

A B S T R A C T

OTHERS; of the push-button type, constituted by a key 1 located within a housing 2 and mounted on one end of a rod 5, the intermediate portion of which goes through a spring 6 and a sliding seat provided within a box 7, and with the opposite end of said rod 5 actuating on electric contacts located within the box 7 and connected to electrical connection terminals 8; with said axially-operated switch having a direction changing device 10 for the forces acting on the switch, constituted by the key 1 and the housing 2, with parts of a guiding device 11-12 slanted in respect to the rod 5 of the switch and, substantially aligned to the "x-y" axis corresponding to the direction of incidence of the operator's finger on the key 1; said direction changing device 10 for the forces acting on the switch having, also, the key 1 and the rod 5 with parts of a sliding fitting 13-14, which, upon the operation of the assembly jointly with the guiding device 11-12 allows a mixed straight line movement of the key 1 formed by two direction vectors, namely: a perpendicular one "y" and a parallel one "x" relative to the rod 5, coaxial to its sliding seat and in the "x" direction of its geometric axis.

AXIALLY OPERATED SWITCH FOR ELECTRICAL CIRCUITS

This patent has as object an axially operated switch which is within the field of electrical components, and that was improved in order to be used, mainly, in rear-view mirrors or other devices which do not normally stay in front of those who operate them.

Axially operated electrical switches, named "push-button", are already known, which have a key mounted on one end of a rod, the intermediate portion of which goes through a return spring, and a sliding seat, located within a box or assembling structure, with the opposite end of said rod operating electric contacts located in said box or structure and connected to the electrical connection terminals.

The operation of such switch is done by pressing the key in the direction which is coaxial to the rod, forcing said rod to move against the spring, to a point in which it changes the state of commutation of the electric contacts. Once the key is let free, the spring pushes the rod and the key towards the initial position, without changing the state of commutation reached.

Following the characteristics of the above described switch, it becomes clear that the most favorable position for its operation is when the user's finger is in a coaxial position in respect to the rod. However, in practice this is not always possible, the mechanical portion of the switch may be particularly submitted to lateral stress, and to undesirable friction and wear.

Actually, many of the electrical-electronic devices, specially those of the type used in automotive vehicles and which use push-button switches, such as: radio and television sets, turn light control switch, lighting switches and others, are located in front of and sideways of the driver, so that they may be operated by the driver without jeopardizing the driving of the vehicle. Therefore, the key-rod assembly of such switches is, in general, pressed in a slanted direction in respect to the geometric axis of the rod, submitting it to a lateral stress and, as a consequence, to a determinate amount of friction against the sliding seat, which tends to wear the whole assembly during its life time.

Considering the above mentioned problems, the operators of electrical-electronic devices having push-buttons which are reached from a lateral position, very often

and intuitively tend to put their finger in a position which is axial to the button, before pressing it, a fact which is undesirable, particularly in instruments used in automotive vehicles and which are operated by the driver, since said procedure would necessarily convey a certain loss of attention by the driver, harming the good driving of the vehicle.

Considering said inconveniences, and trying to overcome them, an improvement, object of this patent, was made in a switch with axial operation for electrical circuits of rear-view mirrors or other devices, with such improvement consisting in providing an axial operation switch with a device which changes the direction of the active force applied on the switch, formed by the operating key, its respective seat, and parts of a device with slanted guides relative to the switch rod, substantially aligned to the axis which corresponds to the direction of incidence of the operator's finger on the key, with said device for modifying the direction of the operating force on the switch providing both the key and the rod with a sliding fit which allows, when the assembly is operated, a straight-line mixed movement for the key, formed by two direction vectors one perpendicular to and the other parallel to the switch rod, allowing, simultaneously, a simple straight-line movement for the rod in the direction of its geometric axis, coaxial to its sliding seat.

This form of construction for the axially operated switch allows its convenient operation, even in cases when the operator's finger touches the push button from a slanted position in respect to the switch rod.

