Dec. 7, 1965 H. FASOLA, JR 3,222,474

SWITCHING DEVICE HAVING MAGNETIC DETENT ACTION

Filed Aug. 27, 1963 2 Sheets-Sheet 1

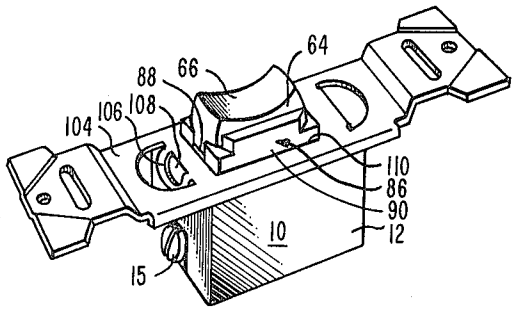


FIG.-1

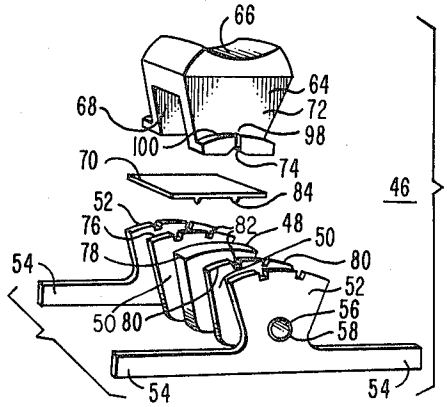


FIG.-2

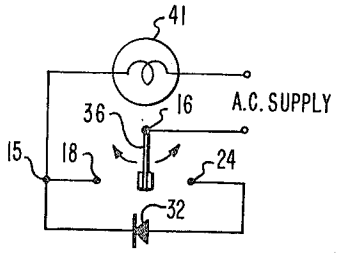


FIG.-3

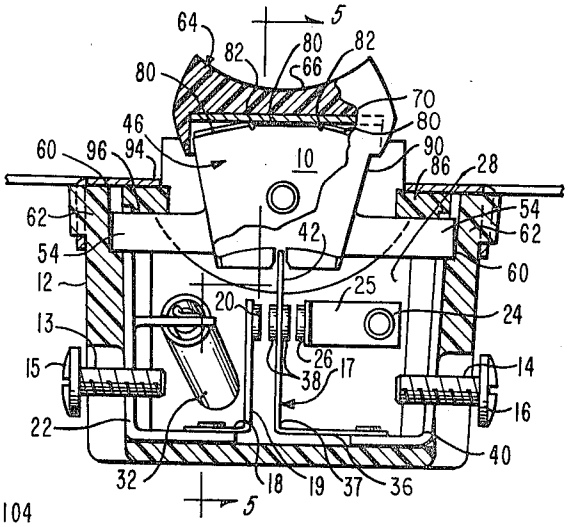


FIG.-4

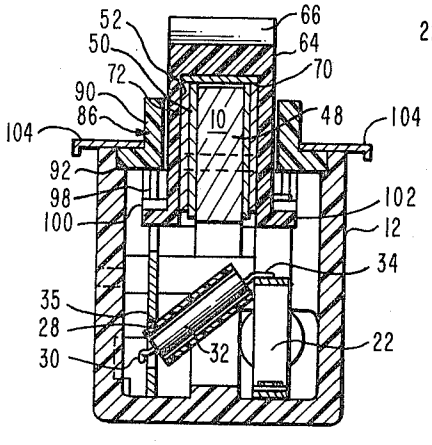


FIG.-5

INVENTOR.
HENRY FASOLA, JR.

