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(54) **Improved foldable glass door system**

(57) It comprises independent and coplanar panes (3) which can be displaced linearly guided in the upper (1) and lower (1') horizontal profiles of the frame as far as successively achieving a certain position where they can rotate through 90°. The panes have four rolling supports, two forward (8, 9) and two rear (6, 7). The rear supports (6, 7) define the hinging axes and are constantly connected to the horizontal profiles (1, 1') of the frame. The forward ones (8, 9) can exit when they reach a lateral opening (24) of those horizontal profiles (1, 1') when the rear ones (6, 7) face and fit into separate hinges (14) premounted in the horizontal profiles (1, 1').

The hinges (14) have a fixed part (15) attached to the horizontal profile (1, 1') and the other rotating part (18) being assisted by a spring (16) which keeps it in an optimum position for being able to receive the connection element (13) of the rear supports (6, 7). The first pane rotates only and comprises some prismatic wedges (31, 31') as rear supports (6, 7) which are attached to the first upper and lower hinge (14) respectively.

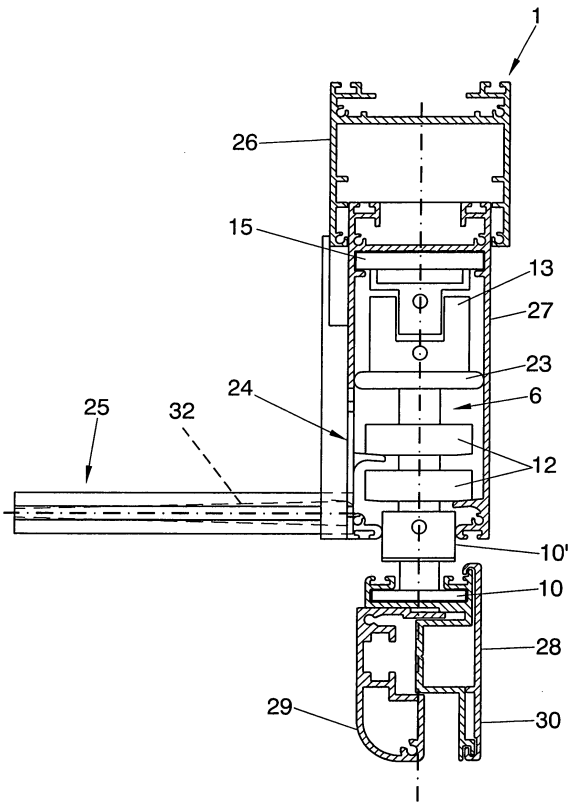

FIG.13

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Description

OBJECT OF THE INVENTION

[0001] As stated in the title of this descriptive specification, the present invention relates to an improved foldable glass closure, and as such it presents certain improved characteristics and technical advantages compared to those currently existing of its kind.

[0002] This kind of closure displays a frame fixed to the gap of the window, whose upper and lower horizontal profiles serve for sliding panes of glass mounted coplanar on a single rail.

[0003] The end panes or those closest to the respective vertical profile of the frame, are rotating since their rear axes of rotation are mounted on respective hinges fixed to the horizontal profiles of the frame, with some semi-axes projecting which we shall hereinafter refer to as supports located at the front free end, via separate upper and lower lateral openings provided in pairs of points on those profiles.

[0004] This pane is rotated through 90° on commencing the folding of the closure and afterwards all the panes remain parallel and close to each other on one and the other side of the frame. The following pane, as with the other central ones of the closure, can be displaced or slid in its plane until it reaches the end where its rear axes fit into separate hinges located in a fixed position on the horizontal profiles of the frame. In this position, the pane can rotate since the previous supports are located precisely so that they are facing the lateral exit openings, this pane remaining parallel with the previous one and so on successively until all the panes are displaced and rotated to one side and the other of the frame.

[0005] One of the objects of the invention is to achieve an improvement and simplification in the functioning since, although the effect characterising this type of closure is very striking or spectacular, due to leaving a smooth surface of coplanar glass panes without any intermediate profiles, it is no less true that its functioning entails an enormous complexity since it is difficult to achieve an optimum attachment of sheets and hinges, wherein lies the main difficulty of this system.

PRIOR ART OF THE INVENTION

[0006] The supports for the forward part of the panes, with the exception of the end pane which does not need them because it does not displace or slide, are currently materialised by means of wheels or rollers as with the supports of the rear part which also possess them in their structure, having one part fixed to the pane profile, two sliding rollers mounted on an axis of that fixed part and a connection element to the hinge when it reaches it and which permits a later completely stable rotation through 90°, from which the rotation starts with the pane being able to become disengaged.

[0007] The mobile part of the hinge has to be maintained in a position that will permit easy entrance of the support for the pane which slides until it connects with it. This is not currently being achieved satisfactorily.

[0008] The supports for the rear part of the sheets (those which never come off the rails materialising the horizontal profiles) do not have their correct attachment position marked with the respective fixed hinge when they are displaced in order to permit folding, which currently gives rise to an obstacle for performing a smooth rotation since it becomes obstructed due to being caught in the upper hinge, or in the lower one, or in both.

[0009] In order to facilitate the entrance and exit of the supports via the lateral pairs of openings of the horizontal profiles of the frame, a guide piece is conventionally provided, also known as an expeller, which is fitted fixed contiguous to that opening via the exterior part of the frame. This expeller piece is two-handed since it needs to be mounted at both ends of the upper horizontal profile of the frame.

DESCRIPTION OF THE INVENTION

[0010] In general, the improved foldable glass closure, which the invention proposes is of the kind commented on above but with the improvements that are carried out to the features mentioned, preventing the poor or anomalous functioning of the prior art.

[0011] First of all, in accordance with the invention, a new hinge is designed which is fitted with a spring in its base or fixed part attached to the horizontal profile of the window frame and paired in both horizontal profiles, said spring pushing on the rotating part thereof in order to adopt an angular position determined by a stop, so that this mobile part can return to the ideal position once the pane has left it and which can thus perfectly receive the support or connection element for the axis of the sliding pane provided thereafter and which has to be rotated for being folded in the lateral gathering.

[0012] Another improvement consists of the incorporation of a disc adjacent to the connection element and coaxial with it, of diameter corresponding to the maximum interior width of the horizontal profile. This disc makes contact with that of the preceding pane in the gathering, in a position in which it is coaxial with the corresponding hinge. This enormously improves the guiding and location at the exact point at which the rotation can take place for the gathering.

[0013] As the first pane is not displaced and merely rotates, the attachments to the fixed points of rotation or hinges mounted in the upper and lower profiles of the frame, along with the structure of the hinges themselves, are preferably distinct from those of the rest of the panes. In other words, in terms of the hinges of the first pane, it is not necessary for them to have two components and the positioning spring which assists the mobile part, since the locking is always maintained due to the fact that there is no sliding. In the upper and lower horizontal profiles the supports are introduced for the rotation, these sup-

ports being defined by some prismatic wedges matching those profiles, attached with respective axis-screws which traverse them and are fixed to the base of the supports attached to the profiles of this first pane. Entering into the axial hole of these wedges is the pin of the base piece fixed to the upper and lower horizontal profile of the frame, in order to permit the hinging.

[0014] In order to optimise the functioning of the entrance and exit of the upper exterior supports of the panes, the expeller and guide piece for facilitating that entrance and exit can, instead of being as described, also incorporate two rolling bands or flanges for the pair of wheels which define the rolling and suspension unit for the panes on the forward side. Such flanges have different geometries for different diameters of wheel or roller, also having different width.

[0015] As secondary aspects of the invention, mention can be made of the symmetric design of the expeller and guide piece for the entrance of the panes in the horizontal profiles and thereby permit mounting on both sides of the closure without having to have two symmetric pieces (two-handed) as currently occurs; and the use of composite profiles for the window frame, thereby achieving the correct fit of the frame with respect to the gap and of the guide rails for the panes. Moreover, the same profiles of pane are used with telescopic operation, for application to different thicknesses of glass.

[0016] In order to facilitate the understanding of the features of the invention and forming an integral part of this descriptive specification, some sheets of drawings are attached containing figures in which, on an illustrative rather than limiting basis, the following have been represented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Figure 1.- Is a schematic view in front elevation of a window with the panes fitted with the folding system for gathering at both ends of the closure.

Figure 2.- Is a schematic view in plan of that shown in figure 1.

Figure 3.- Is a partial view of one of the panes with the supports at pairs of points at its ends, with the improvements forming the object of the invention, these four supports being shown in respective blown-up detail.

Figure 4.- Is an exploded view in sectioned elevation of one of the hinges which have to be mounted at fixed pairs of points of the upper and lower horizontal profiles of the frame of the closure, in accordance with the invention.

