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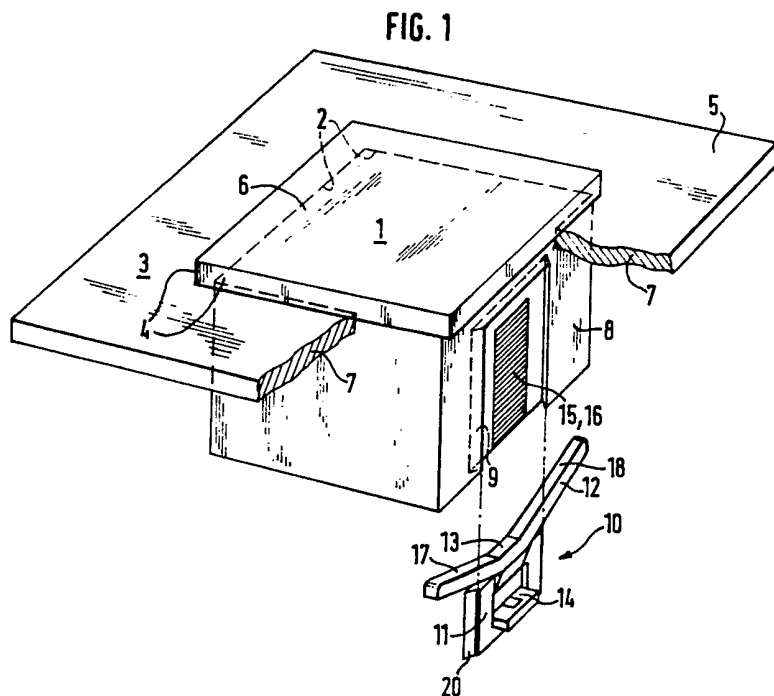
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**Selected US specifications from IPC sub-classes H05K**

**F16B F21V**

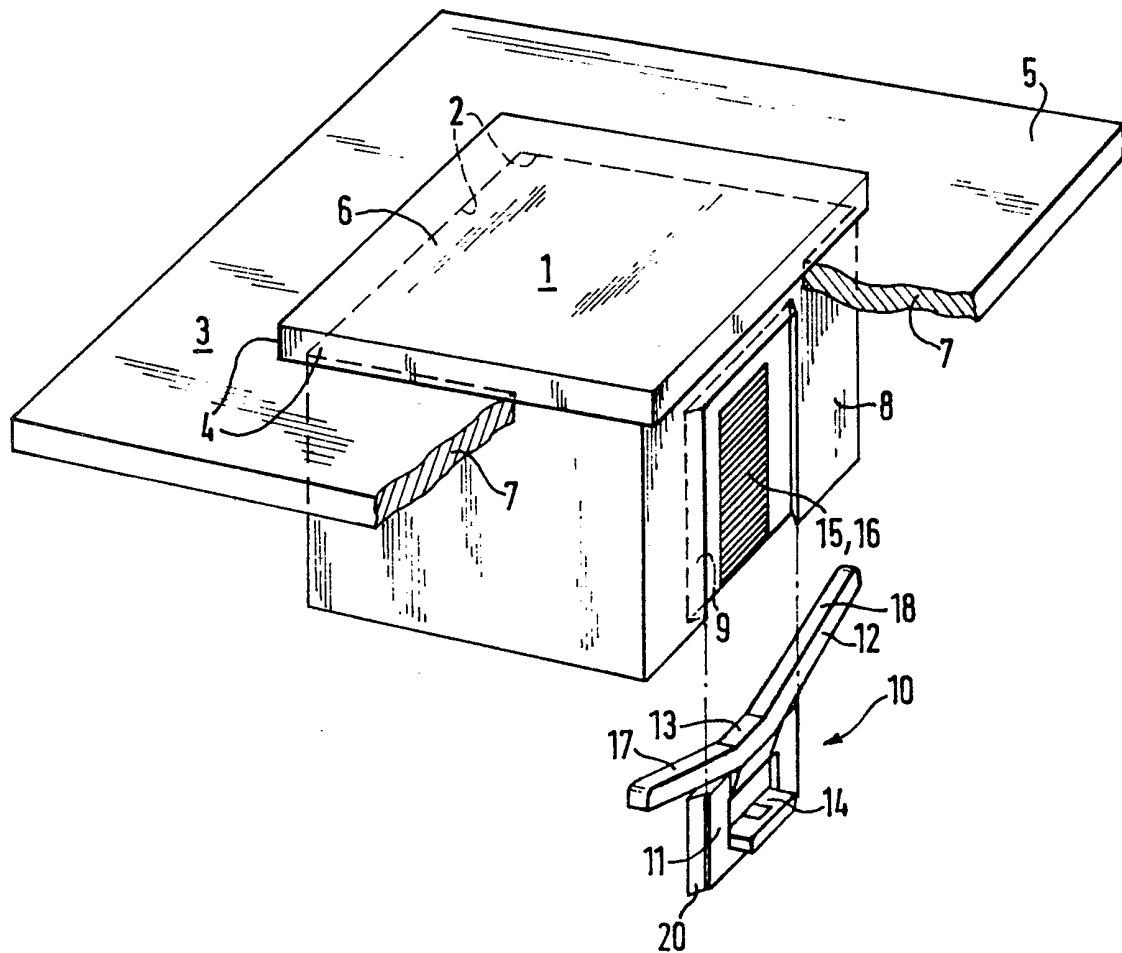
(54) **Electrical equipment housing  
and fastener arrangement**

