

United States Patent

[11] 3,579,159

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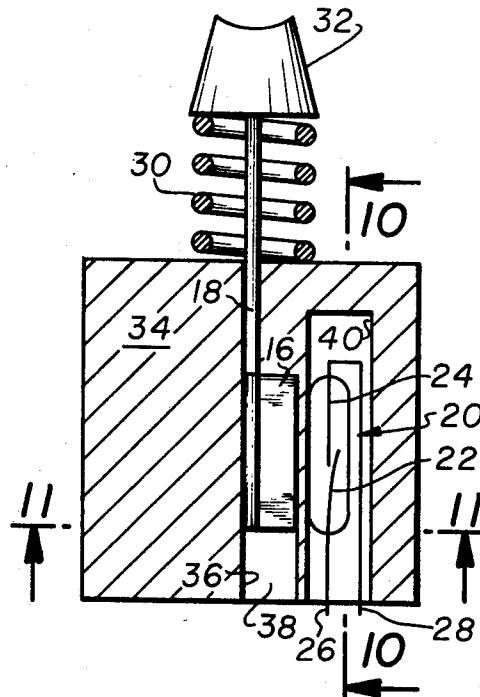
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[54] PUSHBUTTON MAGNETIC REED SWITCH
7 Claims, 32 Drawing Figs.

[52] U.S. Cl. 335/205
[51] Int. Cl. H05b 51/28
[50] Field of Search 335/205,
206, 207

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ABSTRACT: A novel reed switch assembly provided with a ceramic bar magnet as the switch actuating means is disclosed. The structure of the novel reed switch is characterized by the arrangement of the ceramic bar magnet with an iron backing plate.