Figure 5.- Is a view similar to that of figure 4 with its components fitted.

Figure 6.- Is a cross-section along the line of cut A-A of figure 5.

Figure 7.- Is a schematic view in plan in order to see the relative position of the rear supports of the panes and the hinges in the gathering of panes according to the invention.

Figure 8.- Is a view in perspective of the expeller guide piece, according to the invention.

Figure 9.- Is a transverse cross-section in elevation of the upper horizontal profile of the frame of the closure, including the hinges and rear supports mounted on the panes.

Figure 10.- Is a view similar to that of figure 9 but in the forward zone of the panes or in correspondence with the front supports which have to exit from the horizontal profiles.

Figures 11 and 12.- Are respective views similar to figures 9 and 10, but of the lower supports.

Figure 13.- Is a view similar to figure 9 in the zone where the upper horizontal profile presents the lateral exit opening for the forward support, in another adjustment position of the composite profiles of frame and panes.

Figure 14.- Is a view similar to figure 10 with the support of the pane exiting from the horizontal profile via the lateral opening, and in another different position of the profiles comprising frame and panes.

Figure 15.- Are three views in cross-section elevation of the lower horizontal profile of the panes, in different positions of their two components for being adapted to different thicknesses of glass.

Figure 16.- Is a view similar to figure 9 but corresponding to the upper supports of the first pane, which do not need to include wheels because said first pane only effects rotations.

Figure 17.- Is a view similar to figure 11 showing the lower support modified for the first pane, in the zone of hinging.

Figure 18.- Is a view in perspective of the expeller piece according to the second form of embodiment.

Figure 19.- Is a view in perspective of the same expeller piece as figure 18 from the opposite and inverted side.

DESCRIPTION OF THE PREFERRED FORM OF EMBODIMENT

[0018] Making reference to the numbering adopted in the figures, the improved foldable glass closure, which the invention proposes, is of the type that functions in the following manner (see figures 1 and 2).

[0019] The frame which perimetrically encloses the gap of the window which it is wished to be fitted with the foldable closure, gathering the panes on one side and the other, is formed from the upper 1 and lower 1' horizontal profiles and vertical profiles 2. The panes 3 have horizontal profiles 4 and in the case that is shown they lack vertical profiles because the glass 5 itself acts as reinforcement.

[0020] As can be seen better in figure 3, the panes 3 have rolling supports for the sliding along the interior of

the horizontal profiles. The other end of the sheets 3 never exits from the horizontal profiles 1; we will call them the rear end and they have to be in correspondence with the hinging axis at 90° in order to achieve the folding at the end of the sliding travel of the pane that we are considering.

[0021] The rear rolling supports are referenced with the number 6 for the upper one and 7 for the lower. The forward rolling supports respectively correspond to the numbers 8 and 9.

[0022] The upper supports 6 have the following components: base 10 for attachment to the upper profile 4 of the pane 3, axis 11 with guide wheels 12 inside the profile 1 (see figure 9), the connection element 13 with respect to the hinges 14 which are fixed in the horizontal profiles 1 at the points where they have to be gathered (see figure 2), and other complementary elements which we will analyse further below. These hinges 14 are shown in detail in figures 4 to 6.

[0023] The lower supports 7 have a geometry similar to the previous one 6 though they lack the guide and suspension wheels 12 since they only require centring with the cylindrical segment 10' given that the panes are suspended (figure 11).

[0024] The supports 8 and 9 are similar to supports 6 and 7 respectively and they lack the connection pieces 13 in the shape of a fork because they do not have to connect with the hinges 14 since, let us recall, they exit from a pair of side openings of the horizontal profiles 1 when rotating through 90° on reaching the final sliding position, there existing lateral openings on one and the other side of the glass.

[0025] Making special reference now to figures 4 to 6, these show the structure of the hinges 14 and components thereof. They consist of the base piece 15 for fixing to the upper and lower horizontal profile 1 (see figures 9 and 11), the helical spring 16, the rotation axis 17 and the rotating connection piece 18 which is cylindrical with two parallel millings (see figure 7).

[0026] The spring 16 has its lower end fixed in the base piece 15 and is housed in the seating 19, having its other end connected to the pivot 20 fitted in the rotating piece 18 in the eccentric axial position. The unit is axially fixed by means of the transverse pin 21.

[0027] The spring 16 assists the rotating piece 18 so that, at rest, it can adopt the ideal position for properly receiving the fork 13 corresponding to the upper 6 or lower 7 supports, a task which is achieved by the existence of a stop 22 for the pivot 20. The shape of this stop (see figure 6) also determines some means of limiting the maximum opening position for the pane, which can therefore only rotate through about 90°.

[0028] Figure 7 shows schematically that in one of the two ends of the closure there have to remain three folded panes 3 since there are three hinges 14 mounted whose square bases 15 touch each other, marking their correct position. The first pane 3 is folded through 90° and, as we said earlier, it does not displace, it merely rotates.

[0029] The pane 3, which is linearly displaced by the rail of the horizontal profiles 1 (shown partially and schematically with a solid line), will come to occupy the position contiguous with the first pane, its fork 13 coaxially coinciding with the machined pin or connection element 18 of the rotating piece of the hinge 14 which, as we saw earlier, is perfectly aligned in order to receive it. The coaxial position is achieved according to the invention due to the existence of the free disc 23 contiguous with the fork 13, whose diameter also coincides with the side of the square of the base piece 15 of the hinge 14. The first pane has this free disc 23 and the following one makes contact with it by means of its analogous disc 23, the two discs remaining tangent and so on successively.

[0030] In these positions of tangency, before the front supports 8 and 9 commence their 90° rotation, they coincide exactly with the corresponding exit lateral opening (referenced with 24 in figure 1) provided in the horizontal profile 1, in the position in which the expeller guide piece is found, which we will be talking about later on (in figure 2 it has been referenced with 25), These paired front supports 8 and 9 are shown out of phase with respect to the end of the sheet in order to compensate for the delay implied by the already folded panes (see figure 2).

[0031] In figure 7, the third hinge 14 which is free (above and below since it is always mounted as a pair in order to materialise the axis of rotation or hinging) has its connection element 18 orientated correctly awaiting reception of the fork 13 of the third pane which will come once the preceding one has entered and rotated through 90°.

[0032] In figure 8 we can see in perspective the expeller guide piece 25 and that it is symmetric in order to be able to be fitted on the left or right part, without having to have a double stock of parts.

[0033] In figures 13 and 14 we can see this expeller piece 25 mounted in the upper horizontal profile 1.

[0034] These figure 13 and 14 show the geometry offered by the upper horizontal piece 1 where the lateral housing or opening 24 is made and the expeller piece 25 is mounted. The profile 1 of the frame consists of two telescopic sections 26 and 27 in order to compensate for possible maladjustments of the gap. Similarly, the lower profile 1' consists of two sections with telescopic coupling 26 and 27'.

[0035] The horizontal profile 4 of panes 3 also comprises in this example of embodiment the sections 28 and 29. The first is fixed and the second is displaceable in order to be adapted to different thicknesses of glass (best seen in figure 15, positions 1), b) and c) where the locking screws and nuts which secure the glass are included). The screws will be hidden by the embellishing cap 30 attached to the fixed section 28. The cap 30 has the additional advantage of permitting the colour to be changed since it is exchangeable.

[0036] Figure 14 shows the exit opening 24 for the front upper supports 8 (showing an initial exit position and with the lower roller 13 of the unit now resting on the rib of the

expeller piece 25).

[0037] Figure 13 shows that the upper rear support 6 cannot exit via the opening 24 and how the free disc 23 performs its centring task.

[0038] Making special reference now to figures 16 and 17, due precisely to the fact that the first pane 3 does not displace but merely rotates, it is not necessary for it to have the pair of wheels 12 above it (see figure 16), or at least it lacks the upper one of the pair, and in this case a prismatic body or wedge 31 is mounted fitted to the upper horizontal profile 27 of the frame in which it is introduced in order to permit its rotation without displacement. The projection 18 or similar of the hinge 14, which in this case can be different since said projection is preferably cylindrical, is introduced into the actual entrance hole or the axis-screw 11 which is secured to the internal hinge 6. Nor does this first pane need to have the free disc 23 above it, since the second pane will stop against said prismatic wedge 31 by means of its own free disc 23, which has the same diameter as the width of the prismatic wedge 31. In a variant embodiment, the prismatic wedge 31 can also be extended underneath via part of the base in order to rest on the opposite flange of the profile 27, optimising the attachment and rendering it unnecessary to have this lower wheel 12 used as support.

