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54 Electrical switch with a plurality of operation buttons.

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Description

The present invention relates to a switch adapted to be used as a remote controlling switch for motor-driven rear view mirrors of a motor vehicle and, more particularly, to a switch which has switch elements composed of a pressure-sensitive electrically conductive rubber sheet.

Each of a pair of motor-driven rear view mirrors mounted on a door, a fender or the like, of a motor vehicle has two electric motors, etc. in its driving section, said electric motors, etc. being controlled by means of a switch inside the vehicle so as to adjust the direction of inclination, horizontal or vertical, of each mirror. The switch for controlling the motor-driven rear view mirrors is required to have the functions of actuating each of said two electric motors of each mirror independently, and changing the polarity of electric power supply thereto. Also, the switch must be easy to fix in the instrument panel, etc.

To meet such requirements, the inventors have already invented a switch which, as disclosed in Japanese Utility Model Application No 56—71428 comprises a plurality of stationary contact elements each formed of a pair of printed circuit electrodes arranged around a specific central position on an insulating board, a pressure-sensitive electrically conductive rubber sheet forming switch elements together with said stationary contact elements and laminated on said contact elements, two sets of power source polarity changing switches composed of said switch elements, and operation buttons each having a pressing surface tiltably at said specific central position on said rubber sheet and including a constantly resettable trend for driving each switch element.

Then, the button is tiltably operated in a desired direction to operate the corresponding switch element, thereby converting and controlling the angle of the mirror in the predetermined amount in elevational and lateral directions.

U.S. Patents Nos. 2,748,205 and 4,249,086, Japanese Utility Model Publication No. 41—7847 and Japanese Patent Laid Open No. 55—32334 disclose switches comprising a plurality of operation buttons or interceptor means. In particular, Japanese Patent Laid Open No. 55-32334 discloses a switch wherein a rotary member and the engaging pawls of operation buttons form a means for preventing simultaneous operation of switch elements. However, this switch has a common operation button arranged for a plurality of switch elements, individually operates the corresponding switch element by tilting one button in the desired direction, and converts and controls the angle of the motor-driven rear view mirror in elevational or lateral direction. Accordingly, the relationship between the elevational and lateral control directions and the operating positions is not sufficiently established, and it does not provide the good operability and good feeling of use.

It is therefore an object of the invention to

provide a multi-position electrical switch which obviates all the disadvantages of the prior art, and which eliminates the above drawbacks, said multi-position electrical switch comprising an insulating board, a plurality of stationary contact elements each formed of a pair of printed circuit electrodes and arranged around a specific central position on said board, a pressure-sensitive electrically conductive rubber sheet arranged on said stationary contact elements, said rubber sheet and contact elements forming switch elements, a plurality of operation buttons disposed on said rubber sheet, said buttons having constantly resettable trend, pressing surfaces for driving said switch elements and an engaging pawl projected toward said specific central position on said board, and a crown-shaped interceptor rotatably arranged at said specific central position and having a sawtoothed cam surface with teeth of a number different from that of said buttons which corresponds to said pawls at the end face thereof, wherein when a button is depressed so that its pawl is introduced into the deepest part of the valley on the cam surface, said switch element is operated, thereby allowing said respective switch element to exclusively operate.

The present invention will now be described in detail, with reference to embodiments illustrated in Figs. 1 to 15 in which the invention is applied to a switch for controlling a motor driven rear view mirrors of a motor vehicle.

3. Brief description of the drawings

Fig. 1 is a plan view of a multi-position electrical switch according to the invention.

Fig. 2 is a sectional view taken along the line II—II in Fig. 1,

Fig. 3 is a back view of the housing,

Fig. 4 is a plan view showing the supporting plate removed from Fig. 2,

Fig. 5 is a plan view of the operation button,

Fig. 6 is a view as seen from an arrow Y in Fig. 5,

Fig. 7 is a bottom view of the button,

Fig. 8 is an enlarged perspective view showing the interceptor removed from Fig. 2,

Fig. 9 is a plan view of the interceptor,

Fig. 10 is a view developed at the side surface of the interceptor with the engagement pawl,

Fig. 11 is a sectional view taken along the line XI—XI in Fig. 1,

Fig. 12 is a bottom view illustrating of the slide block removed from Fig. 11,

Fig. 13 is an enlarged plan view showing the printed board removed from Fig. 2,

Fig. 14 is a plan view illustrating the model of the relative disposition of the switch elements on the printed board, and

Fig. 15 is a circuit diagram showing the relation between the switch elements.