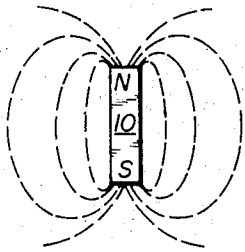


FIG. 1
PRIOR ART

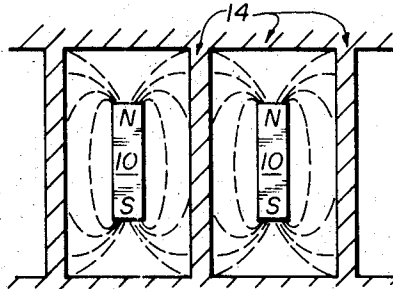


FIG. 2
PRIOR ART

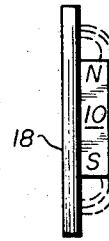


FIG. 3
PRIOR ART

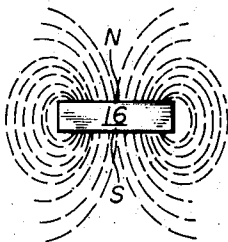


FIG. 4

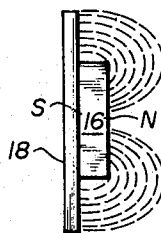


FIG. 5

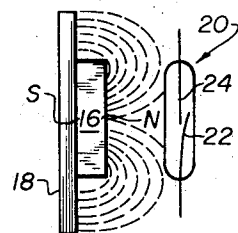


FIG. 6

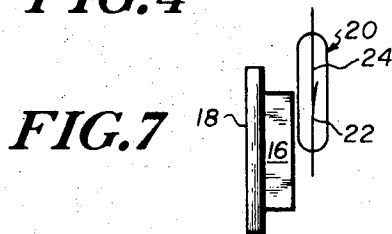


FIG. 7

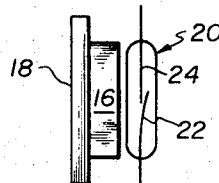


FIG. 8

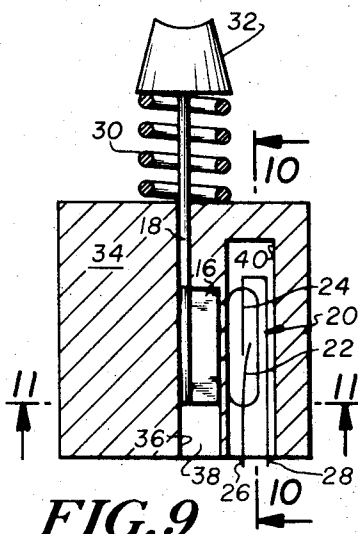


FIG. 9

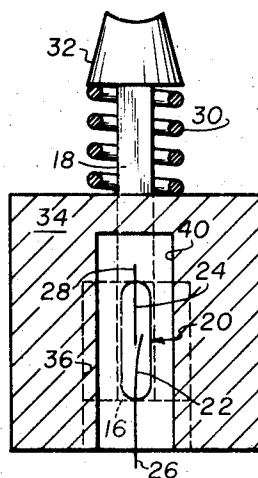


FIG. 10

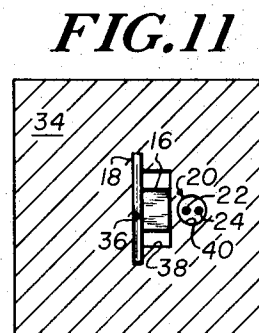
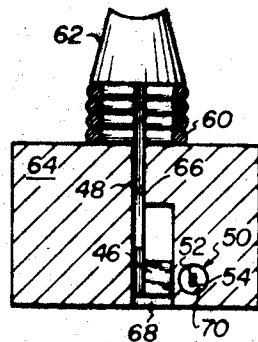
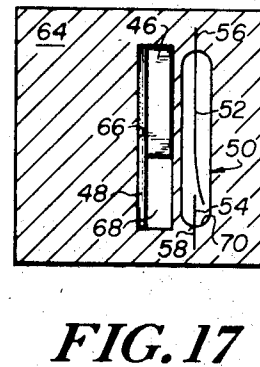
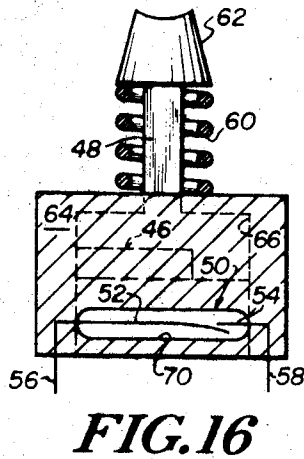
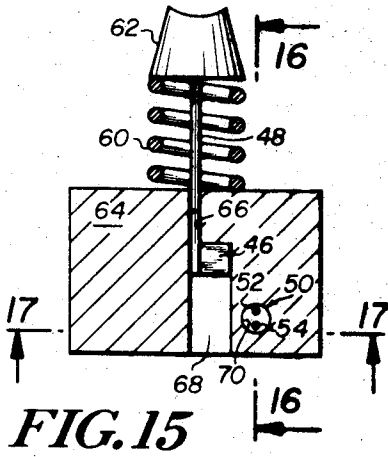
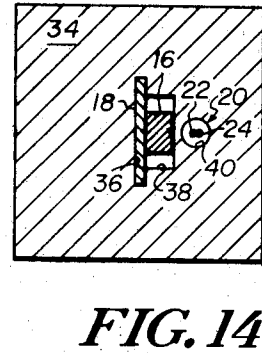
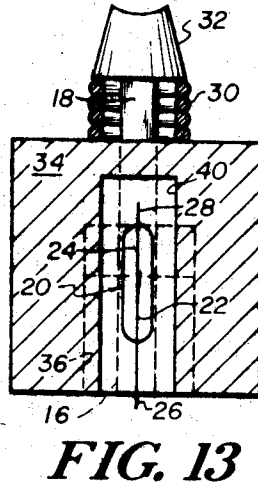
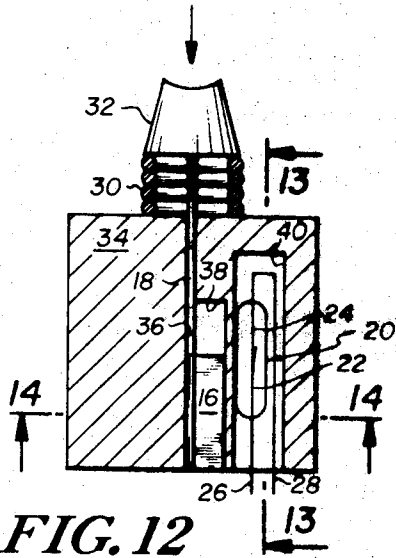


