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Multi-channel mechanical splicing device for fibre-optic cables

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Multi-channel mechanical splicing device for fibre-optic cables

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ABSTRACT OF THE DISCLOSURE

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The device comprises a central splicing body (1) serving to connect in situ two cable end plugs (2) which fit into the splicing body. The central body (1) has lower rails (18) hollowed out therein and bears lateral shoulders (37) for guiding and locking the end plugs (2) constituted by a lower part (20) and by an upper part (21) fixed to one another by a press fit.

Application to the in situ splicing of optical fibres.

Figure 1

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AUSTRALIA

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ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

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Invention Title: Multi-channel mechanical splicing device for fibre-optic cables

The following statement is a full description of this invention, including the best method of performing it known to me:-

The invention relates to the technical field of fibre-optic cables and, more precisely, to a splicing device that has the advantage of being installable in situ.

Devices for the simultaneous mechanical splicing of several fibres from round or ribbon cables that have to be joined are known in the art. For this purpose, each end of the cable is immobilised in a box or housing in such a way that the bared ends of the optical fibres are held in position before being placed end to end within an assembly body by means of which the splice is made. The said assembly body often takes the form of a tunnel in which the fibres of the two ends to be connected are placed, and by means of which they are clamped. To carry out these operations, it is necessary to have a working surface to which the fibres are brought, as well as suitable equipment on the said working surface for making the necessary splices, which are then located at the point at which they have to be finally installed. Apart from the fact that this equipment necessitates a large number of components and takes up a space that has to be specially set aside for making the splices, it has, above all, the drawback of making it necessary to pull the required length of cable right up to the working surface and then to re-coil up this additional length of cable, the ends of which have been spliced, on the installation site.

It would obviously seem far more advantageous to be able to dispense with this working surface or work bench and its equipment, and to make the requisite splices on their actual site of installation.

For this purpose, the Applicant has devoted itself to finding a solution that caters for this problem by removing the drawbacks inherent in the known systems.

The invention thus proposes a mechanical splicing device for fibre-optic cables comprising a central splicing body serving to connect in situ two cable end plugs fitting into

the said central splicing body, the central splicing body being provided with means for guiding and locking the end plugs, as well as with means for positioning the bared fibres, a plate being housed inside the central splicing body and capable of being manoeuvered by cams to clamp and hold the bared fibres in the said central body.

According to one preferred embodiment of the device according to the invention, the central body is composed of a base plate bordered by two vertical wings surmounted by a cap having a generally trapezoidal profile, and a tunnel provided between the wings receives the manoeuverable plate in contact with a flat bottom of the tunnel.

The manoeuverable plate is manoeuvered by cams borne by the cap.

According to one particular feature of the invention, the means for guiding and locking the end plugs in the central splicing body are constituted by rails hollowed out in the lateral parts of the base plate, by horizontal lateral shoulders provided at the base of the cap, and by inclined surfaces on horizontal strips that prolong the cap.

Furthermore, the means for positioning the bared fibres in the central splicing body are constituted by V-shaped grooves hollowed out in the lower, flat part of the tunnel provided between the wings.

According to another main feature of the invention, the end plug is composed of a lower part and an upper part fixed to one another by a press fit between the rims or edges of the lower part and cut out portions in the upper part.

Further particular features and advantages of the invention will emerge from the following description of a non-limitative exemplary form of embodiment in which reference is made to the annexed drawings, which show:

Figure 1, a perspective exploded view of the mechanical splicing device;

Figures 2 and 3, elevation and end views, respectively,

of the central splicing body;

Figures 4 and 5, schematic side views of two alternative embodiments of the manoeuverable plate;

Figures 6 and 8, longitudinal cross-sectional and end views, respectively, of the upper part of the end plug;

Figures 7 and 9, longitudinal cross-sectional and end views, respectively, of the lower part of the end plug;

Figures 10 to 13, lateral schematic views of the splicing device showing the stages in the introduction of an end plug into the central splicing body.

Figure 1 shows a splicing body, generally designated by reference number 1, as well as two end plugs, generally designated by reference number 2.

Splicing body 1, which is also shown in figures 2 and 3, is composed of a base plate 10 bordered by two vertical wings 11 surmounted by a cap 36 of a generally trapezoidal profile having horizontal lateral shoulders 37 and the top portion of which is pierced by orifices for the passage of two pins 12 on which hinge two cams 13. Cap 36 is prolonged by horizontal strips 14 which extend above plate 10, and the lower faces of which have inclined surfaces 35 orientated downwardly and towards the centre of the splicing body.

Between wings 11 and plate 10 is provided a tunnel inside which is placed a plate 15 on which are stacked a number of metallic strips or leaf springs 16, which are inserted between the plate and the shaped ends 17 of cams 13. End feet 7 of plate 15 come into contact with the flat bottom 8 of the tunnel.

Rails 18 are hollowed out over the entire length of the lateral parts of plate 10, and the lower, flat part 8 of the tunnel is provided with parallel V-shaped grooves 19, which can be seen in figure 3b, which shows an enlarged portion of figure 3a. The grooves serve to house the bared fibres 40, which are placed under the lower face 3 of plate 15. Upon assembly, cams 13 are inserted into body 1 via the chamfer

portion 4, which is present on the pins of the cams and on the splicing body, respectively. Pins 12 of cams 13, which can be metallic pins, are then positioned in holes 6 provided in the lateral walls of cap 36.

Figure 4 more clearly illustrates the shape of plate 15 introduced between wings 11 of the splicing body. Its lower face is flat, but its upper face curves upwards in its central part in an area in which leaf springs 16 are not subjected to the pressure exerted by the cams.

In the alternative embodiment shown in figure 5, plate 15 is no longer fitted with metallic leaf springs but has recesses 9 which permit a certain degree of bending of the plate perpendicularly to the points on which cams 13 bear.

Figures 1, 6, 7, 8 and 9 show how an end plug 2 is designed.

The said plug is composed of a lower part 20 and of an upper part 21, which are fixed to one another by a press fit. The latter is accomplished by a tight fit between rims or edges 22 on part 20 and cut out portions 23 in part 21. The upper face, 24, of lower part 20 and the lower face, 27, of upper part 21 comprise transverse grooves with striations 33 in relief.

Downwardly orientated legs 28 are provided beneath the central area of upper part 21. Above this area are also provided two lateral bosses 31.

Note should be taken of the special profile of lower part 20 of plug 2, the wings of which end in a rounded portion 29 above, and a rounded guide member 30 below and slightly set back to permit the passage of a splitting blade. In addition, the underneath of the said lower part is provided with specially shaped inclined portions 32 permitting lateral positioning of the end plug in the splicing body.

To mechanically splice a plurality of optical fibres using splicing body 1, the first operation is to equip each

end of the multi-fibre element or micromodule, or ribbon cable, with an end plug 2. The second operation is to insert the two end plugs, in situ, into the splicing body, and then to close the latter. The end preparation work at each end reduces the free lengths of fibres needed for preparing and making the splices, without any particular working surface being required. Consequently, the re-coiling lengths and the space they take up are also reduced.

To fit the end plug, the ends of the optical fibres are first bared before they are placed on the lower part 20 in such a way that their sheathed portions are placed in striations 33 and that the bared fibres are placed in grooves 25. Upper part 21 is then press fitted onto part 20. Legs 28 then clamp the fibres in grooves 25 (figure 6b) and bend until the striations in relief 27 press against the sheathed portion of the cable. The fibre cladding and the bare fibres are thus jointly held in the end plug.

The fibres are then split level with the end 34 of the plug.

The following operation is to insert each end plug into splicing body 1. These operations are illustrated in figures 10 to 13. First of all, guide members 30 of plug 2 are placed at the entry to rails 18 of splicing body 1 (figure 10). Thus positioned, the end plug is moved towards the inside of the splicing body in such a way that rounded portions 29 are inserted beneath horizontal strips 14 (figure 11). As a result, the end plug is guided completely. The contact of rounded portion 29 on inclined surface 35 of the splicing body causes the plug to be inclined in relation to the body (figure 12) which corresponds to the placing of the bared optical fibres 40 in grooves 19. This flexing of the fibres is maintained over a certain length by the contact of rounded portion 29 beneath the horizontal edge 37 of cap 36 until the said rounded portion comes into place in a central recess 38 provided on the horizontal edge. The optical fibres are thus

immobilised in the narrow space between the lower face 3 of the plate and grooves 19 (figures 3b and 12). Lateral bosses 31 of each plug then bend strips 14, the elasticity of which ensures that the plug is locked in the splicing body. At the end of its travel, the end plug comes-into abutment against the end faces 38 of vertical wings 11.

The optical fibres of each end plug are thus perfectly aligned, since they are perfectly positioned in their respective grooves.

Cams 13 are then used so that their specially shaped ends 17 exert a pressure on metallic sheets or leaf springs 16 which will lower the plate and deform it so that the bare fibres are clamped in their grooves. The two cams then remain in lowered position so that the splicing body and the end plugs are frictionally held by the pressure of strips 14.

Throughout the specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

THE CLAIMS DEFINING THE PRESENT INVENTION ARE AS FOLLOWS:

1 Mechanical splicing device for fibre-optic cables, characterised in that it includes a central splicing body serving to connect in situ two cable end plugs which fit into the said central splicing body, in that the central splicing body is provided with means for guiding and locking the end plugs, as well as with means for positioning the bared fibres, and in that a plate housed inside the central splicing body can be manoeuvred by cams to clamp and hold bared fibres in the said central body.

2. Splicing device according to claim 1, wherein the central body is composed of a base plate bordered by two vertical wings surmounted by a cap having a generally trapezoidal profile, and in that a tunnel provided between the wings receives the plate in contact with a flat bottom of the tunnel.

3. Splicing device according to claims 1 and 2, wherein two cams are hinged on two pins passing through two holes pierced in the cap, and act, via their specially shaped ends, on metallic sheets or leaf springs placed above the plate.

4. Splicing device according to claims 2 and 3, wherein the lower face of the plate is flat and in that its upper face curves upwards in its central portion in an area in which the leaf springs are not subjected to the pressure exerted by the cams.

5. Splicing device according to claims 1 and 2, wherein two cams are hinged on two pins passing through holes pierced in the cap and act, via their specially shaped ends, directly on the upper face of the plate, itself provided with recesses enabling it to bend.

6. Splicing device according to claims 1 and 2, wherein the means for guiding and holding the end plugs in the central splicing body are constituted by rails hollowed out in the lateral parts of the plate, horizontal lateral shoulders provided on the base of the cap, and inclined surfaces on horizontal strips which prolong the cap.

7. Splicing device according to claims 1 and 2, wherein the means for positioning the bared fibres in the central splicing body are constituted by V-shaped grooves hollowed out in the lower, flat part of the tunnel provided between the wings.

8. Splicing device according to claim 1, wherein the end plug is composed of a lower part and of an upper part fixed to one another by a press fit effected between edges of the lower part and cut out portions of the upper part.

9. Splicing device according to claim 8, wherein the upper face of the lower part and the lower face of the upper part have transverse grooves with striations in relief.

10. Splicing device according to claim 8, wherein the wings of the lower part end in a rounded portion above, and in a rounded guide member, below and slightly set back.

11. Splicing device according to claim 8, wherein the upper part bears lateral bosses.

12. A mechanical splicing device for fibre-optic cables, substantially as herein described with reference to the accompanying drawings.

DATED this 12th day of December, 2000

CABLES PIRELLI SA
By Their Patent Attorneys
DAVIES COLLISON CAVE

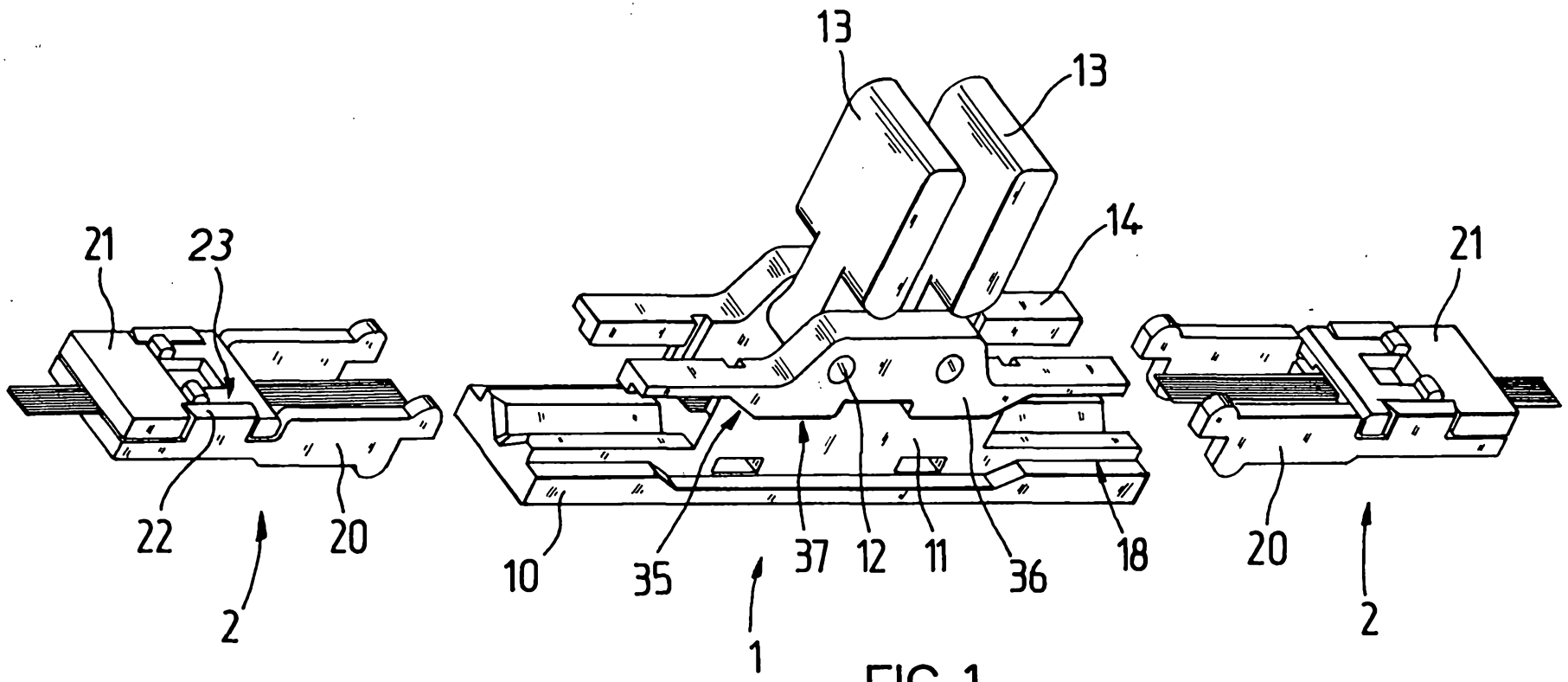

FIG.1

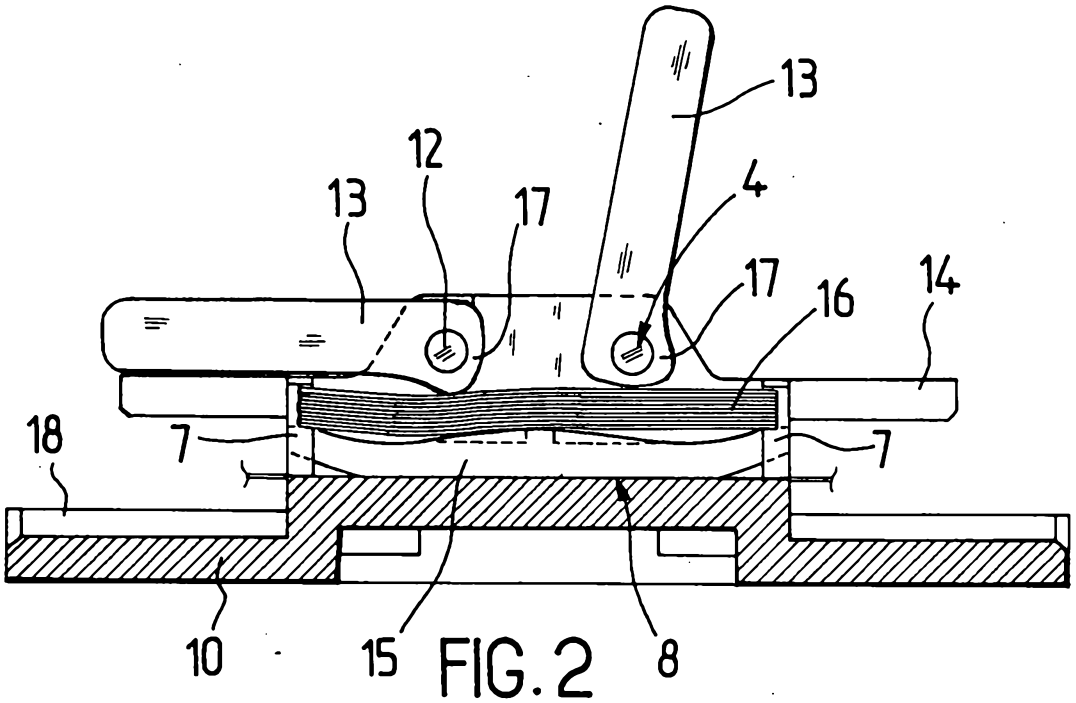

FIG. 2

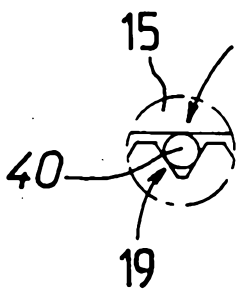

FIG. 3b

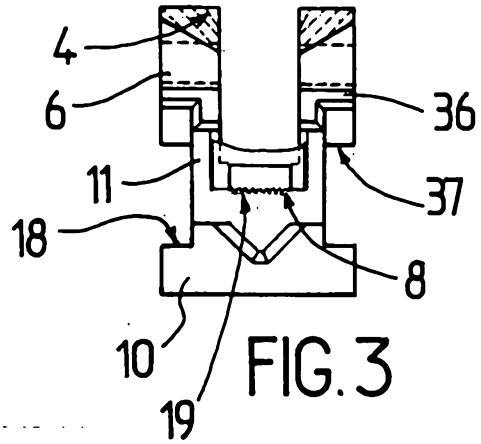

FIG. 3a

FIG. 3

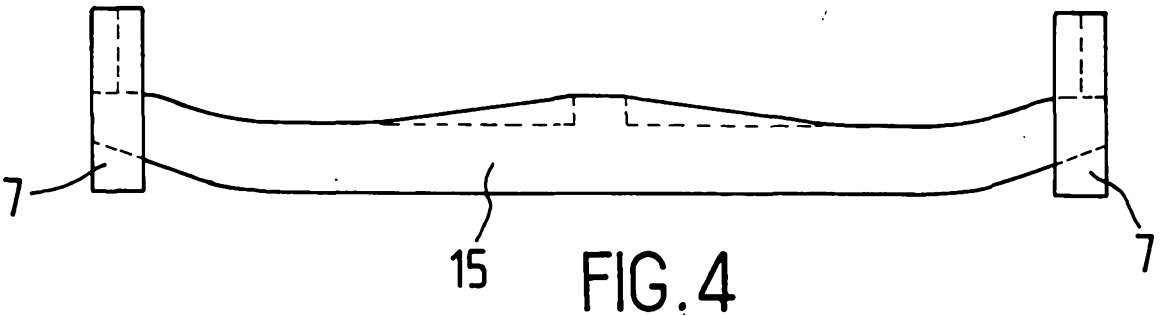

FIG.4

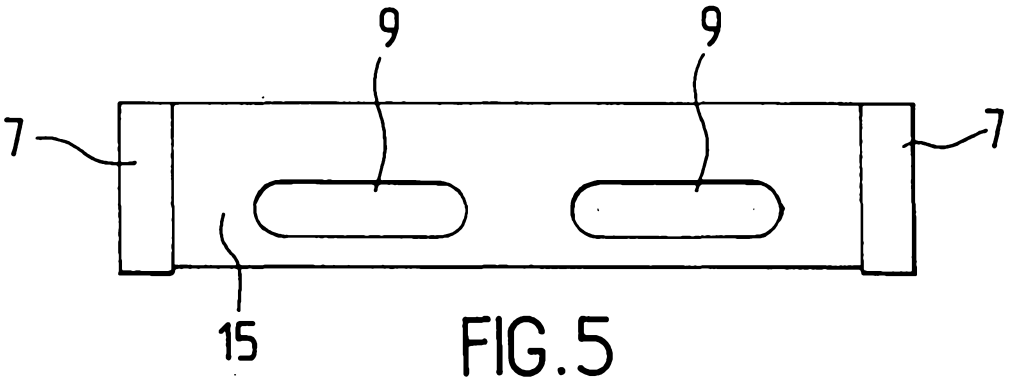

FIG.5

FIG.6b

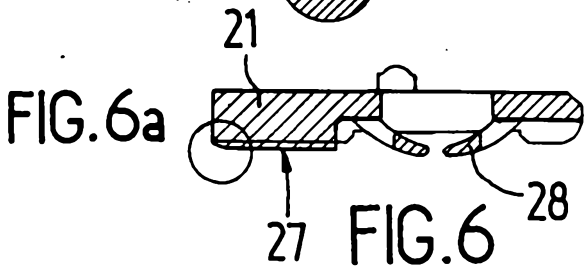

FIG.6a FIG.6

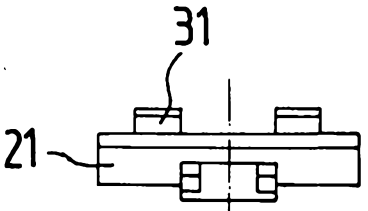

FIG.8

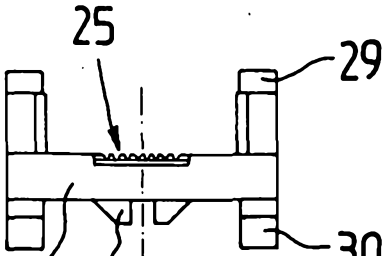

FIG.9

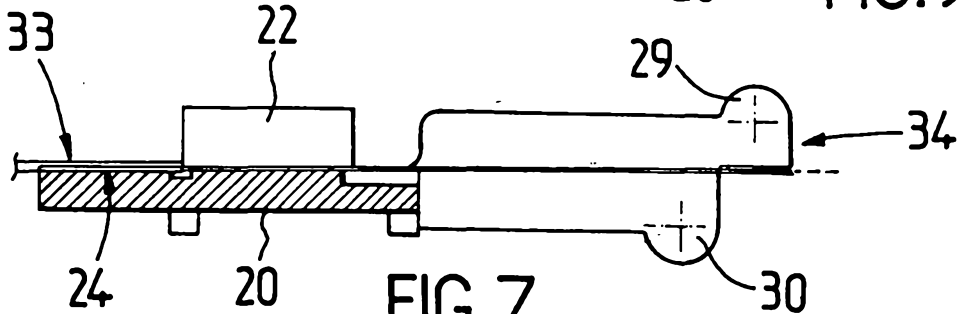

FIG.7

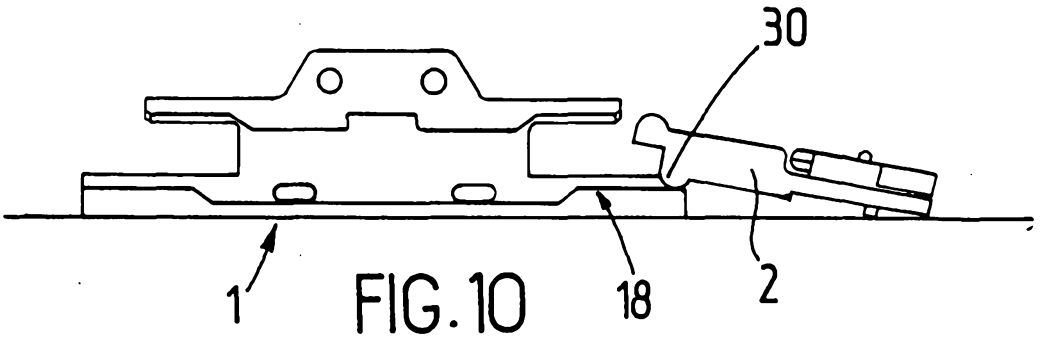

FIG.10

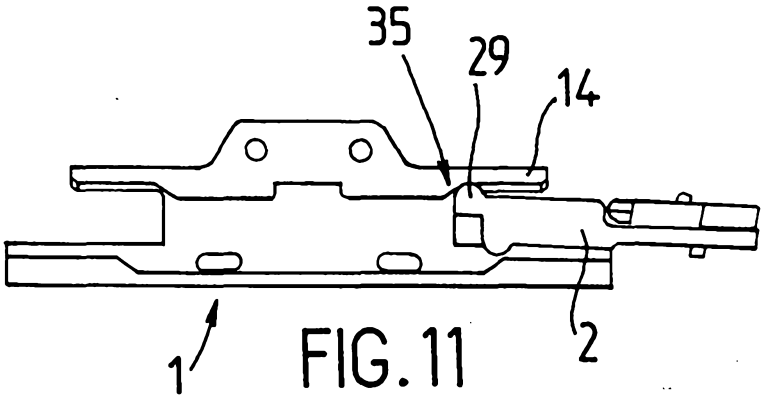

FIG.11

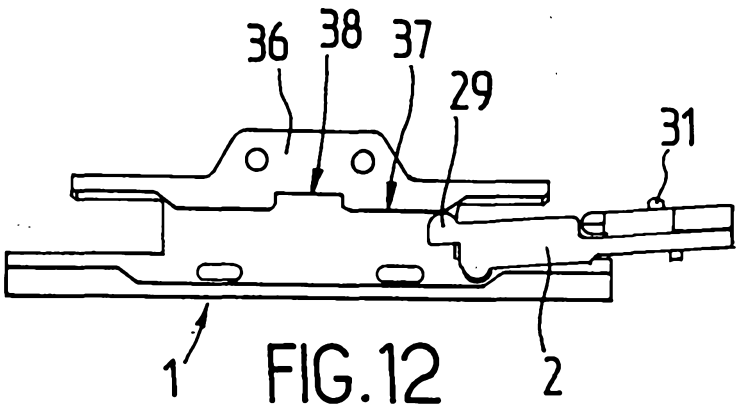

FIG.12

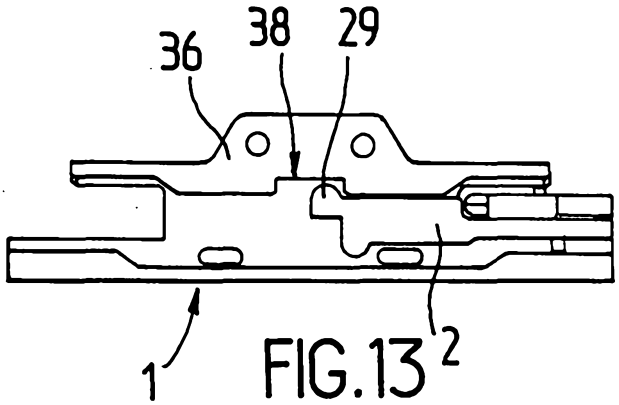

FIG.13