4. Description of the preferred embodiments

The constitution will be described, and numeral in the drawings represents a housing, 2 a printed board (an insulating board) which operates also as the bottom plate of the housing 1 as shown in

Figs. 1 and 2. Disposed within the housing 1 are a switch S_1 forming a switch for changing the polarity of a power supply and another switch S_2 for changing a motor driven rear view mirror.

First, the switch S_1 will be described in detail. The switch S_1 comprises, for example, six switch elements illustrated by A to F as shown in Fig. 15. Each pair of printed circuit electrodes 3a and 4a to 3f and 4f, serving as stationary contact elements of the switch elements A to F, are printed around a specific central position 7 on the printed board 2 in a pectinated shape. The printed circuit electrodes 3a and 4a to 3f and 4f are disposed to occupy the substantially square area around the specific central position 7 of the printed board 2 as a whole (Fig. 13).

A pressure-sensitive electrically conductive rubber sheet 5, becoming a movable contact of a conventional switch element, is laminated on said stationary contact elements. This rubber sheet 5 is common to all the stationary contact elements. The pressure-sensitive electrically conductive rubber sheet 5 is made of composite material which contains silicone rubber and metal particles. It is a material which is transferred from insulating state to conductive state in response to the pressure stimulus.

Thus, according to the present invention, the six switch elements A to F are disposed planely on the printed board 2 and these switch elements A to F are connected by printed conductors 6 so as to form two sets of power supply polarity changing switches as connected as required. That is, in Fig. 15, the three switch elements A, B and E form one switch means for vertical adjustment to be described later and the three switch elements C, D and F form the other switch means for horizontal adjustment. The two switch elements E and F are commonly used with the switch for changing the polarity of both power supplies. The arrangement of the switch elements A to F on the printed board 2 is illustrated in Fig. 14. Driving mechanism as follows is disposed over said switch elements A to F formed as described above.

More particularly, a supporting plate 21 as shown in Fig. 4 is disposed on the rubber sheet 5, and is fixed at its peripheral to the housing 1. The supporting plate 21 is provided at its portions corresponding to the positions of said switch elements A to F with openings 21a into which pressing surfaces (described later) are loosely inserted. The housing 1 is provided at its portion corresponding to said specific central position 7 on the inside with a projecting axial pin 1e as shown in Fig. 3, said housing 1 further having four trapezoidal openings 1a to 1d disposed with the axial pin 1e as the center of symmetry. Operation buttons 22 to 25 are respectively inserted into the trapezoidal openings 1a to 1d so that each of the operation buttons can be pushed in and automatically returns to its original position. Each of the buttons 22 to 25 is provided on its side facing the rubber sheet (5) with two pressing surfaces 22a, 22b which project slightly as designated representatively of the buttons 22 in Figs. 5 to 7. One

pressing surface 22a of the two pressing surfaces corresponds to the switch element A, while the other pressing surface 22b corresponds to the switch element F. The operation button 22 is provided with an engagement pawl 22c engaged toward the axial pin 1e, having a triangular section with its vertex facing downward (toward the rubber sheet side). The button 22 further has a spring hole 22d at the intermediate between the two pressing surfaces 22a and 22b. A helical spring 26 is disposed within the spring hole 22d and is compressed between the operation button 22 and the supporting plate 21 so as to provide the operation button 22 a tendency to return to its original position. Usually the pressing surfaces 22a and 22b of the operation button 22 are partially inserted into the openings 21a of the supporting plates 21 so that the pressing surfaces 22a and 22b are surely guided by the openings 21a when the operation button 22 is pushed.

The construction and arrangement of the other operation buttons 23 to 25 are the same as mentioned above. The operation button 23 corresponds to the switch elements B and E. The operation button 24 corresponds to the switch elements F and C. The operation button 25 corresponds to the switch elements D and E. The operation button 25 corresponds to the switch elements D and E. In this way, each of the operation buttons 22 to 25 corresponds to two switch elements.