FIG. 11

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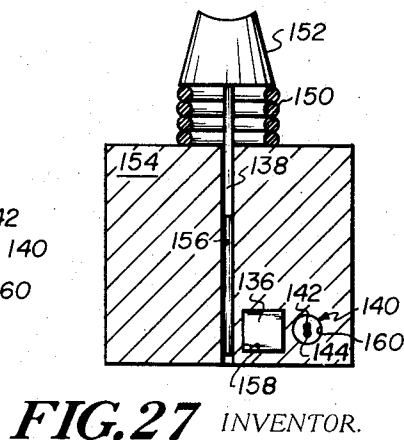
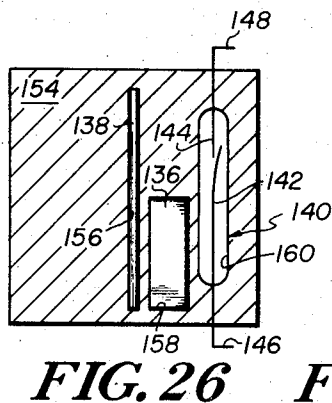
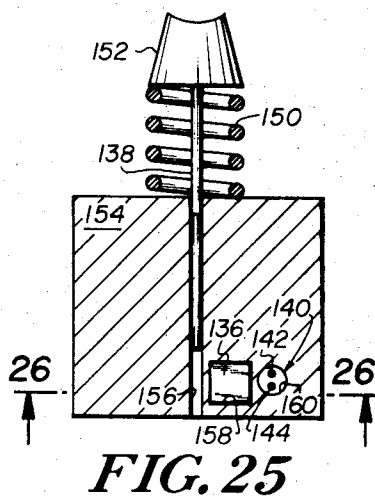
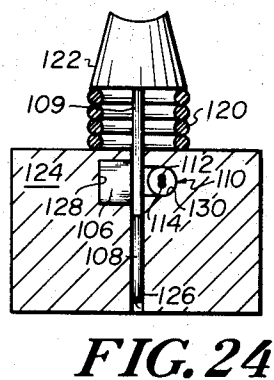
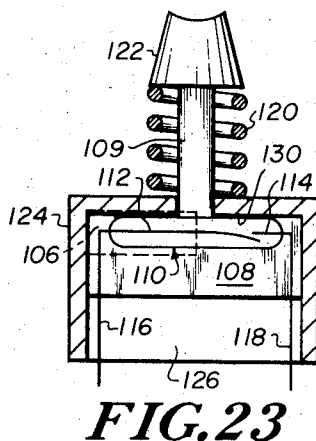
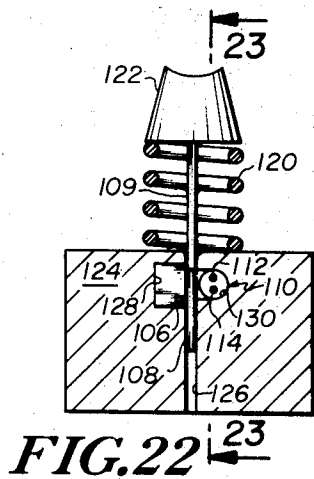
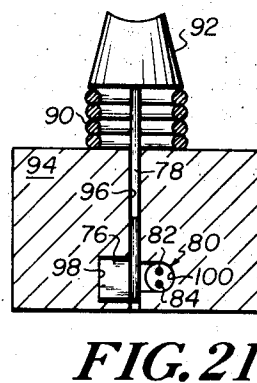
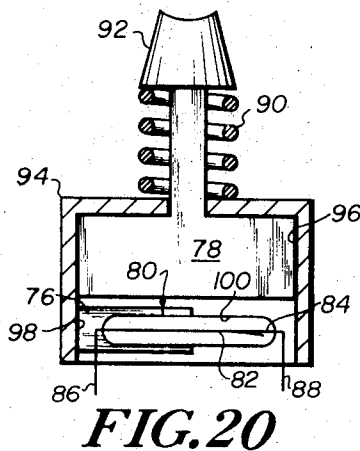
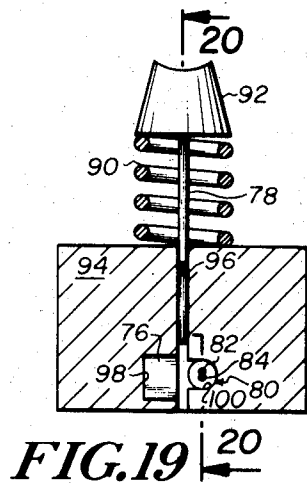
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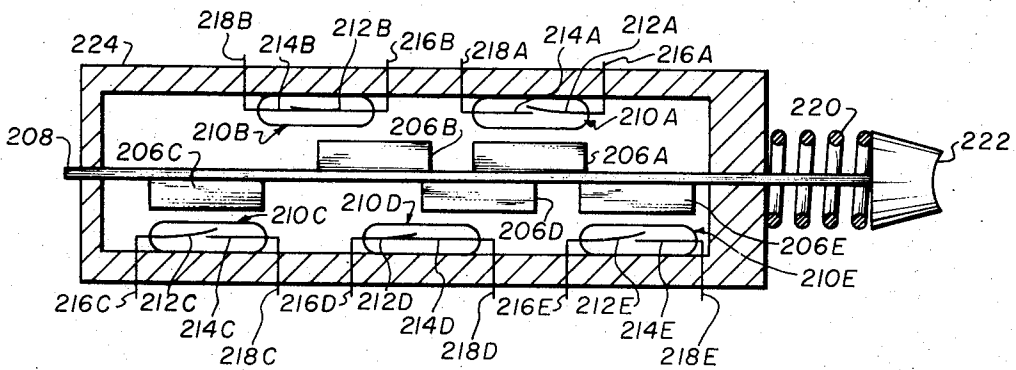
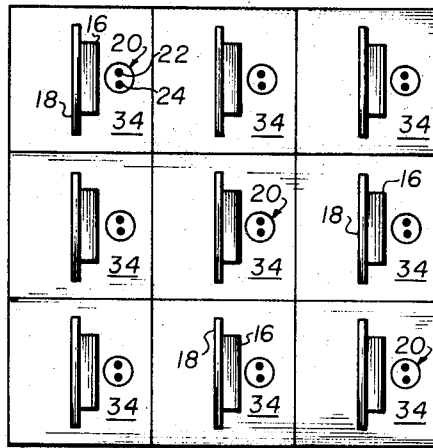
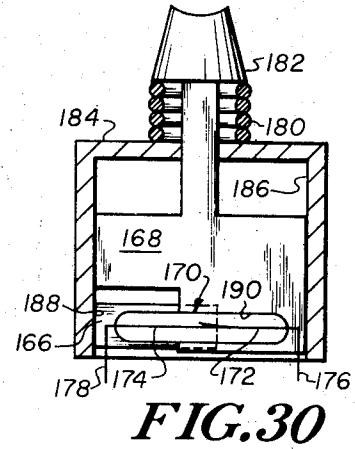
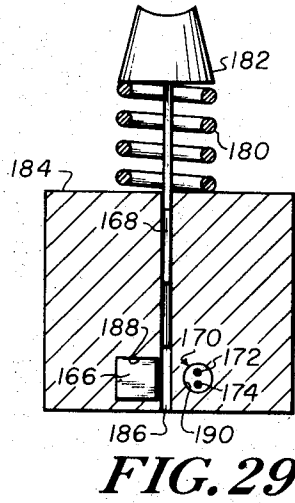
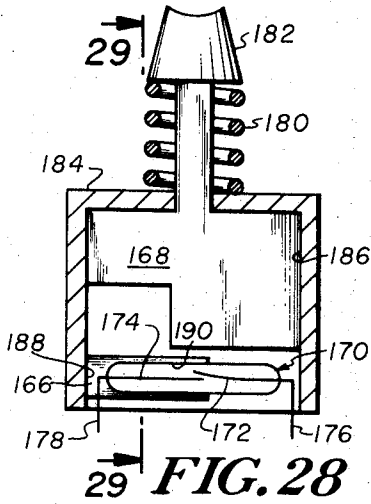
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PUSHBUTTON MAGNETIC REED SWITCH

FIELD OF THE INVENTION

The invention relates to switches for electrical circuits and has application to any electrical circuit wherein conventional reed switches may be used. It has particular application to opening and closing circuits in computers, calculating machines, stock quotation machines and similar equipment wherein reliable noiseless response is vital.