It was then possible to develop an internal rear-view mirror with electrical circuit for courtesy light, or other circuits, object of this patent application, which may be actuated by a push-button axially-operated switch, capable of complying with the most rigid ergonomic specifications.

Actually, this axially operated switch, used in the electric circuits, such as the one for the courtesy light, in internal rear-view mirrors, has its key and seat located in the frontal lower edge of the mirror's housing, which allows it to be reached in a comfortable manner, even from a slanted position, resulting from the fact that the driver or the front seat passenger are in front and below relative to the mirror. This allows the driver and/or the front seat passenger to operate the switch with a "mechanical" movement, without paying too much attention to it, avoiding the loss of attention to the driving of the vehicle.

On the other hand, the lateral stress on the rod is minimized or even eliminated, avoiding excessive friction and wear of the assembly.

The attached drawing shows the improvement in an axially operated switch for electric circuits of rear-view mirrors, or other circuits, object of this patent, where:

Figure 1 shows the switch assembly in an exploded perspective view;

Figure 2 shows the switch assembly in a lateral view, with a partial cross section, for a better understanding; and

Figure 3 shows an improved internal rear-view mirror, with the axially operated switch in a lateral view.

Following what is shown by the above listed figures, the axially operated switch object of this patent is of the so called push-button type, and has a key 1, located within a housing 2 of the panel 3 in the receiving device of the switch, mounted in one end of a rod 5, the intermediate region of which goes through a spring 6 and a sliding seat located in a box 7, with the opposite end of said rod 5 activating electric contacts (not shown), located within the box 7 and connected to electric connection terminals 8.

In the present improvement, the axial switch has a device 10 which changes the direction of the force acting on the switch, constituted by the key 1 and the housing 2 which has parts of a guiding device 11-12 slanted in respect to the rod 5 of the switch, and substantially aligned to the "x-y" axis, corresponding to the direction of incidence of the operator's finger on the key 1, where said direction changing device 10 has, also, a key 1 and a rod 5 with parts of a sliding fitting 13-14, which allows, when the assembly is operated together with the guiding device 11-12, a mixed straight-line movement of the key 1, formed by two direction vectors, namely: one "y" direction, perpendicular to the rod 5, and one "x" direction, parallel to the rod 5, allowing, simultaneously, a simple straight-line movement for the rod 5 in the "x" direction of its geometric axis, coaxial to its sliding seat of the box 7.

In a preferred configuration, as shown in Figures 1 and 2, the guiding device 11-12 has the key 1 with the upper and lower surfaces 11 slanted in respect to the front surface 20, slidably supported on the respective upper and lower surfaces 12 which project from the window 21 of the housing 2. The upper surface 11 of the key 1 provides an intermediate stop 22, while the lateral faces 23 provide shoulders 24 which, jointly with the respective sides 25 and 26 of the window 21 of said housing 2, define a stop motion and blocking device for the key 1 in the rest position of the assembly. On the sides of the lower slanted surface 12 of the housing 2 there are walls 27 which guide the lateral faces 23 of the key 1.

The sliding notch 13-14 of the key 1 and rod 5 is formed by a slide rail 13 provided in the back region 30 of the key 1, arranged in a "T" position which intercepts the "x" geometric axis of the rod 5 and the "x-y" direction of the guiding device 11-12, where the groove 14 provided in the end of the rod 5 is engaged.

The rear-view mirror 4 (fig. 3) object of this application for patent is of the internal type, provided with courtesy light and formed, substantially, by a mirror plate subject to an anti-glare mechanism (not shown), with said mirror plate arranged on the front opening, and the mechanism within the housing 40, with said opening provided with a finishing molding 41. Within said housing 40 there is the electric circuit (not shown) for the courtesy lights 42, located in the lower or bottom side 43 of said housing, having between them a window for the anti-glare mechanism operating lever 44; on the back or rear side 45 of the housing 40 there is an opening 46 from which a supporting arm 47 projects, the free end of which is jointly connected to the base 48, fixed to the vehicle body or windshield.

