(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 529 814 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92306920.7**

(22) Date of filing : **29.07.92**

(51) Int. Cl.[5] : **H01H 15/06,** H01H 15/10, G05G 1/02, H01C 10/14, F16J 15/16

(30) Priority : **30.07.91 GB 9116425**

(43) Date of publication of application : **03.03.93 Bulletin 93/09**

(84) Designated Contracting States : **BE DE FR GB IT NL**

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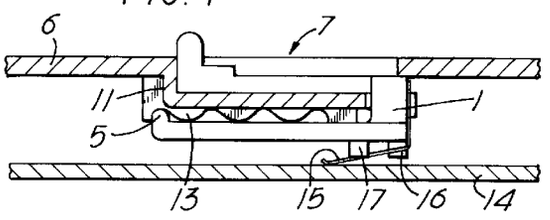
(54) Slider control.

(57) In a domestic heating control unit slider 1 has a handle 3 projecting through aperture 7 in housing 6. When slider 1 is moved along channel 8 formed by side walls 10, 11 and back wall 12, engagement between cam surfaces 13 and cross-bar 5 ensure that there are three or more specific rest positions corresponding to appropriate position of contract arm 15 on circuit board 14. Arm 2 of slider 1 and back wall 12 inhibit access to circuit board 14 through aperture 7 for all positions of slider 1.

FIG.4



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The present invention relates to a slider control arrangement, for example for a control unit.

There exist many different designs of slider controls, but typically such an arrangement has a control element slidably retained within a housing and having a lug forming a knob which extends through an aperture in the housing. The slider can rest only in certain pre-determined positions each associated with a specific command and it cannot remain in any location intermediate these positions, this being achieved by an undulating cam surface provided near the slot such that as the slider moves along the slot, there is resilient abutment against the cam surface. The slider is thereby urged to assume a position corresponding to the nearest location where the cam surface is set back furthest from the slot. Such an arrangement may have two or more rest positions.

An important requirement in the design of a slider for use in domestic heating control units powered from the electric mains is that access to the interior of the housing through the slot must be inhibited for all positions of the slider. This is particularly important because in many types of unit an electronic circuit board is disposed close to the slider controls. There exist some designs of slider controls with two rest positions and with some degree of inhibited access, but these do not afford thoroughly reliable safety and are of complex design; also they have component parts which are difficult or slow to assemble together.

The present invention provides a slider control arrangement comprising a first element having an elongate aperture, a second element for positioning on one side of the first element and having handle means to actuate the slider control extending through the aperture, the second element being slideable with respect to the first element, the arrangement characterised by cam means comprising a cam surface on one element for butting with the other element to provide relative movement therebetween in a direction substantially perpendicular to that plane containing the aperture and to provide at least three rest positions in respect of relative movement between the elements, and by means to inhibit access through the aperture.

Preferably, the means to inhibit access through the aperture comprises an arm of the second element which underlies at least part of the length of the aperture when the second element is away from one extreme position.

Moreover, preferably, the means to inhibit access through the aperture comprises a wall located below the aperture such that the second member slides between the wall and aperture when moving between extreme positions.

Advantageously, the wall extends between the two side walls depending from the first element to form a channel to accommodate the second element during sliding action.

Thus the invention ensures that a slider control arrangement having more than two rest positions safely isolates the interior for the entire movement of the slider and hence it can be used for all applications requiring powering from the mains. Moreover, the invention also ensures that these criteria can be achieved in an arrangement which is compact (for example allowing two or more such slider controls to be located close by one another), yet which also has simple and low-cost construction and assembly.

Preferably, the cam surface extends from at least one side wall, for example there may be two cam surfaces, one extending from each side wall.

Preferably, the means to inhibit access includes an end wall extending between that part of the first element defining the aperture and said wall.

The arm of the second element may include means to limit one extreme position of movement of the second element, for example in the form of a raised portion of the arm to abut the end of the elongate aperture at one extreme position of movement.

According to another aspect of the invention, there is provided a slider control arrangement comprising a first element having an elongate aperture, a second element for positioning on one side of the first element and having handle means to actuate the slider control extending through the aperture, the second element being slideable with respect to the first element, the arrangement characterised by means to permit selective coupling of the second element with an element of another adjacent slider control arrangement, thereby to allow selective combined operation of the two slider control arrangements.