DESCRIPTIONS OF THE PRIOR ART

The basic idea of a pushbutton magnetic reed switch is presently known in the art. As a result of the inherent reliability and durability of magnetic reed switches, a wide variety of applications have been found for their use. They are particularly suited for installations wherein noiseless operation is desirable.

In general, a pushbutton reed switch assembly is comprised of a housing having arranged therein a reed switch and means to open and close the reed switch.

Conventional reed switches generally consist of a pair of coating reeds arranged in a capsule of glass or similar dielectric material. The reeds are usually connected to a respective electrical conductor and operate to close the circuit in which they are located when they are forced to make contact. Normally, the reeds are made of material of high magnetic permeability and low magnetic retentivity to facilitate the use of a magnetic field to effect opening and closing of the switches.

Presently electromagnets and permanent conventional bar magnets of iron, nickel, cobalt or similar materials are used to provide the magnetic field required to activate the reed switches. It is a characteristic of these magnets that their field radiates almost uniformly in all directions. Consequently, when a reed switch employing one of these magnets is used in an environment wherein the magnetic field emanating therefrom might inimically effect a component located nearby, a magnetic shield must be placed around the magnet. Magnetic shielding, in turn, absorbs much of the magnet's magnetic field hence, a larger magnet than would normally be needed must be used to provide a sufficient magnetic field to actuate the reed switch.

This problem is particularly acute in high-speed applications, such as typewriter keyboards wherein the space between switches on the keyboard must generally be limited to three-fourths of an inch.

The prior art also includes ring magnets of the same ceramic material found in the type magnet used in the reed switch of the present invention. The ring magnet, as seen in U.S. Pat. No. 3,283,274 (Nov. 1, 1966), like the conventional bar magnets also suffers from the fact that it also occupies more space when used in a magnetic reed switch assembly than the ceramic magnet of the present invention. In addition, the field of the ring magnet is designed to be as strong at the side remote from the switch reeds as the side adjacent the switch reeds.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a pushbutton magnetic reed switch that will occupy a minimal amount of space.

It is another object of the present invention to provide a pushbutton magnetic reed switch that will not require shielding.

It is a further object of the present invention to provide a reliable, durable and virtually silent pushbutton reed switch which will be able to operate in environments wherein space requirements are restricted to a minimum.

To this end, the present invention embodies a pushbutton reed switch wherein a ceramic bar magnet is used to open and close the switch elements of the reed switch. The ceramic magnet of the present invention is polarized across its transverse axis and arranged with a backing plate of magnetizable material which serves to increase the magnetic field facing the

reed switch while attenuating the field remote therefrom. Accordingly, with the use of the ceramic bar magnet in the pushbutton assembly of the present invention a compact array of pushbutton reed switches can be arranged in close proximity without the requirement of shielding.

Basically, the ceramic bar magnet and the reed switch capsule are arranged in adjacent chambers within the pushbutton reed switch housing. Normally the reed switch capsule is snugly secured within its internal chamber to insure against movement while the ceramic bar magnet is mounted on the iron backing plate for slidable movement with respect to the reed switch.

The movement of the ceramic bar magnet with respect to the reed switch must be arranged to provide an orientation wherein the ceramic bar magnet is directing its magnetic field only to one reed of the reed switch and a second orientation wherein the field of the ceramic bar magnet is directed to either both reeds or to neither reed. When the magnetic field is directed to only one reed the switch will close. When the magnetic field is directed to both reeds or neither reed the switch will remain open.

Basic embodiments of the invention include moveably mounted ceramic bar magnets which can be moved into and out of communication with one of the reeds of the reed switch and fixed position ceramic bar magnets combined with moveable shielding designed to selectively afford or deny communication between the magnetic field and one reed of the reed switch.

A variety of specific embodiments more fully described hereinafter results from the versatility afforded by the desirable properties unique to the ceramic bar magnet.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic sketch of a conventional bar magnet made of iron, nickel, cobalt or similar material and the magnetic field emanating therefrom;

FIG. 2 is a diagrammatic view of two closely arranged conventional permanent magnets with magnetic shielding;

FIG. 3 is a diagrammatic view of a conventional permanent magnet on an iron plate and the effect thereof on the magnetic field;

FIG. 4 is a diagrammatic view of a ceramic bar magnet polarized through its transverse axis and the attendant magnetic field;

FIG. 5 is a diagrammatic view of the ceramic magnet of FIG. 4, arranged on an iron plate and the resultant magnetic field;

FIG. 6 is a diagrammatic view of the magnetic field of the ceramic magnet and iron backing plate of FIG. 5 with a conventional encapsulated reed switch;

FIG. 7 shows the ceramic magnet and iron backing plate of FIG. 5 arranged in proximity to one blade of a conventional encapsulated reed switch;

FIG. 8 shows the ceramic magnet and iron backing plate of FIG. 5 arranged in proximity to both blades of a conventional encapsulated reed switch;