The improvement introduced in the internal rear-view mirror 4 mentioned above consists in providing a push-button axially operated switch to control the electric circuit of the courtesy lights 42, with a direction changing device 10 for the forces acting on the switch, constituted by the key 1 and the housing 2, with parts of a guiding device 11-12 slanted in respect to the "x" geometric axis of rod 5 of the switch and, substantially aligned to the "x-y" axis corresponding to the direction of incidence of the operator's finger on the key 1; the key and a rod 5 with parts of a sliding fitting 13-14, which allows a mixed straight-line movement of the key 1, formed by two direction vectors, a perpendicular one "y" and a parallel one "x" relative to the rod 5 and which allows, simultaneously, a simple straight line movement for the rod 5 in the "x" direction of its geometric axis; said housing 2 and the key 1, fitted in it, are located in the front-lower edge 49 of the front molding 41, in the mirror housing 40, in order to facilitate the access to the key 1 for an operator located in a normal position relative to the rear-view mirror - below and in front of it. The switch remains seated on a printed circuit plate 50 (fig. 1) mounted within the housing 40, which receives electric connections.

Of course, this axially operated switch with a direction changing device 10 for the forces acting on the switch may be used in other electric-electronic instruments of an automotive vehicle, to be operated mainly by the driver and which are not, necessarily, located in front of the driver, but -above or below and/or laterally - as it happens, as an example, with radio, television and tape recorder sets, command panels for turn lights and illumination lights, electrically operated window glass controls and others.

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This switch may, of course, be used to command electric-electronic instruments used in other vehicles, such as aquatic, airborne and others, or in other common uses, such as in houses, offices, industries and other places.

What is claimed is:

1. An axial switch for electrical circuits of a review mirror of a vehicle, comprising a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end to be actuated and an opposite end adopted to actuate electrical contacts upon its movement in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; and direction changing means cooperating with said key so that said key being pressed toward said rod by a user is displaced in direction of a y axis which is substantially perpendicular to said axis of said rod and also in direction of an x axis substantially parallel to said axis of said rod without turning and as a result acts on said one end of said rod so as to move said rod in the axial direction.

2. A rearview mirror of a vehicle, comprising a mirror housing having a front opening provided with a finishing molding which has a front lower edge; a mirror plate located in said housing; courtesy lights located in a lower side of said housing and having an electric circuit lodged in said front opening; and an axially operated switch assembly controlling said electric circuit of said courtesy lights, said switch assembly having a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end to be actuated and an opposite end adapted to actuate electrical contacts upon its movement in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; and direction changing means cooperating with said key so that said key being pressed toward said rod by a user is displaced in direction of a y axes which is substantially perpendicular to said axis of said rod and also in direction of an x axes substantially parallel to said axis of said rod and as a result acts on said one end of said rod so as to move said rod in the axial direction.

3. A rearview mirror of a vehicle as defined in claim 2, wherein said housing has a window and an opening; and further comprising an anti-glare mechanism operating lever extending through said window of said housing; a supporting arm extending through said opening of said housing and having a free end; and a base connected with said free end of said supporting arm and fixable

to a vehicle.

4. An axially operated switch for electrical circuits, comprising a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end to be actuated and an opposite end adapted to actuate electrical contacts upon its movement in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; and direction changing means cooperating with said key so that said key being pressed toward said rod by a user is translatorily displaced in direction of a y axes which is substantially perpendicular to said axis of said rod and also in direction of an x axis substantially parallel to said axis of said rod and as a result acts on said one end of said rod so as to move said rod in the axial direction.

5. A rearview mirror of a vehicle, comprising a mirror housing having a front opening provided with a finishing molding which has a front lower edge; a mirror plate located in said housing; courtesy lights located in a lower side of said housing and having an electric circuit lodges in said front opening; and an axially operated switch assembly controlling said electric circuit of said courtesy lights, said switch assembly having a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end to be actuated and an opposite end adapted to actuate electrical contacts upon its movement in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; and direction changing means cooperating with said key so that said key being pressed toward said rod by a user is translatorily displaced in direction of a y axes which is substantially perpendicular to said axis of said rod and also in direction of an x axes substantially parallel to said axis of said rod and as a result acts on said one end of said rod so as to move said rod in the axial direction.

