MAGNETIC COUPLING SWITCH ASSEMBLY

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Filed Aug. 23, 1967, Ser. No. 662,628

Int. Cl. H01H 9/00

U.S. Cl. 335—207

3 Claims

ABSTRACT OF THE DISCLOSURE

Snap acting switch assembly in which the usual mechanical couplings are replaced by magnetic couplings. The switches may be manually operated and snapped into open or closed positions by the forces of attraction or repulsion of the magnetic field of a magnet and may be magnetically operated on the repulsion principle by movement of one magnetic field relative to another. In one form of the invention a magnet of one polarity is carried on one switch arm and a magnet of the same polarity is carried on a next adjacent switch arm. Movement on one magnet and switch arm into one position will exert a repelling force on the next adjacent magnet and switch arm, and reset the next adjacent switch arm. In another form of switch assembly, the switch arms have magnets of the same polarity on their outer ends and a magnet bar is spaced from the outer ends of the switch arms and extends along the ends of the switch arms and is positioned to be of the same polarity as the magnets on the switch arms. The magnet bar is relatively movable with respect to the switch arms to set up a magnetic field repelling the magnetic fields of the magnets on the switch arms, to effect snapping of the switches to their closed positions and to reset the switches upon intentional movement of the magnet bar. Other forms of the invention include various forms of switches operating on the principle of magnetic repulsion.

Summary of the invention and objects

In carrying out our invention we provide a frictionless silent operating switch assembly, particularly adapted for electric guitars and other musical instruments by the use of ceramic permanent magnets, the magnetic fields of which may effect resetting on one or more of the switch arms, as one switch arm is manually moved in a circuit making direction, in response to the repelling lines of force of the magnetic field of the adjacent switch arm. The switches may operate with snap actions by the force of magnetic repulsion and any number of switches may be arranged in side-by-side relation. Resetting of one switch or all of the switches can be attained by individual magnets of the same polarity on the adjacent switch arms, by a movable magnet bar moved by a resetting member, to reset all of the switches of a series of switches or by movement of one switch arm beyond its circuit making position to effect movement of a resetting magnet bar.

A principal object of the invention, therefore, is to provide a novel and improved form of silent operating electric switching assembly in which a snap action in operation of the switching assembly is attained by a magnetic coupling.

Another object of the invention is to utilize a magnetic field to effect a snap action of a switch and the like and to reset certain switches of a series of switches by the operation of one switch in a circuit making direction.

Still another object of the invention is to provide an improved form of silent operating "on" and "off" switch in which friction is minimized by the substitution of a magnetic coupling for the mechanical couplings previously utilized in such switches, and in which the magnetic coupling not only serves to effect a switching operation, but also serves to effect the switching operation with a snap action.

Still another object of the invention is to provide a switching assembly having a plurality of manually operable switches disposed in side-by-side relation with respect to each other, in which a magnetic couple is utilized to effect resetting and operation of the switches with a snap action.

Still another object of the invention is to provide a friction free snap action switch operated by relative movement between two magnets.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIG. 1 is a diagrammatic plan view of an "on" and "off" switch constructed in accordance with the principles of the present invention;

FIG. 2 is a diagrammatic end view of the switch shown in FIG. 1 looking at the switch along lines II—II of FIG. 1;

FIG. 3 is a diagrammatic sectional view taken substantially along lines III—III of FIG. 1;

FIG. 4 is a diagrammatic side view of a modified form of switch constructed in accordance with the principles of the present invention;

FIG. 5 is a fragmentary diagrammatic end view of the switch shown in FIG. 4, with certain parts broken away;

FIG. 6 is a fragmentary diagrammatic top view of the switch shown in FIGS. 4 and 5 with certain parts broken away in order to show certain details of the invention not shown in FIGS. 4 and 5;

FIG. 7 is a fragmentary diagrammatic perspective view of still another form, in which the switch assembly of the present invention may be embodied;

FIG. 8 is a fragmentary diagrammatic perspective view of a form of rocker switch constructed in accordance with the principles of the present invention;

FIG. 9 is a fragmentary diagrammatic end view of a switch like that shown in FIG. 8 with the push button replaced by a solenoid coil;

FIG. 10 is a diagrammatic view of still another form in which my invention may be embodied;

FIG. 11 is a diagrammatic plan view of a scanner switch constructed in accordance with the principles of the present invention; and

FIG. 12 is a diagrammatic generally vertical sectional view of the switch shown in FIG. 11, taken substantially along line XII—XII of FIG. 11.