FIG. 9 is a sectional elevational view of a pushbutton switch assembly with a ceramic bar magnet and backing plate slidably arranged in the same vertical plane with a conventional encapsulated reed switch;

FIG. 10 is a sectional elevational view taken through line 10-10 of FIG. 9;

FIG. 11 is a sectional plan view taken through line 11-11 of FIG. 9;

FIG. 12 is a sectional elevational view of the pushbutton switch assembly of FIG. 9 with the pushbutton depressed;

FIG. 13 is a sectional elevational view taken through line 13-13 of FIG. 12;

FIG. 14 is a sectional plan view taken through line 14-14 of FIG. 12;

FIG. 15 is a sectional elevational view of a pushbutton reed switch having a slidably arranged horizontally disposed ceramic

ic bar magnet and a horizontally disposed conventional encapsulated reed switch;

FIG. 16 is a sectional elevational view taken through line 16-16 of FIG. 15;

FIG. 17 is a sectional plan view taken through line 17-17 of FIG. 15;

FIG. 18 is a sectional elevational view of the pushbutton reed switch of FIG. 15 with the pushbutton depressed;

FIG. 19 is a sectional elevational view of an embodiment of the pushbutton reed switch of the present invention with a horizontally disposed ceramic bar magnet, a conventional reed switch and a vertically moveable iron plate therebetween;

FIG. 20 is a sectional elevational view taken through line 20 of FIG. 19;

FIG. 21 is a sectional elevational view of the pushbutton reed switch of FIG. 19 with the pushbutton depressed;

FIG. 22 is a sectional elevational view of a variant form of the pushbutton reed switch of FIG. 19 with a horizontally disposed ceramic bar magnet and a conventional reed switch;

FIG. 23 is a sectional elevational view taken through line 23-23 of FIG. 22;

FIG. 24 is a sectional elevational view of the pushbutton reed switch of FIG. 22 with the pushbutton depressed;

FIG. 25 is a sectional elevational view of another variant of the basic pushbutton reed switch with a horizontally disposed fixed ceramic magnet and a conventional encapsulated reed switch;

FIG. 26 is a sectional plan view taken through line 26-26 of FIG. 25;

FIG. 27 is a sectional elevational view of the pushbutton reed switch of FIG. 25 with the pushbutton depressed;

FIG. 28 is a sectional elevational view of another variant of the basic pushbutton reed switch with a fixed horizontally disposed ceramic bar magnet and a conventional encapsulated reed switch;

FIG. 29 is a sectional elevational view taken through the line 29-29 of FIG. 28;

FIG. 30 is a sectional elevational view of the pushbutton reed switch of FIG. 28 with the pushbutton depressed;

FIG. 31 is a sectional plan view of a plurality of adjacently arranged pushbutton reed switches of the present invention as embodied in FIGS. 9-13; and

FIG. 32 is a multiple reed switch embodying the basic design of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The advantages of the pushbutton reed switch of the present invention can best be appreciated by an analysis of the magnetic properties of ceramic and conventional magnets. As best seen in FIGS. 1 and 2, the field of a conventional magnet 10, as shown by the attendant lines of force, radiates outwardly with virtually equal intensity from the magnet 10 in all planes. Consequently, when several magnets are arranged in proximity to each other, magnetic shielding 14 must be employed to obviate the deleterious effect the magnetic field of one magnet will have on the other. Since, as previously noted, it is typical of many installations which employ pushbutton magnetic reed switches that a massive array of magnets are arranged in close proximity, magnetic shielding is presently a common requirement.

The ceramic bar magnet 16 employed in the pushbutton magnetic reed switch of the present invention is shown in FIG. 4, wherein the field of the ceramic bar magnet 16 is shown by their lines of force which extend from the lateral axis. This is due to the fact that the ceramic magnet is most effectively magnetized through its minor or athwart axis. Unlike typical permanent magnets ceramic magnets are made of ferrite material such as sintered iron oxide.

A further property of the ceramic bar magnet 16 which renders it especially suitable for use in pushbutton reed switches is the effect an iron plate 18 has on it when arranged

adjacently to serve as a backing plate. As shown in FIG. 5, it has been found that arranging a ceramic bar magnet 16 on an iron backing plate 18 will effectively increase the magnetic force emanating from the pole remote from the iron plate 18, in this case the N pole, while substantially reducing the magnetic force in the area of the pole in contact with the iron plate 18. Conversely, when a conventional bar magnet 10 is arranged on an iron backing plate 18, as seen in FIG. 3, virtually the entire magnetic field is absorbed by the backing plate 18, thereby eliminating any useful magnetic force.

Application of the previously discussed principles of a ceramic magnet to a pushbutton reed switch assembly is seen in FIGS. 6, 7 and 8, wherein a typical reed switch capsule 20 is arranged with a ceramic magnet 16 mounted on a backing plate 18 of iron or similar magnetizable material. As illustrated in FIG. 6, a ceramic magnet 16 located remotely from the reed switch capsule 20 will not close the switch. This occurs because the same polarity field enters both reed switch elements 22 and 24. For operation of a reed switch, it is necessary that the respective blades or switch elements 22 and 24 be oppositely polarized to generate an attractive force therebetween.

Consequently, by arranging a ceramic bar magnet 16 in close proximity and adjacent to only one blade or switch element 22 as shown in FIG. 7, the switch will be forced to close. Under these conditions, the magnetic field enters only one blade 22 and causes the necessary polarization between the blades 22 and 24 to effect the closure of the switch. The switch can be opened by translating the ceramic magnet 16 and backing plate 18 to a position shown in FIG. 8 wherein the magnetic field enters both blades 22 and 24 or, of course, removing it entirely from the environment of the switch 20.