An existing two-position slider control with access-inhibition cannot be modified to have more than two rest positions without making the design unsafe and inadequate for situations in which the unit is powered from the electric mains and without making the arrangement complex and difficult to assemble.

Preferably the cam surface is integral with one element and is located, in use, set back from the elongate aperture in a direction away from the face of the slider control exposed for actuation. Advantageously, the cam surface is provided on the first element.

A slider control arrangement of the present invention may include any combination of the following features:-

one element has two cam surfaces abutting with a common surface on the other element (thus enhancing the stability of interengagement of the two elements, reducing the risk of jamming during sliding, and providing a stiffer sliding action and hence generally improving the action of the slider control);

a cam surface has a plurality of undulations lying in a line such that their displacement is substantially parallel to the elongate direction of the aperture;

the other element has a ridge or groove to engage with the cam surface(s) of the one element; and

the second element is a unitary piece, for example being a generally D-shape with the two arms being flexible therebetween.

In order that the invention may be more readily understood, a description is now given, by way of example only, reference being made to the following drawings of which:-

Figure 1 is a perspective view of a slider embodying the present invention;

Figure 2 is a perspective view of the back of a housing for use with the slider of Figure 1;

Figure 3 is a perspective view of the slider and housing of Figures 1 and 2;

Figure 4 is a part-sectional view in the direction of arrows IV - IV in Figure 3;

Figure 5 is a perspective view of another slider embodying the present invention; and

Figures 6 to 8 show another arrangement embodying the present invention.

In Figure 1, there is shown a slider 1 made of plastics material in a generally U-shape, one arm 2 of which has an actuating knob 3 at one end, the other arm 4 being bifurcated with a cross-bar 5 at the end. The structure of arm 4 ensures a substantial degree of flexibility allowing movement of the arms together and apart while providing stability of arm 4 against torsional forces; moreover the structure facilitates moulding, reduces the amount of material required, and avoids the necessity of a moulding seam line along the longitudinal axis of the slider.

The slider 1 is used with a housing 6 having an aperture 7, recessed behind which is a channel 8 formed by side walls 9 and 10, end wall 11 and back wall 12 as shown in Figure 2 which is a view from within the housing 6. Each of the sidewalls 9 and 10 has a cam surface 13 extending inwardly of the housing beyond back wall 12 in a direction perpendicular to the exterior surface of the housing 6. This produces a very compact arrangement ensuring that two slider controls can be located very close to one another side-by-side.

Figure 3 shows the slider 1 located within channel 8 when in an intermediate position, such that access through the aperture 7 is inhibited partly by the back wall 12 and partly by a portion of the slider arm 2.

Figure 4 shows, in part cross-section, the slider 1 at one extreme position within channel 6 such that the entire aperture 7 is covered over by slider arm 2 so that it is impossible to contact the circuit board 14 within housing 6; sliding movement of slider 1 within aperture 7 causes the slider 1 to move a contact arm 15, fixed by cold-staking to arm 4, over the surface of circuit board 14 in order to make the appropriate connection or switching action. When such sliding action of slider 1 occurs along aperture 7, flexibility between the arms 2 and 4 enables cross-bar 5 to move up and down the undulations of the cam surfaces 13 which ensure that the slider is urged into one of the four rest positions defined by the uppermost (as viewed in Figure 4) portions of the cam surfaces.

As slider 1 is of unitary construction and can be readily moulded in plastics material, it has very low manufacturing costs and requires no pre-assembly other than attachment of the metallic contact arm 15 before being inserted into channel 6. Such insertion is achieved by bringing slider 1 towards the open end of channel 8 from a direction corresponding to the interior of housing 6 and then, while flexing arms 2 and 4 apart from their normal rest position, knob 3 is urged through the opening in channel 6 while cross-bar 5 is made to pass over some of the undulations in cam surfaces 13. Such assembly of slider 1 can be done quickly and readily and is suited to automatic operations.

Slider 1 has two depending lugs 16 and 17 for linkage purposes as will be described in connection with Figures 6 to 8.

