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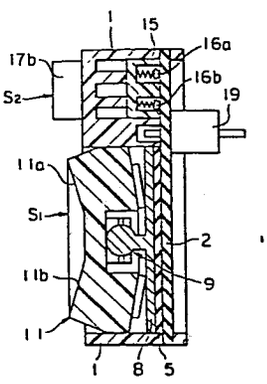
(54) **SWITCH DEVICE.**

(57) A switch device which opens or closes a plurality of switch elements used when an electrically-driven automobile mirror is remotely operated, or in a similar operation, by the use of a single or a divided actuating member, and which has for its object a reduction of the space occupied by such switches on an automobile control panel. For that purpose, stationary contact pairs (3a, 4a), ..., (3f, 4f) are printed symmetrically around the periphery of a specific central position (7) on an insulated substrate (2) which constitutes a stationary contact structure. A movable contact (5), which can electrically shortcircuit each of the contact pairs (3a, 4a), ..., (3f, 4f) when pressed down, is provided on the surface of the structure. One or more actuating members (11), each provided on the surface of the control panel, have a pressure surface for pressing together the corresponding switch elements comprising one of the stationary contact pairs (3a, 4a), ... (3f, 4f) and the movable contact (5), and means is provided for automatically resetting each of the elements when the surface is not pressing it.

図 2 図



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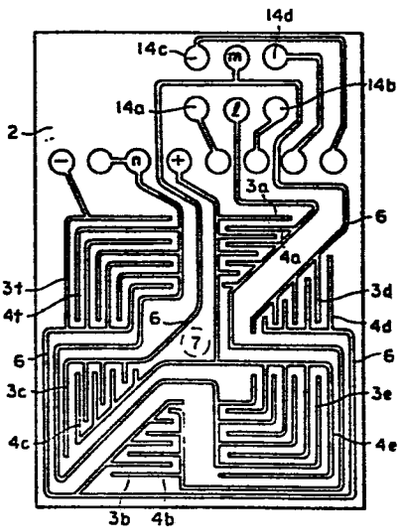


D E S C R I P T I O N

TITLE OF THE INVENTION:

SWITCH DEVICE

TECHNICAL FIELD:

This invention relates to a switch adapted to be used as a remote controlling switch for a motor driven mirrors of a motor vehicle associated with a plurality of switch elements forming a switch for changing the polarity of a power supply.

BACKGROUND ART:

Each of a pair of motor-driven 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 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 inventor has already invented a switch which, as disclosed in Japanese Utility Model Application No. 56-71428. That is, this switch comprises a housing, an operation member disposed within said housing at a predetermined clearance from the inner walls of said housing, said operation member being adapted to rock from its neutral position in the directions meeting at right angles with one another, two switch elements disposed between a pair of plate-shaped electrodes via a pressure conductive rubber sheet and arranged by two at the four interval positions, and a switch for changing the polarity of a power supply is formed of said switch elements.

However, the prior art switch has a deep shape and cannot be made small because the operation member is rockably disposed within the housing and the switch elements are disposed between the operation member and the four inner walls of the housing. Also the switch is not very easy to fix in the instrument panel, etc. Furthermore, it does not provide sufficient assembling property and a good feeling of use because the operation member has almost no stroke and does not click at all.

DISCLOSURE OF INVENTION:

According to one aspect of the present

invention, there is provided a switch which has obviated the disadvantages of the prior art, and which comprises an insulating board arranged in a housing, a plurality of stationary contact elements, each of said elements formed of a pair of film electrodes and arranged around a specific central position on said insulating board, a pressure conductive rubber sheet forming switch elements laminated on said stationary contact elements together with the elements, operation buttons having pressing surfaces for driving said each switch element and arranged tiltably to the rubber sheet at said specific central position as a tiltable fulcrum, and a ball and socket bearing having spheres arranged at the fulcra and sphere retainers corresponding to said spheres, each of said spheres having a pin projected toward the tilting direction of said button, each of said sphere retainers having split grooves having narrow width slightly smaller than the diameter of said pin corresponding to each said pin and resettable force, thereby providing a resettable trend at said button via said pin and grooves.

According to another aspect of the present invention, there is provided a switch which comprises an insulating board, a plurality of stationary contact elements and a pressure conductive rubber sheet similarly to the first aspect, further a plurality of operation

buttons, each of said operation buttons arranged on said rubber sheet and having a constantly resettable trend imparted thereto and an engaging pawl projected toward said pressing surface and specific central position for driving said switch element, and a crown-shaped interceptor formed with a sawtoothed cam surface made of number of teeth different from the number of said buttons corresponding to said engaging pawls on the end face rotatably arranged at said specific central position for operating said corresponding switch element when said pawl is press-fitted into the deepest part of the concave on said sawtoothed cam surface, thereby preventing the simultaneous operations of said switch elements.

According to still another aspect of the present invention, there is provided a switch which comprises similarly to the stationary contact elements on said insulating board of the above switch, further cushions of crest shape in section expanded toward said elements at the position arranged with said elements, movable contacts secured to the inside of the top of said cushion, pressing surfaces for driving said each switch element by pressing said cushions, and push buttons arranged tiltably and each of said buttons having projections arranged at the positions corresponding to said specific central position and the position

corresponding to the intermediate positions between the arranging position of said cushions for preventing the simultaneous operation of said switch elements.

In the structure of the switch constructed as described above, a flat, thin and small profile can be readily secured in a relatively small space such as an instrument panel of a motor vehicle. Therefore, the switch according to the present invention can be adapted for use in the drive control of motor-driven mirrors of a motor vehicle.

In addition to the aforementioned advantages, each of the embodiments has its own advantages as follows:

According to the first embodiment in which the switch comprises a plurality of operation buttons and an interceptor in the specific central position for preventing the simultaneous closing of the switch elements, when the switch is used for controlling the mirrors of a motor vehicle each of the independent operation buttons definitely corresponds to each of the directions (up, down, right and left) in which the angle of the mirrors is adjusted. Therefore, the switch is ready to use and provide a good feeling of use.

According to the second embodiment in which the switch comprises a crest-shaped elastic portion disposed over the stationary contact elements, said

elastic portions being respectively provided inside with movable contacts, and a tiltable operation button having projections for preventing the simultaneous closing of the switch elements, the operation button is inclined against the elastic force of the elastic portions and is returned to its original position thereby. Therefore, the operation button provides a more constant feeling of use and ensures smooth operation even after it is used for a long period of time. Also, the switch is inexpensive because the movable contacts do not have to be made of expensive pressure conductive rubber and even when they are they can be made smaller.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the accompanying drawings: Figs. 1 to 11 show a first embodiments of a switch according to the present invention; Fig. 1 is a plan view of a switch; Fig. 2 is a sectional view taken on line II-II of Fig. 1; Fig. 3 is a plan view of a supporting plate removed from Fig. 2; Fig. 4 is a bottom view of an operation button; Fig 5 is a sectional view taken on line V-V of Fig. 1; Fig. 6 is a bottom view of a slide block removed from Fig. 5; Fig. 7 is an enlarged plan view of a printed board removed from Fig. 2; Fig. 8 is a schematic plan view showing the disposing relationship of switch elements on the printed

board; Fig. 9 is a circuit diagram showing the connection relationship for the switch elements; Fig. 10 is an enlarged sectional view showing a ball and socket bearing removed from Fig. 2; Fig. 11 is a sectional view showing the operating state of the ball and socket bearing; Figs. 12 to 21 show is a second embodiments of a switch according to the present invention; Fig. 12 is a plan view of a switch; Fig. 13 is a sectional view taken on line XIII-XIII in Fig. 12; Fig. 14 is a back view of a housing; Fig. 15 is a plan view of a supporting plate removed from Fig. 13; Fig. 16 is a plan view of an operation button; Fig. 17 is a view as seen from a direction of an arrow Y; Fig. 18 is a bottom view of the operation button; Fig. 19 is an enlarged perspective view of an interceptor removed from Fig. 13; Fig. 20 is a development view of the side of the interceptor; and Figs. 22 to 27 show a third embodiments of a switch according to the present invention; Fig. 22 is a plan view of a switch; Fig. 23 is an enlarged sectional view taken on line XXIII-XXIII in Fig. 22; Fig. 24 is a bottom view of an insulating sheet; Fig. 25 is a bottom view of an operation button; Fig. 26 is an enlarged plan view of an insulating board; and Fig. 27 is a schematic plan view showing the disposing relationship of the switch elements on the insulating board.

BEST MODE OF CARRYING OUT THE INVENTION:

The present invention will now be described in detail, with reference to an embodiment illustrated in Figs. 1 to 10 in which the invention is applied to a switch for controlling a motor driven mirrors of a motor vehicle.

Figs. 1 to 10 show the first embodiment of the switch according to the present invention.