[0039] In the internal lower part (see figure 17) something similar happens to that just referred to above, since the connection element 13 and its free disc 23 have been replaced with another wedge 31' fitted to the lower profile 27' of the frame, having also the entrance hole for the axis-screw 11' and the projection 18 of the hinge 14 or similar.

[0040] This special attachment of the first pane in the hinging axis 11-11' provides a better quality in its fixing to the profiling.

[0041] According to the invention and as an improvement for the guided functioning of the panes, in the entrance and exit phases, the expeller piece 25, instead of possessing a single rolling band like that shown in figure 8 referenced with 32, possesses two bands 32 and 33 for the joint guiding of the respective wheels 12. They have different geometry for permitting the guiding of wheels or rollers of different diameters.

Claims

1. IMPROVED FOLDABLE GLASS CLOSURE, of the type of those formed by independent panes joined to the upper and lower horizontal profiles of the framework, able to adopt an arrangement parallel to each other and perpendicular to the plane of the frame, due to one of the ends of said planes being constantly connected to said horizontal profiles, while the other ends comprises supports which can be extracted via a lateral opening provided for the purpose at fixed pairs of points on both horizontal profiles, the upper of which includes an expeller guide piece in an adjacent position; each pane including in upper and lower pairs of points at least one forward rolling support and another rear support also rolling, the latter having a connection element which connects with the respective hinge of those mounted in fixed pairs of points close to each other inside the horizontal profiles of the frame, marking the position of rotation in order to permit the successive gathering of the panes, **characterised in that** said hinges (14) have in the base or fixed part (15) for attachment to the horizontal profile (1, 1'), a seating 1191 for housing a helical spring (16) with an end that is bent and attached at a fixed point of said base or fixed part (15), and whose other end is joined to the rotating part (18) thereof, causing it to return to a position of rotation resting against a stop (22) in order to receive the connection element or fork (13) which defines the axis of rotation of the pane (3) which slides and is received.

2. IMPROVED FOLDABLE GLASS CLOSURE, according to claim 1, **characterised in that** the base or fixed part (15) of the hinge (14) includes stopping means (22) in the position of maximum opening of the pane.

3. IMPROVED FOLDABLE GLASS CLOSURE, according to claim 1, **characterised in that** the connection element or fork (13) of the pane (3) comprises an adjacent free coaxial disc (23) which makes contact with that mounted in the pane (3) coming from the gathering in a position in which it is coaxial with the axis of the hinge (14) which receives it and which is one of those mounted fixed in the horizontal profiles (1, 1') of the frame.

4. IMPROVED FOLDABLE GLASS CLOSURE, according to claim 1, **characterised in that** the expeller guide piece (25) for the extractable supports (8, 9) of the panes (3) is symmetric with respect to a horizontal plane for its mounting on one or the other side of the closure, in a position adjacent to the lateral exit openings (24).

5. IMPROVED FOLDABLE GLASS CLOSURE, according to claim 1, **characterised in that** the attachment profile for the glass of the panes is a profile comprising two parts, one fixed (28) and the other displaceable (29) in order to adapt itself to different thicknesses of glass, the fixed part 28 in turn having an embellishing cap 30 which hides the assembly screws and allows for changing the colour.

6. **IMPROVED FOLDABLE GLASS CLOSURE,** according to claim 1, **characterised in that** at least the horizontal profiles (1, 1') of the frame comprise two telescopic sections that can be fixed together.

7. IMPROVED FOLDABLE GLASS CLOSURE, according to claim 1, **characterised in that** the first pane (3) has its rear supports (6, 7) defined by separate prismatic wedges (31, 31') fitted inside the respective horizontal profile (1, 1') of the frame, provided with an axial hole for the entrance of an axis-screw (11, 11') for securing to the attachment base (10) of the horizontal profiles (4) of the panes (3), and of the pin or connection piece (18) of the respective first hinge (14) of the horizontal profiles (1, 1') of the frame.

8. IMPROVED FOLDABLE GLASS CLOSURE, according to claim 1, **characterised in that** the expeller guide piece (25') of the upper extractable supports (8) of the panes (3) comprises two rolling bands (32, 33) providing joint support for the two wheels (12) constituting the same.