BY

Fraser and Bogucki

ATTORNEYS

Dec. 7, 1965 H. FASOLA, JR 3,222,474

SWITCHING DEVICE HAVING MAGNETIC DETENT ACTION

Filed Aug. 27, 1963 2 Sheets-Sheet 2

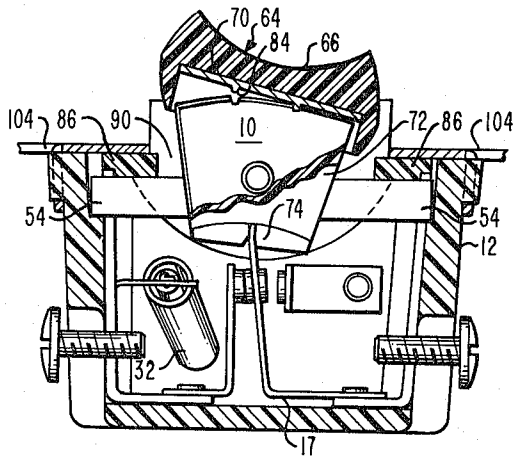


FIG.-6

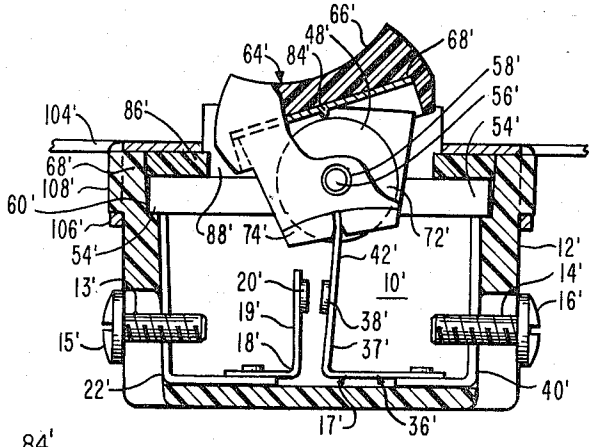


FIG.-7

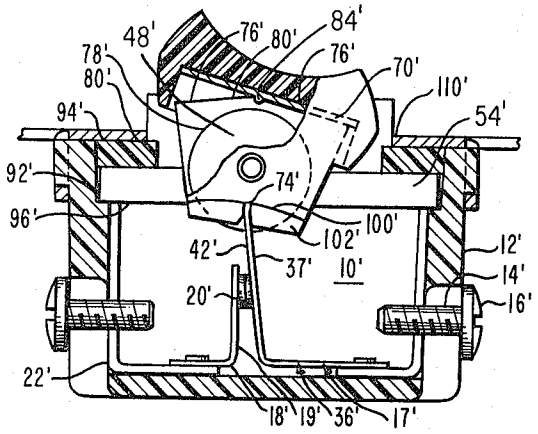


FIG.-8

INVENTOR.
HENRY FASOLA, JR.

BY Fraser and Boguski

ATTORNEYS

United States Patent Office 3,222,474
Patented Dec. 7, 1965

3,222,474

SWITCHING DEVICE HAVING MAGNETIC DETENT ACTION

Henry Fasola, Jr., Los Angeles, Calif., assignor to David Blonder as assignee for creditors of Brass Copper Lighting Fixture Co., Los Angeles, Calif.

Filed Aug. 27, 1963, Ser. No. 304,760
16 Claims. (Cl. 200—67)

The present invention generally relates to switching means and more particularly relates to improved electrical switches employing magnetic components.

Toggle and detent type electrical switches characteristically employ a considerable number of moving parts, including springs, levers and the like, which are subject to wear at critical points. As a result, over a period of time, the positive action of such switches tends to degrade to a point where the switches fail. By employing more expensive components, the useful life of such switches can be increased. However, there is an expanding need for switches which are not only durable but which are also inexpensive, including switches having a plurality of switching positions for light dimming applications and the like.

A few of the newer types of switches employ durable magnetic components. Such magnetic switches generally have a fewer number of moving parts and, accordingly, have an increased useful life. However, many of such magnetic switches are relatively complex and expensive to fabricate. Moreover, such switches characteristically employ the magnetic components in the switch circuitry. As is well known, magnetic materials are relatively inefficient electrical conductors and have a tendency to heat up when subjected to considerable current flow. A substantial rise in the temeprature of a magnet usually has the effect of impairing its magnetic properties, so that the permanency of the magnet may become endangered.

Accordingly, it is a principal object of the present invention to provide an improved switching device.

It is also an object of the present invention to provide an improved magnetic switch.

It is a further object of the present invention to provide a simple durable magnetic switch which is essentially free from degradation of operating characteristics over a relatively long period of time.

It is also an object of the present invention to provide an inexpensive, durable multi-position magnetic switch containing a small number of components, which switch can be easily assembled and disassembled.

It is a still further object of the invention to provide a multi-position magnetic switch which exhibits a positive, durable snap switching action.

These and other objects are accomplished in accordance with the present invention by providing a simple, durable magnetic switch which is relatively inexpensive to construct, assemble, and disassemble and which is essentially free from degradation of operating characteristics. The switch is capable of providing a plurality of switching positions, so that it is suitable for use as a light dimming switch. Moreover, the switch has the major advantage of being adaptable to a wide variety of other applications with minimal redesign of components thereof. The switch is essentially noiseless in operation and is convenient and simple to use under fingertip control.