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

First, the switch S_1 will be described in detail. The switch S_1 comprises, for example, eight switch elements illustrated by A to F' as shown in Fig. 9. Each pair of film electrodes (3)a and (4)a to (3)f' to (4)f', 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 film electrodes (3)a and (4)a to (3)f' and (4)f' are disposed to occupy the substantially upper and lower, right and left areas of the printed board

(2) as a whole (Fig 8).

An insulating sheet (5) is laminated on said stational contact elements. This sheet (5) has cushions (6a) to (6h) of crest shaped in section corresponding to a plurality of stationary contact elements. The cushions are made of rubber integrally with the sheet (5), or they may be made of a different insulating material separately from the sheet (5). Movable contacts (7a) to (7h) are fixed inside the top of the cushions (6a) to (6h). The movable contacts may be made of a composite material having pressure conductive rubber consisting of silicone rubber and metal particles or they may be metal plates, etc.

Thus, according to the present invention, the eight 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 (8) so as to form two sets of power supply polarity changing switch as connected as required. That is, in Fig. 10, the four switch elements A, B, E and F form one switch element for switch element for vertical adjustment to be described later) and the four switch elements C, D, E' and F' form the other switch means (switch means for horizontal adjustment). The arrangement of the switch elements A to F' on the printed board (2) is illustrated in Fig. 9.

Driving mechanism as follows are disposed over said switch elements A to F' formed as described above.

More particularly, a supporting plate (8) as shown in Fig. 3 is disposed on the rubber sheet (5), and is fixed at its peripheral to the housing (1). An operation button (11) is tiltably arranged substantially at the center of the plate (8) on the rubber sheet (5) via a ball and socket bearing (9). The operation button (11) is formed in a square shape as an example as seen in a planar manner as shown in Fig. 1, and is respectively pressed at four positions of upper and lower, right and left sides by numerals (11)a to (11)d in Fig. 1. The rubber sheet (5) to the button (11) is correspondingly formed in a prism-shaped conical state with the bearing (9) of a tiltable fulcrum as a vertex as shown in Figs. 2 and 4. Each of the four prism-shaped conical surfaces (11)e to (11)h of the buttons (11) to (14) is provided on its side facing the rubber sheet (5) with two pressing surfaces (12)a, (12)b which project slightly as designated representatively of the buttons (11) in Figs. 2 to 4. One pressing surface (12)a of the two pressing surfaces corresponds to the switch element A, while the other pressing surface (12)b corresponds to the switch element F. The operation button (11) is provided with an engagement pawl (12)c which corresponds to the switch

element E, and (12)d corresponds to the switch element B. Thus, two switch elements correspond to the surfaces (11)e to (11)h of the four prism-shaped surfaces (11)e to (11)h.

Through holes (8)a,.. are opened at the supporting plate (8) corresponding to the pressing surfaces (12)a to (12)h.

The ball and socket bearing (9) for supporting the button (11) consists of a sphere (10) provided at the side of the plate (8) and a sphere retainer (13) provided at the button (11) side. At the sphere (10) are projected pins (10)a in cross shape at the four prism-shaped surfaces (11)e to (11)h, and split grooves (13)a each having narrow width and elastic force and being slightly smaller than the diameter of the pin (10)a are formed at the side of the retainer (13). Further, the button (11) has a resettable trend always to the neutral position by the split grooves (13)a, and the pin (10)a.

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 (16)a to (16)d, corresponding to the six contacts, are printed near one end (upper portion in Fig. 7) of the board 2. A slide

block (15), slidable right and left in Fig. 5 (or 7), is disposed over the contact patterns ℓ, m and (14)a and (14)d. The slide block (15) is provided with movable contacts (16)a and (16)b corresponding to the contact patterns ℓ, m and (14)a to (14)d. A pair of push buttons (17)a to (17)b 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 (15)a and (15)b formed on both ends of the slide block (15). Numerals (18)a and (18)b represent balls for positioning the push buttons (17)a and (17)b.

Thus, the embodiment illustrated in Figs. 1 to 10 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 (14)a to (164d in the changeover switch S_2 to the exterior (the mirrors R and L). Referring to Fig. 9, 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 with reference to Fig. 11.

Reference will be made to the case of controlling the right-handed mirror R by pushing the push button (17)a of the changeover switch S_2. When the push button (17)a is pushed, the slide block (15) is slid toward the left in Fig. 5 and its movable contacts (16)a and (16)b respectively close the contacts ℓ and (14)a together and the contacts m and (14)c together so that the switch S1 is connected with the right-hand mirror R. (See the state in Fig. 9.)

When the operation button (11) is pushed at the position (11)a at the predetermined tiling stroke thereafter, and the switch elements A and F are closed. Then, the electric motor M_1 rotates in such a direction as changes the angle of the right-hand mirror R upward. The pin (10)a corresponding to the ball and socket bearing (9) is engaged within the split groove (13)a as shown in Fig. 11 at this time. When the pressing force is released, the pin (10)a is elastically pushed out and is reset to the neutral position as shown in Fig. 10. The clicking feeling is produced at the operating time by the elastic operation of the bearing (9) in this manner.

Similarly, when the positions (11)b of the button (11) is pressed, the switch elements B, E, 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 the position (11)c is pushed, the switch elements C and F are closed and the electric motor M_2 rotates in such a direction as changes the angle of the right-handed mirror R toward the left.

When the position (11)d is further 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.

The operations of the bearing (9) when the positions (11)b, (11)c, (11)d are pressed are similar to the pressing of the position (11)a.

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

Figs 12 to 21 show a second embodiment of a switch according to the present invention. The arrangement and connection of the switch elements of the first embodiment are substantially the same as the first embodiment, and only the operating mechanism is different from the first embodiment. That is, the operation buttons are divided into a plurality of segments, and an

interceptor for preventing the simultaneous operation of the switch elements is arranged at the central position of the button. The different pints from the first embodiment will be mainly described. The members or positions which are the same as those in Figs. 1 to 10 will be designated by the same numerals and characters as described above, and duplicate description will be omitted.

The constitution will be first described. A supporting plate (21) is disposed on the rubber sheet (5). As compared with the plate (8) in the first embodiment, the supporting plate (8) is formed in slightly larger thickness, and is secured at the peripheral surface to the housing (1). Openings (21)a into which pressing surfaces (described later) are loosely inserted are formed at the positions corresponding to the positions of said switch elements A to F' at the supporting plate (21). The housing (1) is provided at its portion corresponding to said specific central position (7) on the inside with a projecting axial pin (1)e as shown in Fig. 14, said housing (1) further having four trapezoidal openings (1)a to (1)d disposed with the axial pin (1)e as the center of symmetry. Operation buttons (22) to (25) are respectively inserted into the trapezoidal openings (1)a to (1)d 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 (22)a, (22)b which project slightly as designated representatively of the buttons (22) in Figs. 16 to 18. One pressing surface (22)a of the two pressing surfaces corresponds to the switch element A, while the other pressing surface (22)b corresponds to the switch element F. The operation button (22) is provided with an engagement pawl (22)c engaged toward the axial pin (1)e, having a triangular section with its vertex facing downward (toward the rubber sheet side). The button (22) further has a spring hole (22)d at the intermediate between the two pressing surfaces (22)a and (22)b. A coiled spring (26) is disposed within the spring hole (22)a 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 (22)a and (22)b of the operation button (22) is partially inserted into the openings (21)a of the supporting plates (21) so that the pressing surfaces (22)a and (22)b are surely guided by the openings (8)a 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 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 (24) 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 (27)a corresponding to the engagement pawls (22)c to (25)c is rotatably attached to to the axial pin (1)e in the specific central position (7). As shown in Figs. 19 to 21, the sawtoothed cam surface (27)a 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 (22)c to (25)c. The sectional crests forming the respective teeth is 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.20 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 (27)a 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. 21, when one (22)c of four engagement pawls is in a position corresponding to the deepest portion of a concave, the other engagement pawls (23)c to (25)c are in position corresponding to other portions of respective concaves. When any one of the engagement pawls (22)c to (25)c 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.

The other members and elements such as a changeover switch S_2 are constructed similar to those in the first embodiment.

The operation of the switch will now be described.

Reference will be made to the case of controlling the right-handed mirror R.

When the operation button (11) is pushed thereafter, the engagement pawl (22)c of the button (11) enters the deepest portion of a concave on the sawtoothed cam surface (27)a (See Fig. 21) and the switch elements A

and F are closed. Then, the electric motor M_1 rotates in such a direction as changes 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 (23)c to (25)c thereof is not allowed to enter the deepest portion of a concave on the sawtoothed cam surface (27)a and therefore no other switch elements are closed.

When only the operation button (23) is pushed, the engagement pawl (23)c thereof contacts the sawtoothed cam surface (27)a and turns the interceptor (27) until it enters the deepest portion of a concave on the sawtoothed cam surface (27)a. 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 (24)c 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 as changes 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 button (17)b of the changeover switch S_2 is pushed, the left-handed mirror L is controlled in the same way as described above.