A crown-shaped interceptor 27 having a sawtoothed cam surface 27a corresponding to the engagement pawls 22c to 25c is rotatably attached to the axial pin 1e in the specific central position 7. As shown in Figs. 8 to 10, the sawtoothed cam surface 27a has teeth, the number of which is different from the number (four) of the operation buttons 22 to 25, that is, the number (four) of the engagement pawls 22c to 25c. The sectional crests forming the respective teeth are not formed at both sides in a symmetrical shape at the edge (crest part), but the crests formed in the range of 72° of the opening angle planely as shown in Fig. 9 are formed in an opening angle of 30° at the one around the edge and in an opening angle of 42° at the other. The number of the teeth of the sawtoothed cam surface 27a is five in the illustrated example, but it is not limited thereto and may be three, seven, nine or any other number provided that the difference between the number of the teeth and the number of the operation button is an odd number.

As shown in Fig. 10, when one 22c of four engagement pawls is in a position corresponding to the deepest portion of a concave, the other engagement pawls 23c to 25c are in position corresponding to other portions of respective concaves. When any one of the engagement pawls 22c to 25c is pushed into the deepest portion of a concave, only two switch elements corresponding to the operation button pushed are exclusively closed so that the other switch elements are prevented from being closed at the same time.

Reference will now be made to the switch S_2 .

The switch S_2 is for selectively connecting the above-mentioned switch S_1 with either the right-hand mirror R or the left-hand mirror L and is constructed as follows: The switch S_2 comprises two circuits and six contacts. Contact patterns l , m and $14a$ to $14d$ corresponding to the six contacts, are printed near one end (upper portion in Fig. 13) of the board 2. A slide block 15, slidable right and left in Fig. 11 or 12, is disposed over the contact patterns l , m and $14a$ to $14d$. The slide block 15 is provided with movable contacts $16a$ and $16b$ corresponding to the contact patterns l , m and $14a$ to $14d$. A pair of push buttons $17a$ and $17b$ respectively corresponding to the right-hand mirror R and the left-hand mirror L are disposed on both sides of the slide block 15 in the direction of its slide. The driving end of each push button is engaged with each of taper portions $15a$ and $15b$ formed on both ends of the slide block 15. Numerals $18a$ and $18b$ represent balls for positioning the push buttons $17a$ and $17b$.

Thus, the embodiment illustrated in Figs. 1 to 15 is a hybrid switch comprising said switch S_1 including the six switch elements A to F and said changeover switch S_2 .

Numeral 19 in Fig. 2 represents a connector for externally leading the contacts l , m and $14a$ to $14d$ in the changeover switch S_2 to the exterior (the mirrors R and L). Referring to Fig. 15, symbols M_1 , M_2 represent electric motors for horizontally and vertically driving the right-handed mirror R, and M_3 , M_4 represent electric motors for vertically and horizontally driving the left-handed mirror L.

The operation of the switch will now be described.

Reference will be made to the case of controlling the right-handed mirror R by pushing the push button $17a$ of the changeover switch S_2 . When the push button $17a$ is pushed, the slide block 15 is slid toward the left in Fig. 11 and its movable contacts $16a$ and $16b$ respectively close the contacts l and $14a$ together and the contacts m and $14c$ together so that the switch S_1 is connected with the right-hand mirror R. (See the state in Fig. 15).

When the operation button 22 is pushed thereafter, the engagement pawl 22c of the button 22 enters the deepest portion of a concave on the sawtoothed cam surface 27a (See Fig. 10) and the switch elements A and F are closed. Then, the electric motor M_1 rotates in such a direction to change the angle of the right-hand mirror R upward. Even if any of the other operation buttons 23 to 25 is pushed at this time, the engagement pawl 23c to 25c thereof is not allowed to enter the deepest portion of a concave on the sawtoothed cam surface 27a and therefore no other switch elements are closed.

When only the operation button 23 is pushed, the engagement pawl 23c thereof contacts the sawtoothed cam surface 27a and turns the interceptor 27 until it enters the deepest portion of a concave on the sawtoothed cam surface 27a. As a result, the switch elements B and E are closed and the electric motor M_1 rotates in a reverse direction

so as to change the angle of the right-hand mirror R downward.

When only the operation button 24 is pushed, the engagement pawl 24c thereof behaves in the same way as mentioned above. Then, the switch elements C and F are closed and the electric motor M_2 rotates in such a direction to change the angle of the right-handed mirror R toward the left.

When only the operation button 25 is pushed, the switch elements D and E are closed in the same way as mentioned above. Then, the electric motor M_2 rotates in a reverse direction so as to change the angle of the right-hand mirror R toward the right.