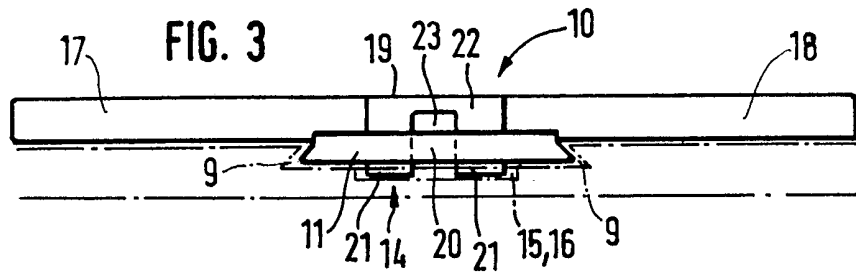
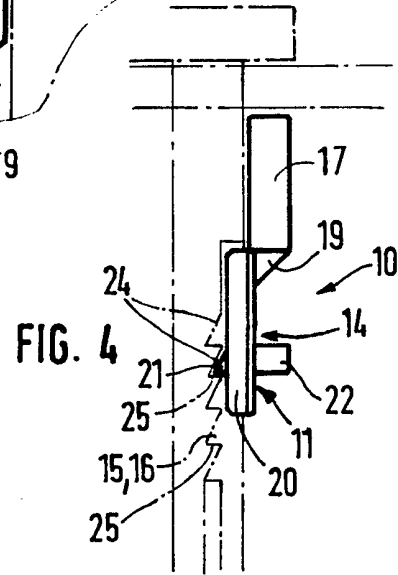
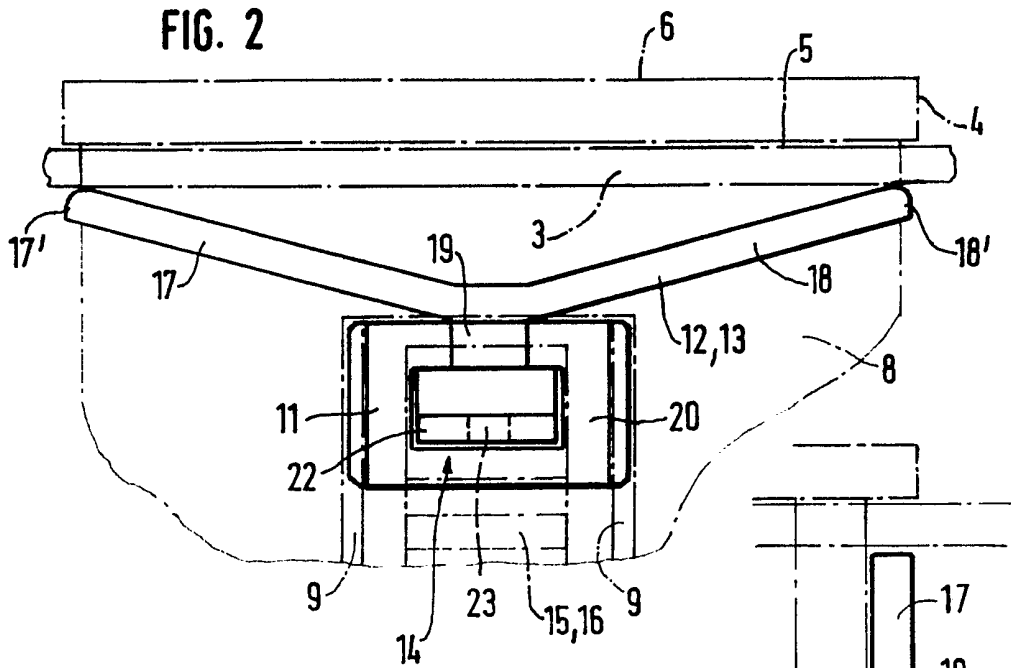
(57) A device is provided for fastening a housing 1 for electrical or electronic equipment in an opening 2 in a switchboard 3. The housing 1 has on at least two, preferably opposite, sides projections 4 which engage over the opening 2 and are pressed by means of holder elements 10 against the front side 5 of the switchboard 3. The holder elements 10 consist of two functional parts, namely the holding part 13 and the guide part 11. The guide part 11 is arranged displaceably in guides 9, situated on or in the side parts 8 of the housing 1, perpendicular to the switchboard 3. The holding parts 13 have at least one resilient element 12, which is pressed against that side of the switchboard which lies opposite the projections 4. Furthermore, the holder elements 10 have a detent mechanism 14, through which sliding-back of the guide parts 11 in the guides 9, is prevented.