Figs. 22 to 27 show a third embodiment of a switch according to the present invention. The third embodiment is mainly different from the aforesaid first and second embodiments in the construction of the movable contacts in switch elements. That is, cushions of a crest-shaped section having elastic force are provided on the stationary contact elements and a movable contact is fixed inside the top of each of the cushions. Therefore, the movable contacts may be made of a metal unlike in the first and second embodiments. Connections between the switch elements are substantially the same as in the first and second embodiments. The third embodiment will now be described in detail with respect to the differences from the first and second embodiments.

The structure of this embodiment will now be described. An insulating sheet (31) is laminated on said printed board (insulating board) (2). This sheet (31) has cushions (32a) to (32h) of crest shaped in section corresponding to a plurality of stationary contact elements. The cushions are made of rubber integrally with the sheet (31), or they may be made of a different

insulating material separately from the sheet (31). Movable contacts (32)s to (32)h are fixed inside the top of the cushions (6a) to (6h). The movable contacts may be made of a composite material having pressure conductive rubber consisting of silicone rubber and metal particles or they may be metal plates, etc.

Thus, according to the present invention, the eight 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 switch as connected as required. That is, in Fig. 10, the four switch elements A, B, E and F form one switch element for switch element for vertical adjustment to be described later) and the four switch elements C, D, E' and F' form the other switch means (switch means for horizontal adjustment). The arrangement and connecting state of the switch elements A to F' on the printed board (2) is illustrated in Figs. 26 and 27 substantially the same as the first embodiment.

Driving mechanism as follows are disposed over said switch elements A to F' formed as described above.

More particularly, an operation button (34) is disposed over the eight cushions (32a) to (32h) of the insulating sheet (31). The operation button (34) is square in its plan view, and the outside of its top is

engaged with the corners between the inner walls of a housing (1) and the top plate (1a). Projecting push buttons (34a) to (34d) provided on the top of the operation button (34) protrude upward from openings (1a) provided in the top late of the housing (1). As shown in Fig. 25, the operation buttion (34) is provided at its bottom with four pressing surfaces (34e) to (34h) so divided by two diagonals. Cushions (32a) to (32h) of crest sectional shape corresponding to a plurality of stationary contact elements are disposed on the sheet (31). The operation button (32) is square in its plan view, and the outside of its top is engaged with the corners between the inner walls of a housing (1) and the top plate (1a). Projecting push buttons (34a) to (34d) provided on the top of the operation button (9) protrude upward from openings (1a) provided in the top plate of the housing (1). As shown in Fig. 25, the operation buttion (34) is provided at its bottom with four pressing surfaces (34e) to (34h) so divided by two diagonal lines, said pressing surfaces respectively lying on top of two cushions (32a) and (32b), (32c) and (32d), (32e) and (32f), (32g) and (32g) and (32h). Therefore, the pressing surface (34e) corresponds to the switch elements A and F, the pressing surface (34f) corresponding to the switch elements B and E, the pressing surface (34g) corresponding

to the switch elements C and F', the pressing surface (34h) corresponding to the switch elements D and E'. Thus, the pressing surface (34e) to (34h) of the operation button (34) corresponds to two switch elements.

The operation button (34) is provided in the center and four corners of its bottom with projections (34i) and (34j) to (34m) for preventing the simultaneous operation of more than one pressing surface thereof. If two push buttons, for example, (34a) and (34c) or (34a) and (34d), are pushed with the same force at the same time, the projection (34i) passes through an opening (5a) in the center of the insulating sheet (31) and contacts the board (2) while one of the projections (34j) to (34m) passes through one of notches (31b) and contacts the board (2), so that the switch elements corresponding to two pressing surface, for example, F and F', A and D or F and E', are not closed at the same time, thus the possibility of the oblique movement of the mirror or short circuit being eliminated. Therefore, the lengths of the projections (34i) and (34j) to (34m) are designed such that the projections are out of contact with the board (2) when one of the push buttons (34a) to (34d) is properly pushed and corresponding switch elements are closed while the projections come into contact with the board (2) so as to prevent any switch elements from being closed when a

plurality of push buttons are pushed at the same time.

The other members and elements such as the switch S_2 are constructed substantially in the same as those in the first and second embodiments.

The operation of the switch of the above embodiment will now be described.

Reference will be made to the case of controlling the right-handed mirror R by pushing the push button (17)a of the changeover switch S_2. When the push button (17)a is pushed, the cushions (32a), (32)b are contracted and its movable contacts (33)a and (33)b respectively close the stationary contacts (3f), (4f), and (3a), (4a) together so that the switch elements A, F are closed, the motor M_1 is rotated in a normal direction, thereby controlling to direct the angle of the right-hand mirror R upward. When the position (34a) of the operation button (34) is pushed thereafter in the predetermined inclining stroke, the cushions (32a), (32b) are contracted, the movable contacts (33a), (33b) are pressure contacted with the switch elements A, F, which are closed and the motor M_1 rotates in the positive direction, thereby changing the angle of the right-handed mirror R toward upward direction. When the pressing pressure is released, the operation button (34) returns to its neutral position as shown in Fig. 23 by the elasticity of the

cushions (32a), (32b). Such elastic action of the cushions (32a), (32b) provide a good feeling of clicking.

When the position (34b) of the operation button (34) is pressed, 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 the position (34c) of the operation button (34) is pressed, the switch elements C and F' are closed and the electric motor M_2 rotates in such a direction as changes the angle of the right-handed mirror R toward the left.

When the projection (34d) of the operation button (34) is pressed, the switch elements D land E' are closed and the electric motor M_2 rotates in a reverse direction so as to change the angle of the right-handed mirror R toward the right.

When the positions (34b), (34c), or (34d) is pressed, the cushions (32c) and (32d), (32e) and (32f), or (32g) and (32h) behave in the same way as when the position (34a) is pressed.

When the push button (17b) of the changeover switch S_2 is pressed, the left-hand mirror L is controlled in the same way as described above.

INDUSTRIAL APPLICABILITY

According to the present invention, a plurality of switch elements are mounted in a housing, and two sets of switches for changing the polarity of the power supply can be constructed.

According to the present invention as described above, an insulating board in which stationary contact elements, each having a pair of film electrodes are arranged in a housing, and cushions provided corresponding to the elements, in which the insulating sheet provided with stationary contact elements and movable contacts forming switch elements and operation buttons for operating the switch elements are arranged, the operation buttons are tiltable and constantly resettable trend by utilizing the elastic force of the cushions. Accordingly, the profile may be formed in flat and thin structure, the number of parts can be reduced with ready assembling work in high reliability in the switch. Particularly in the present invention, it is not necessary to use the expensive pressure conductive rubber. Further, a pair of right and left side motor-driven mirrors mounted in a fender of a vehicle contain two motors at the respective drive units, and the polarities of the applied voltage from the power supply to the motors are switched, thereby controlling to switch the angles of

the mirrors between upward and downward or between the rightward and leftward. Accordingly, the two sets of the switches for changing the polarity of the power supply can correspond to the two motors for controlling to switch between the upward and the downward directions and between the rightward and the leftward directions, thereby facilitating the assembling of the switches to the instrument panel of the vehicle to be adapted for use in the industrial field.

CLAIMS:

1. A switch comprising an insulating board arranged in a housing, a plurality of stationary contact elements, each of said elements formed of a pair of film electrodes and arranged around a specific central position on said insulating board, a pressure conductive rubber sheet forming switch elements laminated on said stationary contact elements together with the elements, operation buttons having pressing surfaces for driving said each switch element and arranged tiltably to the rubber sheet at said specific central position as a tiltable fulcrum, and a ball and socket bearing having spheres arranged at the fulcra and sphere retainers corresponding to said spheres, each of said spheres having a pin projected toward the tilting direction of said button, each of said sphere retainers having split grooves having narrow width slightly smaller than the diameter of said pin corresponding to each said pin and resettable force, thereby providing a resettable trend at said button via said pin and grooves.

2. The switch as claimed in claim 1 wherein the pressing surfaces of said operation buttons are four, two each of said switch elements correspond to each of said pressing surfaces, and said switch elements form two sets of switch means for changing the polarity of an

electric power supply.

3. A switch comprising a housing, an insulating board disposed in said housing, a plurality of stationary contact elements and a pressure conductive rubber sheet, a plurality of operation buttons, each of said operation buttons having a pair of film electrodes, arranged on said rubber sheet and having a constantly resettable trend imparted thereto and an engaging pawl projected toward said pressing surface and specific central position for driving said switch element, and a crown-shaped interceptor formed with a sawtoothed cam surface made of number of teeth different from the number of said buttons corresponding to said engaging pawls on the end face rotatably arranged at said specific central position for operating said corresponding switch element when said pawl is press-fitted into the deepest part of the concave on said sawtoothed cam surface, thereby preventing the simultaneous operations of said switch elements.

