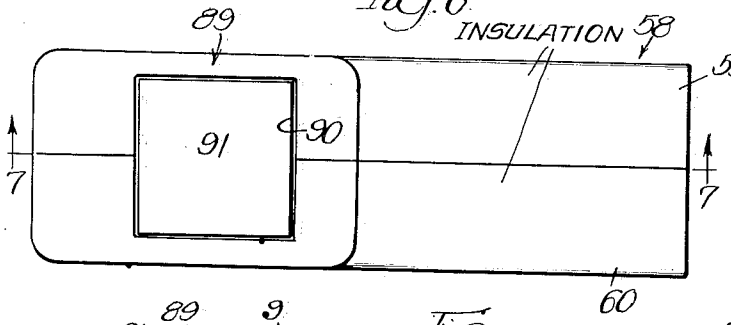



Fig. 9

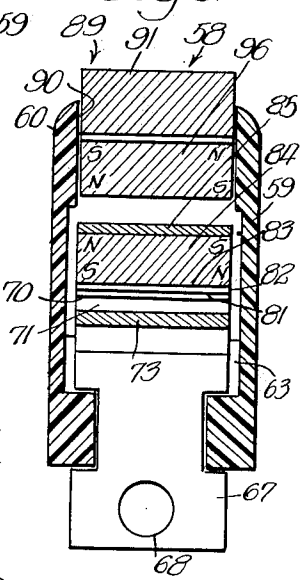



Fig. 7

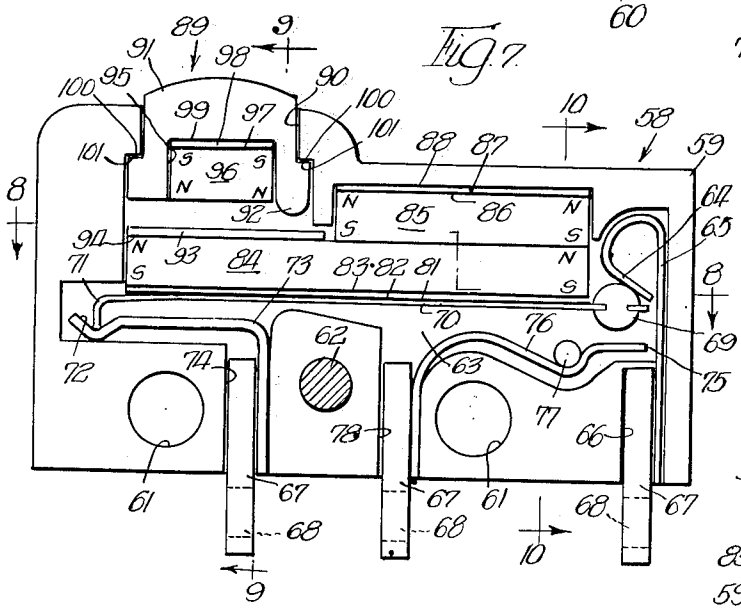



Fig. 10

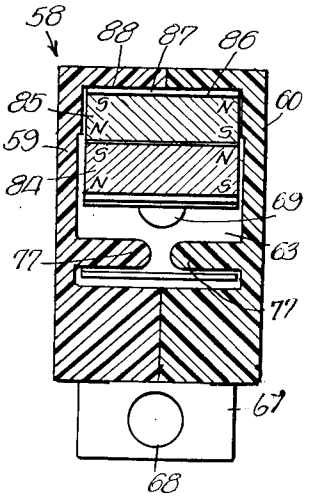
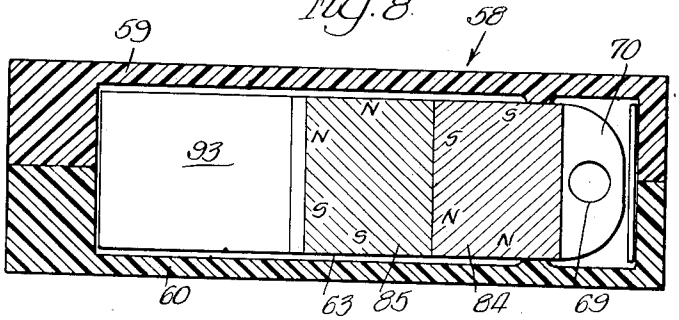