When the push $17b$ of the changeover switch S_2 is pushed, the left-handed mirror L is controlled in the same way as described above.

According to the present invention as described above, a plurality of operation buttons are independently arranged around the specific central position as a center, pressing surfaces and engagement pawls for driving the switch elements are provided at the respective buttons, a crown-shaped interceptor formed with a saw-toothed cam surface made of teeth of the number different from the number of the buttons is rotatably arranged at the specific central position corresponding to the engagement pawls, the buttons are pressed to operate the switch element when the pawl enters the deepest part of the concave on the cam surface, and the switch element is exclusively operated. Therefore, when this is applied as a switch for controlling the motor driven rear view mirror of a vehicle, the control object such as vertical and horizontal controls of the mirror can be clearly corresponded by 1:1 to the buttons. Consequently, the operability and using feeling can be remarkably improved. Since the outer profile can be formed in a flat, thin and small shape, the switch can be readily mounted in a relatively small space such as in an instrument panel of a vehicle.

Claims

1. Electrical switch with a plurality of operation buttons comprising:

an insulating board (2), arranged in a housing (1)

a plurality of stationary contact elements (3a—3f, 4a—4f) each formed of a pair of printed circuit electrodes and arranged around a specific central position (7) on said board (2),

a pressure sensitive electrically conductive rubber sheet (5) arranged on said stationary contact elements, said rubber sheet and contact elements forming switch elements (A—F),

the plurality of operation buttons (22—25) disposed on said rubber sheet (5), said operation buttons having constantly resettable trend, pressing surfaces (22a, 22b—25a, 25b) for driving said switch elements (A—F) and an engaging pawl (22c—25c) projected toward said specific central position (7) on said board, and

a crown-shaped interceptor (27) rotatably

arranged at said specific central position and having a sawtoothed cam surface (27a) with teeth of a number different from that of said operation buttons which corresponds to said pawls at the end face thereof,

wherein, when an operation button is depressed so that its pawl is introduced into the deepest part of the valley on the cam surface (27a) of said interceptor (27) said switch element is operated, thereby allowing said respective switch element to exclusively close.

2. A multi-position electrical switch as claimed in claim 1, comprising four operation buttons (22—25) and wherein each pair of said switch elements (A—F) corresponds to one button, and said switch elements form two sets of switch means for changing the polarity of an electric power supply.

Patentansprüche

1. Elektrischer Schalter mit mehreren Bedienungsknöpfen mit

einer in einem Gehäuse (1) angeordneten, isolierenden Platte (2),

mehreren ortsfesten Kontaktelementen (3a bis 3f, 4a bis 4f), die jeweils ein Paar gedruckte Schaltungselektroden bilden und rund um eine besondere Mittellage (7) auf der Platte (2) angeordnet sind,

einer druckempfindlichen, elektrisch leitenden Gummischicht (5), die an den ortsfesten Kontaktelementen angeordnet ist, wobei die Gummischicht und Kontaktelemente Schaltelemente (A bis F) bilden und die Bedienungsknöpfe (22 bis 25) auf der Gummischicht (5) untergebracht sind und sich ständig zurückzustellen suchende Druckflächen (22a, 22b bis 25a, 25b) aufweisen, um die Schaltelemente (A bis F) und eine in Eingriff stehende Klinke (22c bis 25c) anzutreiben, die an der Platte in Richtung auf die besondere Mittellage (7) vorspringt, und

einem kronenförmigen, in der besonderen Mittellage drehbar gelagerten Auffangstück (27), das eine sägezahnartige Führungsfläche (27a) aufweist, deren Zähneanzahl sich von jener Anzahl der Bedienungsknöpfe unterscheidet, die mit den Klinken an ihrer Abschlußfläche übereinstimmt, wobei das Schaltelement durch Abwärtsdrücken eines Bedienungsknopfes betätigt und seine Klinke in den tiefsten Abschnitt der Zahnücke an der Führungsfläche (27a) des Auffangstückes (27) eingeführt wird, wodurch dem jeweiligen Schaltelement ein ausschließliches Schließen ermöglicht wird.

2. Elektrischer Schalter mit mehreren Stellun-

gen, wie im Anspruch 1 beansprucht, der vier Bedienungsknöpfe (22 bis 25) enthält, und bei dem jedes Schaltelementenpaar (A bis F) einem Knopf entspricht und die Schaltelemente zwei Sätze von Schaltmitteln zum Wechseln der Polung einer elektrischen Stromzufuhr bilden.