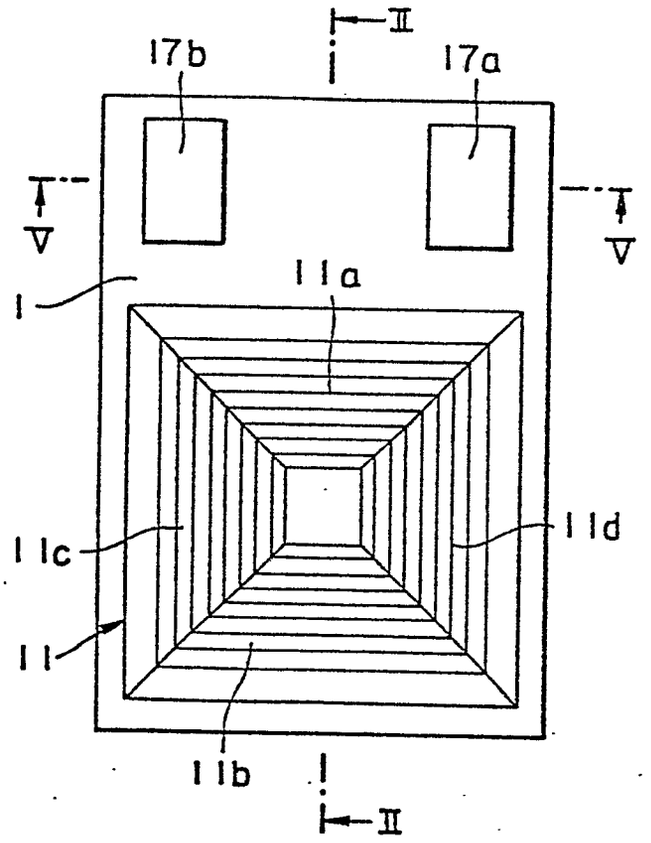
4. A switch as claimed in Claim 3, wherein the number of said buttons is 4, two each of said switch elements correspond to each of said buttons, and said switch elements form two sets of switch means for changing the polarity of an electric power supply.

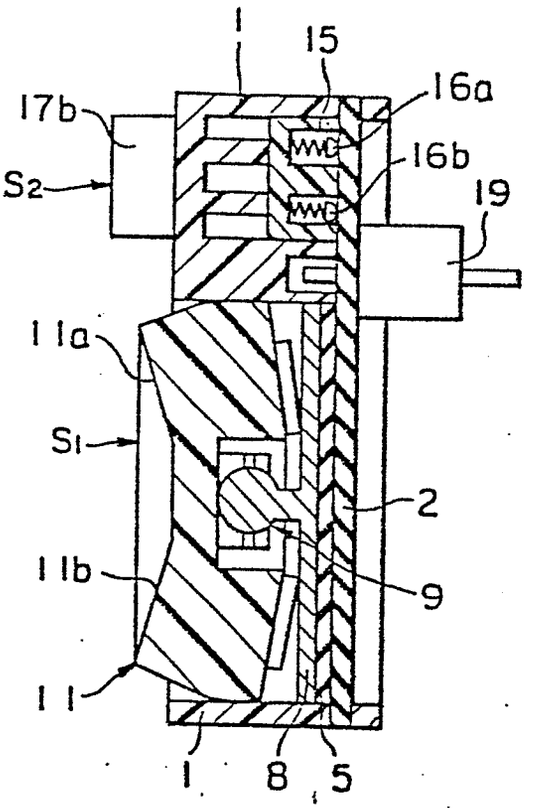
5. A switch comprising a housing, an insulating board arranged in said housing, a plurality of stationary

contact elements, each of said elements formed of a pair of film electrodes and arranged around a specific central position on said insulating board, an insulating sheet arranged on said insulating board, formed with cushions of crest shape in section expanding toward said stationary contact elements at the positions corresponding to the arranging positions of said elements, and secured with said elements and movable contacts forming said switch elements inside the top of said cushions, and operation buttons having pressing surfaces for driving said each switch element by pressing said cushions, arranged tiltably and each of said buttons having projections arranged at the positions corresponding to said specific central position and the position corresponding to the intermediate positions between the arranging position of said cushions for preventing the simultaneous operation of said switch elements.

6. The switch as claimed in claim 5 wherein the pressing surfaces of said buttons are 4, two each of said switch elements correspond to each of said pressing surfaces, and said switch elements form two sets of switch means for changing the polarity of an electric power supply.

第 2 図


Ⅱ
17b
17a
Ⅴ
Ⅴ
1
11a
11c
11d
11
11b
Ⅱ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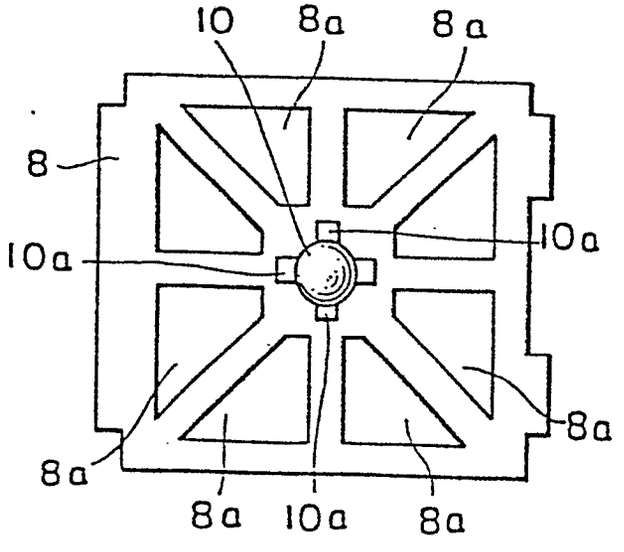
15
16a
17b
16b
S2
19
11a
S1
2
11b
9
11
1
8
5

第 3 図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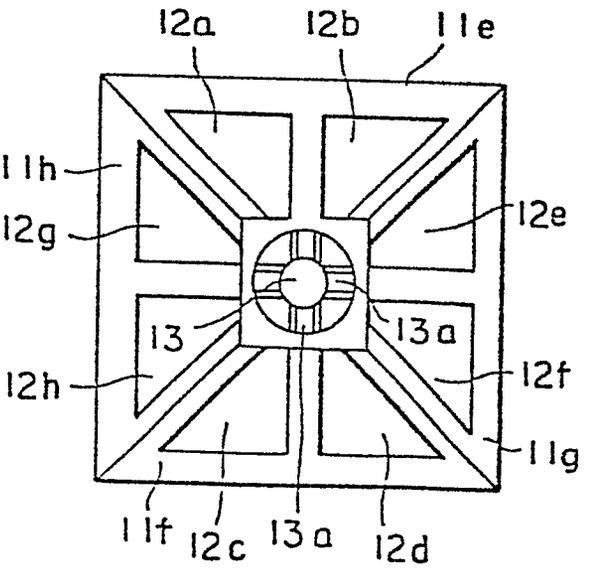
8
10a
10a
8a
8a
8a
10a
8a

第 4 図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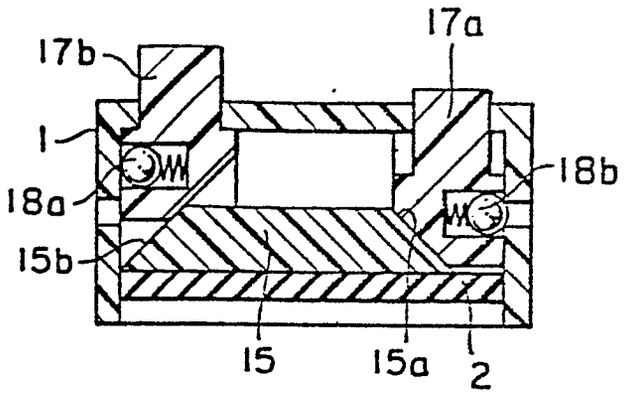
13a
12h
12f
11g
11f
12c
13a
12d