Fig. 8

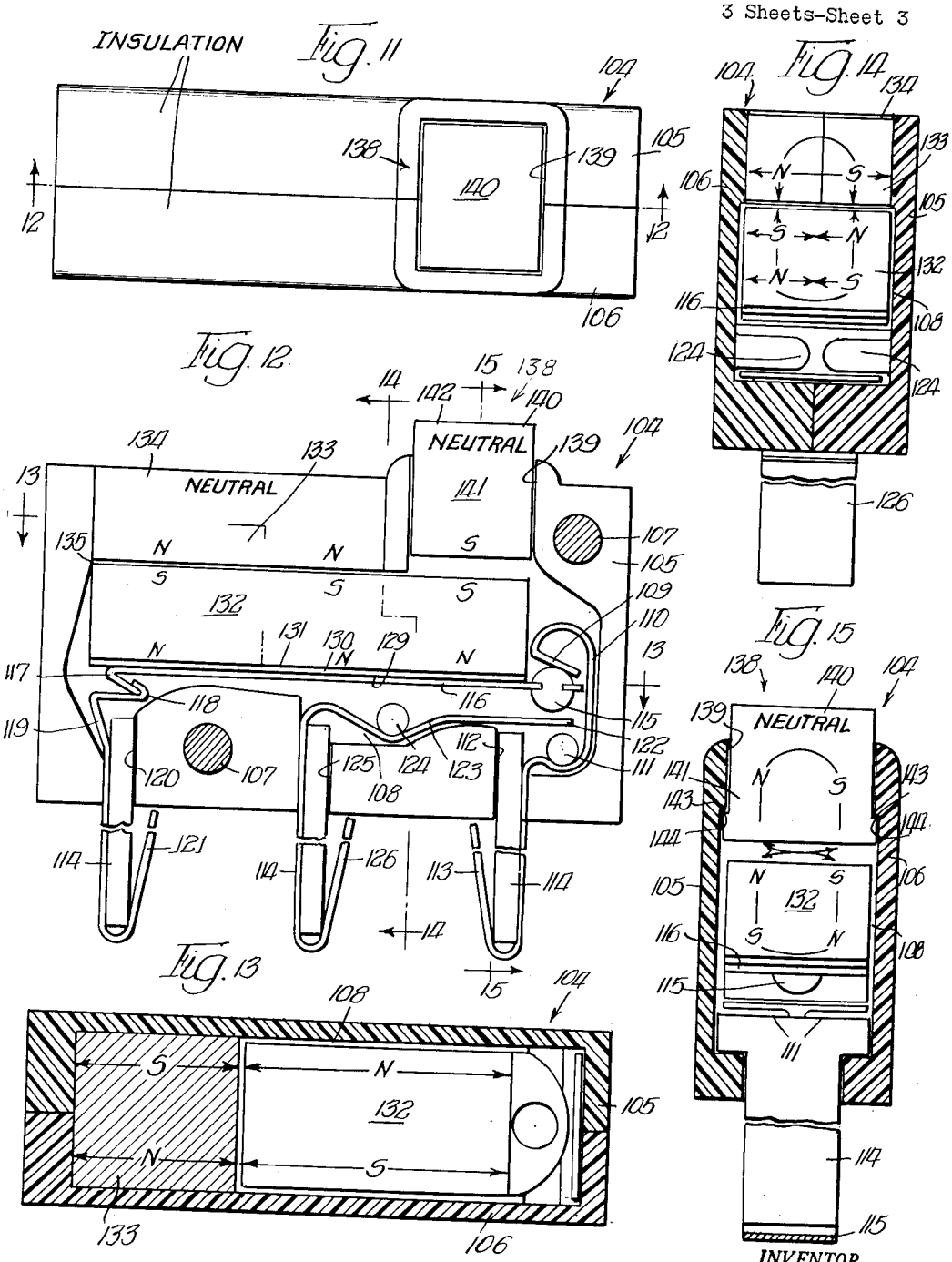



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United States Patent Office

3,055,999

Patented Sept. 25, 1962



# 3,055,999
# MAGNETIC SWITCH OF THE SNAP ACTING TYPE

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Filed May 2, 1961, Ser. No. 107,152
15 Claims. (Cl. 200—67)

This invention relates, generally, to switches or circuit breakers and it has particular relation to snap acting switches of the magnetic type for use on low voltage circuits where the current flow is relatively small. As pointed out in my copending application, Serial No. 64,116, filed October 21, 1960, switches of this type, including the housings therefor, are relatively small in size and have wide application for controlling the flow of current in circuits operating at voltages of the order of 115–230 volts either alternating or direct current.