Figure 5 shows another slider 20 embodying the present invention which differs from slider 1 only in that the position of step 21 on the arm 2 has been changed in order to transform it into a 3-stage slider rather than the 4-stage operation of slider 1. Thus, the invention allows essentially the same design of slider to be used for any number of rest positions or stages with only minor modifications being required.

Figures 6 and 7 shows part of a control unit for a gravity-fed domestic heating system with two slider controls 30, 31 side-by-side, of which the first (30) relates to the "hot water" setting, and the other (31) to the "heating" setting. As the hot water must be operating whenever the heating is on, there is provided a link 32 between the two sliders to represent correctly this situation.

The link 32 is slidably located in a slot below and between the sliders 30 and 31 and comprises a bar 33 which is broad enough to contact lug 16 on "hot water" slider 30 and lug 17 on "heating" slider 31. Thus, if "heating" slider 31 is moved to the user's right (i.e. away from the "Off" position), lug 17 will contact bar 33 and move the link 32 which, in turn, moves "hot water" slider 30. However, when "heating" slider 31 is moved to the user's left, lug 17 moves away from bar 33 and so "hot water" slider 30 is not moved.

When "hot water" slider 30 is moved to the user's left (i.e. towards the "Off" position), lug 16 contacts bar 33 which, in turn, moves "heating" slider 31 in the same direction. When "hot water" slider 30 is moved to the user's right (i.e. away from the "Off" position), lug 16 does not contact bar 33 and hence "heating" slider 31 is not moved.

When a unit with two sliders 30, 31 and a link 32 is being installed in a system not requiring the linking function (for example it is not a gravity-fed system), then the installer need only ensure that link 32 is rotated through 90° (see Figure 8) in order to de-acti-

vate its function, whereupon bar 33 will lie between sliders 30, 31 at all times and allow their operation independent of each other. In this way, it is possible to market one version of the unit suitable to both gravity-fed and other systems.

The slider control arrangement embodying the present invention enables simple and compact interlinking of two side-by-side slider controls, for example as in the way described above.

Claims

1. A slider control arrangement comprising a first element having an elongate aperture, a second element for positioning on one side of the first element and having handle means to actuate the slider control extending through the aperture, the second element being slideable with respect to the first element, the arrangement characterised by cam means (13) comprising a cam surface (13) on one element (6, 7, 9,-12) for butting with the other element to provide relative movement therebetween in a direction substantially perpendicular to that plane containing the aperture and to provide at least three rest positions in respect of relative movement between the elements, and by means (2, 10, 11, 12) to inhibit access through the aperture.

2. A slider control arrangement according to Claim 1 characterised in that the cam surface (13) is integral with one element (6, 7, 9-12) and located, in use, set-back from the elongate aperture (7) in a direction away from the face of the slider control exposed for actuation.

3. A slider control arrangement according to Claim 1 or 2 characterised in that the means to inhibit access through the aperture comprises an arm of the second element (1) which underlies at least part of the length of the aperture (7) when the second element is away from one extreme position.

4. A slider control arrangement according to any preceding Claim characterised in that the means to inhibit access through the aperture comprises a wall (12) located below the aperture (7) such that the second member (1) slides between the wall and the aperture when moving between extreme positions.

5. A slider control arrangement according to Claim 4 characterised in that said wall (12) extends between two side walls (9, 10) depending from the first element to form a channel (8) to accommodate the second element (1) during sliding action.

6. A slider control arrangement according to any preceding Claim characterised in that the cam surface (13) is provided on the first element (6, 7, 9-12).

7. A slider control arrangement according to Claim 5 and 6 characterised in that the cam surface (13) extends from one side wall (9, 10).

8. A slider control arrangement according to Claim 5 and 6 characterised by two cam surfaces (13) one extending from each side wall (9, 10).

9. A slider control arrangement according to any of Claims 3 to 7 characterised in that the means to inhibit access includes an end wall (11) extending between that part of the first element defining the aperture and said wall (12).

10. A slider control arrangement according to any preceding Claim characterised in that the second element (1) of the second element includes means to limit one extreme position of movement of the second element.

11. A slider control arrangement according to Claim 10 characterised in that said limiting means includes a raised portion (21) of said arm (2) to about the end of the elongate aperture (7) at one extreme position of movement.