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FIG. 1





## SPECIFICATION

**A device for, and method of, fastening a housing in an opening in a switchboard, circuit board, panel or the like**

The present invention relates to a device for fastening a housing (for example for electrical or electronic equipment) in an opening in a switchboard, circuit board, panel or the like, and for example, the housing has projections on at least two, (preferably opposite) sides, which projections engage over or overlap said opening and are pressed against or towards the switchboard, circuit board, panel or the like by holder or retention elements which can be guided displaceably in associated side parts, said elements each consisting of a guide part and a holding part.

A device for fastening a housing for electrical equipment in an opening in a switchboard is shown in German Patent Specification No. 26 52 672. This device consists of fastening parts which have in each case a foot which is insertable into an appropriately shaped groove extending in a side wall of the housing parallel to the switchboard. Provided in the fastening parts are guides for threaded rods which are directed perpendicularly to the switchboard. The housing has, on at least two opposite sides, a collar which projects beyond the extent of the housing body part and beyond the opening in the switchboard.

The installation or fastening of such a housing takes place in the following manner:

The housing is introduced from the front of the switchboard into the appropriate opening until it rests with its collar on the switchboard.

Then the fastening parts are pushed into the grooves of the housing, behind the switchboard, and are restrained or locked in a suitable position.

Then the threaded rods are screwed through the fastening parts until they touch or engage the rear of the switchboard and thus press (urge) the collar of the housing against the front of the switchboard.

With this kind of mounting it is, firstly, relatively complicated in that the threaded rod has to be screwed (possibly over a relatively long path) since a tool is necessary for this purpose; secondly, the fastening parts may possibly slip in the grooves during the mounting procedure (which tends to lead in some cases to a defective fastening of the housing). This is particularly important when mounting such items of equipment closely one above the other on a perpendicularly standing switchboard, since then there is not space for the fastening parts between the housings. The fastening parts then have to be situated laterally on the housings, i.e. the grooves in the housing side parts stand similarly perpendicularly, so that the fastening parts could

seemingly very easily slip out of the grooves.