Among the objects of this invention are: To provide an improved snap acting switch construction with externally operable operating means for moving the switch contacts relative to each other; to bias the operating means to the unoperated position in a new and improved manner; to provide the biasing action as a result of the interaction of magnetic forces; to provide permanent magnets on the movable contact carrying means and on the operating means which are magnetized with like polarities whereby they repel each other; to form the operating means wholly of anisotropic permanent magnet material permanently magnetized in the same direction as the juxtaposed portion of the permanent magnet on the movable contact carrying means whereby they are biased apart and the operating means is biased normally to inoperative position; to limit the outward movement of the operating means with respect to the housing; to employ a relatively stationary contact to be engaged by the movable contact and to mount the former at the end of an elongated resilient member; to limit the movement of the resilient member toward the movable contact when the latter moves to open position; to mount the switch mechanism in an insulating housing with terminals connected to the contacts extending from one side of the housing for external connection thereto; to arrange the housing and terminals in the form of a plug for insertion in a suitable receptacle having sockets for receiving the terminals; to form at least part of the housing that overlies the permanent magnet on the movable contact support of anisotropic permanent magnet material permanently magnetized opposite to the polarization of the movable permanent magnet whereby the movable contact and support therefor are attracted toward that portion of the housing; and to form the entire housing of anisotropic permanent magnet material with only that portion as above set forth permanently magnetized.

In the drawings:

FIG. 1 is a top plan view of a snap acting switch in which the present invention is embodied.

FIG. 2 is a vertical elevational view of one of the case sections forming the insulating housing for the switch, the view being taken along the line 2—2 of FIG. 1.

FIG. 3 is a horizontal sectional view taken generally along the line 3—3 of FIG. 2.

FIG. 4 is a vertical sectional view taken generally along the line 4—4 of FIG. 2.

FIG. 5 is a vertical sectional view taken generally along the line 5—5 of FIG. 2.

FIG. 6 is a top plan view of another embodiment of the snap acting switch of the present invention.

FIG. 7 is a vertical elevational view of one of the case sections for the housing of the snap acting switch shown in FIG. 6, the view being taken along the line 7—7 thereof.



FIG. 8 is a horizontal sectional view taken generally along the line 8—8 of FIG. 7.

FIG. 9 is a vertical sectional view taken generally along the line 9—9 of FIG. 7.

FIG. 10 is a vertical sectional view taken generally along the line 10—10 of FIG. 7.

FIG. 11 is a top plan view of still another embodiment of the snap acting switch of the present invention.

FIG. 12 is a vertical elevational view of one of the case sections of the housing taken generally along the line 12—12 of FIG. 11.

FIG. 13 is a horizontal sectional view taken generally along the line 13—13 of FIG. 12.

FIG. 14 is a vertical sectional view taken generally along the line 14—14 of FIG. 12.

FIG. 15 is a vertical sectional view taken generally along the line 15—15 of FIG. 12.

Referring now particularly to FIGS. 1–5 of the drawings, it will be observed that the reference character 10 designates, generally, a snap acting switch in which the present invention is embodied. It will be understood that the showing of the switch 10 is at a greatly enlarged scale for the purpose of facilitating a clearer understanding of the construction.

The switch 10 employs an insulating housing formed of case sections 11 and 12 which are arranged to meet and which may be formed of non-magnetic insulating material such as a phenolic condensation product. Aligned mounting holes 13—13 are provided in the case sections 11 and 12 to permit suitable mounting of the switch 10 as may be desired. A transversely extending rivet 14 holds the case sections 11 and 12 together.

Within the case sections 11 and 12 there is provided a cavity 15 in which the switch mechanism to be described is positioned. The switch mechanism includes a stationary break contact 16 in the form of a rivet of conducting material that is secured to the inner end of a terminal plate 17 which extends through a slot 18 to a position outside of the housing formed by the case sections 11 and 12 where it is provided with a terminal hole 19 to facilitate connection of an external conductor. Cooperating with the stationary break contact 16 is a movable contact 20 that also is in the form of a rivet of good conducting material and it is mounted at the outer end of a resilient conductor 21 adjacent a U-shaped shock loop. The resilient conductor 21, as shown, extends lengthwise of the case section 11 and has a downturned end 22 that is pivoted in a notch 23 at the inner end of a terminal plate 24 which extends outwardly through a slot 25 and is provided with a terminal hole 26 to facilitate external connection. Also cooperating with the movable contact 20 is a relatively stationary make contact 27 in the form of a rivet of good conducting material which is mounted at one end of a resilient conductor 28 the movement of which is limited by a shoulder 29 on the case section 11 in a direction toward the movable contact 20. The resilient conductor 28 extends through a slot 30 and overlies a terminal plate 31 of angle shape which extends out of the lower portion of the case section 11 and has a terminal hole 32 to facilitate external connection.