12. A slider control arrangement according to any preceding claim characterised by means (16, 17, 33) to permit selective coupling of the second element with an element of another adjacent slider control arrangement, thereby to allow selective combined operation of the two slider control arrangements.

FIG. 1

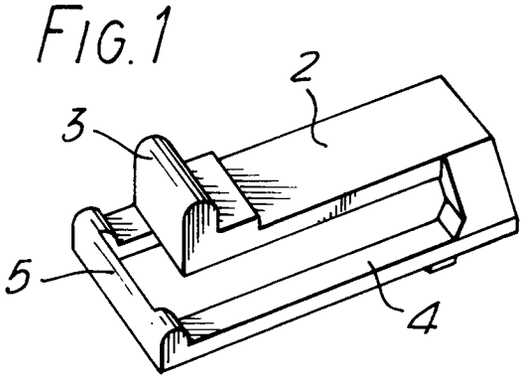


FIG. 2

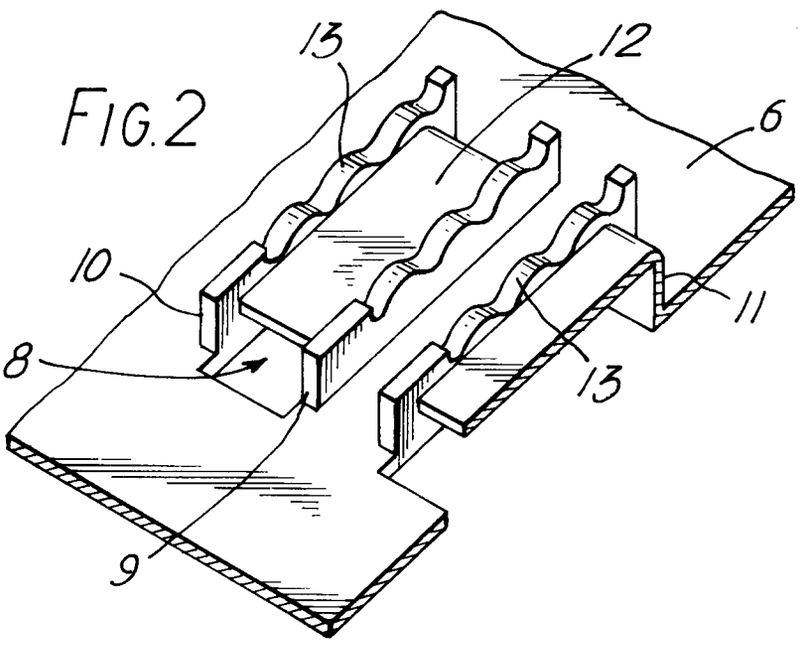


FIG. 3

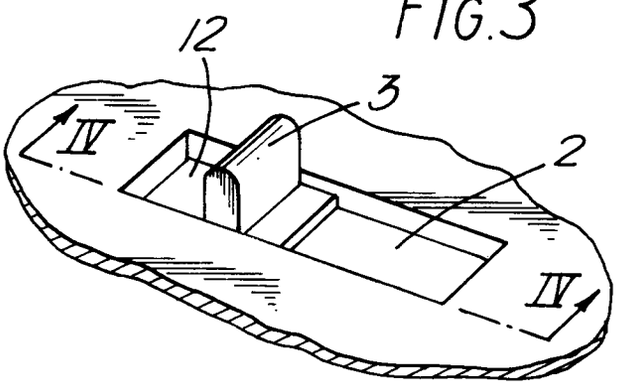


FIG.4

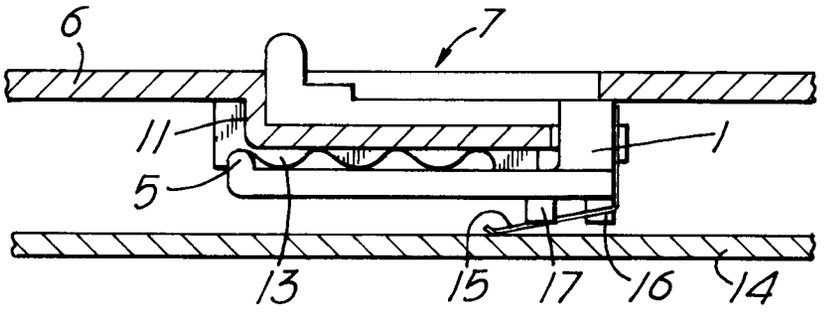


FIG.5

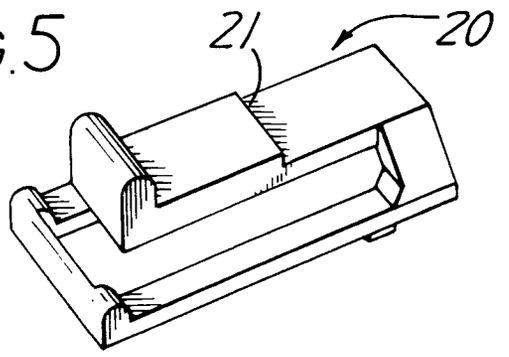


FIG.6

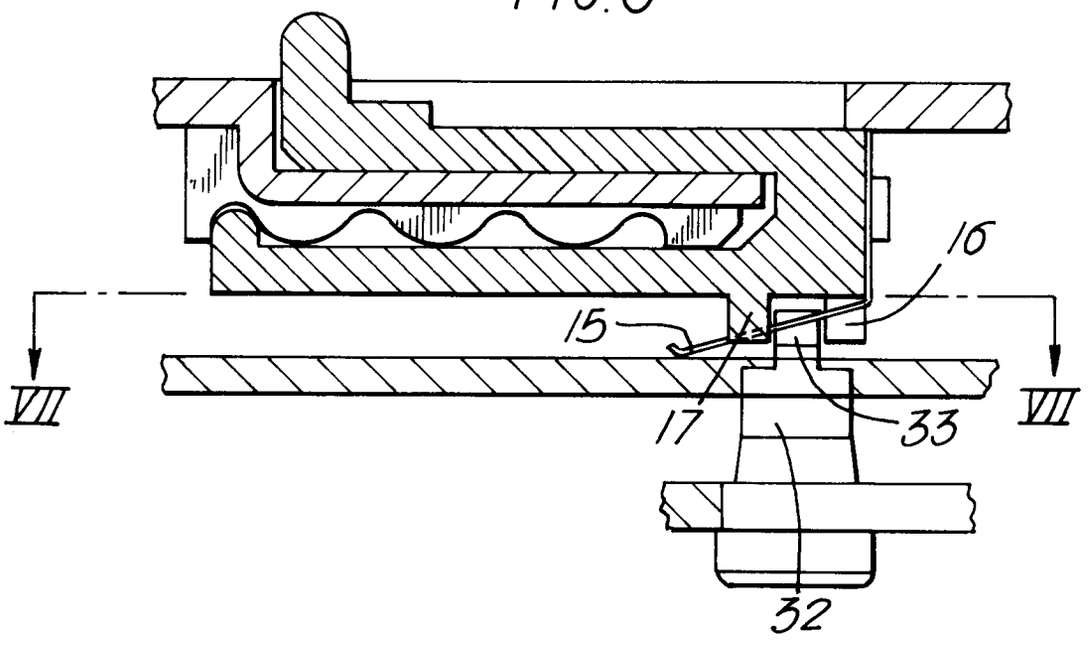


FIG.7

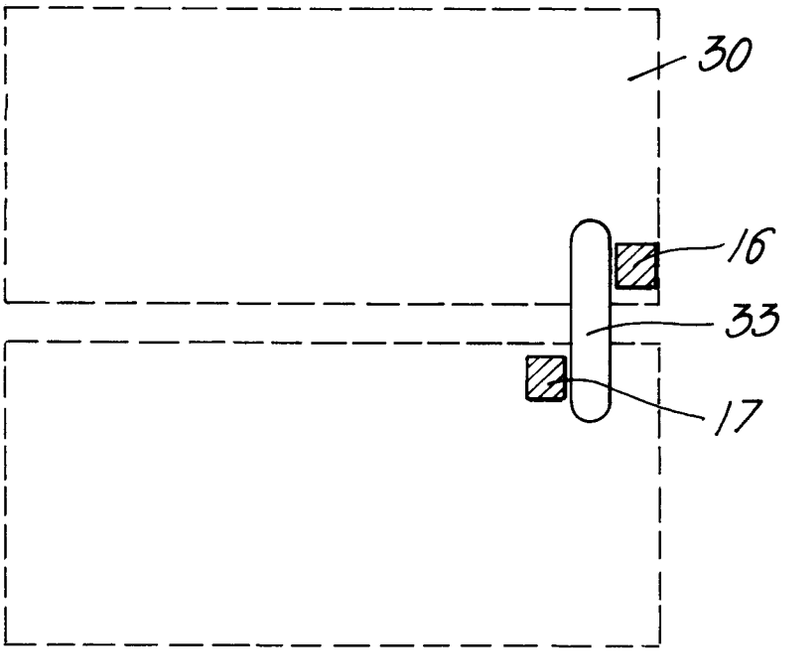