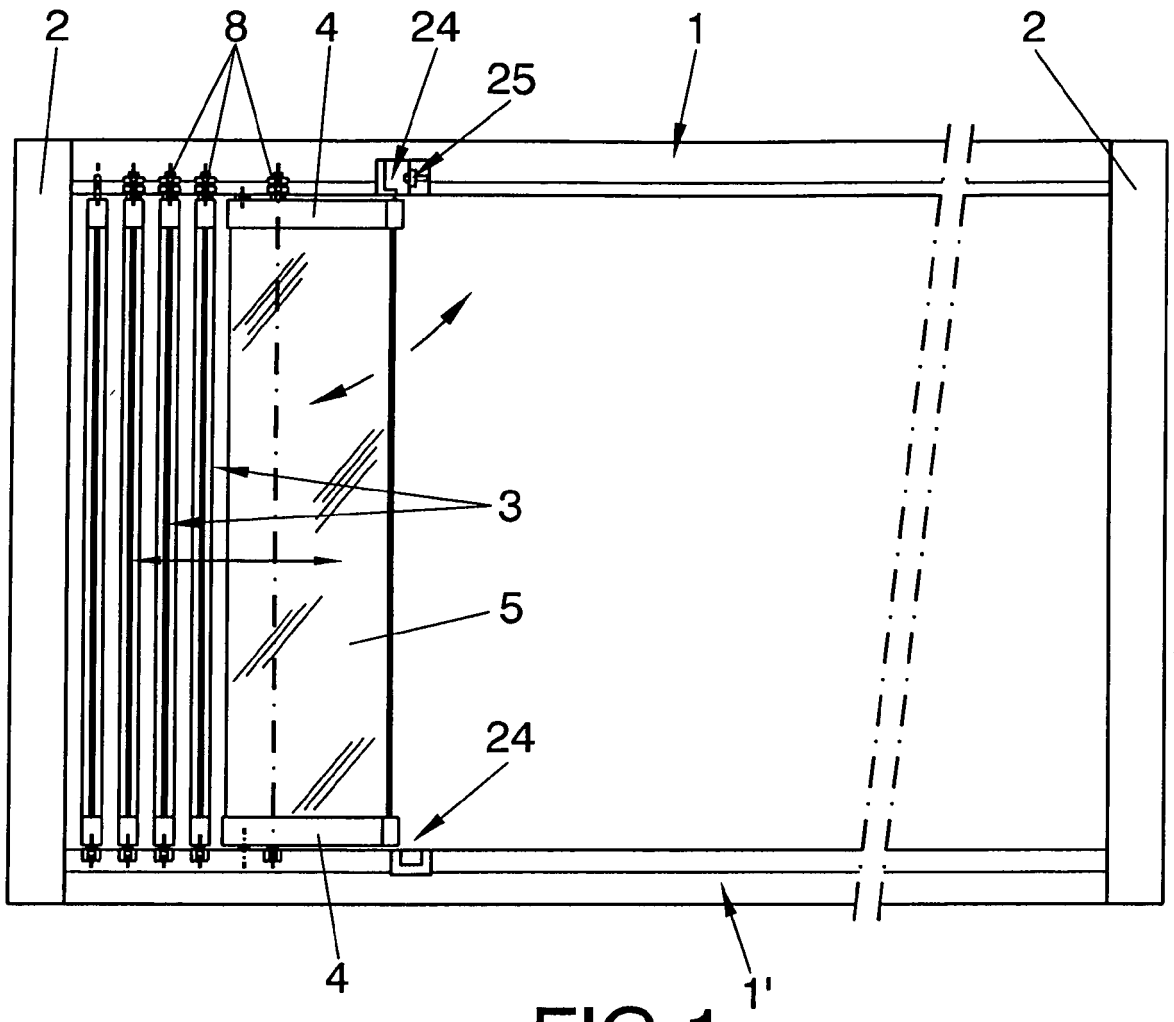

FIG.1

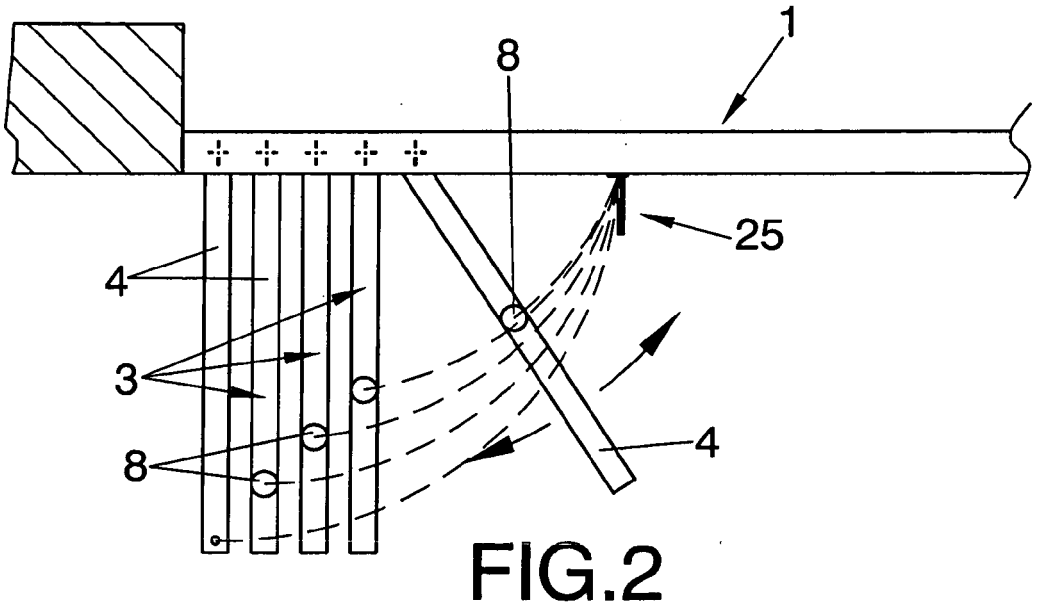

FIG.2

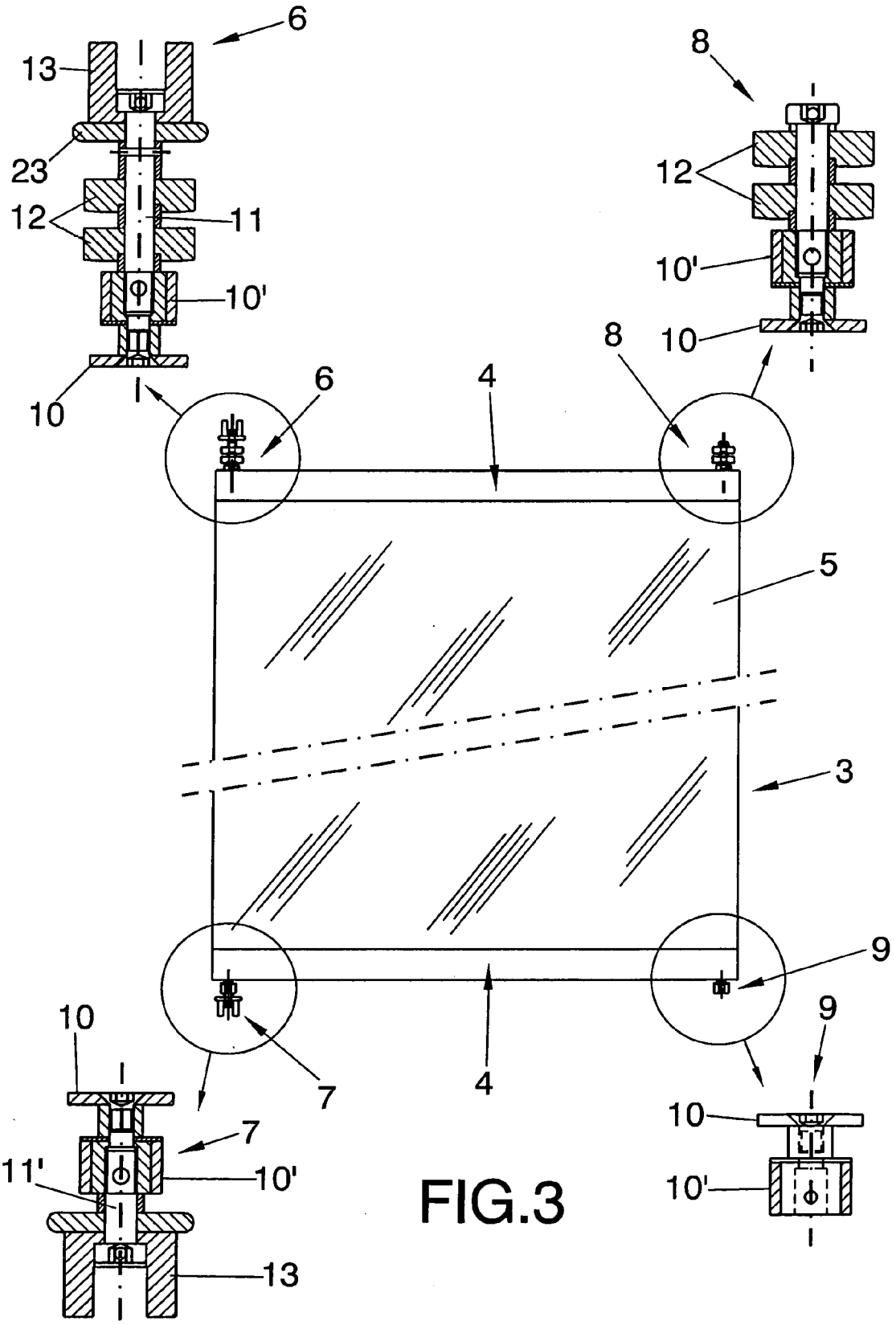

FIG.3

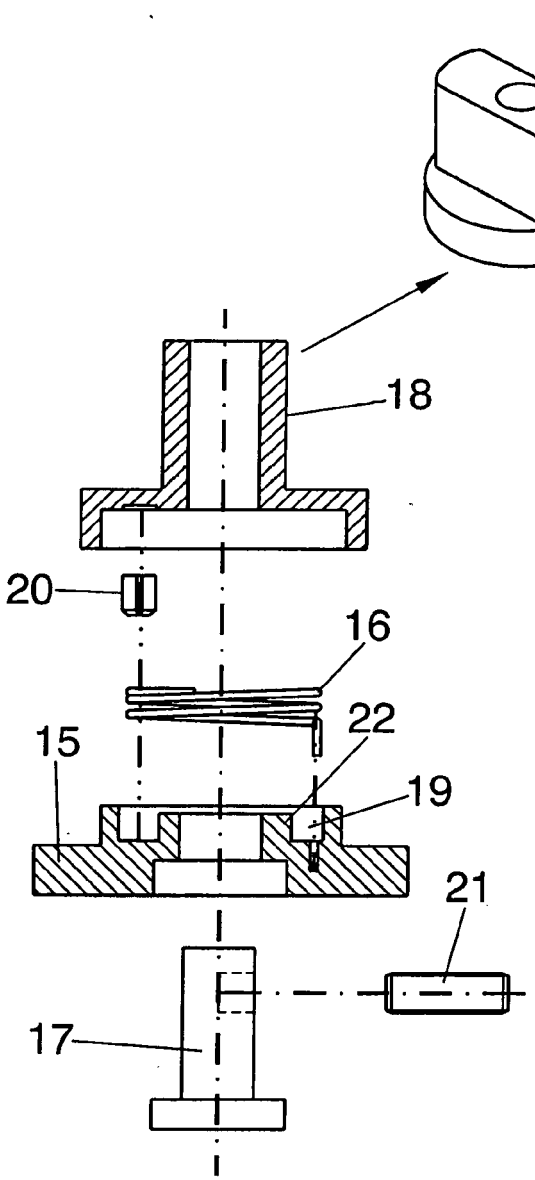