When properly positioned, the required movement of the ceramic magnet 16 and backing plate 18 with respect to the magnetic reed switch 20 can be kept to a minimum. In practice, it has been found that a displacement of the magnet 16 and the backing plate 18 of 0.010 inches to 0.020 inches with respect to the switch 20 will serve to open and close the switch blades 22 and 24.

FIGS. 9, 10, 11, 12, 13 and 14 depict an embodiment of a pushbutton switch having a housing 34 adapted to accommodate a switch assembly comprised of a reed switch 20 and a ceramic magnet 16 fixedly mounted on a backing plate 18 of iron or similar magnetizable material.

The backing plate 18 is slidably arranged in a passage 36 in the housing 34 and is adapted to rigidly mount the ceramic bar magnet 16 vertically. Similarly, a vertical chamber 38 is formed in the housing 34 to slidably accommodate the ceramic magnet 16. The vertical chamber 38 is of sufficient height to allow the magnet 16 to translate vertically, and is positioned in close proximity to a vertical chamber 40 formed in the housing 34 to accommodate the reed switch 20.

Any means may be employed to move the backing plate upwardly and downwardly, however, for illustrative purposes the backing plate is shown projecting upwardly through the housing 34 and having a pushbutton 32 and spring 30 arranged thereon to bias the entire plate and magnet assembly 18-16 upwardly against the top of the magnet chamber 38.

The reed switch 20 is arranged in the vertical chamber 40 adjacent the magnet chamber 38. For illustrative purposes, the reed switch 20 is shown as encapsulated in a conventional hermetically sealed dielectric capsule with blades or switch elements 22 and 24 respectively extending inwardly from the respective longitudinal extremities of the capsule. At their inner termini the blades 22 and 24 are arranged to overlie while, in typical fashion, their opposite extremities connect to conductors 26 and 28 respectively which connect the reed switch 20 to the appropriate system circuitry.

As best seen in FIGS. 9, 10 and 11, the reed switch 20 is open when the ceramic magnet 16 and backing plate 18 are at their most elevated position. At this point, the ceramic magnet 16 and the reed switch 20 are in an orientation with respect to each other such that the magnetic field of the ceramic magnet

16 is exposed to both reed blades 22 and 24. Under these conditions, as previously indicated by FIG. 8, the reed switch blades 22 and 24 will remain open.

To effect closure of the reed switch blades 22 and 24 the ceramic magnet 16 must be translated to a position wherein it is exposed to only one of the blades. As best seen in FIGS. 12, 13 and 14 this is accomplished by depressing pushbutton 32 which, in turn, forces the backing plate 18 and ceramic magnet 16 downwardly and adjacent to only blade 22. As previously described in the analysis of FIG. 7, the reed switch 20 will be forced to close since the magnetic force is exposed to only one reed switch blade, in this case blade 22.

The versatility of the ceramic magnet in a reed switch application can be seen by several of the following embodiments. For example, the reed switch assembly depicted in FIGS. 15, 16, 17 and 18 can be characterized as a short pushbutton switch which has particular application in environments wherein a vertical dimension is critical.

The pushbutton magnetic reed switch housing 64 is provided with horizontal chambers 68 and 66 respectively to slidably accommodate the magnet 46 and backing plate 48 and a horizontal chamber 70 to stationarily accommodate the reed switch capsule 50. As in all other embodiments, a pushbutton 62 biased upwardly by spring 60 is illustrated as the means to facilitate moving the ceramic magnet 46 and backing plate 48 into and out of registry with one blade of the reed switch 50.

In practice it has been found convenient in this embodiment of the magnetic reed switch assembly to offset the switch blades 52 and 54, as seen in FIG. 16, to insure that the magnetic field of the ceramic magnet 46 will be exposed to only blade 52 when the pushbutton 62 has been depressed even though the magnet 46 is of a much shorter length than the reed switch and is arranged to travel vertically in a restricted plane. Conventional conductors 56 and 58 extend from blades 52 and 54 respectively to connect the reed switch 50 with the appropriate electrical circuitry.

In operation the pushbutton 62, is depressed to move the ceramic magnet 46 and backing plate 48 downwardly in their respective chambers 68 and 66 into proximity with the blade 52 of the reed switch 50, thereby providing the energy to close the circuit.

Another embodiment of the short pushbutton reed switch is seen in FIGS. 19, 20 and 21 wherein the magnet 76 is permanently located in a horizontally disposed chamber 98 which is dimensioned identically with the magnet to insure snug fitting thereof. Similarly, the reed switch 80 is also stationarily arranged in a horizontal chamber 100 located in the same horizontal plane with the magnet chamber 98 and spaced apart therefrom only by the vertical chamber 96 which is adapted to accommodate an iron plate 78 for vertical movement. The ceramic magnet 76 is considerably shorter than the reed switch 80 and faces only blade 82 as illustrated in FIG. 20. Again, the blades 82 and 84 of the reed switch 80 are offset for the purpose of facilitating exposure of the magnet 76, and the attendant magnetic field to only blade 82. As in all of the other embodiments conventional conductors 86 and 88 connect the reed switch 80 with the appropriate electrical circuitry.