Description of the preferred embodiment

In the embodiment of the invention diagrammatically illustrated in FIGS. 1, 2, and 3 of the drawings, we have shown a switch assembly 10, comprising a base member 11 and a pair of switch arms 12, 12 riveted or otherwise secured to a bracket plate 13, as by rivets 14. The bracket plate 13 is preferably made from an insulating material and is spaced above the base plate 11 and extends in parallel relation with respect thereto.

As shown in FIGURE 3, the bracket plate 13 is supported on the base 11 by means of nuts and bolts 15, extending through said bracket plate 11 and is spaced above the base plate 11 by nuts 16 threaded on the bolts and interposed between the top side of the base plate 11 and the under side of the bracket plate 13.

The switch arms 12, 12 are made from resilient material which forms a good current conductor, such as Phosphor bronze, or any other form of current conducting material, which will retain its resiliency over
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3. long periods of time. It should be understood, however, that while the switch arms 12 are shown as resilient, riveted to the top surface of the bracket plate 13, that the switch arms need not be resilient, but may be made from a relatively rigid material hinged to said bracket plate.

Each switch arm 12 has a contact 17, depending therefrom intermediate the ends thereof and engageable with a contact 18 on a resilient contact arm 19. The contact arms 19 are suitably secured to the under side of the bracket plate 13 and insulated from the switch arms 12.

A magnet 21 is mounted on the outer end of each switch arm 12 and is shown as extending upwardly therefrom. A push button 22 extends upwardly of each magnet 21 and forms a means for operating the associated switch arm 12, to complete an electrical circuit between the contacts 17 and 18. The magnets 21 are preferably ceramic magnets and preferably made from a thermoplastic material impregnated with barium ferrite. With such magnets the magnetic field may run across the short axis of the bar and will stay in this relationship. The magnetic field also will not be destroyed by the passing of an alternating current through the magnet.

The magnets 21 are each of the same polarity, with their south poles at the tops of the switch arms 12 and north poles at the bottoms of the magnets. As one switch arm and magnet is depressed to complete a circuit between the contacts 17 and 18 and the other switch arm 12 and magnet 21 is in position to complete a circuit between corresponding contacts 17 and 18, the field of force of the magnet on the switch arm moving into a contact making position will repel the field of force of the magnet on the switch arm in a contact making position, and force the magnet on the switch arm in a contact making position to move out of its contact making position by the forces of repulsion between the two magnets. Thus, as one switch arm is moved to make a circuit the other switch arm is reset to break a circuit.

A bridge plate 23 extends across the tops of the switch arms 12, 12 in parallel relation with respect to the base plate 11, and is mounted on the base plate 11 to extend in parallel relation with respect to each other. The bolts 25 extending upwardly of said base plate and held to said base plate by nuts 26 threaded thereon. The bridge plate in turn is secured in position by nuts 26 threaded on the bolts 25 and abutting the top and bottom surfaces of said bridge plate. A resilient stop 27, which may be made from felt or any other suitable resilient material, extends along the bottom of the bridge plate 23, to limit upward movement of the switch arms 12, 12 and prevent chatter of said switch arms, as one magnet is repelled in an upward direction by the other magnet moving in a downward direction. A resilient stop 29 extends across the front portion of the base plate 11 beneath the magnets 21, 21. The resilient stop 29 may likewise be made from felt or any other suitable resilient material and forms a stop for the switch arms 12 and also permits the switch arm 12 and magnet 21 moving in a contact making direction to move beneath the switch arm 12 and magnet 21 in a contact making position, to position the magnetic field of a downwardly moving magnet to repel the magnetic field of the next adjacent magnet and effect upward movement thereof, to reset the adjacent switch arm 12 to an open position.