An object of the present invention is to provide a fastening device and method which allows a seemingly simplified and reliable mounting. More especially, slipping of fastening parts, once mounted on the housing, into unsuitable positions, is to be restrained or prevented. Furthermore, a housing mounted by such a fastening device on a switchboard should also be relatively easily dismantlable again.

According to the present invention there is provided a device for, or method of, fastening a housing (for electrical or electronic equipment) in an opening in a switchboard or panel, which housing has, on at least two, preferably opposite, sides, projections which engage over or overlap the opening and which projections are pressed against or urged towards the switchboard by holder or retention elements which are displaceably guideable in preferably associated side parts, said elements comprising a guide part and a holding part, and in which the guide parts are arranged displaceably in guides situated on or in the side parts, perpendicularly to the switchboard, and the holding parts have at least one resilient element which is pressed (urged) against or towards that side of the switchboard which is opposite the projections, and in which said holding or retention elements have a detent mechanism by way of which sliding-back of the guide parts in the guides, at least with the holding parts pressed against or urged there-towards, is prevented or restrained.

Further according to the present invention there is provided a housing and fastener arrangement for releasable assembly of said housing to a switchboard, panel or the like, the housing comprising a body portion for insertion through an opening in the switchboard, panel or the like, with a projecting portion of the housing overlapping the opening, a plurality of retention elements co-operable in associated guide means on the housing body portion to be slidably displaceable in a first direction generally towards the switchboard, panel or the like and towards said projecting housing portion to retain the housing in the opening, displacement of said retention elements in a direction reverse to said first direction being restrained by a detent mechanism on each of said retention elements, which detent mechanism is co-operable with said housing, each retention element being provided with at least one inherently resilient or flexible element which is, on assembly, urged against or towards said switchboard, panel or the like.

Still further according to the present invention there is provided a method of assembling a housing to a switchboard, panel or the like using the housing and fastener arrangement as described in the immediately preceding paragraph.

As a result of the use of resilient elements

with said holder or retention elements, more especially in the case of unqualified mounting or dismantling attempts, damage or destruction to the housing or to the holder elements may seemingly be most extensively prevented.

Further advantages can be gathered from the sub-claims.

Thus, as a result of the preferred one-piece nature of the holder or retention elements, a further simplification of the mounting is seemingly achieved. Furthermore, it may be possible to produce the holder or retention elements in a simple and economical manner in a plastics injection-moulding process.

As a result of a preferred V-shaped design of the holding parts, a favourable symmetrical distribution of contact pressures may be achieved, so that even fairly large housings may be reliably fastened with only two holder elements.

The detent (catch) mechanism may be advantageously integrated into the guide, or respectively into the guide parts, so that the fastening device is built up in, as a whole, a very compact form, which appears to need very little space in addition to the housing that is to be fastened. More especially, a preferred embodiment of the detent mechanism allows very simple mounting of the fastening device, by the holder element being pushed with little effort into the guide until the holding parts are pressed sufficiently securely against or towards the switchboard. The detent mechanism may then prevent said element from sliding back out of this position.

In a further preferred embodiment, the detent mechanism has a further projection or integrally-formed part, which is directed away from the housing wall. Formed into this projection of integrally formed part is, preferably, a guide opening for a screwdriver blade or the like. As a result of this design, a simple disengagement of the detent mechanism for dismantling of the holder elements is possible, without these being damaged.

An embodiment of a device for, a method of, fastening a housing (for electrical or electronic equipment) in an opening in a switchboard, in accordance with the present invention, will now be described, by way of example only, with reference to the following drawings in which:—

*Figure 1* shows a perspective view of the housing, inserted into the switchboard opening, with a preferred holder or retention element that is still to be mounted on a side of the housing,

*Figures 2 to 4* show various views of the holder or retention element.