Revendications

1. Commutateur électrique pourvu d'une pluralité de boutons de commande, comportant: une plaque isolante (2) disposée dans un boîtier (1),

une pluralité d'éléments de contact fixes (3a—3f, 4a—4f) respectivement formés de deux électrodes de circuits imprimés et disposées autour d'un point central spécifique (7) défini sur ladite plaque (2),

une feuille de caoutchouc électriquement conductrice (5) sensible à une pression et disposée sur lesdits éléments de contact fixes, ladite feuille de caoutchouc et lesdits éléments de contact formant des éléments commutateurs (A—F),

la pluralité de boutons de commande (22—25) disposées sur ladite feuille de caoutchouc (5), lesdits boutons de commande ayant constamment tendance à revenir à un état initial et possédant des surfaces de pression (22a, 22b—25a, 25b) destinées à entraîner lesdits éléments commutateurs (A—F), et un doigt d'encliquetage (22c—25c) qui fait saillie en direction dudit point central spécifique (7) défini sur ladite plaque, et

un intercepteur en forme de couronne (27) monté rotatif au niveau dudit point central spécifique et possédant une surface de came en dents de scie (27a) dont le nombre de dents diffère de celui desdits boutons de commande qui correspond auxdits doigts prévus au niveau de la face d'extrémité de ceux-ci,

dans lequel, lorsqu'un bouton de commande est pressé, de telle façon que son doigt est introduit dans la partie la plus profonde du creux défini sur la surface de came (27a) dudit intercepteur (27), ledit élément commutateur est actionné, pour ainsi permettre exclusivement audit élément commutateur correspondant de se fermer.

2. Commutateur électrique à positions multiples tel que défini dans la revendication 1, comportant quatre boutons de commande (22—25) et dans lequel chaque paire desdits éléments commutateurs (A—F) correspond à un bouton, lesdits éléments commutateurs formant deux séries de moyens commutateurs destinés à changer la polarité d'une alimentation en courant électrique.