In operation, the reed switch 80 is normally closed since the magnet 76 is directly adjacent the blade 82 and the spring 90 bearing against pushbutton 92 acts to elevate the iron plate 78 to a position above the plane of the ceramic magnet 76 and the reed switch 80 thereby allowing communication therebetween. Opening of the switch is effected by depressing pushbutton 92 to interpose the iron plate 78 between the magnet 76 and the blade 82.

A variant of this design is seen in FIGS. 22, 23 and 24 wherein the ceramic magnet 106 nests in a horizontal chamber 128 located in the housing 124 and the reed switch 110 nests in a horizontal chamber 130 in direct proximity to the ceramic magnet 106. Again the ceramic magnet 106 is much shorter than the reed switch 110 and faces only reed

blade 112, as seen in FIG. 23. As a particular convenience, the blades 112 and 114 of the reed switch 110 are offset to insure that the magnetic field of the ceramic magnet 106 communicates only with one reed blade, in this case blade 112. Conventional conductors 116 and 118 connect the reed switch 110 to the appropriate electrical circuitry.

In this embodiment a chamber 126 to slidably accommodate the iron plate 108 is again located between the ceramic magnet 106 and the reed switch 110. However, the plate 108 has formed thereon a section 109 directly above the iron plate section 108 which upper section 109 is formed of non-magnetizable material to allow passage of the magnetic field from the ceramic magnet 106 to the reed switch 110 when plate section 109 is interposed therebetween.

Under normal conditions, with the spring 120 biasing the pushbutton 122 and the plate 108—109 upwardly, the iron plate section 108 is interposed between the magnet 106 and the reed switch 110 to serve as a shield and to distort the magnetic field thereby maintaining the switch in an open position. By depressing the pushbutton 122, the iron plate 108 will be forced downwardly from its position between the ceramic magnet 106 and the reed switch 110 and the nonmagnetizable section 109 will become interposed between the ceramic magnet 106 and the reed switch 110, thereby allowing the magnetic field to act on switch blade 112 to close the switch.

The embodiment shown in FIGS. 25, 26 and 27 represents another form of the short pushbutton magnetic reed switch. As seen in FIG. 25, the ceramic magnet 136 and reed switch 140 are arranged in respective horizontally disposed chambers 158 and 160. Unlike the other embodiments, this design provides constant communication between the ceramic magnet 136 and the reed switch 140 and, as seen in FIG. 26, the ceramic magnet 136 is much shorter than the reed switch 140 to insure that the magnetic field is constantly exposed to blade 142. To further assure that only blade 142 will be subjected to the magnetic field of the ceramic magnet 136, the blades 142 and 144 are offset with blade 142 extending a major portion of the length of the reed switch 140, while blade 144 extends inwardly from the opposite end of the reed switch 140 only a distance sufficient to afford overlying of the blades 142 and 144. Again the blades 142 and 144 are attached to conductors 146 and 148 respectively to connect the reed switch 140 with appropriate circuitry.

The backing plate 138 does not mount the ceramic magnet 136 in this embodiment, but is arranged to slide vertically in chamber 156 into and out of the plane of the ceramic magnet 136 and reed switch 140. Again the means shown to maintain the backing plate 138 in its elevated position is a spring 150 bearing on the lower surface of the pushbutton 152 mounted on the backing plate 138.

In operation, the reed switch 140 is maintained in an open position since the magnetic field of the ceramic magnet 136 chosen for this embodiment is of insufficient strength to exert a magnetic force on reed blade 142 great enough to close the switch 140. However, closure of the switch 140 is effected by depressing the pushbutton 152 which brings the backing plate 138 into the same horizontal plane as the ceramic magnet 136 and the reed switch 140. The arrangement of critical elements is now similar to the basic arrangement shown in FIGS. 5 and 7 wherein the magnetic field of the ceramic magnet 136 is increased due to the presence of a magnetizable plate 138 arranged therebehind. The increase in the magnetic field, resulting from the backing plate 138 is now sufficient to force blade 142 to close switch 140.

The pushbutton magnetic reed switch of FIGS. 28, 29 and 30 is a further variant of the basic design of the present invention. As seen in FIG. 28, both the ceramic magnet 166 and the reed switch 170 are arranged for stationarily nesting in horizontal chambers 188 and 190 respectively with the iron plate 168 again mounted for vertical movement in a chamber 186 located between said chambers 188 and 190.

In this embodiment, the blades 172 and 174 are not offset but simply overlie in the center of the switch 170. In addition,

the ceramic magnet 166 is somewhat larger than the magnets of the other embodiments and presents its magnetic field to both blades 172 and 174 thereby maintaining the reed switch 170 in the open position.

The iron plate 168 is specially configured as seen in FIG. 28, to shield the portion of the ceramic magnet 166 from the blade 172 but to allow continued exposure of the magnetic field of the magnet 166 to blade 174.

Consequently, when the pushbutton 182 is depressed to overcome the force of spring 180, the iron plate 168 shields only one blade of the reed switch 170 from the ceramic magnet 166 and the switch closes.

Again typical conductors 176 and 178 connect the reed switch 170 with the appropriate electrical circuitry.

Due to the advantages of the pushbutton switch of the present invention any one of the embodiments can be used in a multiple keyboard arrangement as shown in FIG. 31. For illustrative purposes, a plurality of the slidably arranged backing plates 18 of FIGS. 9 through 13, are shown mounting respectively a plurality of magnets 16 for selective communication with a plurality of switches 20 to display an array of the magnetic reed switches of the present invention. Although FIG. 31 shows nine pushbutton magnetic reed switches arranged in a square, it is obvious that any various combination can be employed and any one of the other embodiments depicting individual pushbutton switches can be used in the same arrangement. FIG. 31 illustrates the close contact in which the magnetic reed switches of the present invention can be arranged without the need of shielding.