Shown schematically in *Fig. 1* is a generally cuboid housing 1 for an electrical or electronic piece of equipment, which housing is inserted into an opening 2 in a switchboard 3. The housing 1 has projections (projecting rims) 4 which engage over or overlap the opening 2

and which rest on the front face of the switchboard 3. These projections 4 are, preferably, conducted right around the front 6 of the housing 1, or respectively represent a continuation of this front 6, and serve at the same time for completely covering the opening 2 in the switchboard 3. However, the projections 4 would, for a stable fastening of the housing 1 to the switchboard 3, be present at at least two, preferably opposite sides of the housing 1. The projections 4 could, additionally or alternatively be provided at at least two opposite corners of the housing.

In *Fig. 1*, for ease of illustration, the switchboard 3 is shown broken away at 7 in order to show two side parts 8 of the housing 1. One of these side parts 8 has a guide 9, which is arranged perpendicularly to the switchboard 3; at least two such guides 9, preferably on opposite side parts 8, are usually necessary. These guides 9 can be mounted on the side parts 8, or preferably be formed directly into the side parts 8.

Each holder or retention (fastening) element 10, one of which is shown in *Fig. 1* underneath the guide 9, is insertable into a respective one of the guides 9.

The element 10 consists of two functional parts, namely a guide part 11, which is inserted into one of the guides 9 on or in the side parts 8 of the housing 1, and a holding part 13 which is designed as a resilient element 12 and which in its end position in the inserted state is pressed (urged) against the rear of switchboard 3.

In the case of the preferred exemplified embodiment shown in *Fig. 1*, the guide 9 is formed directly into a side part 8 of the housing 1, so that the contour, governing the necessary opening 2 in the switchboard 3, of the housing 1 is a smooth surface (i.e. the opening can be square or rectangular and conform to the dimensions of the housing).

Each holder element 10 has, preferably on the guide part 11, a detent mechanism 14, through which sliding-back of the inserted holder element 10, at least with the holding parts 13 pressed against the switchboard 3, is restrained or prevented. The detent mechanism 14 co-operates advantageously with detent locations 15 formed in the side parts 8 of the housing 1. The detent locations 15 are, preferably, situated inside (within) the guides and consist, for example, of corrugations 16 which are in parallel with the switchboard 3, or with the front 6 of the housing 1.

The elements 10 will now be described in more detail hereinunder with reference to *Figs. 2 to 4*. *Fig. 2* shows the holder element 10 in front view (considered in the direction of a side part 8 of the housing 1); *Fig. 3* shows the holder element 10 in a direction perpendicular to, and from below, the switchboard 3 (considered looking towards the rear of the switchboard), and *Fig. 4* shows an end view

of the holder element.

The holder elements 10 are preferably of one-piece construction, and consist, for example, of a highly impact-resistant, permanently-resilient plastics material.

The holder element 10 shown in Figs. 2 to 4 consists, (as already described in the case of Fig. 1) of two functional parts, namely the holding part 13 and the guide part 11.

The holding part 13 preferably consists of two resilient struts 17, 18 which are arranged in a generally V-shaped manner and which, offset laterally outwards from the V-foot 19, are connected to the guide part 11. With the holder element 10 in place, at least the two free ends 17', 18' of the V-shaped struts 17, 18 are pressed against the switchboard 3. As a result of the pressing procedure (engagement) the "V" can be pressed flatter (i.e. the angle between the struts 17, 18 widened), and the struts 17, 18 rest possibly with a greater part of their overall length on the rear of the switchboard 3. As a result of the spring force which thereby occurs, the housing 1 is pressed (urged) with its projections 4 tightly against the front 5 of the switchboard 3.

The struts 17, 18 preferably have approximately the same width (span) as the corresponding side part 8 of the housing 1. In this way a particularly high installation stability tends to be achieved. With particularly heavy housings 1, or when there are heavy components in the housing 1, it is also possible to select the width (span) of the struts 17, 18 to be greater than that of the associated side part 8.