The switch employs a novel magnetic contact repositioning assembly which is maintained electrically insulated from the electrical circuitry of the switch so that no degradation occurs in the magnetic properties of the permanent magnet number employed in the switch. Such magnet is employed with a pair of multifaced magnetic

elements comprising magnetic end plates which provide a plurality of pairs of successive magnetic pole tips of selected configuration, upon which tips is seated a magnetic member with a plurality of magnetic shunts for the pole tips, each having a matching configuration and being arranged in line in the form of a magnetic rocker plate connected to electrically non-conductive means comprising a switch button. The button is adapted to move the rocker plate in and out of engagement with matched pairs of the pole tips to complete stable magnetic shunt circuits and effect a positive snap switching action while the button acts upon a movable electrical contact of electrical switching device to effect the desired switching by repositioning of the contact.

Further aspects of the invention will be apparent from a study of the following detailed description and the accompanying drawings of which:

FIG. 1 is a perspective view of the first embodiment of the magnetic switch of the invention, illustrating a three-position switch which includes current reducing means;

FIG. 2 is an exploded view of the contact repositioning device of the switch of FIG. 1;

FIG. 3 is a diagrammatic representation of the electrical circuitry of the switch of FIG. 1 together with electrical lighting circuitry;

FIG. 4 is a longtiudinal cross-section of the switch of FIG. 1, illustrating the switch in the "off" (open circuit) position;

FIG. 5 is a transverse cross-section of the switch of FIG. 1;

FIG. 6 is a longitudinal section of the switch of FIG. 1, illustrating the switch in the "on" (closed circuit) full current position;

FIG. 7 is a longitudinal section of a second embodiment of the switch of the present invention, illustrating a two-position switch in the "off" (open circuit) position; and

FIG. 8 is a longitudinal section illustrating the switch of FIG. 7 in the "on" (closed circuit) position.

Now referring more particularly to FIGS. 1 to 6 of the accompanying drawings, a three-position magnetic switch **10** is illustrated, which switch includes current reducing or limiting means and is adapted for use as an "off," "on" and dimmer switch with electrical lighting equipment and the like. As shown in FIGS. 1, 4, 5 and 6 the switch includes an electrically non-conductive, generally rectangular hollow housing **12** fabricated of any suitable material, such as a synthetic plastic, for example, a phenol-formaldehyde resin or the like. The housing **12** has an open upper end and is provided with a pair of apertures **13** and **14** extending into the interior from the sides thereof through which a pair of external screw type terminals **15** and **16** extend to provide conductive coupling with electrical switching assembly **17** disposed within the housing **12**.

The switching assembly **17** includes a first stationary electrical contact **18** comprising an upwardly extending free contact arm **19**, preferably fabricated of a conductive metal spring, such as copper strip or the like, and a contact point **20** disposed on one side of the arm **19**. The stationary contact **18** is secured to and electrically connected at one end thereof to an electrically conductive metal plate **22** which is secured to an interior surface of the housing **12**, and into which the external terminal **15** is threaded for conductive coupling therewith. A second stationary contact **24**, preferably fabricated similar to the stationary contact **18**, and fitted with a contact point **26**, is connected at one end thereof to a vertically extending electrically conductive plate **28** secured to a second interior surface of the housing **12** out of direct electrical contact with the plate **22**. The arm **25** ter-

minates a short distance from the contact 18. To the plate 28 is secured a lead 30 from a diode 32, which diode is also conductively connected, at the opposite end thereof, to the plate 22, as by a lead 34.

A movable contact means 36, preferably fabricated of a spring-like conductive metal, such as a thin copper strip, comprises a vertically disposed free contact arm 37 positioned between the contact arms 19 and 25, which arm 37 is provided with contact points 38 facing and adjacent to the contact points 20 and 26. A portion of the contact 36 is secured to and also conductively coupled at one end thereof to an electrically conductive plate 40 secured to the interior surface of the housing 12 out of conductive contact with plates 22 and 28. The second external terminal 16 is threaded into the plate 40 and is conductively coupled therewith. The contact arm 37 terminates above the level of the contact points 20, 38 and 26 and is adapted to be received within a groove, hereinafter more particularly described, in a portion of a contact repositioning assembly 46 disposed above the electrical switching assembly 17, as shown particularly in FIGS. 4 and 6.

The described switching assembly 17 provides two closed electrical circuits, diagrammatically illustrated in FIG. 3. Thus, when a contact point 38 of the contact 36 is moved by the arm 37 into contact with the contact point 20 of the stationary contact 18, as shown in FIG. 6, an electrical circuit is closed through which electrical current can pass directly between the terminal 16 through contacts 36 and 18, by-passing the diode 32.

Accordingly, full current can be supplied through this circuit to an incandescent electrical light 41 or other load connected to the switch for maximum power.