FIG.4

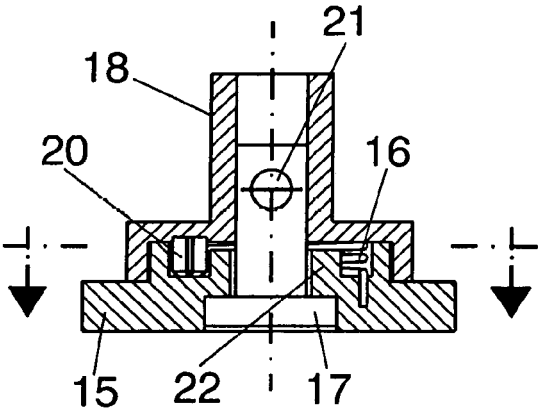

FIG.5

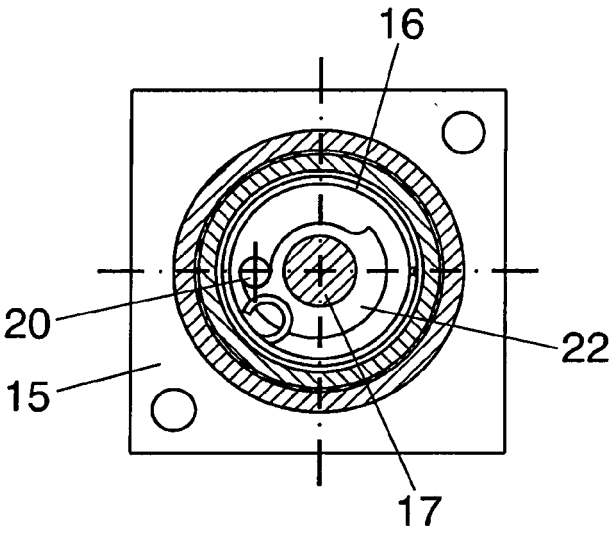

FIG.6

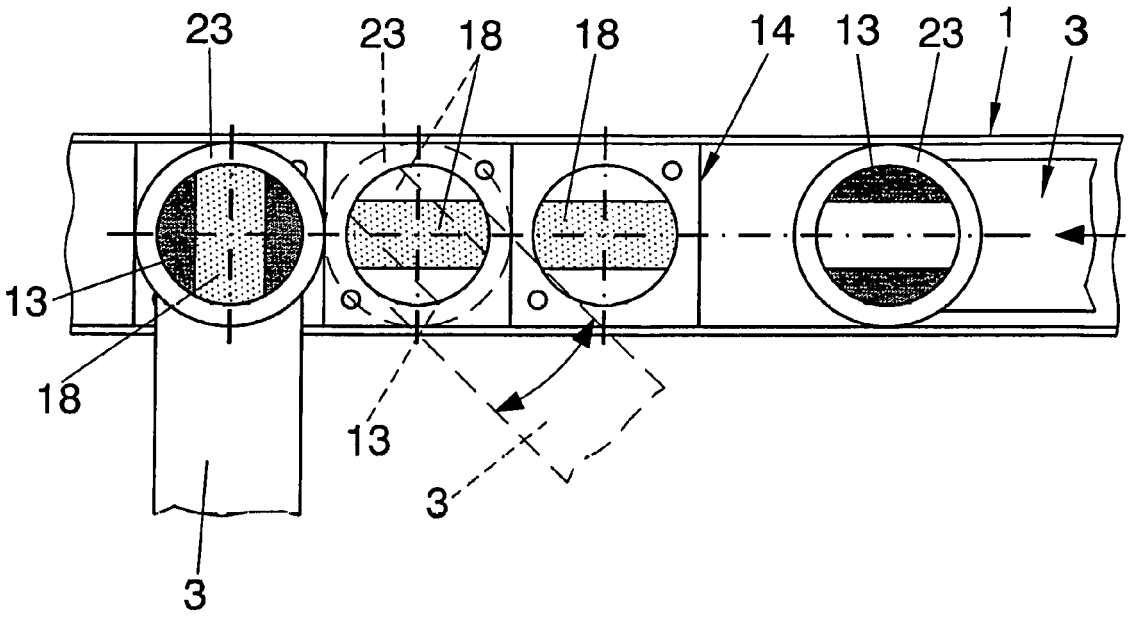

FIG.7

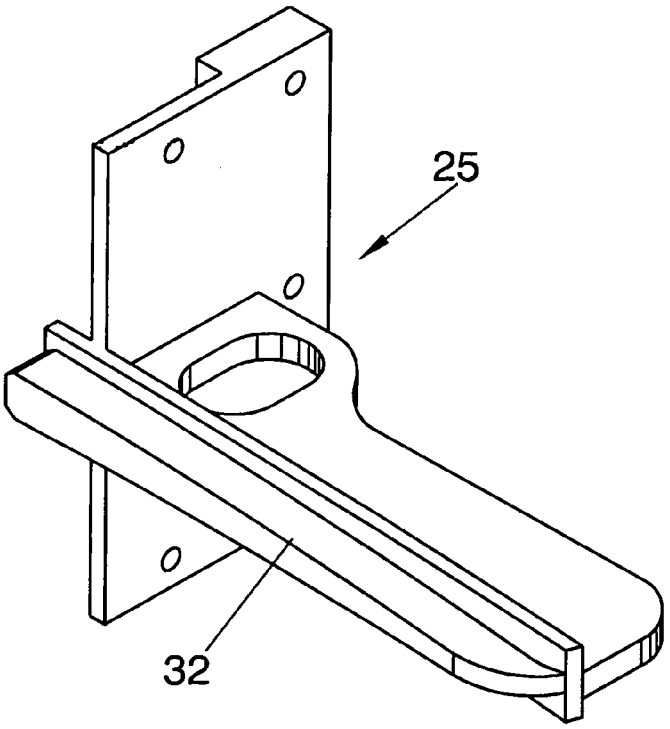