Bonded at 35 to the upper side of the resilient conductor 21 is a magnetic shunt 36 which, in turn, is bonded at 37 to a movable permanent magnet 38 which is formed of anisotropic magnetic material which is permanently magnetized with the polarities indicated in FIGS. 2, 3, 4 and 5. It will be understood that the movable permanent magnet 38 is secured to the resilient conductor 21 and thus moves conjointly with it to effect corresponding movement of the movable contact 20.

In order to provide the desired snap action the movable permanent magnet 38 which constitutes an armature is ar-

ranged to cooperate with a magnetic member 39 that preferably is formed of anisotropic magnetic material that is permanently magnetized to the polarities indicated in FIGS. 2, 3 and 5 of the drawings. The permanent magnet 39 is bonded at 40 to the under side of a magnetic shunt 41 which, in turn, is bonded at 42 to the case sections 11 and 12. It will be understood that the stationary permanent magnet 39 also is bonded along the sides and ends to the case sections 11 and 12 to hold it firmly in position. It will be observed, particularly in FIG. 5, that the magnetization of the movable permanent magnet 38 is opposite to the magnetization of the permanent magnet 39 so that they are attracted toward each other with a force that varies inversely as the square of the distance therebetween.

In order to separate the movable contact 20 from the stationary break contact 16 and cause it to engage the relatively stationary make contact 27 provision is made for applying a force to the movable permanent magnet 38 and parts movable therewith to overcome the attractive force exerted between the permanent magnets 38 and 39. For this purpose an operator, shown generally at 43, is employed. The operator 43 extends through a rectangular opening 44 that is formed in the case sections 11 and 12. The operator 43 includes a pin 45 having a rectangular cross section and formed of insulating material such as a phenolic condensation product. Formed integrally with the pin 45 is a depending pressure flange 46 that is arranged to engage at its lower tapered end with the upper surface of a pressure plate 47 of non-magnetic material that is bonded at 48 to the upper surface of the permanent magnet 38. On the application of sufficient downward pressure to the upper end of the pin 45, the pressure flange 46 engages the pressure plate 47 and moves it downwardly through a slight extent to overcome the attractive forces between the permanent magnets 38 and 39. On release of this force, the attractive forces between the permanent magnets 38 and 39 are sufficient to move the movable contact 28 out of engagement with the make contact 27 and back into engagement with the break contact 16.

It is desirable that the pin 45 be normally held in the non-operated or outermost position. In accordance with this invention the pin 45 is provided with a cavity 49 within which there is located a permanent magnet 50 that is formed preferably of anisotropic magnetic material which is permanently magnetized to the polarities indicated in FIGS. 2 and 4, these polarities being the same as the polarities of the juxtaposed portions of the movable permanent magnet 38. As a result, since the juxtaposed portions of the permanent magnets 38 and 50 are magnetized in the same direction, they repel each other and the pin 45 is normally biased outwardly and held in the non-operated position. Bonded at 51 to the upper side of the permanent magnet 50 is a magnetic shunt 52 that in turn is bonded at 53 to the upper end of the cavity 49 in the pin 45. It will be understood that the permanent magnet 50 is likewise bonded to the sides of the cavity 49 in the pin 45. The outward movement of the pin 45 is limited by shoulders 54—54 on the case sections 11 and 12 when they are engaged by shoulders 55—55 on the pin 45.

In FIGS. 6–10 of the drawings there is shown another embodiment of this invention. It will be observed that it comprises a snap acting switch shown, generally, at 58 which includes an insulating housing formed of case sections 59 and 60. As before, the case sections 59 and 60 can be formed of a plastic insulating material such as a phenolic condensation product. They are provided with mounting holes 61—61 and a transverse rivet 62 holds the assembly together. There is provided a cavity 63 within the case sections 59 and 60 for receiving the switch mechanism to be described.