A second alternative electrical circuit is closed when a contact point 38 of the contact 36 is moved on the arm 37 into electrical connection with the contact point 26 of the stationary contact 24, so that electrical current will pass between the external terminals 15 and 16 through the plate 28 and diode 32. When the switch 10 is connected to a source of alternating current and the described second circuit is utilized, one polarity of the alternating current from the source is blocked so that less than full power passes to the light, and the light dims.

The third position for the contact device 36 is that illustrated in FIG. 4. In such position, the movable contact arm 37 is out of conductive contact with both the contact arm 19 and the contact arm 25 so that no current can pass through the circuitry to the load. It will be understood that in the switch of the invention, additional or alternative electrical circuits and loads may be employed.

The assembly 46 whereby the contact arm 37 is urged into the described positions is illustrated in exploded view in FIG. 2. The assembly 46 includes a permanent magnet 48 of selected configuration disposed between a pair of magnetic end plates 50, also of selected configuration. An arrangement is also provided for supporting the magnet 48 and end plates 50 within the housing 12. As shown in FIG. 2, non-magnetic support plates 52, preferably fabricated of copper or the like, can be disposed against the outer surfaces of the end plates 50 and can be provided with generally horizontally extending legs 54. The magnet 48, the end plates 50, and the support plates 52 can be secured together in fixed relation by any suitable means, for example by a non-magnetic rivet 56 disposed transversely therethrough in a suitable aperture 58 provided therein. The legs 54 are adapted to be received in vertical grooves 60 which extend part of the way down the interior surface of two opposite ends 62 of the housing 12, as shown in FIG. 4, so that the contact repositioning assembly 46 can be seated above the switching assembly 17 in the housing 12.

As shown in FIG. 2, the contact repositioning assembly 46 also includes a pivotable, electrically non-conductive rocker button 64, fabricated of plastic or the like, and having a fingertip-receiving curved upper surface 66. The walls of the button 64 extend down to define an open bottomed recess 68 within which is secured a horizontally extending magnetic rocker plate 70 adapted to complete a magnetic circuit with the end plates 50. The recess 68 is dimensioned to receive the end plates 50 for contact with the plate 70. A pair of legs 72, fabricated of plastic or the like, form a part of the button 64 and extend down on opposite sides thereof. At least one of the legs 72 extends sufficiently far into the housing 12 so that (when the button 64 is seated on the plates 50) the upper end 42 of the contact arm 37 is received with a groove 74 in the lower end of that leg, whereby movement of the button 64 effects movement of the contact arm 37 between the "off" (open circuit) position illustrated in FIG. 4, the "on," full power (closed circuit) position illustrated in FIG. 6, and the "on," reduced power (closed circuit) position (not illustrated) wherein electrical current will pass through the diode 32. It will be noted that in none of the described positions does current pass through the magnet 48 or any other part of the assembly 46, which is electrically insulated from the switching assembly 17. Accordingly, the magnetic properties of the magnet 48 are preserved during use of the switch 10, and there is no impairment of current flow due to the magnet nor heating of the magnet, as would occur if the magnet 48 were to form part of one or more of the electrical circuits of the switch.

An important feature of the invention is the particular configuration and inter-relationship of the magnet 48, the magnetic end plates 50, the support plates 52 and the rocker plate 70 in the device 46. Thus, it will be noted that the end plates are matched in configuration and that the upper margin 76 of each end plate extends slightly above the upper margin 78 of the magnet 48. This is to prevent wear on the magnet 48 during operation of the switch 10. The upper margin 76 of each end plate is specially configured to provide a plurality of planar surfaces 80 disposed at angles to one another. Such planar surfaces preferably have an angular relationship between adjacent sections approximating successive and uniform chords of a circle. In the switch 10, three matched pairs of planar surfaces 80 are provided which are separated from one another at their points of juncture by grooves 82. The grooves 82 match and receive depending protuberances or tabs 84 on the adjoining surface of the rocker plate 70 and form points about which the plate 70 can pivot when moving into and out of contact with the surfaces 80. The planar surfaces 80 of the end plates 50 function as matched pairs of magnetic pole tips, each tip of the pair being of opposite polarity, and provide areas of much greater surface contact and therefore much greater magnetic attraction for the rocker plate 70 than the areas of essentially point contact provided for the protuberances 84 by the grooves 82.