FIG. 1

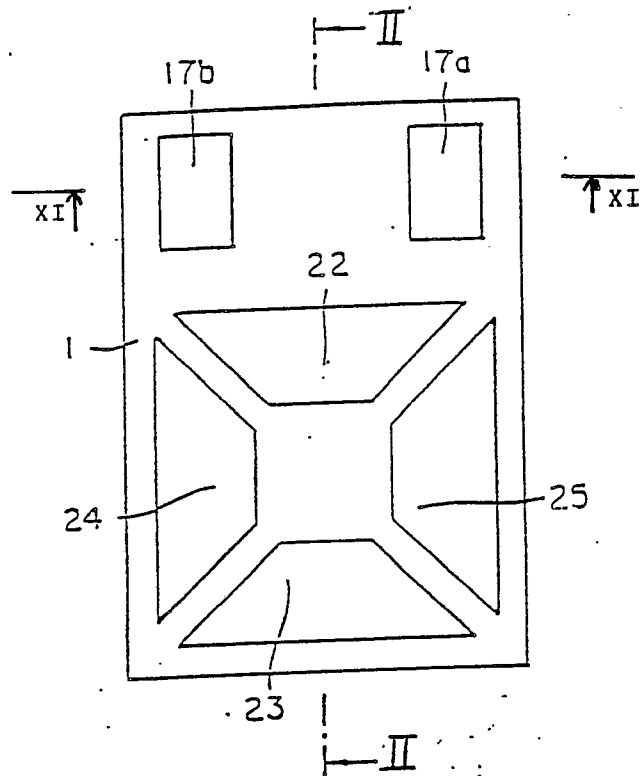


FIG. 2

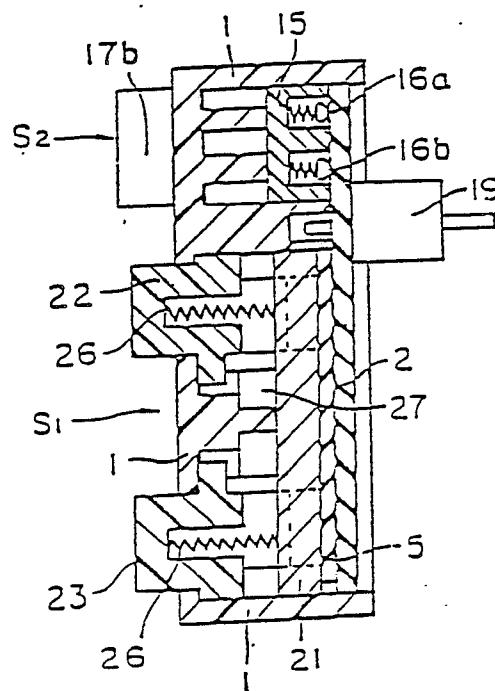


FIG. 3

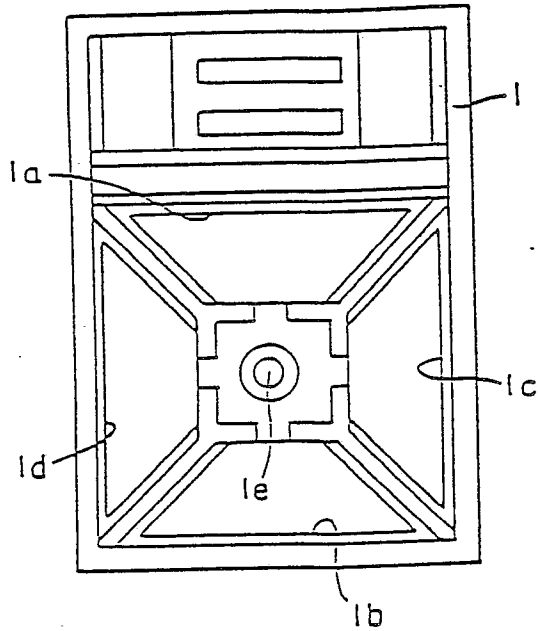


FIG. 4

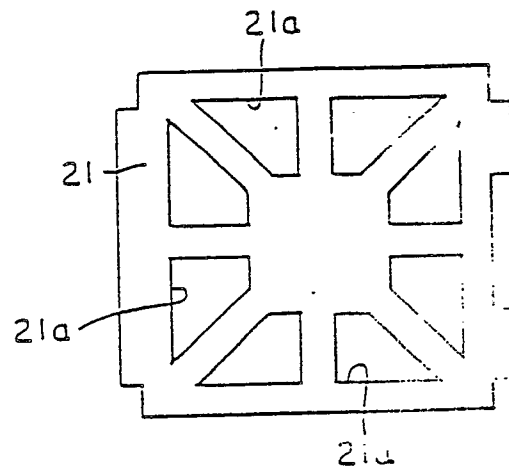


FIG. 5

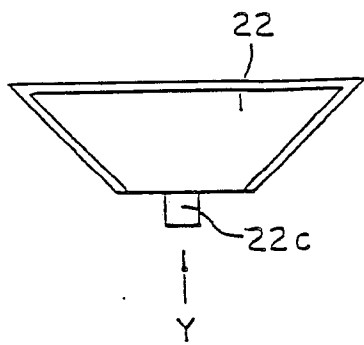