FIG.8

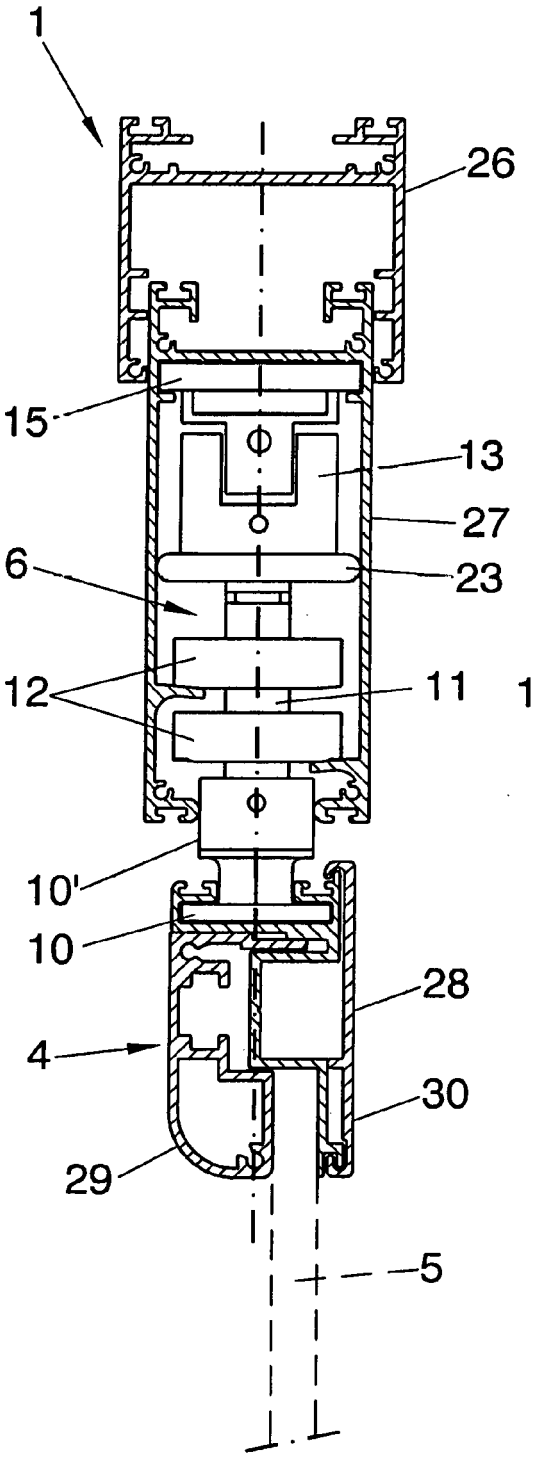

FIG.9

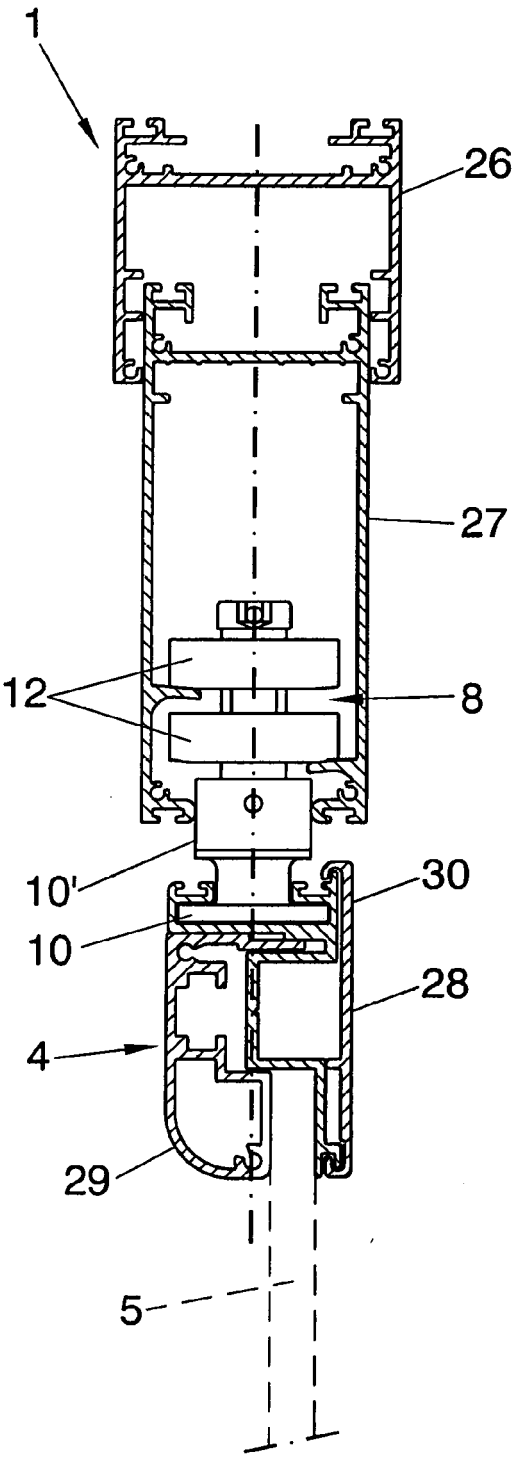

FIG.10

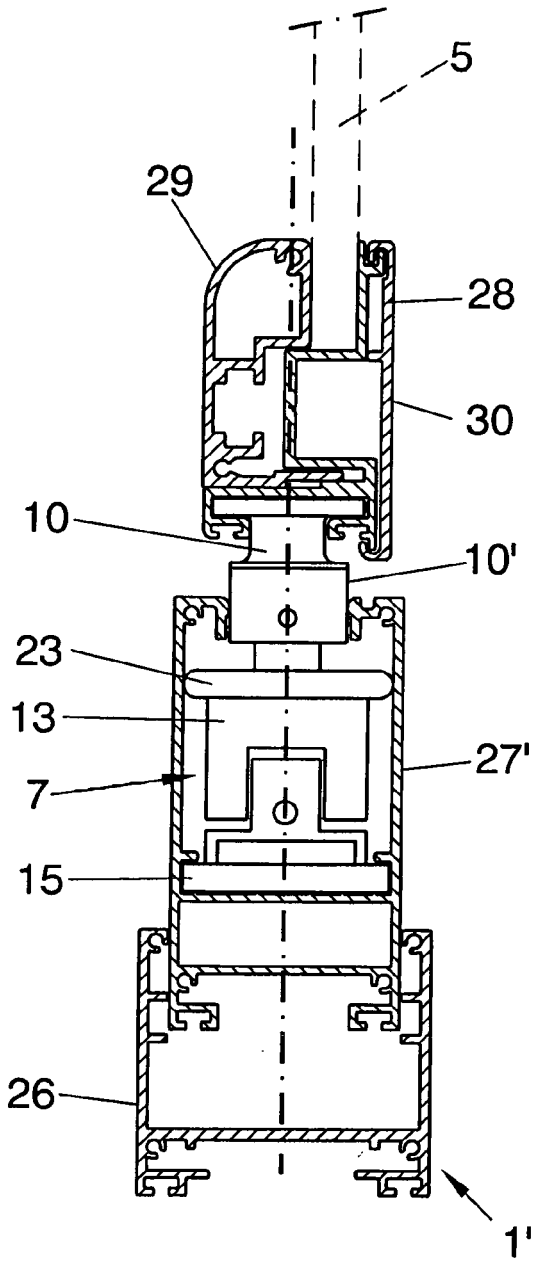

FIG.11

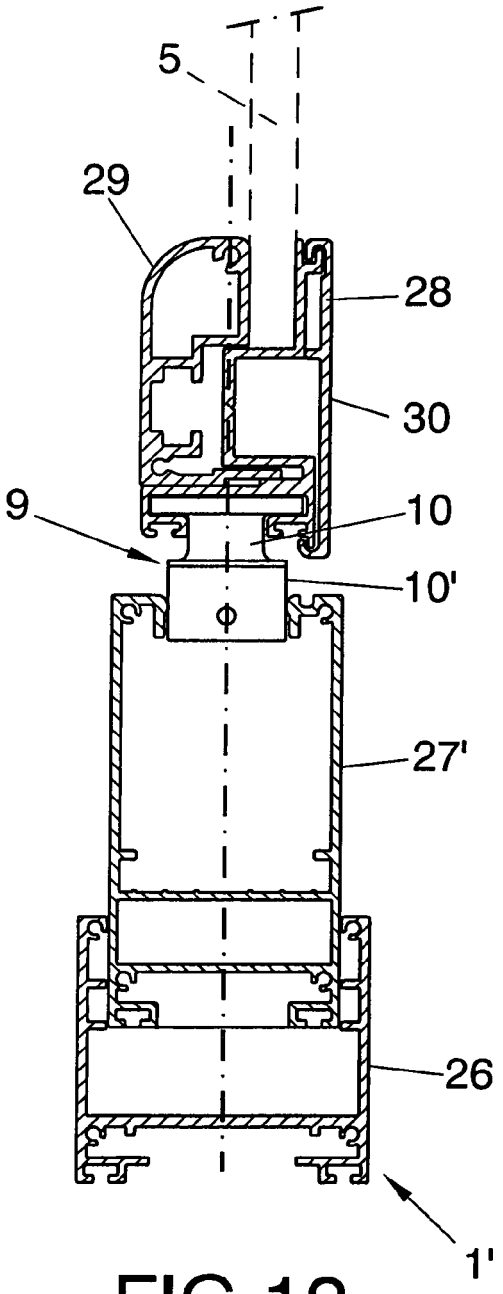