It will be noted that the magnetic field distribution in the region of the pole tips is preferably made essentially uniform for all pairs of the pole tips by providing the magnet 48 with a configuration approximating that of the end plates 52, i.e. with an expanded upper portion, so that all matched pairs of the pole tips extend an approximately equal distance from the magnet 48. Moreover, leakage fields from the magnet 48 tend to be kept to a minimum by bounding the sides of the magnet-end plate assembly with the non-magnetic plates 52.

In the assembled state for the assembly 46, that is, when the button 64 with the rocker plate 70 disposed therein is seated on the upper margin 76, the rocker plate 70 completes a magnetic circuit with the magnet 48 and matched pole tips (planar surfaces 80) of the end plates 50. It will be understood that the magnetic attraction between the magnet 48, the pole tips and the rocker plate 70 maintains the button 64 in position on the pole tips.

The protuberances **84** of the rocker plate **70** can pivot in the grooves **82** between pole tip pairs. Thus, in fingertip shifting of the button from one switching position to another, the magnetic rocker plate **70** is pivoted so that it is first broken free from magnetic attraction with one pole tip pair, and is pivoted away therefrom and through an intermediate position in which it is equally attracted by two pole tip pairs, the pair with which it has most recently been associated and the pair to which it is being pivoted, since these two pairs are most closely adjacent to the plate **70**. Upon further pivoting movement of the plate **70** toward the latter pole tip pair, the plate is increasingly attracted thereto. When the rocker plate is sufficiently close to that pole tip pair to be strongly attracted thereto, it snaps into positive switch positioning contact therewith, thereby forming a stable magnetic circuit and indicating to the operator of the switch **10** that a positive switching action has been effected. During pivoting of the button **64** and rocker plate **70**, as described, electrical circuit switching is effected by means of the concomitant pivoting of the leg **72** of the button **64** within which the contact arm **37** is lodged (in the groove **74**), such pivoting thus urging one or the other of the contact points **38** into or out of contact with the contact point **20** or **26**.

By using successive cords for the planar pole tips in the present switch **10**, the fabricator of the switch can provide a reasonable number of switching positions over a relatively small angular distance, in contrast to conventional switching arrangements which require button movement over much larger angular distances to effect multiple switching actions. Accordingly, the button **64** need only be shifted (pivoted) to a small extent to effect the desired switching action. Moreover, the necessary force required to shift switch positions by movement of the button **64** can be readily and accurately varied merely by varying the strength of the magnet **48** and/or the surface area of contact between the pole tips (planar surfaces **80**) and the rocker plate **70**.

A retainer provided in the switch **10** for assuring inadvertent dislodging of the button **64** from engagement with the pole tips. As illustrated in FIGS. 1 and 2, such retainer comprises a flat retaining ring **86** fabricated of electrically non-conductive material such as plastic and having a central button-receiving aperture **88**, and upwardly extending sides **90**. The ring **86** is dimensioned to be disposed within the housing **12** and is seated on two horizontal shelves or ledges **92** disposed on the upper inner surface of two opposite walls of the housing **12**. The ledges **92** are dimensioned so that the upper flat surface **94** of the ring **86** is level with the upper edge of the housing **12**. The bottom flat surface **96** of the ring **86** may be provided with a pair of triangular downwardly directed rocker tips **98** disposed on opposite sides thereof, each of which is adapted to cooperate with a pair of spaced, downwardly inclined rocker surfaces **100** disposed on the upper part of each of a pair of flanges **102** extending outwardly from the bottom end of the legs **72**.

The ring **86** may, in turn, be secured in position within the housing **12** by any suitable means, for example, a metallic retaining plate **104**, as shown in FIG. 1, which has depending feet **106** adapted to grip a pair of extensions **108** on the other surface of two opposite sides of the housing **12** at the upper end thereof. The retaining plate **104** has a central aperture **110** dimensioned to receive the button **64** and the plate overlies the flat upper surface **94** of the retaining ring **86** to prevent inadvertent removal of the retainer ring.

In assembling the switch **10**, the switching device **17** is secured within the housing **12**, after which the magnet **48**—end plate **50**—support plate **52** assembly, previously secured together by the rivet **56**, is seated in the grooves **60**. Thereupon, the button **64** with the rocker plate **70** attached thereto is seated on the upper margins **76** of the end plates **50**. The retaining ring **86** is placed over the button **64** and the retaining plate **104** is placed over the ring **86** and is secured to the upper end of the housing **12**. Such retaining plate, if desired, then can be connected to a wall switch cover plate (not shown) or the like. In connecting the switch to an electrical lighting system, electrical leads are merely secured to the terminals **16**, whereupon the switch **10** is ready for use.