FIG. 6

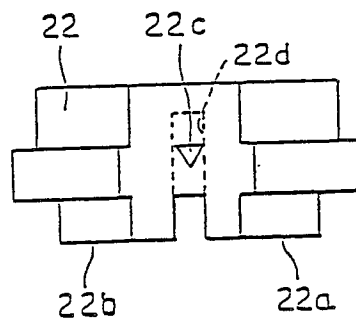


FIG. 7

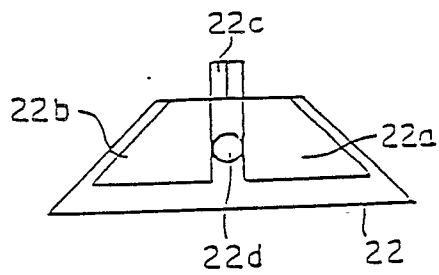


FIG. 8

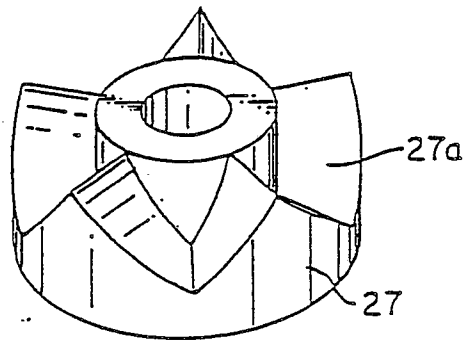


FIG. 9

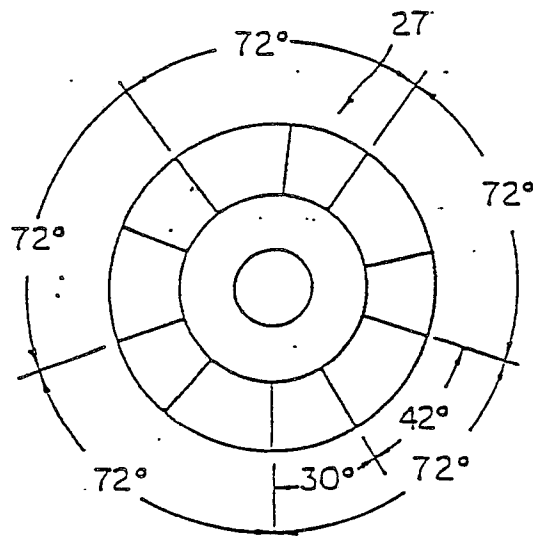


FIG. 10