With the structure just described, the magnetic fields of the two side-by-side magnets, constantly exert a repulsion force on the two magnets to force one switch arm into engagement with the upper stop 27 and to force the other switch arm into engagement with the lower stop 29 as moved past an unstable position. The two switches are thus alternately operable by the operation of a single switch button and the magnetic forces between the magnets 21 give a positive snap action. The switch further is noiseless and has a minimum of moving parts and with no moving parts creating any degree of friction.

In the embodiment of the invention illustrated in FIGS. 4, 5, and 6 of the drawings, we utilize the same general principles of magnetic couples as in the form of the invention shown in FIGS. 1, 2 and 3 of the drawings, but provide a movable magnet 30 spaced in advance of switch arms 31 and magnets 33 mounted on said switch arms, for resetting certain of the switches upon relative movement of the movable magnet 30 with respect to the magnets 33.

As shown in FIG. 4, the switching assembly includes a housing having a bottom plate 37 and vertically extending switch base 36 extending along one side thereof and mounted thereon by angle brackets 37, bolted on otherwise secured to the bottom plate 35. The switch arms 31 like the switch arms 12 are made from a resilient current conducting material such as Phosphor bronze or like material. Said switch arms 31 have right angled bases 39 abutting the inner face of the vertical base plate 36, and riveted or otherwise secured thereto. Beneath each switch arm 31 is a resilient contact arm 40 having a right angle base 41 riveted or otherwise secured to the insulating base plate 36. The switch arms 31 and contact arms 40 made of the magnet and the brackets made from some of the well-known materials providing hardened contact surfaces inhibiting burning between the contacts.

A cover 43 extends parallel to the bottom plate 35 and is spaced above said bottom plate by posts 44 secured to said bottom plate and covered as by means of flat washers, nuts 45, threaded in opposite ends of said posts. The cover 43 is shown in FIG. 6 as having a series of oval openings 46 formed therein to receive push button 47 extending upwardly of the magnets 33.

The magnet bar 30 is mounted on a rocker plate 48 and is spaced above the said rocker plate by a spacer 49 extending therealong. The rocker plate 48 has spaced tangs 50 extending therefrom by openings 51 in the vertical legs of the angle brackets 37. The tangs 50 thus form hinge mountings for said rocker plate on the angle brackets 37. A resilient stop 53, which may be made from felt or like resilient material, extends along the rocker plate 48 and rear side of the spacer 49, and is biased into engagement with the under surface of a contact arm 40 by a tension spring 55.

The tension spring 55 is hooked at one end to the rocker plate 48 intermediate to the ends of said rocker plate, and is hooked at the other end to a bracket 56, secured to the end of the insulating mounting base 36 and extending inwardly therefrom toward the magnet bar 30. A stop arm 57 is bolted or otherwise secured to the insulating base plate 36 and has a leg 59 extending along and above the top surface of the rocker plate 48 toward the spacer 49, and serves to limit upward movement of said rocker plate and magnet bar 30 toward the cover plate 43. The stop 47 may be made from a relatively thin spring steel to give said stop some resilience, as the rocker plate is moved upwardly into engagement therewith by the tension spring 55. resilient stops 60 are shown and secured to the under surface of the cover plate 43 and as extending along opposite sides of the openings 46, to engage the under surfaces of the magnets 33, when the individual switches are in their open positions, to prevent chattering of the switch arms and cut down noise. The resilient stops 60, like the resilient stop 53 may be made from felt or any other suitable sound deadening material.

The magnets 33 are shown in FIGS. 4, 5 and 6 as being mounted on the outer ends of the switch arms 31 with their south poles on the tops of said magnets and their north poles on the bottoms of said magnets, and abutting the tops surfaces of said switch arms, and with their south pole facing upwardly and its north pole facing downwardly.
As a switch arm 31 and movable magnet 33 is manually depressed past center by pushing on the push button 47, the magnet 33 moving downwardly relative to the bar 30 will pass through a mid-position of unrest and will also be magnetically forced downwardly in the position of the switch arm 31 with a contact arm 40 with a snap action, and will be held in position beneath the contact bar 30 by the forces of repulsion between the two magnets.