The improved switch **10** operates easily and effectively for switching current between the described circuits and to and from the "off" position, as desired. The components are simple, inexpensive, easily fabricated, durable and reliable. There is essentially no wear on the switch components during long-continued use, inasmuch as the only moving parts are the magnetically held button and rocker plate, and the movable spring contact arm **37**.

A second embodiment of the improved magnetic switch is illustrated in section in FIGS. 7 and 8. This comprises a two-position, "on"-"off" magnetic switch **10'** generally similar in construction to the switch **10**. Components of the switch **10'** which are substantially identical to those of switch **10** bear identical numerals followed by the prime sign (').

The switch **10'** includes a housing **12'** provided with apertures **13'** and **14'** through which external terminals **15'** and **16'** extend into the interior thereof and into contact with electrical switching assembly **17'**. The assembly includes a stationary contact **18'** with a contact arm **19'** and contact point **20'**, which contact is electrically connected to a conductor plate **22'** secured to a terminal **15'**, and a movable contact **36'** having a contact arm **37'** with a contact point **38'** spaced from the contact point **20'** of the stationary contact **18'**. The contact means **36'** is electrically connected to a second conductor plate **40'** secured to the second terminal **16'**. In this embodiment, no second stationary contact is provided, nor is there any diode.

Making and breaking of the electrical circuit in the switch **10'** is accomplished in a manner substantially as described for the switch **10**, that is, by utilizing a magnetic contact repositioning assembly **46'** similar to that of the switch **10**. In this regard, a magnet **48'** is employed which, however, is annular shaped. The magnet **48'** is secured to a pair of magnetic end plates **50'** disposed on each side thereof but non-magnetic support plates need not be employed. Instead, the end plates **50'** have horizontally extending legs **54'** comparable to the legs **54** of the plates **52**. The legs **54'** are seated in grooves **60'** in the upper interior surface of the housing **12'**. The plates **50'** are secured to the magnet **48'** as by a non-magnetic rivet **46'** disposed in an aperture **58'**.

The upper margins **76'** of the end plates **50'** have a configuration generally similar to those of the end plates **50**, i.e. they are planar surfaces representing two successive cords of an arc of a circle, separated at the points of juncture by grooves **82'** adapted to receive protuberances **84'** depending from the adjacent surface of an associated rocker plate **70'** disposed in the bottom of a recess **68'** in a rocker button **64'**. As in the switch **10**, the button **64'** is magnetically seated on the margin **76'** which extend upwardly beyond the periphery of the magnet **48'** so that the protuberances **84'** are positioned in the grooves **82'**.

Snap switching action into the "on" and "off" switch positions is achieved in the switch **10'**, as in the switch **10**, by pivoting the button **64'** and rocker plate **70'** in the grooves **60'** into and out of contact with the planar surfaces **80'** of the end plates **52'**. The top planar surfaces **80'** act as pole tips for the magnet **48'**. The stable "off" (open circuit) switch position for the switch **10'** in which the contact points **20'** and **38'** are separated from one another is illustrated in FIG. 7, while the stable "on" (closed circuit) position is illustrated in FIG. 8. The button **64'** is firmly held in each stable "on" or "off" position by magnetic attraction between the magnet **48'** (and a given pair of pole tips) and the contacting portion of the rocker

plate 70'. When pivoting the switch into the remaining (opposite) switch position, pivotal pressure of the fingertip on the button 64' breaks the magnetic contact between the pair of pole tips and rocker plate 70', after which the button readily pivots and, upon sufficiently close approach of the rocker plate 70' to the remaining pair of pole tips, the magnetic attraction of the pole tips for the rocker plate causes the button 64' to snap into the next switching position. During such movement, a depending leg 72' of the button, which leg contains a groove 74' in which is received the upper end 42' of the movable ocntact arm 37', acts to move the contact arm 37' to the appropriate position in or out of contact with the stationary contact 18' so as to make or break the electrical circuit passing through the contacts 18' and 36'.

The magnetic contact repositioning assembly 46' is secured within the switch 10' by a retaining ring 86' and overlying retaining plate 104' similar in function and in construction to the ring 86 and plate 104 of the switch 10, the plate 104' being secured to the upper outer surface of the housing 12', as by feet 106' which can be bent down to grip extensions 108' on such portion of the housing 12'.

Accordingly, the switch 10' is simple, inexpensive, effective and durable for its intended purposes. The switch 10' can be easily assembled and disassembled for high speed production, inspection or repair. Its magnetic contact repositioning means is maintained out of electrical connection with its electrical switching assembly and functions to provide desired contact repositioning while causing the button to pivot through only a small angular distance. Moreover, desired snap switching action is provided, and may be used as desired to move any number of contacts.