FIG.12

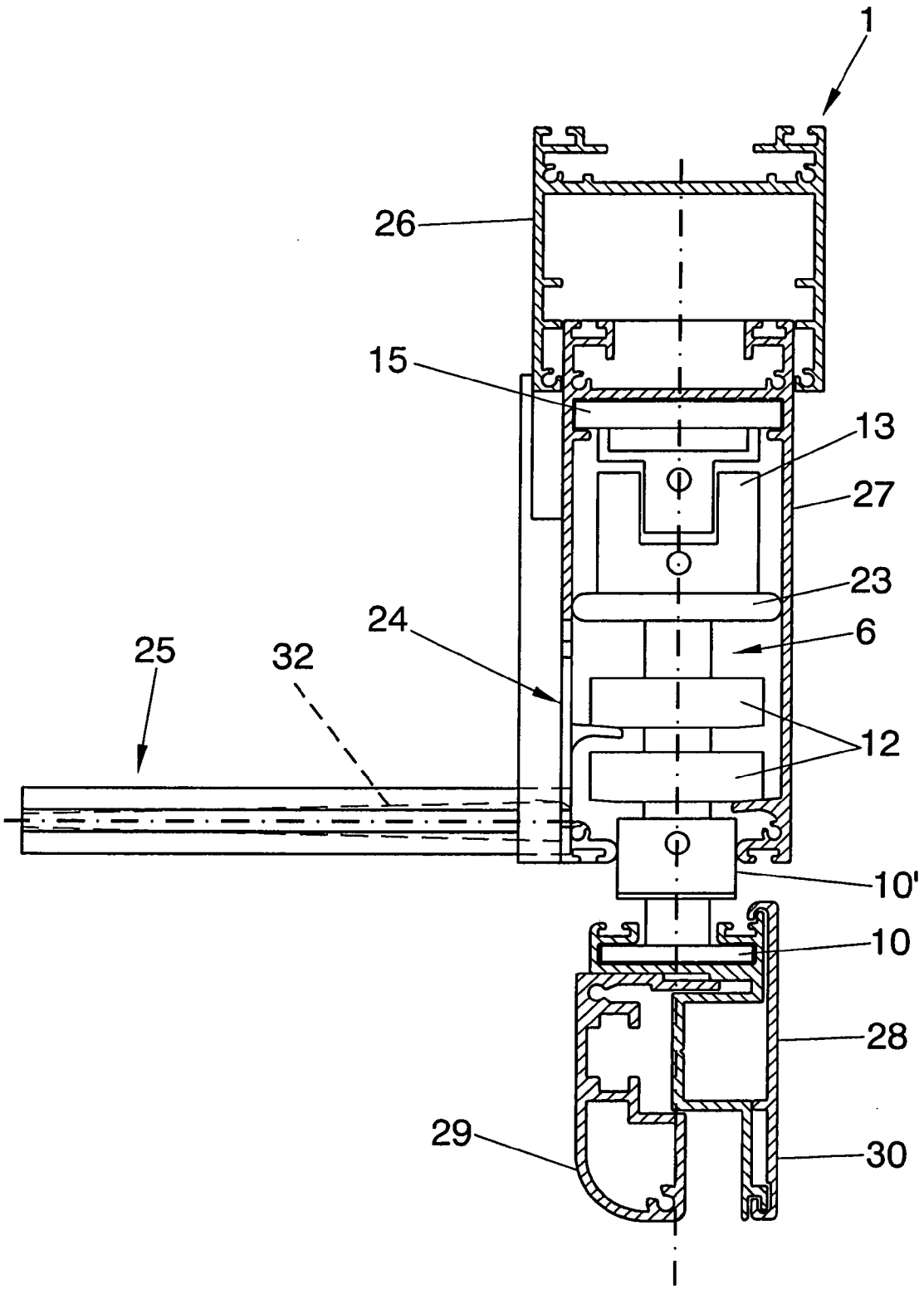

FIG.13

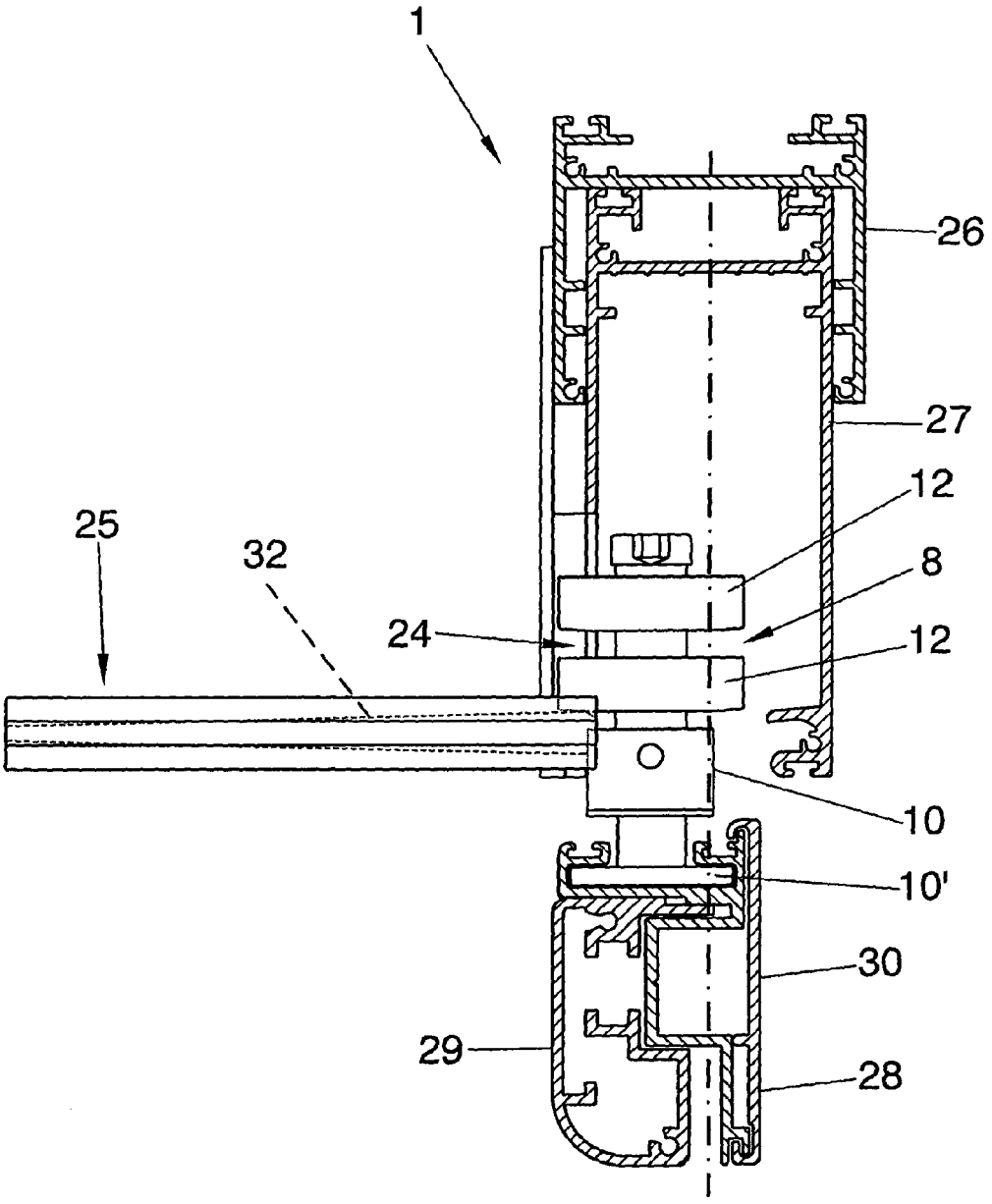

FIG.14

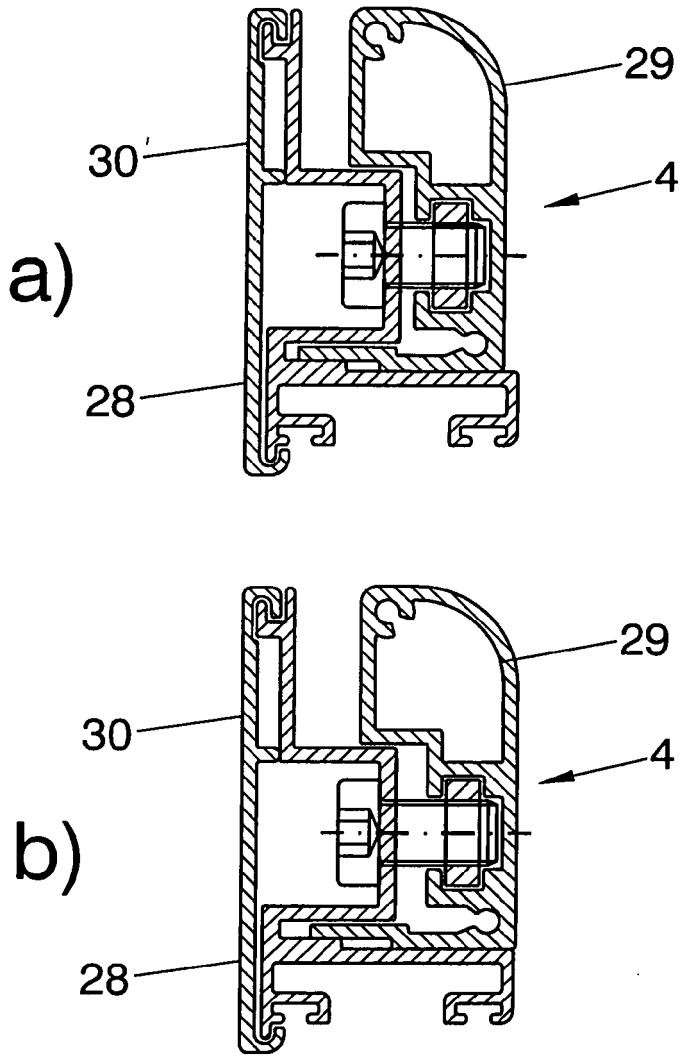

FIG.15