6. An axially operated switch for electrical circuits, comprising a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end to be actuated and an opposite end adapted to actuate electrical contacts upon its movement in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; direction

changing means cooperating with said key so that said key being pressed by a user is translatorily displaced in direction of a y axes which is substantially perpendicular to said axis of said rod and also in direction of an x axis substantially parallel to said axis of said rod and a result acts on said one end of said rod so as to move said rod in the axial direction, said direction changing means including fitting means preventing a disengagement of said key and said rod in said x direction but permitting sliding of said key relative to said rod in said y direction, and guiding means slanted with respect to said rod and extending in the direction of said x and said y axis; and a housing provided with a window in which said key is displaceable, said key having a front surface, said guiding means including an upper surface and a lower surface provided on said key and slanted with respect to said front surface of said key, said guiding means further including an upper surface and a lower surface provided in said window of said housing and being slanted with respect to said front surface of the key so that said upper and lower surfaces of said key slide over said upper and lower surfaces of said window of said housing.

7. An axially operated switch for electrical circuits as defined in claim 6, wherein said upper surface of said key has an intermediate stop, said key having lateral faces provided with shoulders, said window of said housing having sides which together with said intermediate stop and said shoulders define a stop motion and blocking device for said key in a rest position.

8. An axially operated switch for electrical circuits as defined in claim 7, wherein said lower surface of said window of said housing has walls which guide said lateral faces of said key.

9. An axially operated switch for electrical circuits, comprising a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end to be actuated and an opposite end adapted to actuate electrical contacts upon its movement in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; and direction changing means cooperating with said key so that said key being pressed by a user is translatorily displaced in direction of a y axes which is substantially perpendicular to said axis of said rod and also in direction of an x axis substantially parallel to said axis of said rod and as a

result acts on said one end of said rod so as to move said rod in the axial direction, said direction changing means including fitting means preventing a disengagement of said key and said rod in said x direction but permitting sliding of said key relative to said rod in said y direction, and guiding means slanted with respect to said rod and extending in the direction of said x and said y axis, said key having a back region, said fitting means including a slide rail extending in direction of said y-x axis and having a substantially T-shaped recess, and a groove provided in said one end of said rod and formed so that said slide rail engages in said groove and slides in it in direction of said y axis but cannot disengage from said groove in direction of said x axis.

10. An axial switch for electrical circuits of a rear view mirror of a vehicle, comprising a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end adapted to actuate electrical contacts upon its movements in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; and direction changing means cooperating with said key so that said key being pressed by a user is displaced in direction of a y axis which is substantially perpendicular to said axis of said rod and also in direction of an x axis substantially parallel to said axis of said rod and as a result acts on said one end of said rod so as to move said rod in the axial direction, said direction changing means including fitting means preventing a disengagement of said key and said rod in said x direction but permitting sliding of said key relative to said rod in said y direction, and guiding means slanted with respect to said rod and extending in the direction of said x axis of said y axis.

11. An axial switch for electrical circuits of a rear view mirror, comprising a switch rod having an axis and arranged to move in an axial direction, said switch rod having one end to be actuated and an opposite end adapted to actuate electrical contacts upon its movement in an axial direction; a key arranged to act on said one end of said rod and to move said rod in the axial direction; and direction changing means cooperating with said key so that said key being pressed toward said rod by a user is displaced in direction of a y axis which is substantially perpendicular to said axis of said rod and also in direction of an x axis substantially parallel to said axis of said rod and as a result acts on said one end of said rod so as to move said rod in the axial direction;

and guiding means slanted with respect to said rod and extending in the direction of said x axis
and said y axis for guiding said key.