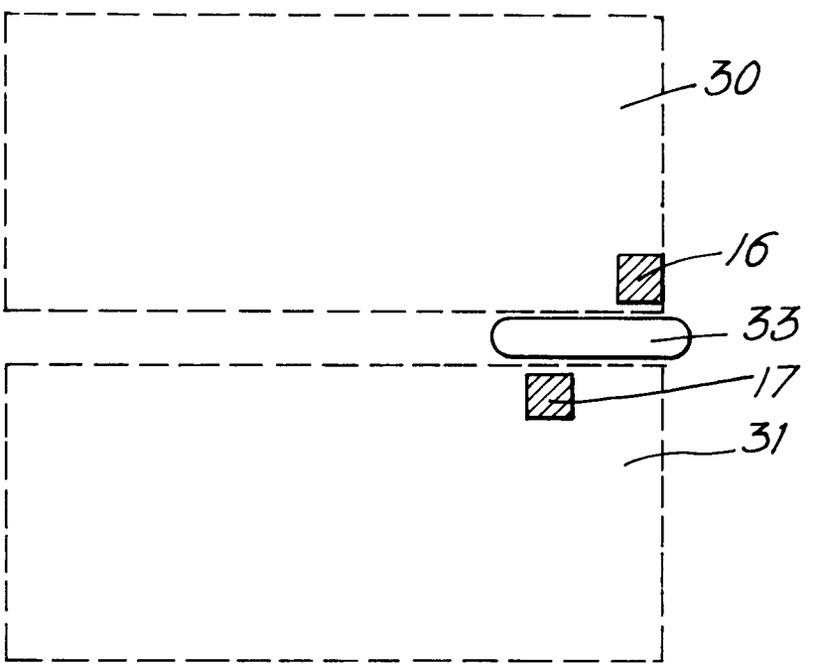


FIG.8



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EUROPEAN SEARCH REPORT

Application Number
EP 92 30 6920

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 441 000 (SUWA) * whole document *	1-3,6-8, 10	H01H15/06 H01H15/10 G05G1/02 H01C10/14
X	DE-U-1 849 285 (BÄR ELEKTROWERKE G.M.B.H.) * claims 1, 4; figures 1 - 6 *	1,2,10	F16J15/16
X	US-A-3 843 852 (LOCKARD) * abstract; column 3, line 16 - column 4, line 4; column 5, line 26 - column 6, line 3; column 6, lines 41 - 50; column 7, line 57 - column 8, line 4; figures 1, 4 - 6 *	1,2,6	
A	DE-A-2 526 319 (KAUTT & BUX KG) * page 6 lines 6 - 27; page 7, lines 14 - 30; figures 1 - 3 *	1-4	
A	IBM TECHNICAL DISCLOSURE BULLETIN vol. 22, no. 6, November 1979, NEW YORK, N.Y., USA pages 2324 - 2325 J.W. RUDOLPH 'SLIDING SELECTOR SWITCH' * whole article *	1,2,6	
A	US-A-3 242 298 (MILLER) * whole document *	1-8,10, 11	
A	US-A-2 453 498 (CROWLEY) * column 3 , lines 17 - 42; figures 1 - 3 *	1,2,6	
A	GB-A-2 187 894 (LUTRON ELECTRONICS CO. INC.) * abstract; figure 1 *	3,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H01H
G05G
H01C
F16J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	16 NOVEMBER 1992	BEITNER M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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