The pushbutton switch of the present invention also lends itself to a multiple switching assembly. FIG. 32 shows a multiple magnetic reed switch assembly employing the switches of the subject invention wherein a housing 224 is adapted to accommodate a plurality of reed switches 210A, 210B, 210C, 210D and 210E and a single axially moveable backing plate 208 on which ceramic magnets 206A, 206B, 206C, 206D and 206E are rigidly mounted. Each ceramic magnet is associated with a respective reed switch to effect opening and closing thereof. As seen in the representation of FIG. 32, the ceramic magnets 206A, 206C and 206E are arranged to expose their magnetic fields to both blades of the respective reed switches 210A, 210C and 210E. Magnets 206B and 206D are arranged to expose their magnetic field to only blades 212B and 212D, respectively, of reed switches 210B and 210D. Consequently, the cooperating blades 212A—214A, 212C—214C and 212E—214E remain in the open position while blades 212B—214B and 212D—214D make contact to close switches 210B and 210D respectively.

The spring 220 and pushbutton 222 combination are again shown as representative means for positioning the ceramic magnets with respect to the reed switches. Conventional conductors, 216A—218A, 216B—218B, 216C—218C, 216D—218D and 216E—218E extend from each of the blades to connect the respective reed switches with the appropriate electrical circuitry.

Any combination of magnet mountings and reed switch mountings can be employed in the multiple switch assembly since complete versatility is inherent in the reed switch assembly of the present invention.

In addition, any mechanical, magnetic, electrical pneumatic or hydraulic means may be used to translate the magnet and backing plate or the slider plate with respect to the switch. The spring loaded pushbutton is merely illustrative of any means that can be used.

The invention, as described, in the specification specifically shows the ceramic magnet and the sliding plate translating vertically. It is obvious that the ceramic magnet and sliding plate can translate horizontally or at any angle. In addition, it is also obvious that the magnetic reed switch capsule can be made to translate with respect to a stationary magnet and backing plate to afford the necessary variation in orientation between the magnet and switch elements to facilitate the operation of a switch constructed in accordance with the present invention.

The present invention has been described in connection with specific embodiments thereof for purposes of illustration.

Therefore, it is to be understood that various changes and modification may be made therein without departing from the scope or spirit of the invention, as defined in the appended claims. Similarly, the abstract of the disclosure is included in the specification merely to serve as an aid in searching and is not meant to limit the invention in any way.

I claim:

1. A magnetically operated switch device comprising:

a support structure;

an elongated backing plate composed of a magnetizable material;

an elongated bar magnet disposed on one side of the backing plate with its longitudinal axis parallel to the longitudinal axis of said backing plate, said magnet being polarized in a direction normal to its longitudinal axis;

at least two elongated switch elements at least one of which is composed of a magnetic material, said switch elements being arranged with a free end of each overlapping a free end of another and with the longitudinal axis of each switch element parallel to the longitudinal axis of every other switch element and parallel to the longitudinal axes of said backing plate and magnet, said switch elements being spaced from said magnet; and means operable in one position to expose said magnetizable switch element to magnetic flux from said magnet and operable in another position to prevent exposure of said magnetic flux, whereby said switch may be operated.

2. A magnetically operated switch device according to claim 17 wherein said switch elements are disposed on the same side of said backing plate as said magnet.

3. A magnetically operated switch device according to claim 1 wherein said bar magnet and switch elements are disposed in spaced apart fixed relation and said backing plate is movable from a position remote from said magnet and switch elements which permits said magnetizable switch element to be exposed to magnetic flux from said magnet to a position between said magnet and switch elements in which said backing plate prevents exposure of said magnetizable switch element to said magnetic flux.

4. A magnetically operated switch device as described in claim 18 wherein the support structure is a housing having a first chamber to accommodate the switch elements; a second chamber in magnetic communication with the first chamber to accommodate the ceramic bar magnet and a third chamber to slidably accommodate the magnetizable backing plate.

5. A magnetically operated switch device as described in claim 4, wherein the top portion of the magnetizable plate extends through the top of the housing; and the means to change the orientation of the ceramic magnet with respect to the switch elements is a spring biased pushbutton arranged on the top portion of the magnetizable backing plate.

6. A magnetically operated switch device as described in claim 5 further comprising a hermetically sealed evacuated longitudinally shaped capsule in which the switch elements are sealed.

7. A magnetically operated switch device as described in claim 6 wherein the first chamber in the housing to accommodate the switch elements is horizontally disposed with respect to the housing; the switch capsule is horizontally disposed with respect to the housing; the ceramic bar magnet is horizontally disposed with respect to the housing; the switch elements are comprised of a pair of coacting blades which extend inwardly from the respective longitudinal extremities of the switch capsule; one of the coacting blades extending inwardly thereof a major portion of the length of the switch capsule; the other coacting blade extending inwardly thereof a minor portion of the length of the switch capsule to overlie the inner terminus of the mating coacting blade and wherein the ceramic bar magnet is fixedly arranged on the slidably mounted backing plate in a position to communicate only with the coacting blade which extends a major portion of the length of the switch capsule when the pushbutton has been depressed and to communicate with neither blade when the pushbutton is in its spring biased elevated position.