The switch mechanism includes a stationary break contact section 64 at one end of a resilient contact strip 65. It will be noted that the break contact section 64 is located at the end of a reverse turn portion of the resilient contact strip 65 and thus it has a slight degree of movement although it is considered a relatively stationary contact section. The other end of the resilient contact strip 65 extends through a slot 66 in the bottom of the case sections 59 and 60 and overlies a terminal plate 67 that has a press fit in this slot and extends outwardly with a terminal hole 68 therein to facilitate external connection thereto. Cooperating with the stationary break contact section 64 is a movable contact 69 in the form of a rivet of good conducting material which is mounted at the outer end of a resilient conductor 70. It will be noted that the resilient conductor 70 extends endwise along the case section 59 and at the other end is provided with a downturned portion 71 which is pivoted in a notch 72 in one arm of an angle shaped conductor 73 the other arm of which extends into a slot 74 in the bottom of the case section 59 in overlying relation to the terminal plate 67 which has a press fit therewith in the slot 74 and provides the necessary external connection. Also cooperating with the movable contact 69 is a relatively stationary break contact section 75 that is located at one end of a resilient contact strip 76 which extends underneath transversely extending stop members 77, FIGS. 7 and 10, which limit the movement of the break contact section 75 toward the movable contact 69 when the latter is moved toward the break contact section 64 for engagement therewith. The other end of the resilient contact strip 76 overlies a terminal plate 67 and both are located in a slot 78 and have a press fit therewith.

The snap action in the operation of the movement of the movable contact 69 from one position to the other is controlled by permanent magnet members which will now be described. Bonded at 81 to the upper side of the resilient conductor 70 is a magnetic shunt 82 that, in turn, is bonded at 83 to the underside of a movable permanent magnet 84 which is formed of anisotropic magnetic material which is permanently magnetized to have the polarities indicated in FIGS. 7, 8, 9 and 10. Overlying the movable permanent magnet 84 is a relatively stationary permanent magnet 85 that is formed of like material and is permanently magnetized to have the polarities indicated in FIGS. 7, 8 and 10. Since the polarities of the juxtaposed portions of the permanent magnets 84 and 85 are of opposite polarities, they are attracted toward each other with a force that varies inversely as the square of the distance therebetween. The relatively stationary permanent magnet 85 is bonded at 86 to the underside of a magnetic shunt 87 which, in turn, is bonded at 88 to the case sections 59 and 60. Also the permanent magnet 85 is bonded to the case sections 59 and 60 at its ends.

In order to move the movable permanent magnet 84 and the movable contact 89 associated therewith away from the stationary permanent magnet 85 an operator, shown generally at 89, is provided. The operator 89 is movable through a rectangular opening 90 that is formed in the case sections 59 and 60. It comprises a pin 91 having a depending pressure flange 92 that is arranged to engage the upper side of a pressure plate 93 of suitable non-magnetic material that is bonded at 94 to the upper side of the movable permanent magnet 84. In order to bias the pin 91 to the outermost inoperative position it is provided with a cavity 95 for receiving a permanent magnet 96 which is bonded at 97 to a magnetic shunt 98 that, in turn, is bonded at 99 to the bottom of the cavity 95. The permanent magnet 96 is permanently magnetized to have the polarities as indicated in FIGS. 7 and 9 of the drawings. It will be observed that the polarities of the juxtaposed portions of the permanent magnets 84 and 96 are the same and thus they repel each other. As a result the pin 91 is magnetically biased to the outermost or inoperative position and a force must be applied to the outer end sufficient to overcome this repelling action in order to move the pressure flange 92 into operative en-

gagement with the upper side of the pressure plate **93**, the force being sufficient to move the permanent magnet **84** out of the attracted position with respect to the permanent magnet **85** with a snap action.

In order to limit the outward movement of the pin **91** shoulders **100—100** on the case sections **59** and **60** are arranged to be engaged by shoulders **101—101** on the pin **91**. Normally, as shown in FIG. 7, the repelling action between the permanent magnets **84** and **96** is such as to hold the pin **91** in the retracted or inoperative position.