Cassan Maclean
Suite 401, 80 Aberdeen Street
Ottawa, Ontario
K1S 5R5
CANADA

(Agents for the Applicant)

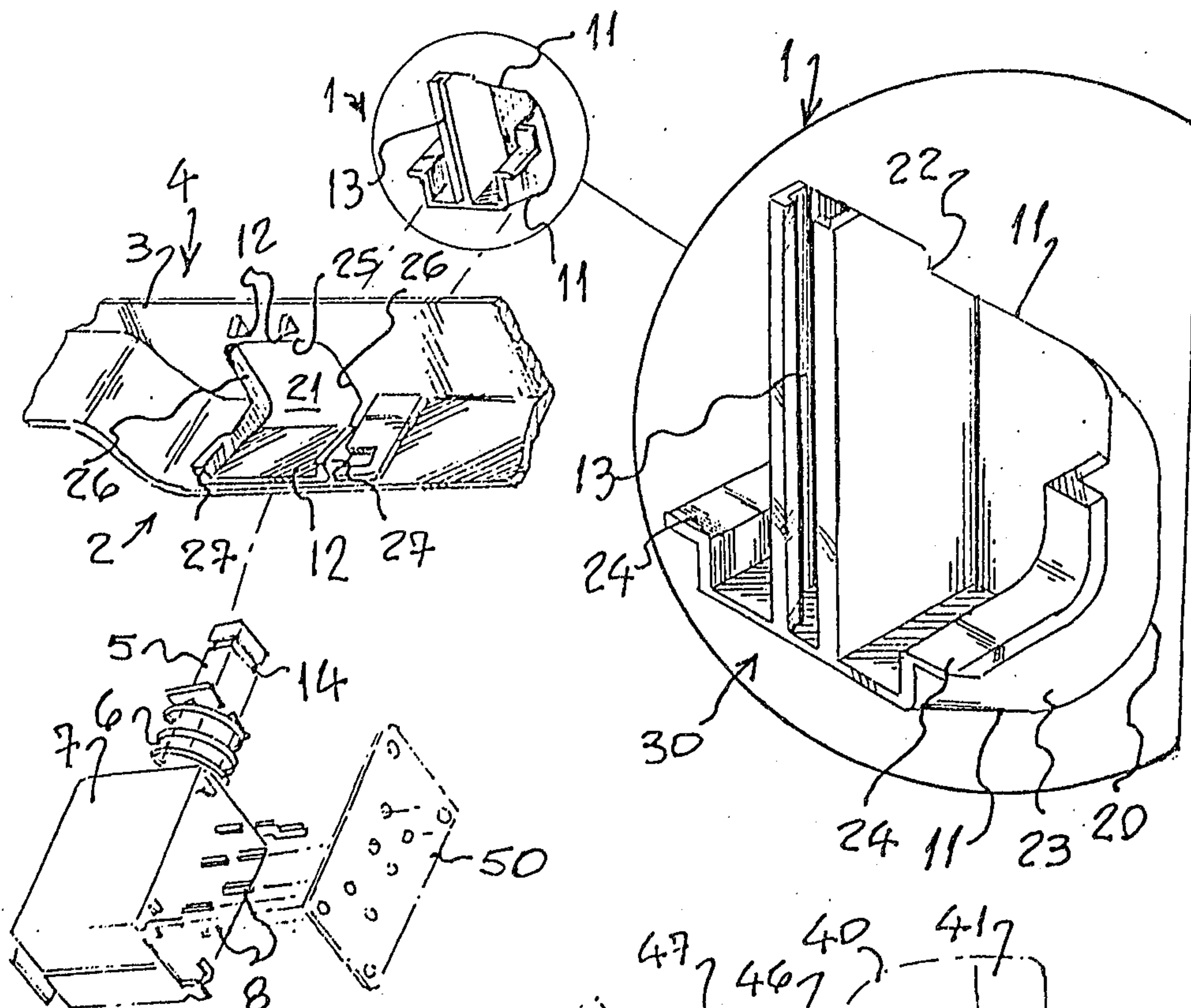


FIG. 1