第 5 図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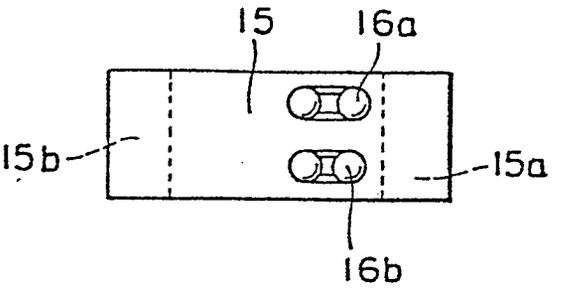
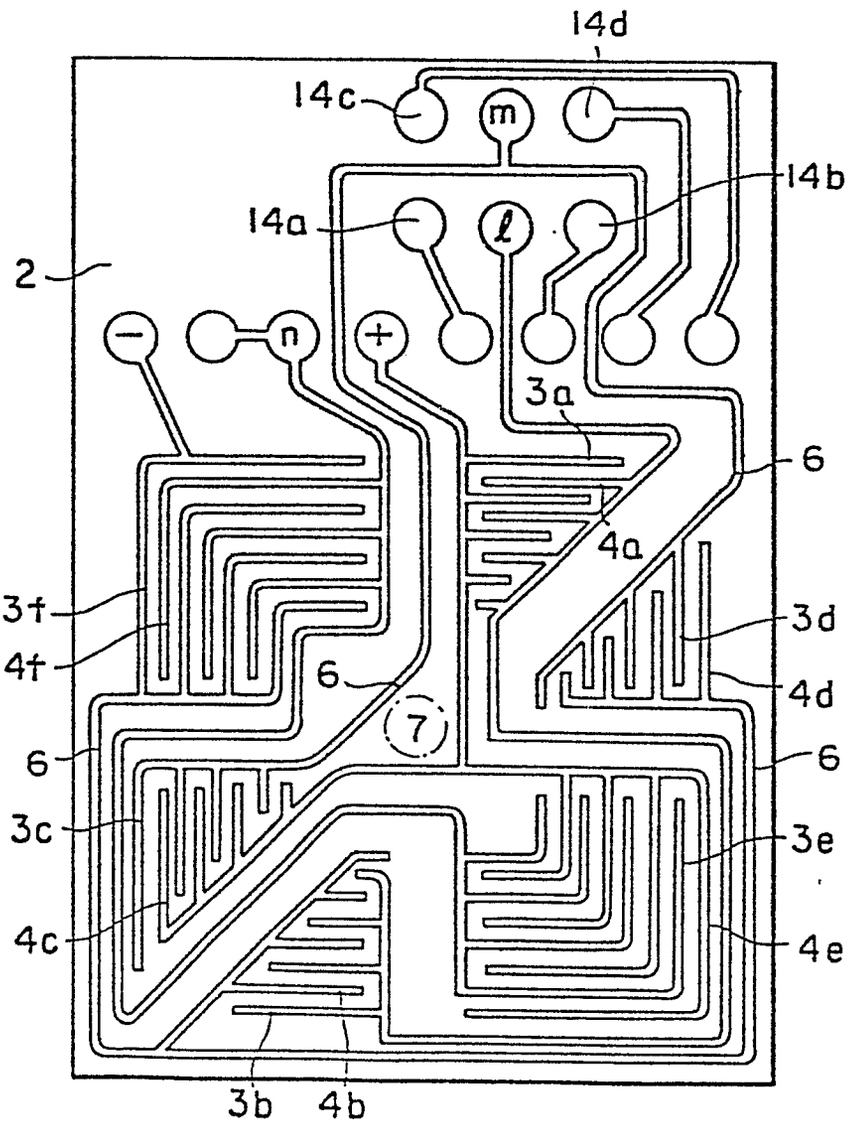
1
18b
18a
15b
15
15a
2

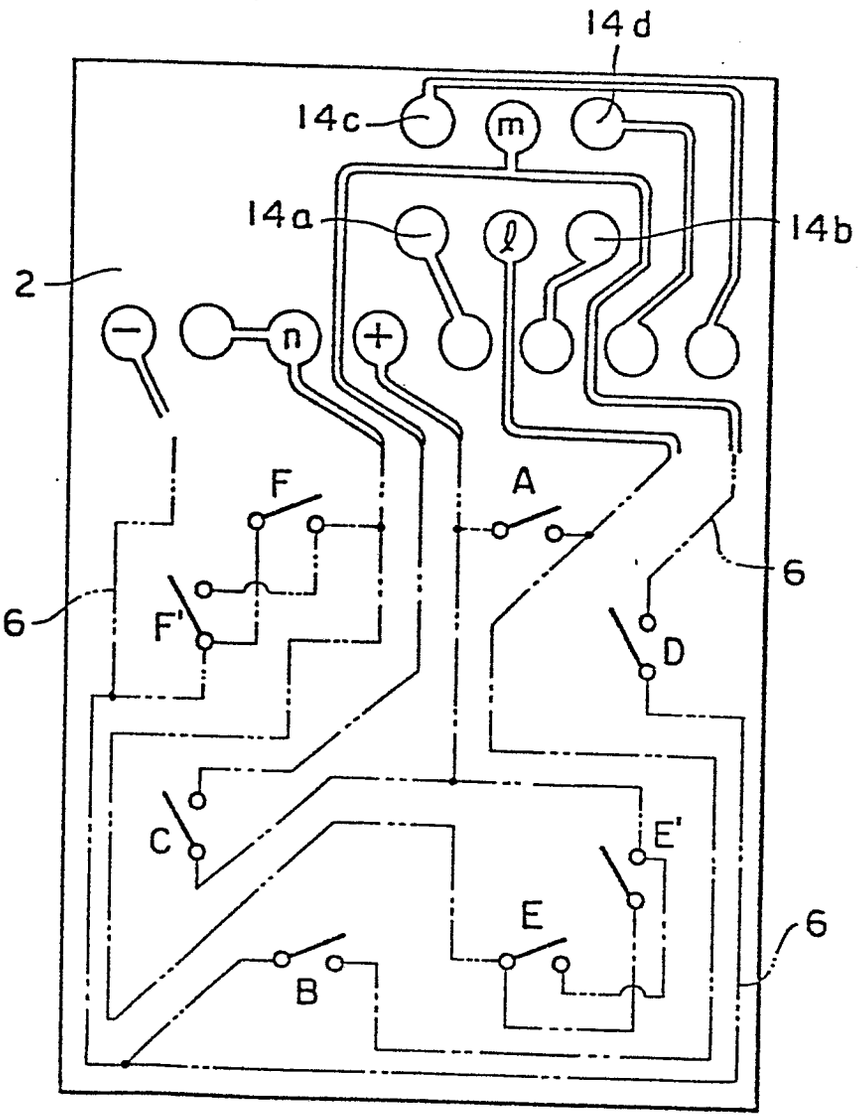
第 6 図


15
16a
15b
15a
16b

第 7 図


14d
14c
m
l
14b
14a
ℓ
2
−
n
+
3a
6
4a
3f
3d
4f
4d
6
7
6
6
3c
3e
4c
4e
3b
4b

第 8 図



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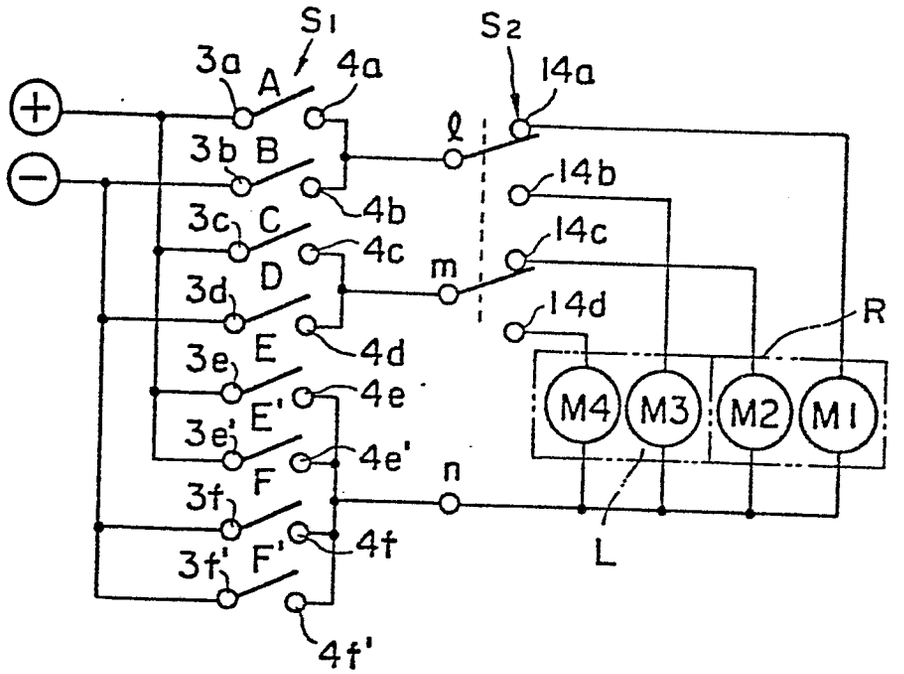

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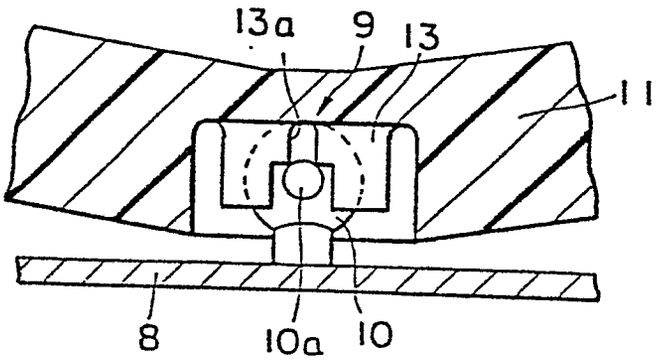