If the magnet 33 is only moved downwardly into position to make contact between the switch arm 31 and the contact arm 40, the magnet will remain in this position by the forces of repulsion and will stay in this position as pressure is relieved from the push button 47. If, however, the movable magnet is pushed downwardly a further distance by the exertion of pressure on the push button 47, the contact arm 40 will be moved into engagement with the resilient stop 53 and cause the rocker plate 48 to pivot downwardly. This will move the magnet bar 30 downwardly, and if another switch arm 31 is in its contact making position, the magnet bar 30 will repel the magnet 33 on the switch arm in its contact making position to force the magnet 33 and switch arm 31 in a contact making position upwardly into a contact breaking position.

It should be understood that the contact arm 40 of a heavier gage material than the switch arm 31. This is to maintain the switch arm 31 in engagement with the contact arm 40, as the rocker plate 48 is forced downwardly by continued downward pressure on the push button 47, and to accommodate the contact arm 40 to remain in the position shown, as the switch arm 31 and magnet 33 are repelled by a downward rocking movement of rocker plate 48 and the magnet 30 mounted thereon.

A reset button 61 is slidably mounted in the cover 43 for engagement with the rocker plate 48, to rock said rocker plate in a downward direction and reset all of the switches into their open positions, upon depression of said push button. While we have shown a reset push button 61 at one end of the switch casing, it should be understood that it may be at either end of the switch casing or in any convenient location along the switch casing. The reset means may also be a lever (not shown) pivotally mounted on the casing intermediary its ends, and engaged at either end to depress the magnet 30 and rocker plate 48 and reset the switches. Also if desired an electromagnet (not shown) may be used to reset the switch.

With the particular magnetic coupled switch arrangement just described, any number of switch arms and push buttons may be provided, and all of these switch arms may be moved to their circuit closing positions as their respective push buttons are depressed and will stay in these positions until released by movement of the magnet bar 30 in position to exert repelling forces on the movable magnets 33 on the ends of the switch arms 31. The switches may be reset by depression of the reset button 61, or by depression of any of the push buttons 47, depressing the switch arms 31 beyond contact making position into position to rock the rocker plate 48 in a downward direction to position the magnet 30 to exert repelling forces on the magnets 33.

The switching assembly just described is particularly useful for electronic musical instruments, and makes it possible for the player to quickly combine several tones by the cooperation of several switches pressed either individually or simultaneously. The switching assembly may have any desired number of push buttons which will operate the switches silently and smoothly and give a positive feel by the snap actions attained by the cooperating stationary and movable magnets.

It will be understood that while the resilient arms 31 are described as contact arms, that said arms need not be contact arms, but may operate separate contact arms, and that the push buttons may be mounted on hinged levers rather than resilient arms, since the magnetic forces will hold the switch contacts in their contact making and contact breaking positions.

In FIG. 7 of the drawings we have diagrammatically shown a magnetic switch operating on the principle of magnetic attraction. The switch shown is similar to the switch of FIGURES 4, 5 and 6 except a physical contact is made between individual magnets 63 on the ends of resilient switch arms 64 and a bar 65 extending along a rocker plate 66 beneath and in direct alignment with the magnets 63. The bar 65 may be a permanent magnet of opposite polarity from the polarity of the magnets 63, to attract and hold said magnets and switch arms 64 in contact making positions with respective contact arms 67, disposed directly beneath said switch arms, as in the form of the invention illustrated in FIGURES 4, 5 and 6.

The switch arms 64 and the contacts arms 67 are riveted or otherwise secured to a base plate 69 made from an insulating material. The rocker plate 66 is rocking mounted in the base plate 69 and biased in the position shown in FIGURE 7 as by a tension spring 70. Suitable stop means may be provided in FIGURES 4 and 5 to prevent the bar 65 from excessive movement of the rocker plate 66 and for positioning the bar 65 in the proper spaced relation with respect to the magnets 63.

The bar 65 may be made from a ferrous material rather than a permanent magnetic material. Where the bar is made from such a material, a ferrous plate 68 may be mounted on the bottom of each magnet 63, to concentrate the magnetic flux of the magnets 63 at the south poles of the magnets, and to thereby increase the holding power of the magnets.