Another embodiment of the invention is illustrated in FIGS. 11–15 of the drawings to which reference now will be had. It will be observed that the reference character **104** designates, generally, a snap acting switch which includes an insulating housing formed by mating case sections **105** and **106**. Not only are the case sections **105** and **106** formed of insulating material but the material also is anisotropic magnetic material a portion of which can be permanently magnetized as described hereinafter. The case sections **105** and **106** are held together by transverse rivets **107—107** to provide a unitary plug-in type of structure specially adapted for such a purpose as will be set forth in detail hereinafter.

Within the case sections **105** and **106** there is provided a cavity **108** in which the switch mechansim is mounted. The switch mechanism in the cavity **108** includes a stationary break contact section **109** which is located as an inturned portion of one end of a resilient contact strip **110** which extends underneath transverse stop members **111—111**, FIGS. 12 and 15, which are formed integrally with the case sections **105** and **106**. The resilient contact strip **110** extends through a slot **112** in the bottom of the case sections **105** and **106** and its outer end **113** extends around a terminal plate **114** which also is located in the slot **112** with a press fit. The arrangement of the outer end **113** of the resilient contact strip **110** in combination with the terminal plate **114** provides a plug-in type of construction which can have good contact engagement with a socket in a suitable receptacle into which the snap acting switch **104** as a unit can be plugged. Such a construction is facilitated since the outer end **113** of resilient material, when unstressed, extends at an angle away from the terminal plate **114**.

A movable contact **115** in the form of a rivet of good conducting material cooperates with the stationary break contact section **109** and is mounted on the outer end of a resilient conductor **116** which extends lengthwise of the case section **105** and at the other end has an inturned end **117** that makes good contact engagement with a hook shaped section **118** at the upper end of a resilient conducting strip **119**. It will be noted that the resilient conducting strip **119** extends through a notch **120** in the bottom of the case section **105** and its outer end **121** overlies the outer end of the terminal plate **114** to provide the plug-in construction described hereinbefore. The movable contact **115** also cooperates with a relatively stationary make contact section **122** at one end of a resilient contact strip **123**. The movement of the make contact section **122** toward the movable contact **115**, when the latter moves toward the break contact section **109**, is limited by transverse stop members **124—124**, FIGS. 12 and 14, which are formed integrally with the case sections **105** and **106**. The resilient contact strip **123** extends through a notch **125** in the bottom of the case sections **105** and **106** and its outer end **126** overlies the outer end of a terminal plate **114** to provide the plug-in effect previously described.

In order to move the movable contact **115** with a snap action the resilient conductor **116** is bonded at **129** to a magnetic shunt **130** which, in turn, is bonded at **131** to the under side of a movable permanent magnet **132**. The movable magnet **132** together with the resilient conductor **116** and the movable contact **115** operate as a unit for effecting the movement of the movable contact **115** out



of engagement with break contact section **109** and into engagement with the make contact section **122** and vice versa.

It will be recalled that the case sections **105** and **106** have been described as being formed of anisotropic magnetic material which can be permanently magnetized. Accordingly, that portion **133** of the case sections **105** and **106** which overlies a major portion of the upper side of the movable permanent magnet **132** is magnetized with the polarities indicated so that, when the permanent magnet **132** is magnetized with the polarities indicated in FIGS. 12 and 14, the permanent magnet **132** is attracted toward the magnetized portion **133** of the case sections **105** and **106** in the same manner that the movable permanent magnets of the previously described embodiments of the invention are attracted toward the relatively stationary permanent magnets of those constructions. Since the case sections **105** and **106** are formed of material which can be permanently magnetized, advantage is taken of this characteristic of the material to provide as integral part thereof the stationary permanent magnet. At the same time, since the material has insulating properties, it functions in this respect in the same manner that a plastic insulating material functions for the case sections of the other embodiments. It will be observed that the magnetized portion **133** of the case sections **105** and **106** does not extend to the upper surface and that a neutral portion **134** is there provided.

An important feature of the construction as shown in FIG. 12 is that the movable permanent magnet **132** is free to pivot at **135** along a line extending across its upper left corner along the junction between the magnetized portion **133** of the case sections **105** and **106** and the end portion thereof. It will be understood that the permanent magnet **132** floats or hangs in this position and normally is attracted to the position shown in FIG. 12 by the attractive forces exerted between the permanent magnet **132** and the magnetized portion **133**. It is unnecessary then to provide a separate pivot for the permanent magnet **132** and parts moving with the movable contact **115**.