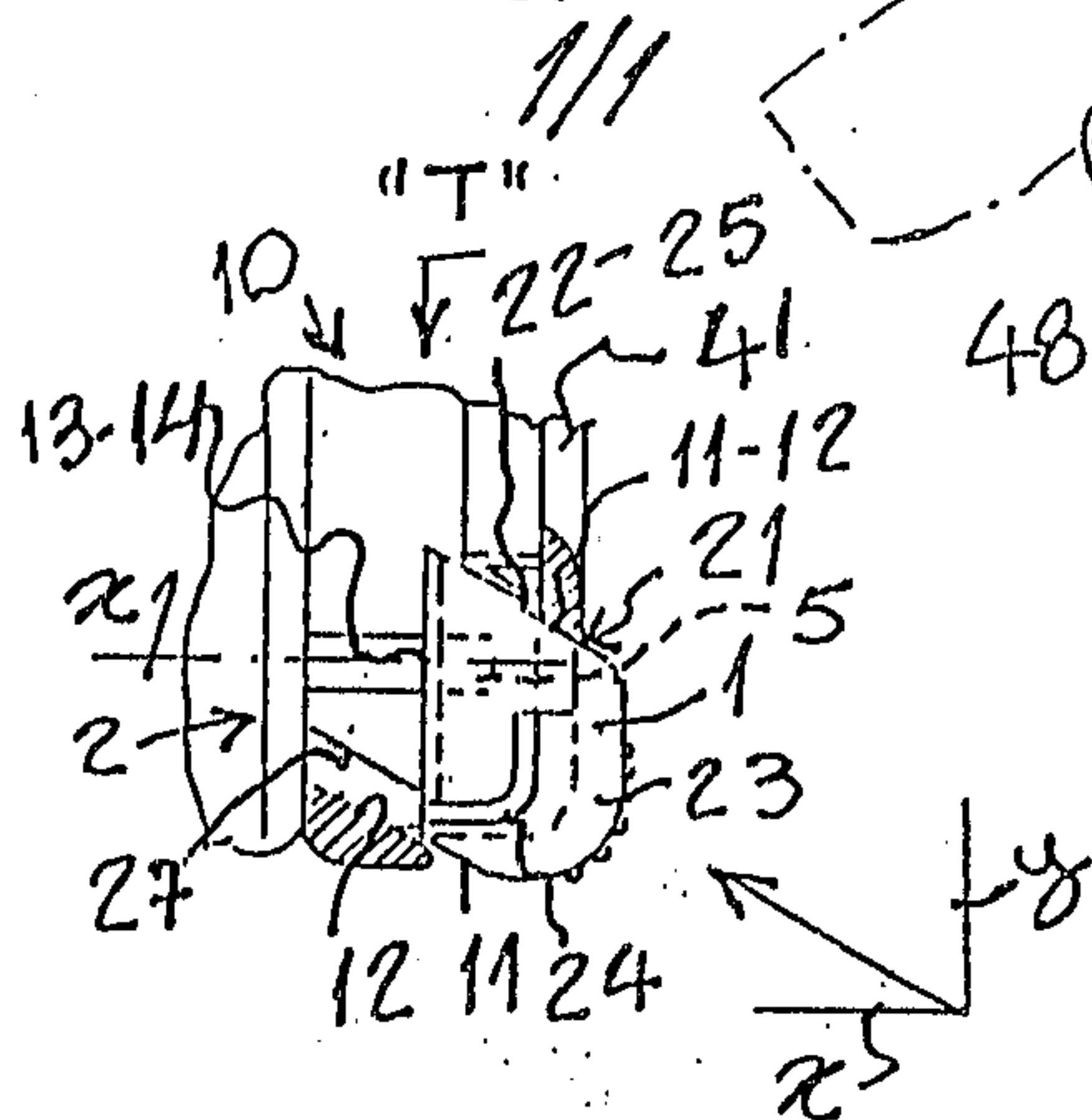


FIG. 2

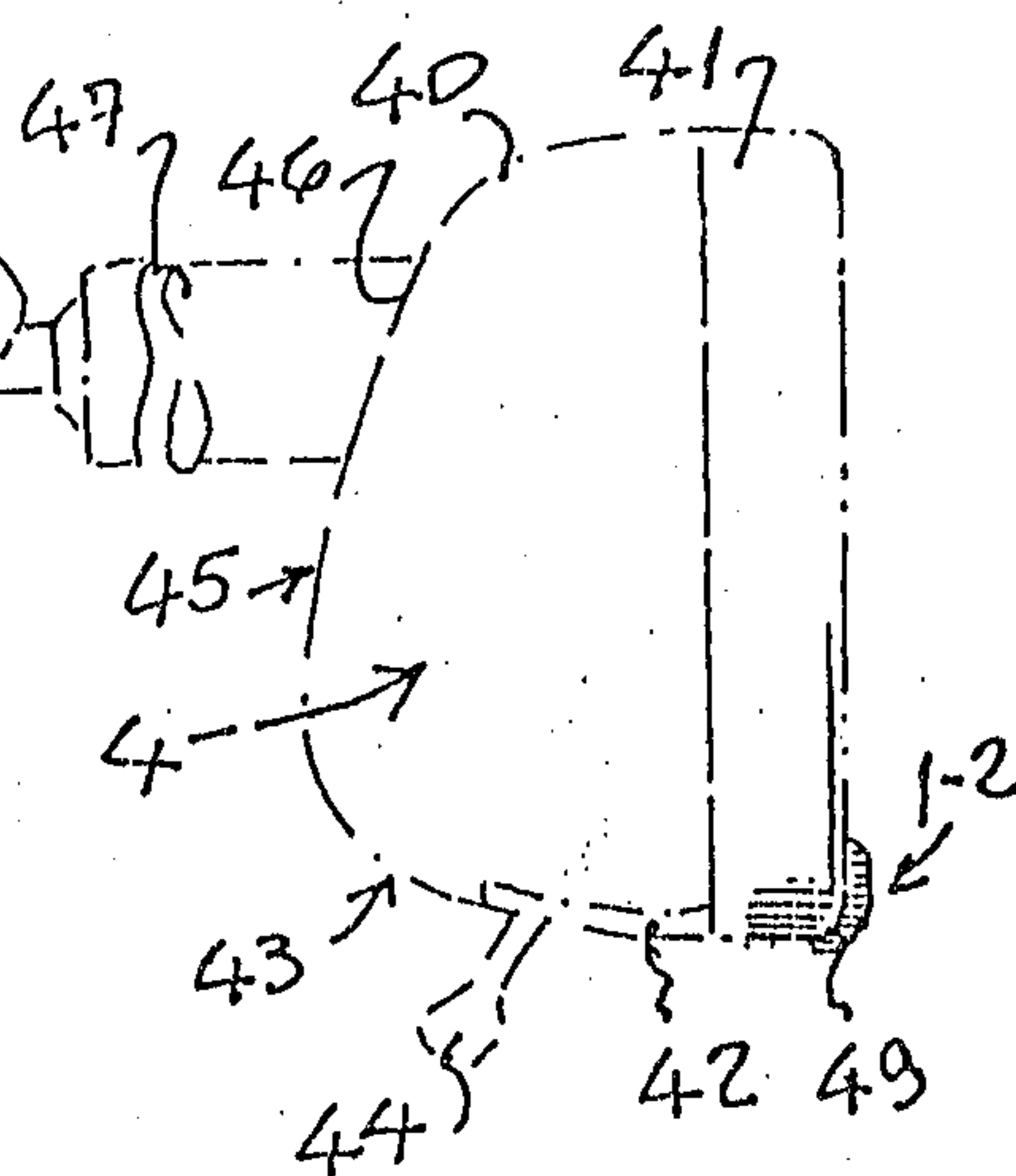


FIG. 3