The guide part 11 connected to the holding part 13 has, with respect to its contour lying inside the guide 9, a dovetail-shape, and the guide is appropriately formed in or on the side part of the housing 1.

The guide part 11 consists of a frame 20 which is arranged parallel to the respective side part 8 and the detent mechanism 14 is incorporated therein. The detent mechanism 14 consists of a stop nose 21 which is fastened resiliently to the frame 20, preferably underneath the V-foot 19, and which stop nose points towards or faces the guide 9, or the side part 8. The stop nose 21 projects inwardly beyond the contour of the guide part 11 and thus, with the guide part 11 inserted, presses against (engages) the side part 8 of the housing 1 inside the guide 9. Inside the guide 9, the detent locations 15 (already mentioned in the case of Fig. 1) are formed into the side part 8. The shape of the detent locations 15 corresponds with the shape of the stop nose 21 in a manner later described.

The detent mechanism 14 with the stop nose 21 is designed in one piece with the frame 20 of the guide part 11. The detent mechanism 14 preferably has an integrally formed part 22 which lies opposite to the

stop nose 21 and which projects outwardly beyond the contour of the frame 20 away from the side part 8 of the housing 1. This part 22 serves as actuating element for raising the stop nose 21 out of the stop locations 15. To facilitate this lifting-out procedure, a guide opening 23 for a screwdriver blade or a similar instrument can be fashioned into the part 22. As a result of these measures, a damage-free, or respectively destruction-free, dismantling of the holder elements 10 from the housing 1 is possible; the stop nose 21 is in this respect raised out of the detent locations 15, so that the holder element 10 can be pushed out of the guide 9. The housing 1 can then be withdrawn without difficulty from the opening 2 in the switchboard 3.

The stop locations 15 and/or the stop nose 21 are asymmetrically designed with respect to the direction of displacement of the holder element 10 in the guide 9. The stop nose 21 preferably has a triangular cross-section, as do the detent locations 15. In this respect, the flanks 24, pointing in the direction of the switchboard 3, of the stop nose 21 and the flanks 24, corresponding thereto, of the detent locations 15 are in each case fashioned at an acute angle (preferably approximately 30°) to the direction of displacement. The flanks 25, pointing away from the switchboard 3, of the cross-section of the stop nose 21 and the flanks 25, corresponding thereto, of the detent locations 15 are preferably fashioned at an angle of about 90° to the direction of displacement. Upon displacement of the holder element 10 in the direction of the switchboard 3, then the 30°-flanks 24 of the cross-section of the nose 21 and detent locations 15 slide one on the other, necessitating only a low expenditure of effort, whilst a displacement in the opposite direction is highly resisted and substantially prevented through resting of the two 90°-flanks on one another.

The detent locations 15 can in a preferred development be formed as a grooving (fluting) 16 inside the guide 9 and into the side part 8 of the housing 1. The grooves of the grooving 16 lie in this respect parallel to the switchboard 3 and extend at least over the entire possible region of displacement of the stop nose 21. The individual grooves of the grooving 16 preferably have the cross-section mentioned above.

The width of the grooving 16, or respectively of the stop nose 21 is limited by the width of the guide 9, or respectively by the width of the interior of the frame 20. Within these limits, however, the width of the grooving, or respectively of the stop nose 21, can be varied in accordance with the necessary holding forces for the housing 1.

The housing 1 may possibly be of any desired cross-section, for example, circular oval or triangular.

The retention elements may possibly be re-

placed by a single retention element which could possibly be in the form of a sleeve, although this could be more expensive. Additionally, the fastening principle may be applicable to holding any component in a panel and, therefore, still further according to the present invention there is provided a component and fastener arrangement for releasable assembly of said component to a panel, the component comprising a body portion for insertion through an opening in the panel, with a projecting portion of the component overlapping the opening, at least one retention or fastener element being co-operable in associated guide means on the housing body portion to be slidably displaceable in a first direction generally towards the panel and towards the projecting housing portion to retain the housing in the opening, displacement of the or each retention or fastener element in a direction reverse to said first direction being restrained by a detent mechanism on the associated retention or fastener element, which detent mechanism is co-operable with said component, each retention/fastener element being provided with at least one inherently resilient or flexible element which is, on assembly, urged against or towards said panel.