In order to move the movable permanent magnet **132** from one operating position to the other to shift the movable contact **115** from engagement with the break contact section **109** to engagement with the make contact section **122**, an operator, shown generally at **138**, is provided. The operator **138** extends through a rectangular opening **139** in the case sections **105** and **106**. The operator **138** comprises a pin **140** having a rectangular cross section and formed entirely of anisotropic magnetic material the lower portion **141** of which is permanently magnetized to have the polarities indicated in FIGS. 12 and 15 while the upper portion **140** is neutral or unmagnetized. It will be noted that the juxtaposed portions of the pin **140** and the movable permanent magnet **132** are magnetized in the same direction with the result that they repel each other and thus the pin is magnetically biased upwardly to inoperative position. Since the pin **140** is located remote from the pivot center **135** of the movable permanent magnet **132**, when a downward force is applied to the upper end of the pin **140**, the repelling force between the magnetized lower portion **141** and the movable permanent magnet **132** is sufficient to effect movement of the latter without actual contact engagement of the lower end of the pin **140** with the upper surface of the permanent magnet **132**.

In order to limit the outward movement of the operator **138** shoulders **143—143** are provided on the case sections **105** and **106** for cooperation with shoulders **144—144** that are located on the lower portion of the pin **140** and extend laterally therefrom.

What is claimed as new is:

1. A snap acting switch comprising, in combination, a support, relatively stationary and movable magnetic members on said support with the movable member being

permanently magnetized, a relatively stationary contact carried by said support, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, operating means mechanically cooperating with said movable permanent magnet to move it away from said stationary magnetic member thereby moving said movable contact relative to said stationary contact, and a permanent magnet on said operating means adjacent said movable permanent magnet and of like magnetization whereby it and said operating means are repelled from each other.

2. A snap acting switch comprising, in combination, a support, relatively stationary and movable magnetic members on said support with the movable member being permanently magnetized, a relatively stationary contact carried by said support, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, operating means mechanically cooperating with said movable permanent magnet to move it away from said stationary magnetic member thereby moving said movable contact relative to said stationary contact, a permanent magnet on said operating means adjacent said movable permanent magnet and of like magnetization whereby it and said operating means are repelled from each other, and means limiting the movement of said operating means away from said movable permanent magnet.

3. A snap acting switch comprising, in combination, a support, relatively stationary and movable magnetic members on said support with the movable member being permanently magnetized, a relatively stationary contact carried by said support, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, operating means cooperating with said movable permanent magnet to move it away from said stationary magnetic member thereby moving said movable contact relative to said stationary contact, a permanent magnet on said operating means adjacent said movable permanent magnet and of like magnetization whereby it and said operating means are repelled from each other, and a non-magnetic extension on said operating means reacting against said movable permanent magnet for moving it away from said stationary permanent magnet.

4. A snap acting switch comprising, in combination, an insulating housing, stationary and movable oppositely magnetized permanent magnets in said housing, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, operating means movable through said housing and cooperating with said movable permanent magnet to move it away from said stationary permanent magnet thereby moving said movable contact relative to said stationary contact, and a permanent magnet carried by said operating means adjacent said movable permanent magnet and of like magnetization whereby said operating means is magnetically biased outwardly of said housing.

5. A snap acting switch comprising, in combination, an insulating housing, stationary and movable oppositely magnetized permanent magnets in said housing, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, an operating pin slidably mounted on said housing for movement transversely of said movable permanent magnet for engaging and moving it to move said movable contact relative to said stationary contact, and a permanent magnet mounted on said operating pin having a polarity like that of said movable permanent magnet and biasing said operating pin to inoperative position.

6. A snap acting switch comprising, in combination, an insulating housing, stationary and movable oppositely magnetized permanent magnets in said housing, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, an operating pin slidably mounted on said housing for movement transversely of said movable permanent magnet for engaging and moving it to move said movable contact relative to said stationary contact, a permanent magnet mounted on said operating pin having a polarity like that of said movable permanent magnet and biasing said operating pin to inoperative position, and cooperating shoulder means on said housing and said operating pin limiting outward movement of the latter relative to the former.

7. A snap acting switch comprising, in combination, an insulating housing, relatively stationary and movable magnetic members in said housing with the movable member being permanently magnetized, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, operating means movable through said housing and cooperating with said movable permanent magnet to move it away from said stationary magnetic member thereby moving said movable contact relative to said stationary contact, a permanent magnet on said operating means adjacent said movable permanent magnet and of like magnetization whereby it and said operating means are repelled from each other, and terminal means connected to said contacts and extending through one side of said housing.