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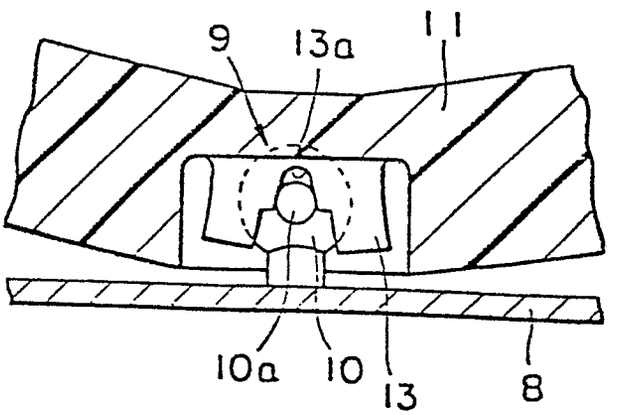

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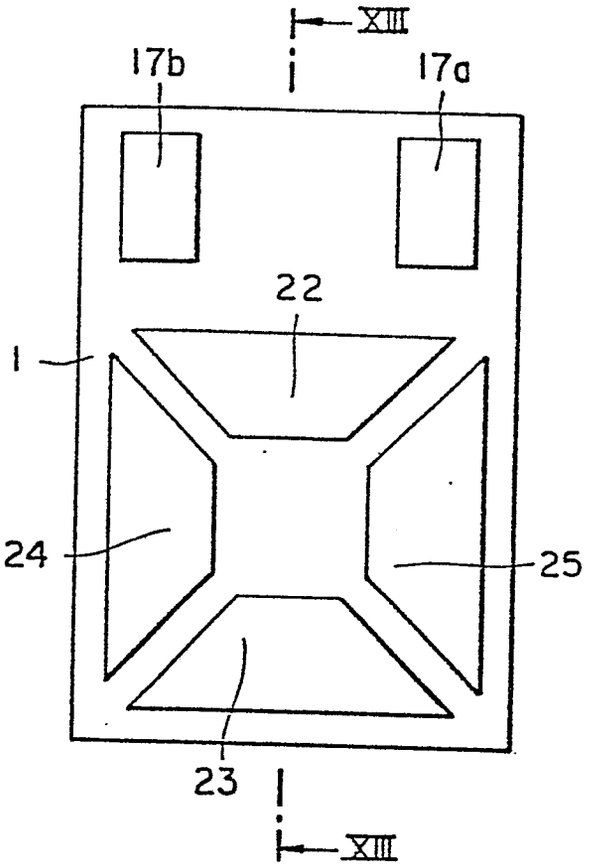
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17a
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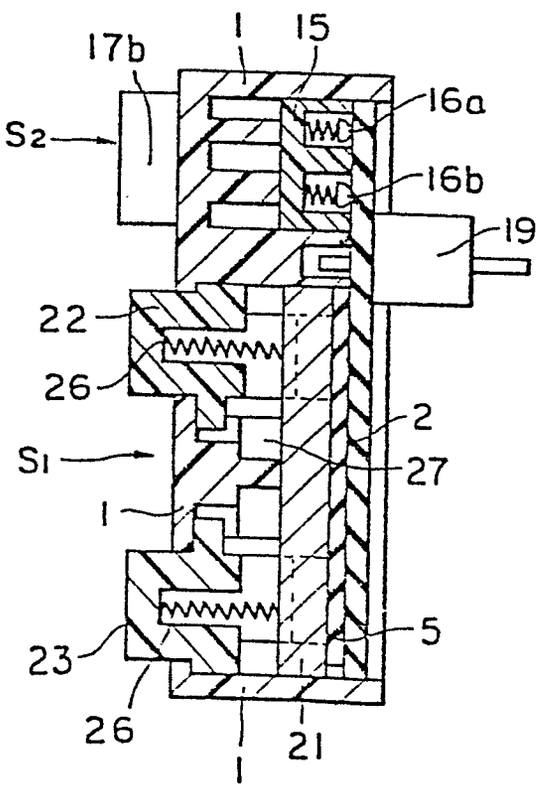
1
24
25
23
XIII

第13図


1
15
17b
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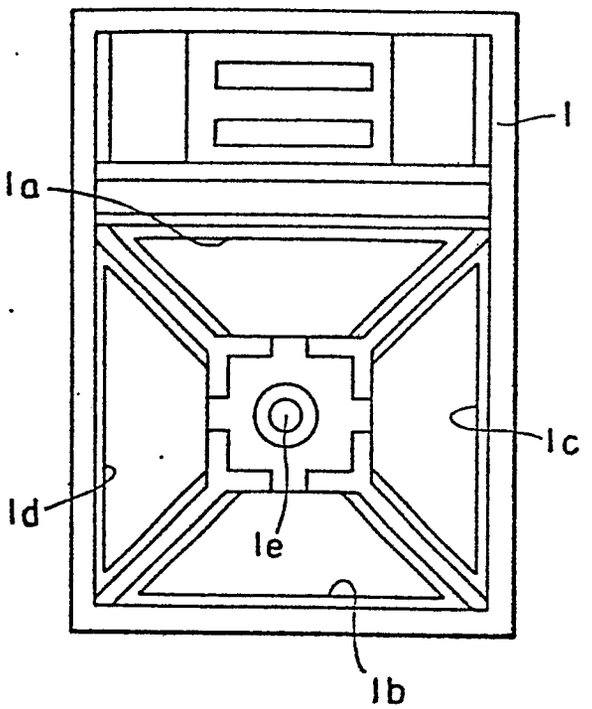
S2
16b
19
22
26
2
S1
27
1
5
23
26
21
1

第14図



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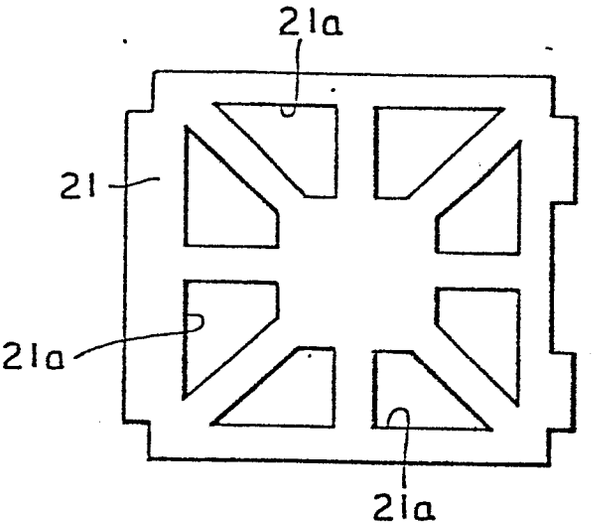

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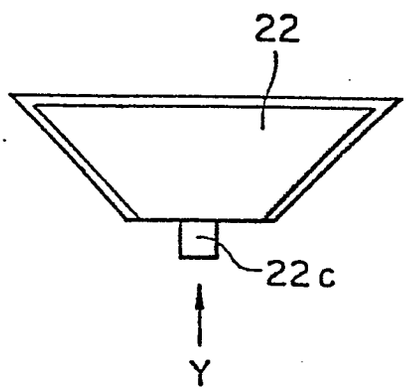

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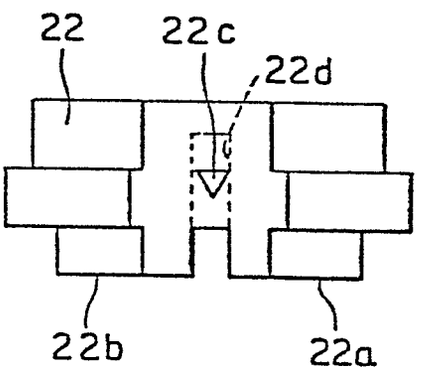

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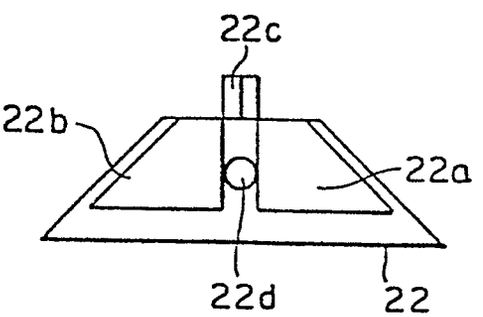