A push button (not shown) or any other suitable operator may be provided to move the switch arms 64 into contact with the contact arms 67 to make an electrical circuit and to contact the bar 65. As the magnets 63 contact the bar 65, the magnetic forces will provide a snap action for the switches and hold the individual contacts in their circuit making positions until positively released by exerting a depressing force on the plate 66.

In the form of the invention diagrammatically illustrated in FIGURE 8 the switch arms are in the form of rocker arms 71 mounted on a rocker shaft 72 suitably supported on a base plate 73.

Each rocker arm 71 has a magnet 75 recessed therein and is shown as having its north pole facing upwardly and its south pole facing downwardly, to be snapped to a switch closing position and then be reset to a switch opening position by the magnetic forces of a resilient magnet 76. The magnet 76 has an upwardly facing north pole and a downwardly facing south pole and is spaced in advance of and extends along the rocker arms 71.

Each rocker arm 71 has a push button 77 extending upwardly therefrom and shown as being in alignment with the associated magnet 75 to accommodate the rocker arm to be rocker into a switch closing position by the finger and to be snapped to its switch opening and closing positions by the repulsion forces between the magnets 75 and 76, as the north pole of the magnets 75 are moved beneath the north poles of the magnets 76. An electrical contact 79 is mounted on the bottom of each rocker arm 71 for cooperation with an electrical contact 80 on the end of a resilient switch arm 81 riveted or otherwise secured to the base 73 and biased toward the contact 79.

A stop 82, which may be made from felt or any other resilient sound deadening material, is provided to prevent movement of each rocker arm 71 in a switch opening direction. A resilient stop 83, which may also be made from felt or any other suitable sound deadening material, is provided to limit movement of the rocker arm 71 in a switch closing direction.

The magnet 76 is mounted on a vertical leg 85 of a resilient bracket 86 and extends inwardly of said vertical leg and is biased in the position shown in FIGURES 8 and 9 by the resiliency of said bracket. The resilient bracket 86 may be made from a spring steel or any other
suitable spring material and has a pair of parallel spaced legs 87 extending along the base 73 and along the outer sides of the rocker arms 71, and riveted to the base plate 73 at their rear or inner ends, as by rivets 88.

The resilient bracket 86 is of sufficient rigidity to normally position the magnet 76 in the position shown in FIGURE 9. A stop 89 (not shown) may be provided to limit upward movement of the magnet 76 and to prevent movement of one or more of the rocker arms from displacing said magnet bar until intentionally displaced by operation of a release lever 89 disposed above said magnet bar. The release lever 89 is shown diagrammatically shown as being pivoted intermediate its end on a pivot pin 90, which may be mounted on the base 73 for movement about a horizontal axis extending transversely of said base. The gage of the metal from which the bracket 86 is made is heavy enough so depression of the lever 89 from either end thereof will displace the main magnet downwardly with its attitude remaining in parallel relation with respect to the base 73. As the main magnet 76 is engaged by the lever 89 by depression of said release lever arm, the bracket 86 will accommodate downward movement of said main magnet, but will retain said magnet for a position with its attitude in generally parallel relation with respect to the base 73. As the main magnet is moved downwardly to position its north pole beneath the north poles of the magnets 75, the forces of repulsion will reset the rocker arms 71 from their dotted line positions shown in FIGURE 9 to the solid line positions shown in FIGURES 8 and 9. Release of pressure on the main magnet will then accommodate the main magnet to return to its position shown in FIGURES 8 and 9 and magnetically bias the rocker arms 71 in the contact opening position shown in these two figures. It should be understood that any number of rocker arms may be mounted on the resilient arm 94 and the release lever 89 may be pivoted intermediate the ends of said base plate to accommodate ready resetting of all of the rocker arms to their switch opening positions from either end of the base plate 73.

In FIGURE 9 we have shown an electromagnet 77a which may take the place of the push buttons 77 and may be energized to exert repelling forces on the permanent magnet 72 and effect movement of a rocker arm 71 into a switch closing direction to operate the switches from remote positions. The magnet 76 may also be moved to a resetting position by energization of a similar electromagnet (not shown).