8. A snap acting switch comprising, in combination, a support, relatively stationary and movable magnetic members on said support, one of said magnetic members being permanently magnetized, make and break contacts on said support, a movable contact on said movable magnetic member cooperating with said make and break contacts, a resilient support for said make contact biasing it toward said break contact, a stop on said support cooperating with said make contact and limiting movement thereof toward said break contact, and operating means cooperating with said movable magnetic member to move it away from said stationary magnetic member thereby moving said movable contact out of engagement with said break contact and into engagement with said make contact.

9. A snap acting switch comprising, in combination, a support, stationary and movable oppositely magnetized permanent magnets on said support, make and break contacts on said support, a movable contact on said movable permanent magnet cooperating with said make and break contacts, a resilient support for said make contact biasing it toward said break contact, a stop on said support cooperating with said make contact and limiting movement thereof toward said break contact, and operating means cooperating with said movable permanent magnet to move it away from said stationary permanent magnet thereby moving said movable contact out of engagement with said break contact and into engagement with said make contact.

10. A snap acting switch comprising, in combination, a support, relatively stationary and movable magnetic members on said support, said movable magnetic member being permanently magnetized, make and break contacts on said support, a movable contact on said movable permanent magnet cooperating with said make and break contacts, a resilient support for said make contact biasing it toward said break contact, a stop on said support cooperating with said make contact and limiting movement thereof toward said break contact, operating means cooperating with said movable permanent magnet to move it away from said stationary permanent magnet thereby moving said movable contact out of engagement with said break contact and into engagement with said make contact, and a permanent magnet on said operating means adjacent said movable permanent magnet and of like magnetization whereby it and said operating means are repelled from each other.

11. A snap acting switch comprising, in combination,

a support, stationary and movable oppositely magnetized permanent magnets on said support, make and break contacts on said support, a movable contact on said movable permanent magnet cooperating with said make and break contacts, a resilient support for said make contact biasing it toward said break contact, a stop on said support cooperating with said make contact and limiting movement thereof toward said break contact, operating means cooperating with said movable permanent magnet to move it away from said stationary permanent magnet thereby moving said movable contact out of engagement with said break contact and into engagement with said make contact, and a permanent magnet on said operating means adjacent said movable permanent magnet and of like magnetization whereby it and said operating means are repelled from each other.

12. A snap acting switch comprising, in combination, an insulating housing, a movable permanent magnet in said housing, at least that portion of said housing overlying said movable permanent magnet being formed of anisotropic magnetic material and oppositely magnetized, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, and operating means cooperating with said movable permanent magnet to move it away from said permanently magnetized portion of said housing thereby moving said movable contact relative to said stationary contact.

13. A snap acting switch comprising, in combination, an insulating housing, a movable permanent magnet in said housing, at least that portion of said housing overlying said movable permanent magnet being formed on anisotropic magnetic material and oppositely magnetized, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, operating means cooperating with said movable permanent magnet to move it away from said permanently magnetized portion of said housing thereby moving said movable contact relative to said stationary contact, and permanent magnet means on said operating means adjacent said movable permanent magnet and of like magnetization whereby it and said operating means are repelled from each other.



14. A snap acting switch comprising, in combination, an insulating housing, a movable permanent magnet in said housing, at least that portion of said housing overlying said movable permanent magnet being formed of anisotropic magnetic material and oppositely magnetized, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, and operating means cooperating with said movable permanent magnet to move it away from said permanently magnetized portion of said housing thereby moving said movable contact relative to said stationary contact, said operating means being formed of anisotropic magnetic material and being permanently magnetized oppositely to said movable permanent magnet whereby it is magnetically biased away therefrom.

15. A snap acting switch comprising, in combination, an insulating housing, a movable permanent magnet in said housing, at least that portion of said housing overlying said movable permanent magnet being formed of anisotropic magnetic material and oppositely magnetized, a relatively stationary contact carried by said housing, a movable contact on said movable permanent magnet cooperating with said relatively stationary contact, operating means cooperating with said movable permanent magnet to move it away from said permanently magnetized portion of said housing thereby moving said movable contact relative to said stationary contact, and terminals connected to said contacts and extending laterally from one side of said housing and forming therewith a unitary plug structure for inserting said terminals in a receptacle.

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