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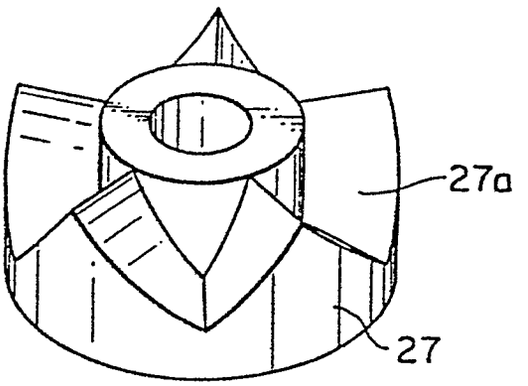

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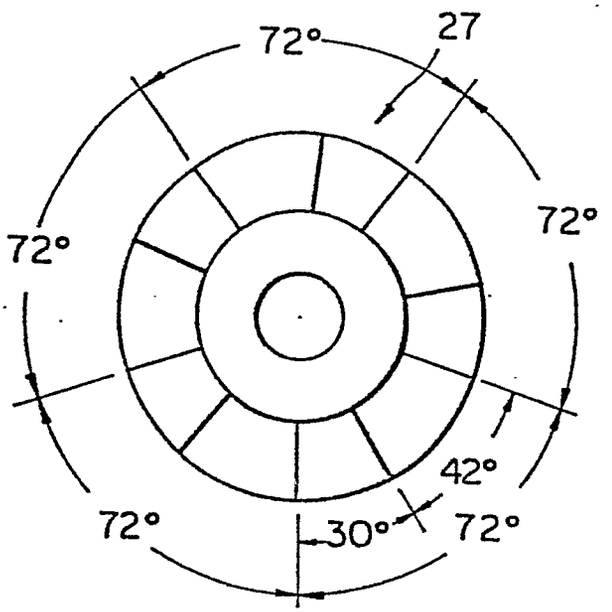

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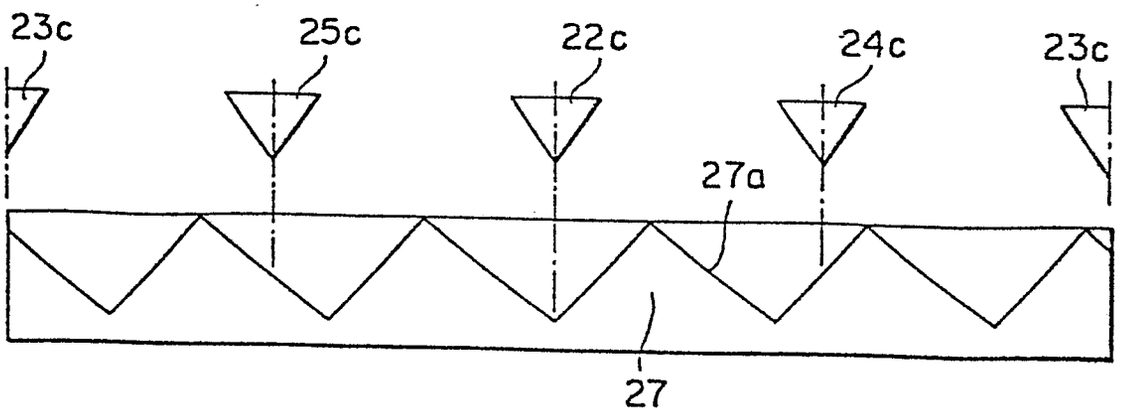

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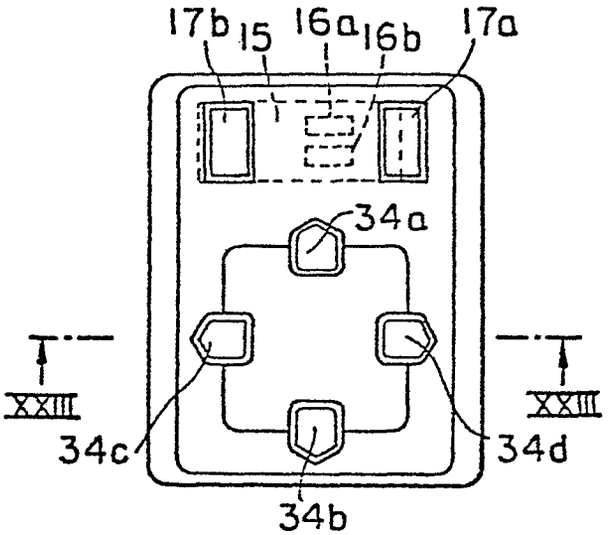
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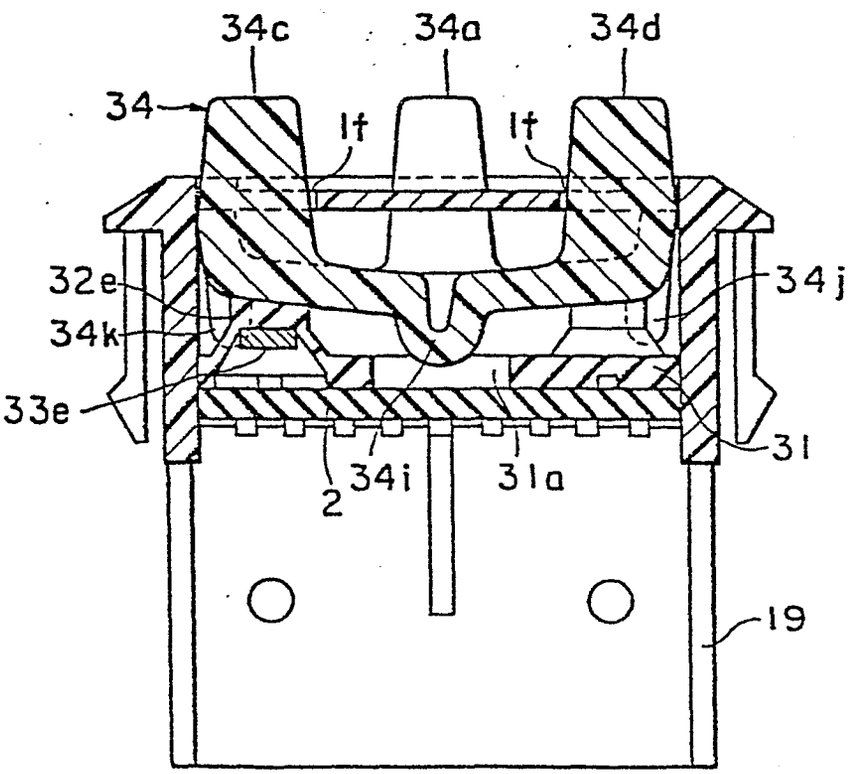
16b
17a
34a
XXIII
XXIII
34c
34d
34b

第23図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1f
32e
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34k
33e
31
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34i
31a
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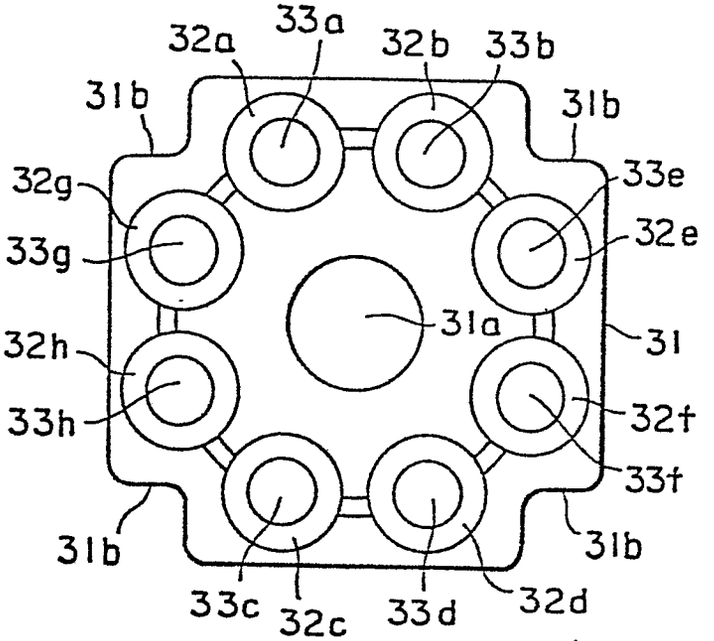
第 24 図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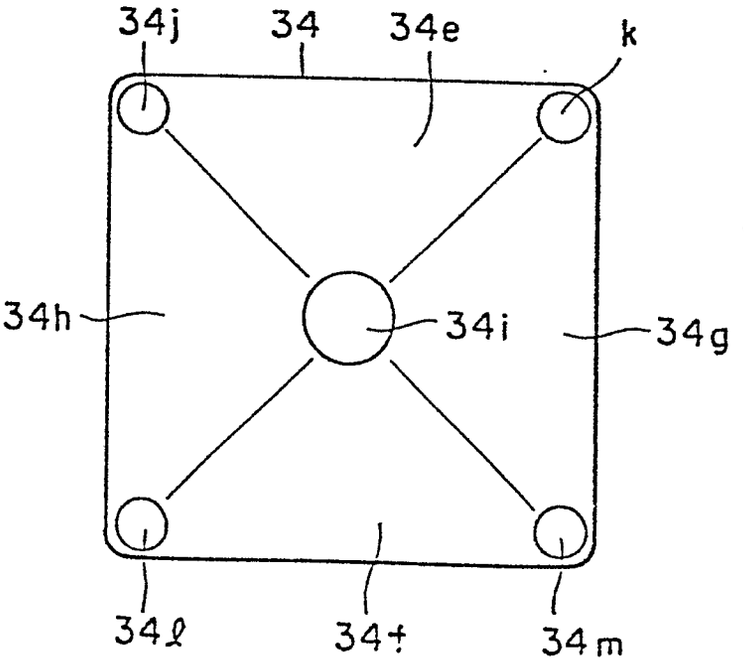
31b
31b
33c
32c
33d
32d