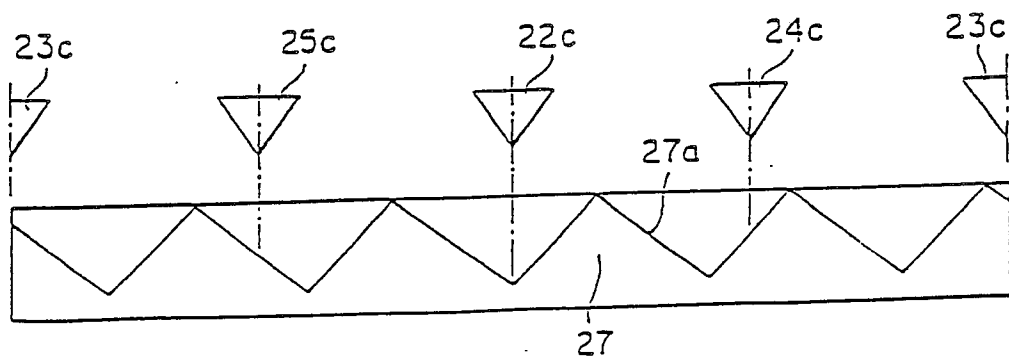


FIG.11

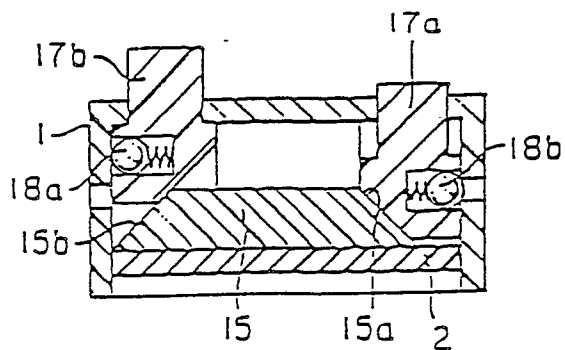


FIG.12

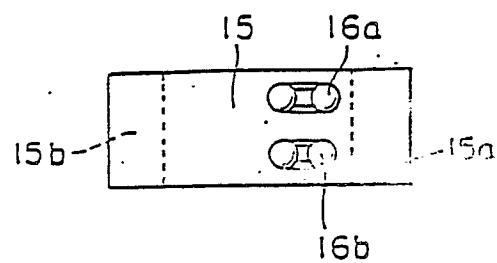


FIG.13

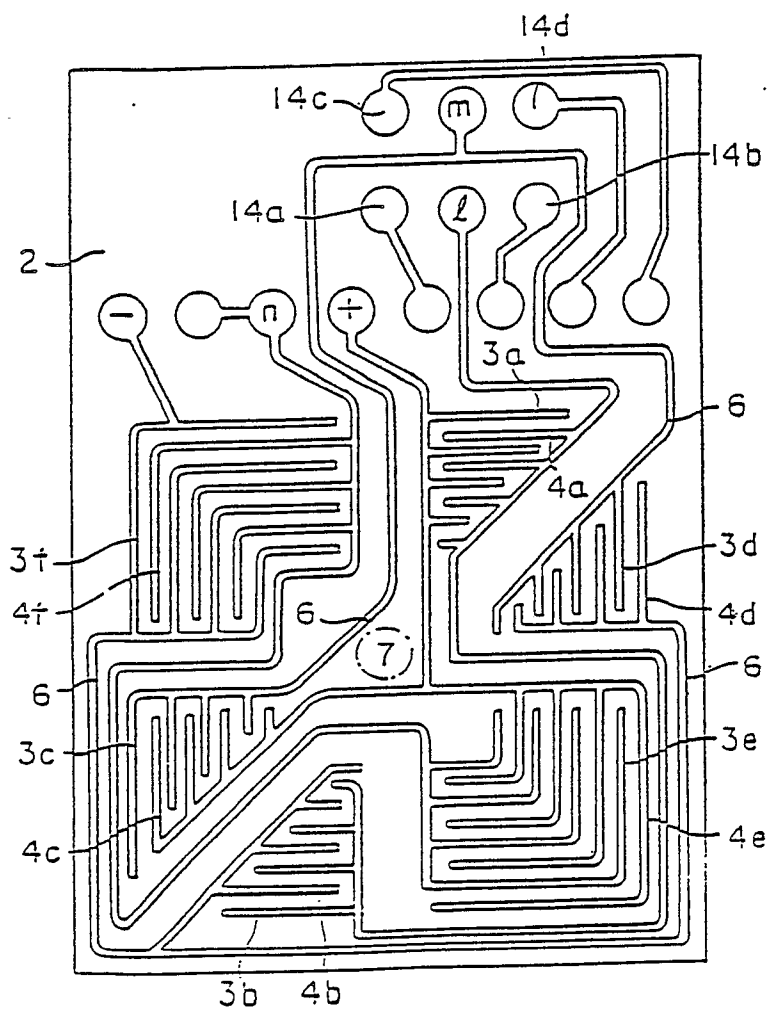


FIG. 14

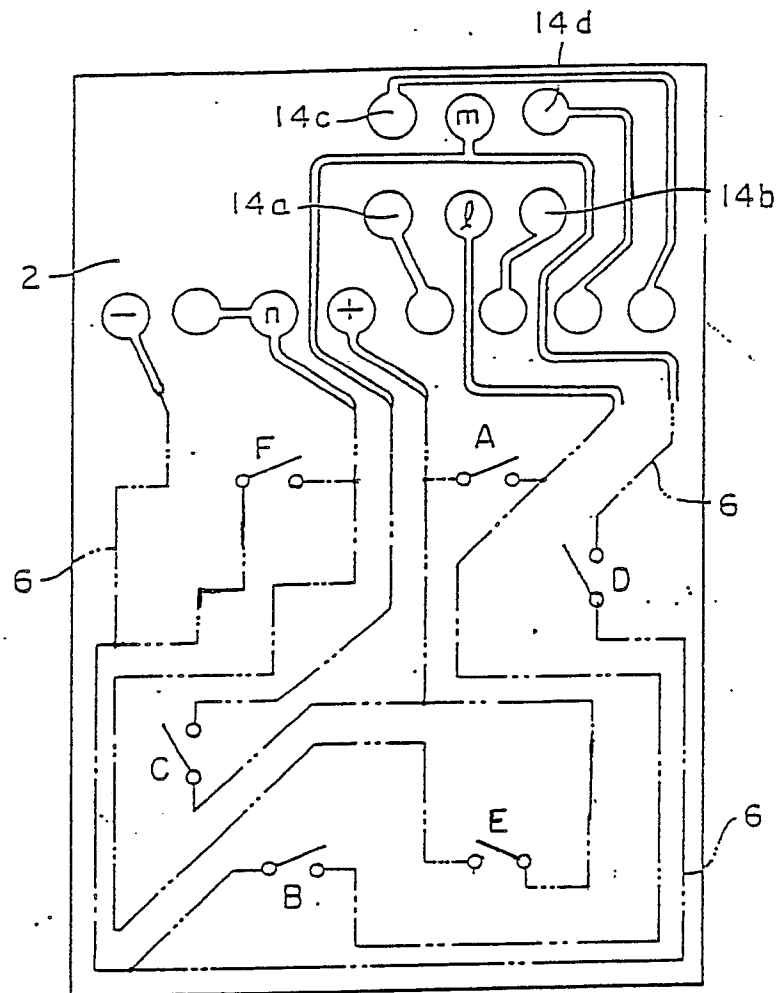


FIG. 15