Individual features as herein described, principles or functions apertaining thereto may be individually patentably inventive, for example the holder or retention elements per se, and the meaning of any specific term as used herein is to extend to any alternative (perhaps generic) term where sensible.

CLAIMS

1. A device for, or method of, fastening a housing (for electrical or electronic equipment) in an opening in a switchboard or panel, which housing has, on at least two, preferably opposite, sides, projections which engage over or overlap the opening and which projections are pressed against or urged towards the switchboard by holder or retention elements which are displaceably guidable in preferably associated side parts, said elements comprising a guide part and a holding part, and in which the guide parts are arranged displaceably in guides situated on or in the side parts, perpendicularly to the switchboard, and the holding parts have at least one resilient element which is pressed (urged) against or towards that side of the switchboard which is opposite the projections, and in which said holding or retention elements have a detent mechanism by way of which sliding-back of the guide parts in the guides, at least with the holding parts pressed against or urged there-towards, is prevented or restrained.

2. A device or method as claimed in Claim 2, in which said elements are designed in one piece and preferably from plastics material.

3. A device or method as claimed in Claim 1 or 2, in which the holding parts consist of

two resilient struts which are arranged in a V-shaped manner and which are connected in a V-foot to the guide part and are pressed (urged) with the two free ends against or towards the switchboard.

4. A device or method as claimed in Claim 3, in which the resilient struts, at least in the pressed-against (urged towards) state have to some extent the same width as the corresponding side part of the housing.

5. A device or method as claimed in any one of the preceding claims, in which the guide parts are dovetail-shaped with respect to their contours present inside the guides.

6. A device or method as claimed in any one of the preceding claims in which the guide parts consist of a frame which is arranged parallel with its associated side part, and in which the detent mechanism consists of a stop nose which is fastened resiliently to the frame and which points in the direction of the side part.

7. A device or method as claimed in Claim 6, in which the detent mechanism has a part which is arranged opposite the stop nose and which projects outwardly beyond the contour of the guide part.

8. A device or method as claimed in Claim 7, in which said part opposite the stop nose has a guide opening for a screwdriver blade or the like.

9. A device or method as claimed in any one of Claims 6 to 8, in which detent locations for the stop nose are formed inside (within) the guide.

10. A device or method as claimed in Claim 9, in which the detent locations consist of a fluting (grooving) which is arranged parallel to the switchboard and which extends over the entire region of the displacement of the stop nose.

11. A device or method as claimed in any one of Claims 6 to 10, in which the stop nose and/or the stop locations are asymmetrically designed with respect to the direction of displacement of the stop nose, so that said elements are displaceable in the direction of the switchboard with fairly low actuating force.

12. A housing and fastener arrangement for releasable assembly of said housing to a switchboard, panel or the like, the housing comprising a body portion for insertion through an opening in the switchboard, panel or the like, with a projecting portion of the housing overlapping the opening, a plurality of retention elements cooperable in associated guide means on the housing body portion to be slidably displaceable in a first direction generally towards the switchboard, panel or the like and towards said projecting housing portion to retain the housing in the opening, displacement of said retention elements in a direction reverse to said first direction being restrained by a detent mechanism on each of

said retention elements, which detent mechanism is co-operable with said housing, each retention element being provided with at least one inherently resilient or flexible element

5 which is, on assembly, urged against or towards said switchboard, panel or the like.

13. A method of assembling a housing to a switchboard, panel or the like using the housing and fastener arrangement as claimed

10 in Claim 14.

14. A device for, or method of, fastening a housing (for electrical or electronic equipment) in an opening in a switchboard or panel substantially as herein described with refer-

15 ence to the accompanying drawings.

15. An assembly comprising a housing and fastener arrangement as claimed in Claim 12 and a switchboard, panel or the like.

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