第 25 図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34e
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34g
34ℓ
34f
34m

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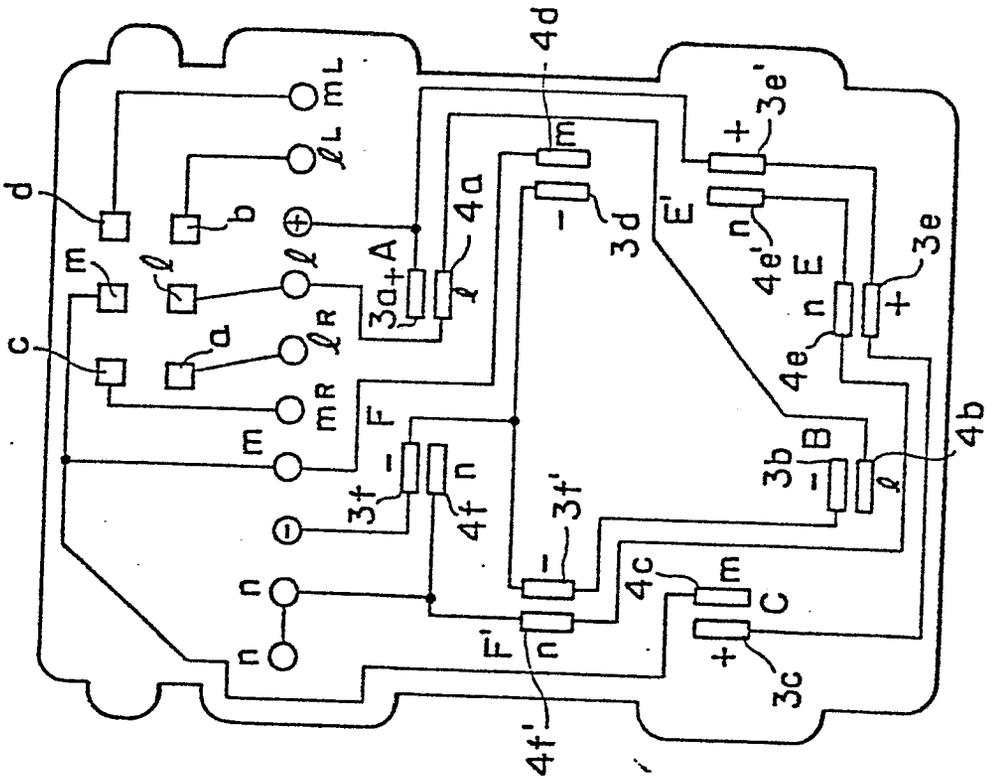
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m
c
b
a
ℓ
mL
ℓL
ℓR
mR
3a
A
4a
4d
3d
E'
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4e'
n
E
3e
4e
F
3f
4f
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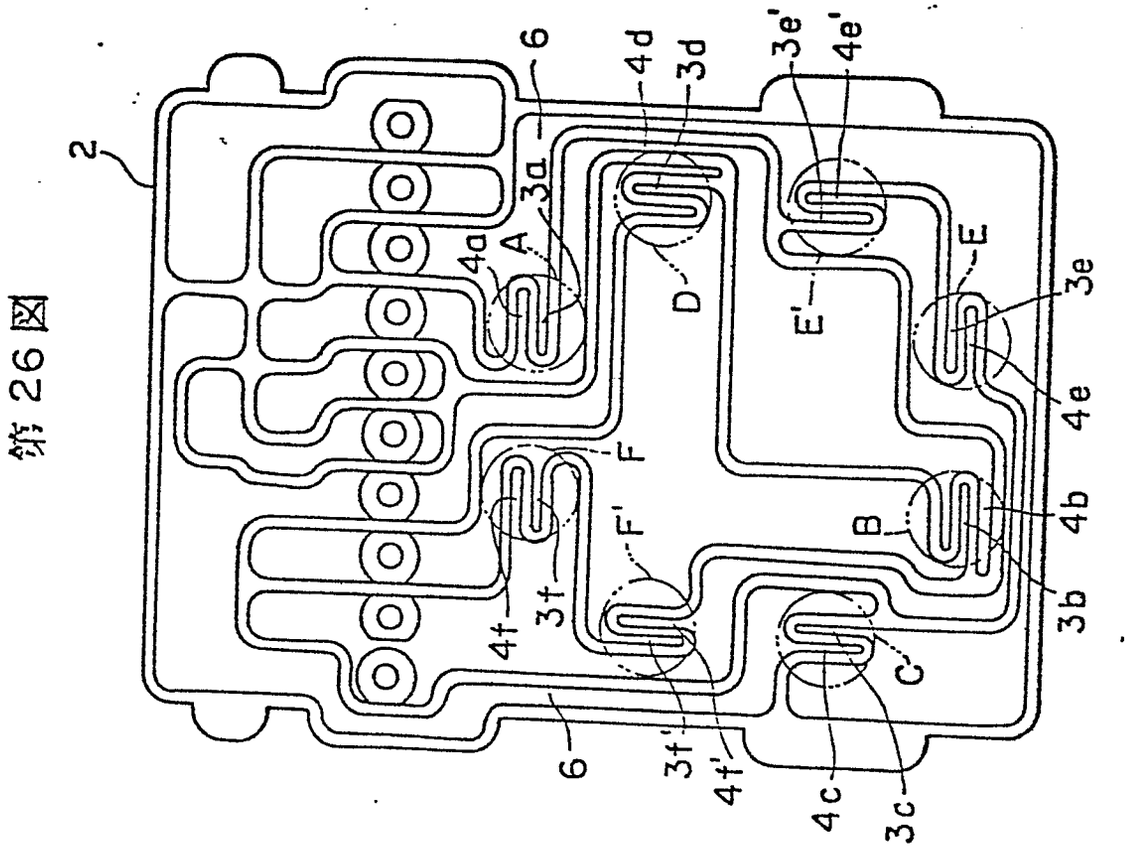
3f'
4f'
F'
4c
C
3c
B
3b
4b

第26図


2
6
4d
3d
3e'
4e'
3a
4a
A
D
E'
E
3e
4e
F
F'
B
4b
3b
3f
4f
3f'
4f'
C
4c
3c

1 : housing

2 : printed board (insulating board)

3a to 3f, 4a to 4f: film electrodes (stationary contact elements)

5 : insulating sheet 7: specific central position

9 : ball and socket bearing 10 : sphere

10a : pin 13 : sphere retainer

13a : split groove

11, 22 to 25, 34 : operation buttons

12a to 12h, 22a, 22b, 34e to 34h : pressing surfaces

22e to 25c : engagement pawls 27 : interceptor

27a : sawtoothed cam surface 31 : insulating sheet

32a to 32h : cushions 33a to 33h : movable contacts

A to F : switch elements S_1 : switch

S_2 : changeover switch L : left-hand mirror

R : right-hand mirror

INTERNATIONAL SEARCH REPORT 0102394

International Application No. PCT/JP82/00406

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[3] H01H 25/04, H01H 13/72

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
I P C	H01H 25/04, H01H 13/72, B60R 1/02-1/08

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Koho 1959 - 1982

Kokai Jitsuyo Shinan Koho 1971 - 1982

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category*	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	JP,U, 56-1340, 8-1-1981, Figs. 3 to 17, Ichikoh Industries Ltd.	1
Y	JP,A, 55-32334, 7-3-1980, Figs.1,2,15, 16, Yushin Seiki Kogyo Kabushiki Kaisha	3, 4
Y	JP,Y1, 41-7847, 20-4-1966, Figs. 1, 3, 4, Fuji Tsushinki Seizo Kabushiki Kaisha	3, 4
A	JP,U, 54-169775, 30-11-1979, Figs. 1, 2, Niles Parts Co., Ltd.	5
A	JP,U, 56-17635, 16-2-1981, Figs. 1, 2, Ichikoh Industries Ltd.	5

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
January 10, 1983 (10.01.83)	January 17, 1983 (17.01.83)
International Searching Authority [1]	Signature of Authorized Officer [20]
Japanese Patent Office	