Accordingly, the present invention provides improvements in magnetic switches which enable such switches to be made rapidly and inexpensively on a mass production basis from readily available materials. The switches can be fabricated to provide a desired number of switching positions with any desired number of movable contacts and to exhibit a positive snap switching action. The magnet employed in each switch can be maintained in a permanently magnetized stable condition and in no way interferes with the operation of the electrical circuitry of the system. Other advantages are as set forth in the foregoing.

Various modifications, changes and rearrangements can be made in the switch of the present invention. All such modifications, changes and rearrangements as are within the scope of the appended claims form a part of this invention.

What is claimed is:

1. An improved magnetic switch comprising, in combination, magnetic contact repositioning means and electrical switching means, the electrical switching means including movable electrical contact means, the magnetic contact repositioning means comprising a permanent magnet member, a pair of multi-faced magnetic elements disposed on opposite poles of the magnet member, the respective faces of the magnetic elements forming successive magnetic pole tip pairs of opposite magnetic polarity, generally planar magnetic rocker means in contact with the faces and movable into contact with each single pole tip pair to form a magnetic shunt, and electrically non-conductive means secured to the planar means and coupled to the movable electrical contact means, whereby movement of the planar means effects repositioning of the movable contact means.

2. The improved magnetic switch of claim 1 wherein the magnetic contact repositioning means is maintained out of electrical connection with the electrical switching means.

3. An improved multiposition magnetic switch comprising magnetic contact repositioning means and electrical switching means maintained out of electrical connection therewith, the electrical switching means including a plurality of electrical contact means having movable electrical contact means adapted for connection to electrical circuitry, the magnetic contact repositioning means including a permanent magnet member, a pair of multi-faced magnetic elements disposed on opposite poles of the magnet member and secured in magnetic relation thereto, the respective faces of the magnetic elements forming successive magnetic pole tip pairs of opposite magnetic polarity having generally planar surfaces, the generally planar surfaces of each pole tip pair being disposed at an angle to the generally planar surfaces of each remaining pole tip pair, the number of pole tip pairs corresponding to the number of switch positions of said switch, planar magnetic means seated on a pair of magnetic pole tips and movable by rocker action into contact with successive single pole tip pairs, and electrically non-conductive means secured to the planar means and adapted to move the planar means into contact with successive single pole tip pair, the electrically non-conductive means extending into coupling relation with the movable electrical contact means, whereby movement of the planar means between the pole tip pairs effects repositioning of the movable contact means and electrical switching.

4. The improved multiposition magnetic switch of claim 3 wherein the respective faces of the magnetic elements form planar surfaces representing successive chords of an arc of a circle, wherein the points of juncture of adjacent planar surfaces define recesses and wherein the adjacent surface of the planar magnetic means includes protuberances to be received within the recesses, the planar magnetic means being readily pivotable on the protuberances in the recesses for snap contact with each single pole pair.

5. The improved multiposition magnetic switch of claim 4 wherein the permanent magnet member has a surface adjacent the pole tip pairs defining an arc substantially parallel to and adjacent to the chords of the arc of the magnetic elements, whereby the magnetic flux distribution between respective pole tip pairs is substantially uniform.

6. The improved multiposition magnetic switch of claim 5 wherein a housing is disposed around the electrical switching means, and wherein non-magnetic support elements are disposed adjacent the outer surfaces of the magnetic elements and wherein the permanent magnet member, the magnetic elements and the magnetic support elements are secured together and supported in spaced relation from the electrical switching means in the housing.

7. An improved multiposition magnetic switch comprising in combination, magnetic switch arm repositioning means and electrical switching means, the magnetic switch arm repositioning means comprising a permanent magnet element, a pair of magnetic planar members disposed on opposite poles of the permanent magnet element and in contact therewith, the pair of magnetic planar members being aligned in coextensive parallel relation and having like flat peripheral segments disposed in coplanar relation to define a plurality of pole tip pairs lying on uniform successive chords of an arc, the permanent magnet element having a surface adjacent the pole tip pairs defining an arc lying substantially parallel to the arc defined by the chords of the pole tip pairs, whereby substantially equal magnetic bridging fluxes exist across the pole tips of the successive pairs, a magnetic plate having a flat surface disposed on one of the pole tip pairs, the magnetic plate being free from mechanical attachment to the pole tip pairs and being affixed thereto only by magnetic attraction at the pole tip pairs, the magnetic plate being pivotable on a point between successive chords into contact with each single pole tip pair, a manual button element attached to the magnetic plate, movable therewith and seated over the pole tip pairs, and means coupled to the manual button element, movable therewith and adapted to engage the free end of a movable switch arm, the electrical switching system including a plurality of contact points and a movable switch arm having a free end extending in the direction of the manual

button element, the switch arm being movable into a plurality of electrical contact positions by the means coupled to the manual button element in response to movement of the magnetic plate between successive pole tip pairs.