In FIGURE 10, we have shown a form of rocker switch similar to the rocker switch shown in FIGURES 8 and 9 in which a rocker arm 71a on a shaft 72a is held in its circuit energizing position by a stationary magnet 76a mounted on a base plate 73a with its magnetic field in repelling relation with respect to a permanent magnet 75a depending from the rocker arm 71a. The stationary magnet 76a besides giving a snap opening and closing action to the switch, holds the switch in its open and closed positions. A contact 79a on the bottom of the rocker arm 71a cooperates with a contact 89a on contact arm 81a, to complete an electrical circuit when the switch is in the position shown in FIGURE 10. Stops 82a and 83a like the stops 82 and 83 are provided to limit rocking movement of the rocker arm 71a in either direction.

In FIGURES 11 and 12 of the drawings, we have shown the principles of our invention applied to a taping machine form of the invention, a stator 91 is provided and is shown as being in the form of a disc 93 made from an insulating material, such as, a phenolic material, and having a plurality of resilient switch arms 94 extending radially of the periphery thereof and having upwardly facing permanent magnets 95 on the ends thereof. Rivets 96 or other suitable securing means are provided to mount the arms 94 on the disc 93. A series of stops 97 is shown as being disposed above the resilient arms 94 to limit upward movement of said arms and to thereby prevent bounce of said arms. Each resilient arm 94 has a contact 98 on the bottom thereof engageable with a contact 99 on a base 100. A rotor shaft 101 extends through the disc 93 and is rotatably mounted in the base 100 to enable an arm 102 extending radially from said shaft and a magnet 103 on the end of said arm to be positioned in registry with a selected magnet 95. The magnets 103 and 95 are arranged with the magnetic fields of said magnets repelling each other and thereby forcing a contact 98 to engage a contact 99 by the resiliency of the switch arm 94. The arm 102 is sufficiently rigid to hold the magnet 103 from downward movement relative to the magnet 95.

Each time a magnet 103 is moved into registry with a magnet 95, a circuit will be completed between the contacts 98 and 99, and as the magnet 103 moves past the magnet 95 the circuit will be broken by the resiliency of the switch arm 94. While the magnet 103 is shown as being of the same size as the magnet 95, and is thereby effective to operate only one switch, the magnet 103 may be in the form of a segment of a circle to operate more than one switch if desired.

In FIGURE 12 we have shown an indexing magnet 105 spaced above the magnet 103. One indexing magnet 105 may be spaced above each magnet 95 in the manner diagrammatically shown in FIGURE 12, to positively index the arm 102 and magnet 103 as it moves over a selected magnet 105, by the forces of attraction between the magnets 105 and 103. The indexing magnets are particularly advantageous where it is necessary to rapidly select a circuit since it causes a drag in rotatable movement of the rotor magnet 103 and holds the rotor magnet in position when positioned under a magnet 105 and thereby eliminates the necessity of mechanical indexing in devices, which are particularly necessary where the entire switch assembly may be enclosed within a casing and the magnet 103 is moved about the axis of the rotor shaft 101 by hand.

In the present form of scanner switch the friction as the contacts slide against each other during rotation of the rotor and the resultant drag on the rotor and wear of the contacts is eliminated, and a simple positive acting scanner switch has been provided, requiring a minimum amount of maintenance.

It should be understood that where the magnet is made from a thermoplastic material impregnated with barium ferrite that the material may be formed to conform to various switch arrangements, and that parts of a strip may be magnetized while other parts may be demagnetized.

While we have herein shown and described several forms in which the invention may be embodied, it should be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

We claim as our invention:
1. A switch assembly comprising in combination,
(a) a base,
(b) an insulating plate mounted on and spaced from said base in parallel relation with respect thereto,
(c) at least two switch arms mounted on said insulating plate in side-by-side relation with respect to each other and for relative movement with respect to each other in opposite directions in laterally spaced parallel planes,
(d) contact means in alignment with said individual switch arms and spaced therefrom and contacted by said switch arms to complete energizing circuits,
(e) an individual magnet mounted on each of said switch arms remote from said insulating plate,
(f) means individual to said switch arms accommodating manual movement of a selected switch arm into a contact making position,
(g) the magnetic fields of said magnets being in repelling relation with respect to each other in the circuit.
making and circuit breaking positions of said switch arms, whereby manual movement of one switch arm into a circuit making position will effect movement of the other switch arm into a circuit breaking position.