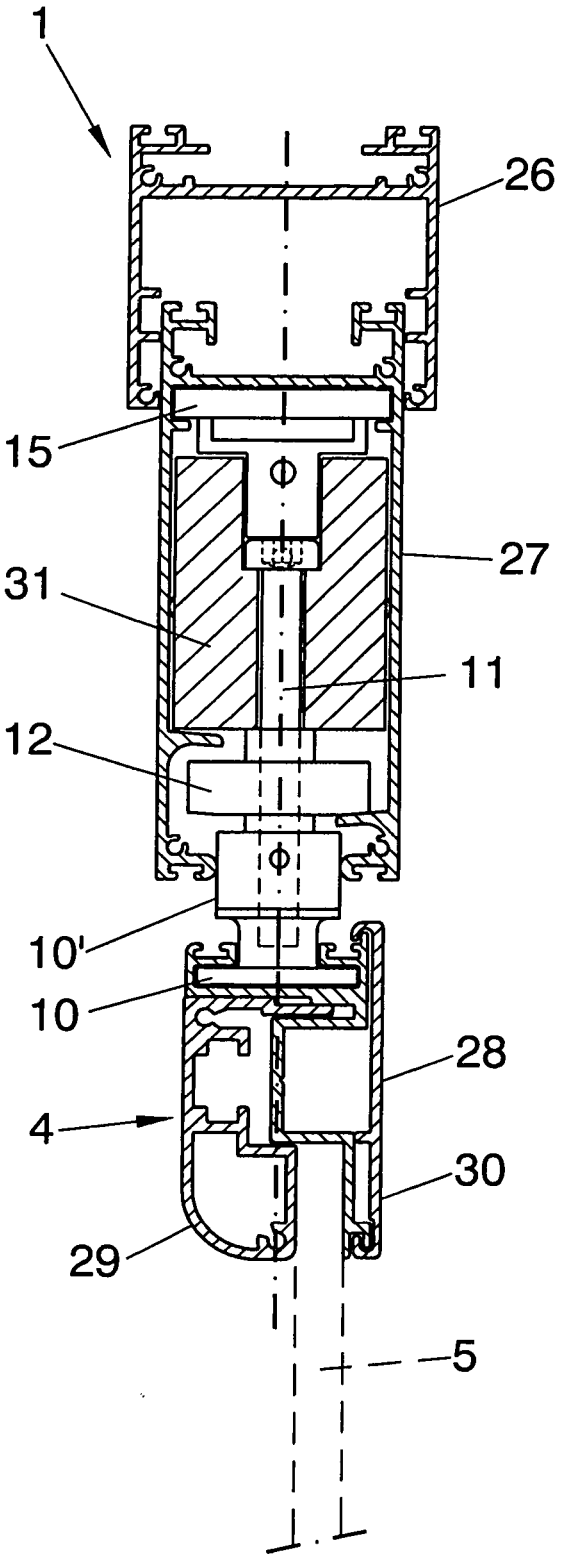

FIG.16

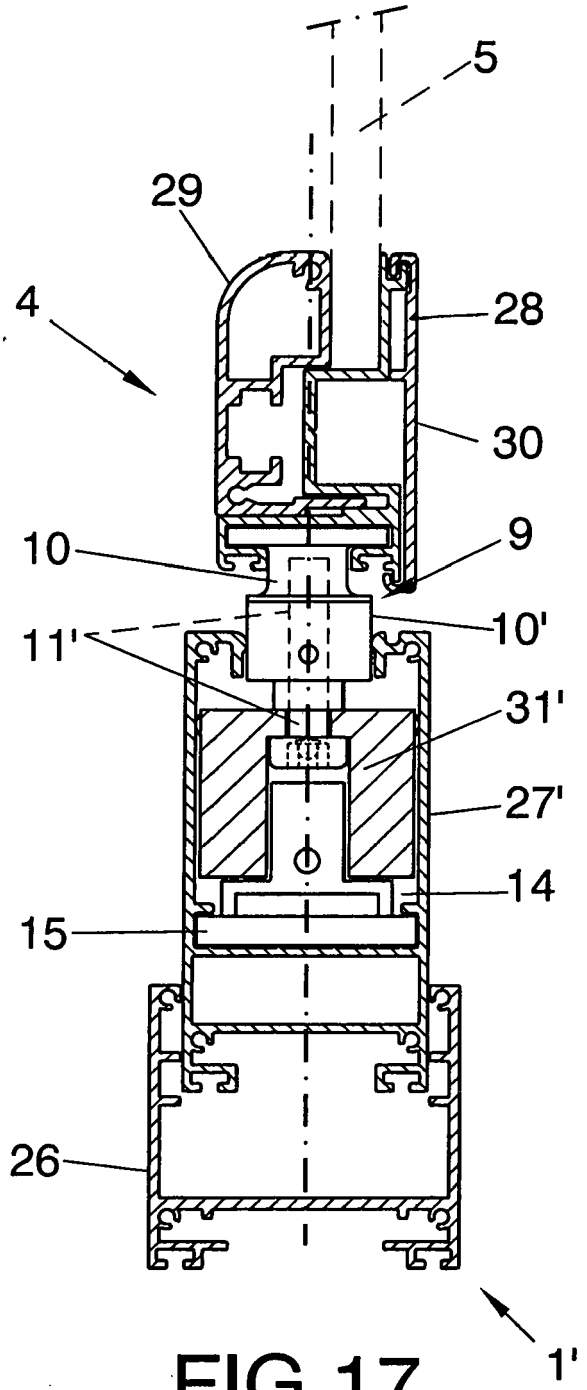

FIG.17

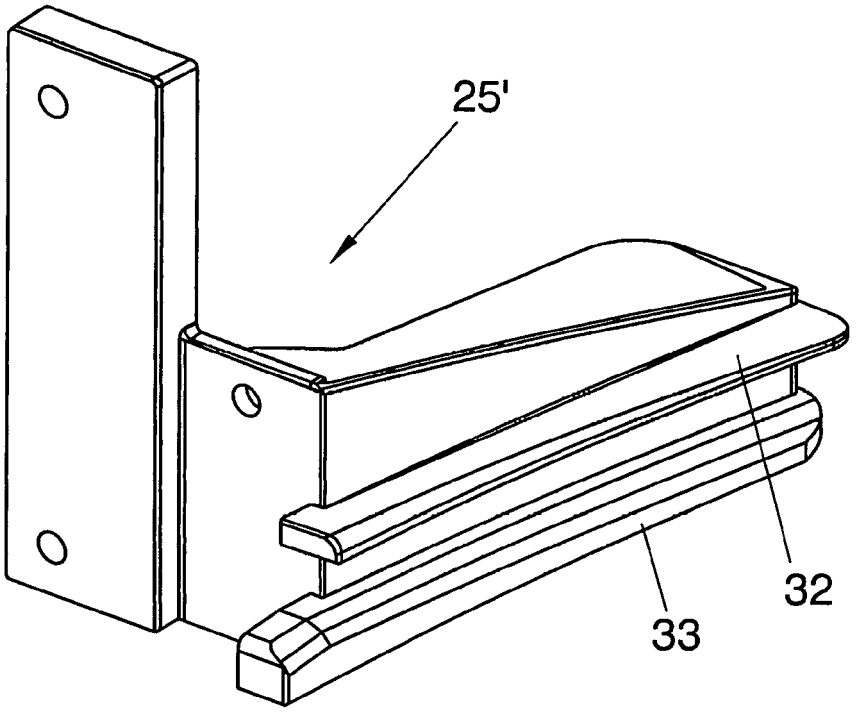

FIG.18

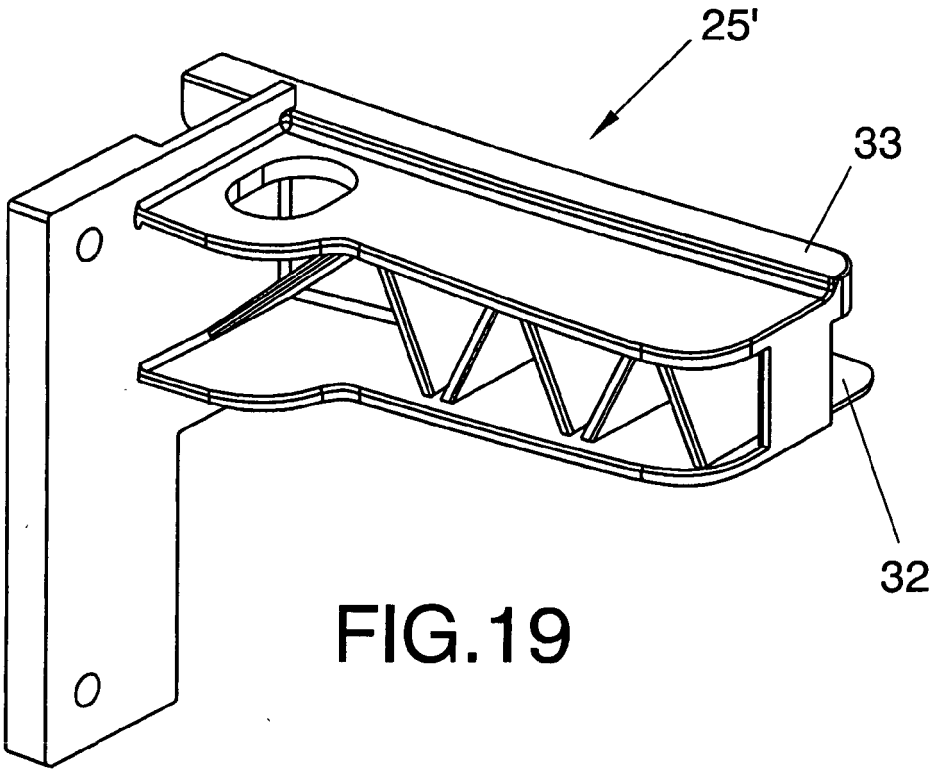

FIG.19