8. The improved multiposition magnetic switch of claim 7 wherein the electrical switching means includes electrical circuitry which is connected to each of the plurality of contact points through the switch arm and is disposed in an electrically non-conductive housing, wherein the switch arm repositioning means is disposed in the housing out of electrical contact with the electrical switching means, and wherein retaining means are disposed around the button and secured to the housing.

9. The improved multiposition magnetic switch of claim 8 wherein the switch is a three-position switch, and wherein the electrical circuitry includes a light dimming circuit containing a diode adjacent the switch arm and inside the electrically non-conductive housing, the diode being coupled electrically to the three-position switch.

10. A mechanical switching device comprising a magnetic member providing a pair of pole tips separated from one another across a magnetic gap, said pair of pole tips having multiple faces which consist of successive elongated sections with each section having a given configuration, and a magnetic shunting member having successive sections each having a configuration to fit the successive facing sections of said pair of pole tips to form individual stable magnetic shunts across the pole tip pair, said successive sections of the pole tips providing pole tip surfaces lying in selected angular relationship with respect to adjacent sections, said successive sections of the magnetic shunt member having a different angular relationship between adjacent sections than that of the pole tips so that only one section of the pole tip is in contact with the matching section of the magnetic shunt member while the remaining matching sections are angularly disposed relative to one another to form a magnetic gap, whereby said magnetic shunt member is pivoted at a junction between adjacent sections of said pole tips to bring successive matching sections of the shunting member into stable magnetic contact with the faces of the pole tips.

11. The switching device of claim 10 wherein said pole tip faces and said magnetic shunting member include mating surface configurations of small area at the junctions between adjacent sections providing a pivotal point when the magnetic shunting member is pivoted from contact with one matching section of the face of the pole tips to an adjacent matching section.

12. A switching device for providing snap action between successive switch positions comprising a magnetic member having a pair of separated pole tips, said pole tips having multiple faces consisting of successive elongated sections, and a magnetic shunting member also having successive elongated sections, the successive elongated sections of said magnetic shunting member each having a configuration matching the configuration of a

corresponding section of said pole tips for bridging the separation between pole tips to form individual stable magnet shunts across the pole tip pair, said successive sections of the pole tips and the magnetic shunting member having different surface configurations, there being a divergence between the successive sections of the pole tips and the magnetic shunting member, such that only one section of the pole tip is in contact with a matching section of the magnetic shunting member whereby said magnetic shunting member and said magnetic member may be pivoted relative to one another to bring successive matching sections into contact to provide multiple stable switch positions.

13. The switching device of claim 12 wherein means are disposed between adjacent sections on said pole tips and said magnetic shunting member providing a positive pivotal point between sections.

14. The switching device of claim 13 further including an electrical contact means having a multiposition movable contact, and non-conductive extension means coupled for movement by the pivotal action bringing successive matching sections of the shunting member and the pole tips into contact with one another, said non-conductive extension engaging said movable contact for movement between different magnetic switching positions.

15. A multiposition switching mechanism comprising a permanent magnet, a pair of magnetic elements disposed on opposite poles of the permanent magnet, said magnetic elements having a plurality of faces forming separate successive pole tip pairs, and a magnetic shunting member pivotable with respect to adjacent pole tip pairs for positively engaging only one pole tip pair at a time, the magnetic shunting member having a face lying in a diverging angular relationship relative to the faces forming the successive pole tip pairs of said magnetic elements.

16. A multiposition switching mechanism comprising a magnet, a pair of magnetic elements disposed on opposite poles of the magnet, said magnetic elements having a plurality of faces forming successive pole tip pairs of opposite magnetic polarity, and a magnetic shunting member having a plurality of successive faces for contacting only one pole tip pair at a time, the plurality of faces of said mangetic elements lying in a diverging angular relationship relative to the successive faces of said magnetic shunting member said magnetic elements and said magnetic shunting member being pivotable with respect to one another to bring successive faces of said magnetic shunting member one at a time into contact with a respective pole tip pair.

References Cited by the Examiner

UNITED STATES PATENTS

2,896,125	7/1959	Morton	200—144 X
2,971,068	2/1961	Wegner	200—67
3,172,976	3/1965	Abel	200—87

BERNARD A. GILHEANY, *Primary Examiner.*