2. A switch assembly comprising in combination,

(a) a base,
(b) at least two switch arms mounted on said base in side-by-side relation with respect to each other for movement relative to each other,
(c) a separate first magnet mounted adjacent the free end of each switch arm,
(d) a second magnet mounted on said base in advance of said first magnets and extending therealong for relative movement with respect to said switch arms and the magnets thereon,
(e) an individual operating member for each first magnet and switch arm associated therewith,
(f) means mounting said second magnet for movement relative to said first magnets,
(g) the magnetic field of said second magnet being in repelling relation to the magnetic fields of said first magnets and extending along the short axis of said magnet, and
(h) said operating means for said second magnet, being operated by operation of a selected operating member for one of said switch arms and operable to reset the other of said switch arms upon movement of said one of said switch arms into a contact making direction.

3. A switch assembly according to claim 2,

wherein said mounting means for said second magnet biases said second magnet in the general plane of said first magnets in the circuit making positions of the switch arms, carrying said first magnets, and wherein said individual operating members are in alignment with and have operative connection with said means means mounting said second magnet on said base, and are each operable to operate said means mounting said second magnet on said base and effect movement of said second magnet into position to reset the other of said switch arms upon operation of any one of said operating members, and movement of the switch arm operated by said operating member beyond a circuit closing position.

4. The switch assembly of claim 3,

wherein the second magnet is so positioned with respect to the magnets on said switch arms as to effect snap movement of said switch arms in their circuit making and circuit breaking directions.

5. The switch assembly of claim 4,

wherein the first and second magnets are made from a thermo-plastic material impregnated with barium ferrite and are all magnetized along the short axis of the material.

6. In a switch assembly,

(a) a base,
(b) at least two switch arms mounted on said base in side-by-side relation with respect to each other,
(c) contacts on said base spaced from said switch arms,
(d) a magnet on the end of each switch arm, said magnets being arranged with their magnetic fields flowing in the same direction,
(e) a movable magnet member extending along said magnets on said switch arms and positioned with its magnetic field flowing in the same direction as the magnetic fields of said magnets on said switch arms and along the short axis of said movable magnet member, to hold said switch arms in circuit making positions by the forces of repulsion between said movable magnet member and said magnets on the ends of said switch arms upon depression of one of said switch arms,
(f) means mounting said movable magnet member on said base for movement into position to repel said magnets on said switch arms and to effect movement of said switch arms into circuit opening positions,
(g) and operating means for said means mounting said movable magnet on said base effective to move said movable magnet member relative to said base to repel said magnet on at least one of said switch arms and reset the switch associated therewith.

7. A switch assembly in accordance with claim 6 including:

(a) a rocker plate hinged to said base and forming the means mounting said movable magnet member on said base,
(b) biasing means normally positioning said rocker plate and the movable magnet mounted thereon into position to effect snap action movement of said switch arms into closed positions upon manual depression of said switch arms,
(c) and said switch arms being in alignment with said rocker plate and having engagement therewith upon depression of one switch arm beyond its circuit closing position to effect movement of said rocker plate and the movable magnet mounted thereon to reset the other switch arm into a circuit opening position.

8. A switch assembly in accordance with claim 7 wherein in more than two switch arms are mounted on said base and wherein an operator is guided for movement with respect to said base for moving said rocker plate and the magnet thereon into position to effect resetting all of said switch arms into circuit opening positions by the forces of repulsion between said magnets.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,497,842 Dated February 24, 1970
Inventor(s) J. C. Cookerly et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 33, change "repeal" to --repel--.
Column 4, line 15, change "on" to --or--.
Column 4, line 19, change "Phosphor" to --luminum--.
Column 6, line 55, change "rocker" to --rocked--.
Column 7, line 13, change "end" to --ends--.

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(SEAL)
Attest:
Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents