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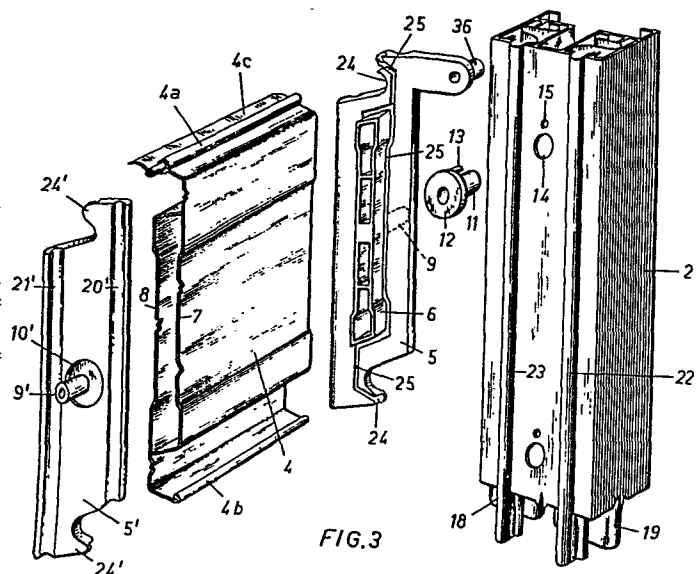
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54 Air-tight shutter with movable slats.

57 Air-tight shutter with moveable slats. The shutter is made up of two longitudinal (2, 2') and two transverse (3, 3') aluminum sections to form a frame within which are arranged rotating slats operated by a single handle. The lateral hinges of the slats are air-tight. The seal between lateral supports (5, 5') of the slats and longitudinal sections (2, 2') is ensured by nylon sections (18, 19, 18', 19') incorporated in sections (2, 2') to function as springs. The seal between the slats (4) is ensured by their congruent angular molding (4a, 4b), equipped with plastic gasket (4c). The seal of the upper and lower slats of the shutter is ensured by the congruence of the respective angular molding (4a, 4b) with the corresponding angular molding (35) of sections (3a, 3b), equipped with plastic gasket (3a') and inserted in grooves in sections (3, 3'). The lateral seal of sections (3a, 3b) is ensured by slats (31) (figures 2, 3).



Air-tight shutter with moveable slats

This invention concerns a shutter with slats which may be rotated simultaneously from a completely open position to an air-tight closed one.

5 There are currently many types of shutters, ranging from traditional ones formed of two rotating wings on hinges fixed in the window frame, equipped either with fixed parallel slats from the top to the bottom or with move-
able slats controlled by a vertical hinged rod, to so-
10 called rolling shutters. All these types of shutters have protection from light as their major purpose, allowing the light penetration in the habitation to be varied. However, they also serve, especially at night, to protect from cold, wind, inclement weather in gener-
15 al, and in particular for inhabitants of apartments or houses at or near street level also to give greater protection from the outside.

All of the above shutters are able to regulate the in-
20 tensity of the light penetrating the living areas, but can only partially protect them from inclement weather, such as wind, rain, snow, or from smog, dust, cold and noise. Furthermore, they always require somewhat costly maintenance and are subject to frequent damage, espec-
25 ially in the case of rolling shutters.

This invention aims to realize a type of shutter which, while allowing the light flow in the living areas to be regulated, also allows an absolutely air-tight seal with respect to the external environment. It absolutely
5 guarantees thermal isolation, as well as isolation from inclement weather, smog, dust, snow and noise, while also ensuring that the slats are fixed and stable in each position intermediate between total opening and air-tight closing.

10

This goal is achieved through the realization of a shutter with a framework of anodized or painted aluminum sections arranged in parallel longitudinal and transverse pairs and with slats which may be rotated simultaneously from a completely open to a completely closed
15 air-tight position, wherein:

- all the anodized or painted aluminum sections of the framework show the same internal and external molding;
- two nylon sections are pressure inserted in each of
20 the two longitudinal sections, such that due to elasticity they remain fixed in the position acquired through the internal molding of said aluminum section;
- said nylon sections protrude slightly the entire length of the longitudinal aluminum section from the
25 inside of the framework, to form parallel swellings;
- along the mid-line of each longitudinal aluminum section, at equal intervals, rotating supports for the slats are applied to the inside of the framework with

air-tight hinges; the slats in turn are equipped with devices to connect them tightly with one another as well as with the swellings of said nylon sections;
- on the inside of the framework, an aluminum section is
5 pressure inserted in each of the transverse sections, molded so as to form a hermetic seal with the bottom and top slats of the shutter, and is equipped with lateral sealing devices.

10 The fundamental concept of the invention is thus based on the realization of a perfectly air-tight seal. To this end, according to this invention, said rotating supports of said slats are equipped on the side facing the longitudinal section of the framework with devices
15 to connect via grooves with the swellings of said nylon supports pressure inserted in the respective longitudinal aluminum sections. These devices consist of two parallel grooves drawn in said rotating supports with the distance between them equal to that between the
20 swellings formed by the nylon sections. When the shutter slats are opened, the rotating supports rotate with the slats to reach a position in which they form a 90° angle with the two longitudinal aluminum sections; due to their elasticity, the swellings of the two nylon sections are then pressed against the surface of the rotating supports. When the shutter slats are in the closed
25 position, said swellings lock into said grooves in the rotating supports to form a perfectly air-tight seal

with them. Furthermore, on the opposite side of the longitudinal sections of the framework, said rotating supports have a protruding molding which penetrates a corresponding molding of the slat; the edge of the latter in turn penetrates a groove drawn in said supports which runs along the edge of said protruding molding, to form the seal.

According to this invention, along each longitudinal edge, the shutter slats have identical angular moldings arranged opposite to one another. Upon closing, these penetrate the corresponding angular molding of the slat directly above or below the slat in question. Along the edges of said moldings are grooves containing strips of a plastic material like nylon to contribute to a better seal of the slats with one another.

This invention also provides that said anodized or painted aluminum sections pressure inserted in the top and bottom transverse sections of the framework have the same right angle molding as the slats, placed opposite the congruent angular molding of the top and bottom slat. The edges of the molding on these sections are also equipped with a gasket to form a groove seal with the angular molding of the respective slat once the slats are placed in the closed position.

Finally, this invention also provides that the sides of

said aluminum sections pressure inserted in the top and bottom transverse sections of the framework are equipped with nylon sealing slats with grooves on both sides to seal with the end of said transverse section as well as
5 with the swellings of the nylon sections incorporated in the longitudinal sections of the framework.

Therefore, the air-tight seal of the shutter is due to the grooved elastic connection of the rotating supports
10 of the slats with the swellings of the nylon sections incorporated in the longitudinal sections of the framework, to the grooved coupling of the slats with the rotating supports, to the hinges sealing these with the longitudinal sections of the framework, to the elastic
15 rabbets of the angular molding of the slats with one another and of the slats with the sections on the transverse sections of the framework, as well as to the lateral groove-forming slats with said applied sections and with the swellings of the nylon sections along the longitudinal sections of the framework.
20

The advantages of this invention thus arise from the air-tight closure of the shutter. This allows perfect thermal isolation of the living area from the outside
25 as well as protection from inclement weather. Because the shutter is very solid, made entirely of anodized or painted aluminum, and because its levers and hinges are all made of nylon, there is no danger of deteriora-

tion or breakage and so no maintenance is required.
Finally, the shutter according to this invention may easily be assembled on site, with consequent savings of transportation and labour costs.

5

The object of this invention is described in more detail below, with reference to a preferred realization as shown in the enclosed exemplifying but non-limiting drawings.

10

Figure 1 shows an external frontal view of a shutter made up to two elements hinged to the panel of the window opening.

15 Figure 2 shows an enlarged frontal view of a single element of the shutter.

Figure 3 shows an enlarged view of the support and sealing elements of one of the rotating slats on the right
20 longitudinal aluminum section of the framework.

Figure 4 shows a longitudinal section from the inside of a pair of slats in the closed phase.

25 Figure 5 shows a longitudinal section like figure 4, in the open phase.

Figure 6 shows a transverse section of a view from the

top in the direction of the slat hinges with the shutter closed, in a normal scale.

Figure 7 shows a transverse section, similar to figure 5 6, in the open position.

Figure 8 shows a perspective view of the aluminum section to be pressure inserted in the upper aluminum section of the framework.

10

Figure 9 shows a perspective view of the hinged connection of the operating handle to the rod connected to the slats and to the right longitudinal section of the framework.

15

Figure 10 shows an enlarged section of the position of the three connecting hinges.

Figure 1 shows a shutter according to this invention in 20 the closed position, with two wings. Note how each wing is enclosed by a principal framework consisting of four sections 1. The left and right longitudinal and top and bottom sections of the wing are indicated as 2,2' and 3,3' respectively. The rotating slats are indicated 25 ted with 4.

Figure 2 shows one wing only of the shutter. Note the four sections 1 of the principal frame which, after the

elements of the wing are assembled, are connected to one another in a known way through sections 1' blocked on the inside with peg 1" and locked with a countersunk head screw not shown in the drawing. Hinges 1" ensure
5 that the wing is hinged to the window frame. Note also right and left longitudinal aluminum sections 2', 2 and transverse top and bottom aluminum sections 3, 3', rotating supports 5', 5 for the slats, slats 4, top and bottom sections 3a and 3b pressure inserted in transverse
10 sections 3 and 3' of the framework, and finally the respective lateral sealing slats 31', 31 .

Slat 4 is shown in figure 3 in its assembly position. This has angular moldings 4a, 4b on its upper and lower
15 edges which will join either with the congruent angular moldings immediately above and below or with the equal angular molding of the respective section 3a (fig. 4), respectively 3b, pressure inserted in top or bottom transverse section 3 or 3' of the framework. Note that molding 4a of the slat carries a gasket 4c in plastic, for
20 example nylon, to form a better seal. Slat 4 consists of two walls 7, 8 forming between them a suitable profile to act as a pressure groove with a corresponding protruding molding 6, 6' of right and left rotating supports 5 and 5'.
25 Positioned in this way in the two rotating supports 5, 5', slat 4 is hinge mounted on right and left longitudinal sections 2 and 2' (the latter is not shown in figure 3). On the side opposite moldings

6,6', rotating supports 5,5' have a circular hollow pin 9,9' at the bottom of which is a shallow circular cavity 10,10' in which base disk 12,12' is placed, with a sleeve 11,11' equipped with a stop pin 13,13'. Sleeve
5 11,11' fits on hollow pin 9,9'. Sleeves 11,11' are in turn inserted in the holes 14,14' provided in right and left longitudinal sections 2,2' of the framework, while stop pin 13,13' functions by entering holes 15,15' in said supports. In this way, sealed rotation is possible
10 for slat 4, with hollow pins 9,9' mobile inside sleeves 11,11', in turn blocked in rotation on sections 2,2'. Sleeves 11,11' are then blocked on the inside of sections 2,2' with distancing sockets 16,16' and Parker screws 17,17', as shown in figures 6 and 7. All the
15 hinge elements are in nylon to ensure perfect reciprocal seals. Inside right and left longitudinal sections 2, 2' of the framework, two nylon sections 18,19,18',19' are pressure inserted; the molding of sections 2,2' in anodized or painted aluminum and those of sections 18, 19,18',19' of the nylon sections are such to guarantee
20 a completely stable position for the latter. As shown in figure 3, nylon sections 18,19,18',19' protrude above the surface of sections 2,2' to form sewllings 22, 23,22',23'. These exert an elastic action against ro-
25 tating supports 5,5', in which there are parallel grooves 10,21,20',21' the same distance apart as the distance between sections 18,19,18',19'; this is shown more clearly in figure 6. The elastic action is exerted when the

shutter is closed (figure 4) since said nylon sections hold the slats in a fixed position, blocking them through the coupling with grooves 20,21,20',21', as well as when the shutter is open (figure 5) since they exert pressure
5 on slat supports 5,5' to ensure they hold a fixed position. Finally, rotating supports 5,5' have upper and lower angular moldings 24,24' opposite to one another, such that they form a perfect reciprocally sealed connection when the shutter is closed (figure 4). Said
10 supports also have a groove 25,25' running along the edge of protruding molding 6,6', identical in profile with slat 4. When joined with protruding molding 6,6', said slat penetrates groove 25,25' to form a seal.

15 The above description of figure 3 shows how all the structural elements necessary for assembly and functioning of slat 4 have been planned and designed with the aim of obtaining a perfectly air-tight seal.

20 This can be seen more clearly in figure 4, which shows a section of the wing with an internal view of the right side. Note how angular moldings 24, congruent with rotating supports of slat 4, are joined together with a perfect seal, further ensured by gasket 4c. On the top,
25 the seal is ensured by the congruence of the angular moldings of section 3a fitted with gasket 3a' with the congruent angular molding 4a of slat 4 fitted with gasket 4c. Evidently, angular moldings 24,24' of rotating

supports 5,5' are aligned, on the same level, for the entire of slat 4 with angular moldings 4a and 4b of said slats. Also note how grooves 20,21 (dashed lines) of rotating support 5 are arranged to couple geometrically and seal with nylon sections 18,19, which serve as the elastic element. Figure 4 also shows the hinges, indicated generically with 26,27 and 28, between rotating supports 5 and rod 29 connecting them, between handle M and lever arm 30 and, respectively, between said lever 10 30 and handle M. These hinges will be discussed in greater detail with reference to figures 9 and 10.

Figure 5 gives a sectional view of the position of the right side of the shutter, when opened. In this position, nylon sections 18,19 functioning as springs, exert 15 pressure on the surface of rotating supports 5 to contribute effectively to holding their position (and thus that of the slats) fixed at the point pre-established with handle M. Note rod 29 hinged to various rotating 20 supports 5 of the slats in 26, plus the point of hinge 27 of rod 29 to lever arm 30, and the point of hinge 28 of this lever to handle M. Arrow F indicates the opening direction.

25 Figure 6 shows in transverse section the closed position of the slats. Note nylon sections 18,19,18',19' fitted in grooves 20,21,20',21' of rotating supports 5,5'.

On the other hand, figure 7 shows how swellings 22,23 of nylon sections 18,19 are pulled back from their position in figure 6. In fact, they have come out of grooves 20,21, exerting pressure against the surface of rotating support 5. The slats are in the opening position.

Figure 8 shows part of section 3a to be pressure inserted with arms 33,33' in upper transverse section 3 of the framework. In the same figure, a lateral sealing slat made of nylon, indicated with 31 (the right, in this case), has on the inside a groove 32 of the same shape as section 3a and, on the outside, two parallel grooves 20a the same distance apart as nylon sections 18',19'. Groove 32 fits with section 3a, and grooves 20a seal with nylon sections 18',19'. Slat 31 also has an angular molding 34 which, once assembled, is aligned with angular molding 35 of section 3a to receive the corresponding angular moldings 24 of rotating support 5 and the angular molding of the upper slat. The seal of these elements is completed by gasket 3a'. Naturally, the mirror image of this slat is applied to the left side of top section 3a and to both sides of bottom section 3b.

25

Figure 9 shows operating handle M hinged to rod 29 connecting slats 4 and to right longitudinal section 2 of the framework. Note hinges 26, 27, 28 previously men-

tioned with reference to figures 4 and 5. It should be noted that all the hinge elements, as well as rod 26, are made of nylon.

- 5 Figure 10 shows in an enlarged longitudinal section how the three hinges are made. Note hollow pin 36 with stepped base, part of rotating support 5 (figure 3). This is inserted in a hole in rod 29 and hinged with flat head pin 37, also nylon, fitted with swelling 38
- 10 which is elastically depressed during insertion and then expands to form the stop. Hinge 27 is made up of a circular head hollow pin passed through a hole in rod 26 and corresponding holes in section 2 and lever arm 30. On the inside, this hollow pin has a swelling 42 in
- 15 which pin 40, inserted in hollow pin 39 on the opposite side, is blocked by elasticity and pressure. Hinge 28 is made analogously. To repeat, all elements of the hinges are made of nylon.
- 20 The object of this invention has been described and illustrated with reference to a preferred form. However, different proportions, dimensions and arrangements are possible without going beyond the bounds of this invention.

Claims:

1. Air-tight shutter with moveable slats, with a framework made up of anodized or painted aluminum sections arranged in longitudinal and transverse pairs opposite and parallel to one another and of slats which may be rotated simultaneously from a completely open position to a hermetically closed one, wherein:
- all the aluminum sections (2,2',3,3') of the framework have the same internal and external molding;
 - two nylon sections (18,19,18',19') are pressure inserted in each of the two longitudinal sections (2,2'), so as to remain fixed through elasticity in the position acquired thanks to the internal molding of the respective section (2,2');
 - the two nylon sections (18,19,18',19') protrude slightly the entire length of respective longitudinal sections (2,2') on the inside of the framework to form parallel swellings (22,23,22',23');
 - along the mid-line of each longitudinal section (2,2'), on the inside of the framework, rotating supports (5,5') for the slats (4) are applied at equal intervals; said slats are in turn equipped with devices to seal them both with the swellings (22,23,22',23') of the nylon sections (18,19,18',19') and with the slats (4);
 - an aluminum section (3a,3b) is pressure inserted in each of the two transverse sections (3,3') on the in-

side of the framework, said section is molded to form a hermetic seal with top and bottom slats (4) and is equipped with lateral sealing devices.

5 2. Shutter according to claim 1, wherein said air-tight hinges through which rotating supports (5,5') for slats (4) are applied to longitudinal sections (2,2') of the framework, are made up of a hollow pin (9,9') with a shallow circular cavity (10,10') at the bottom in which
10 the base disk (12,12') of coupling (11,11') is placed, equipped with a small stop pin (13,13') and fitting on hollow pin (9,9'); said coupling (11,11') when passed through hole (14,14') in the longitudinal section (2,2') of the framework, is blocked on the opposite side of
15 the section with distancing socket (16,16') and Parker screws (17,17'), with the stop pin (13,13') of the coupling (11,11') penetrating the hole (15,15') in the section to block said coupling, within which the pin (9,9') of the support (5,5') rotates.

20

3. Shutter according to claims 1 and 2, wherein said coupling devices to seal the rotating supports (5,5') with the slats (4) are made up of a protruding molding (6,6') which fits into the hollow space of slat (4) and
25 of a groove (25,25') in the surface of the support (5,5') running along the edge of the protruding molding (6,6') for the edge of the slat (4) to fit into.

4. Shutter according to claims 1 to 3, wherein said coupling devices to seal the rotating supports (5,5') with the swellings (22,23,22',23') in the nylon sections (18,19,18',19') are made up of grooves (20,21,20',21')
5 in the rotating support (5,5') on the side facing the section (2,2'), parallel to one another and the same distance apart as the nylon sections (18,19,18',19').

5. Shutter according to claims 1 to 4, wherein the sec-
10 tion (3a,3b) pressure inserted in the top and bottom transverse sections (3,3') of the framework has two arms (33,33') to fit into the latter and an angular molding (35) congruent with an angular molding (4a,4b) of the top, or bottom, slat (4), with a plastic gasket (3a')
15 to provide a better seal.

6. Shutter according to claims 1 to 5, wherein said lateral sealing devices applied to the sections (3a,3b) are made up of nylon slats (31,31') with a groove (32)
20 on one side into which the section (3a,3b) fits and with two parallel grooves on the other side the same distance apart as the nylon sections (18,19,18',19') with which they are fitted.

25 7. Shutter according to claims 1 to 6, wherein the slats (4) have identical but reciprocally arranged angular moldings (4a,4b) along each longitudinal edge which on closing penetrate the corresponding angular molding of

the slat immediately above or below; only one of the two longitudinal edges has a plastic gasket (4c) to seal the slats one to another.

FIG.1

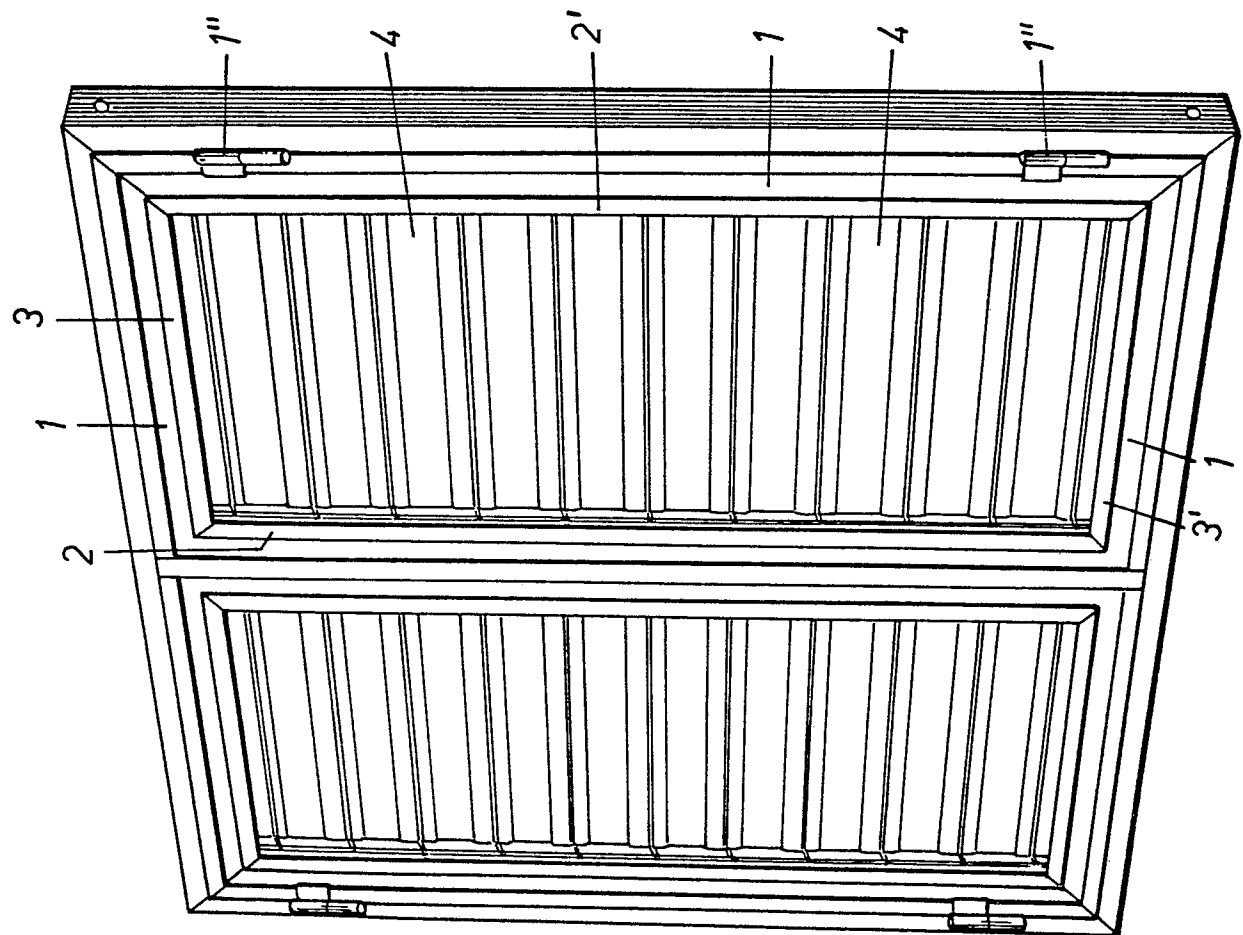
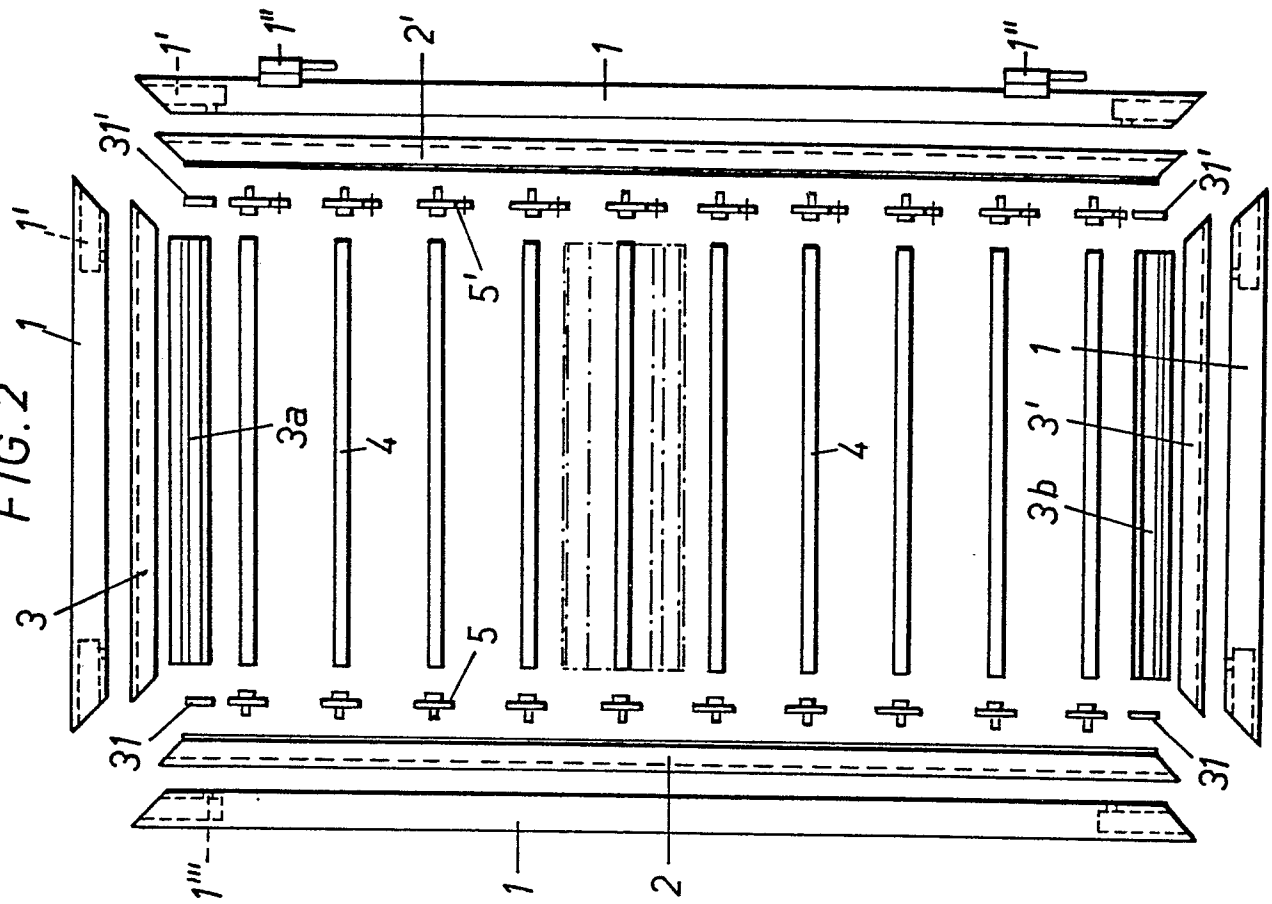


FIG.2



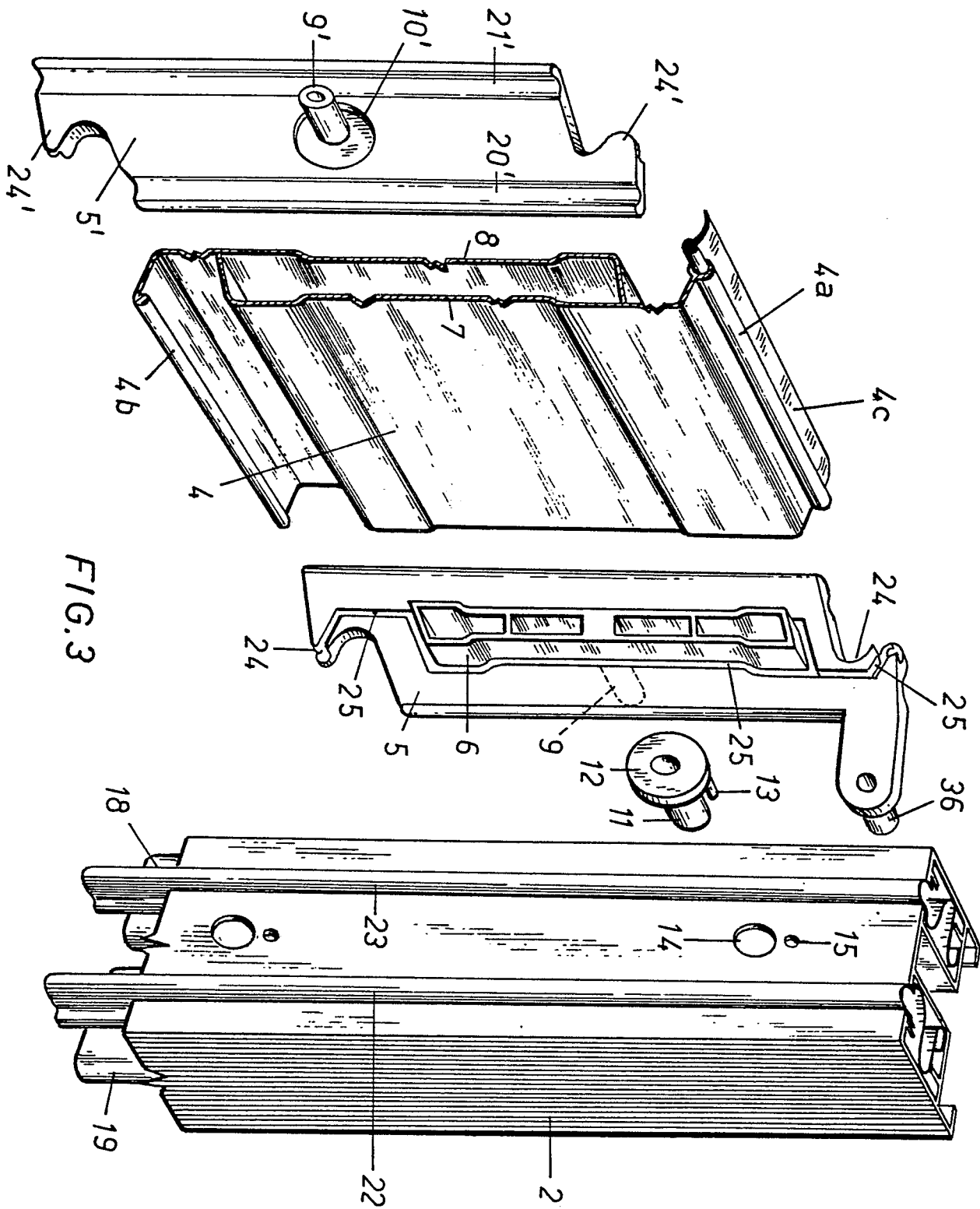


FIG.4

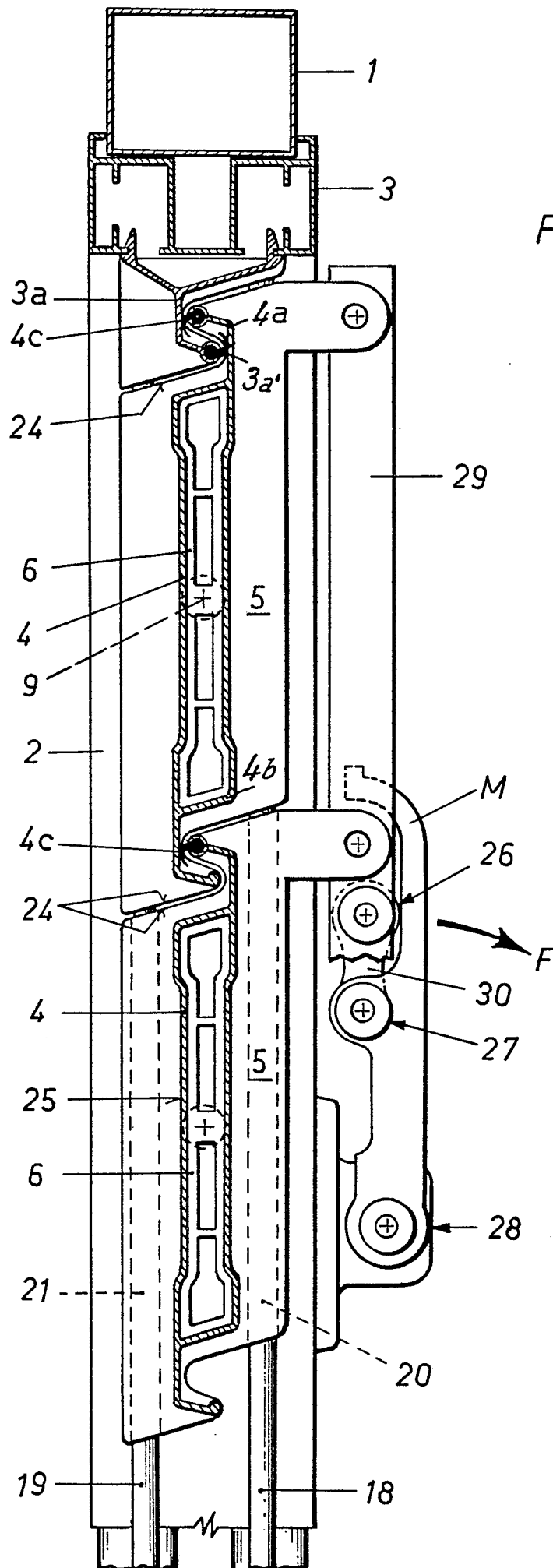
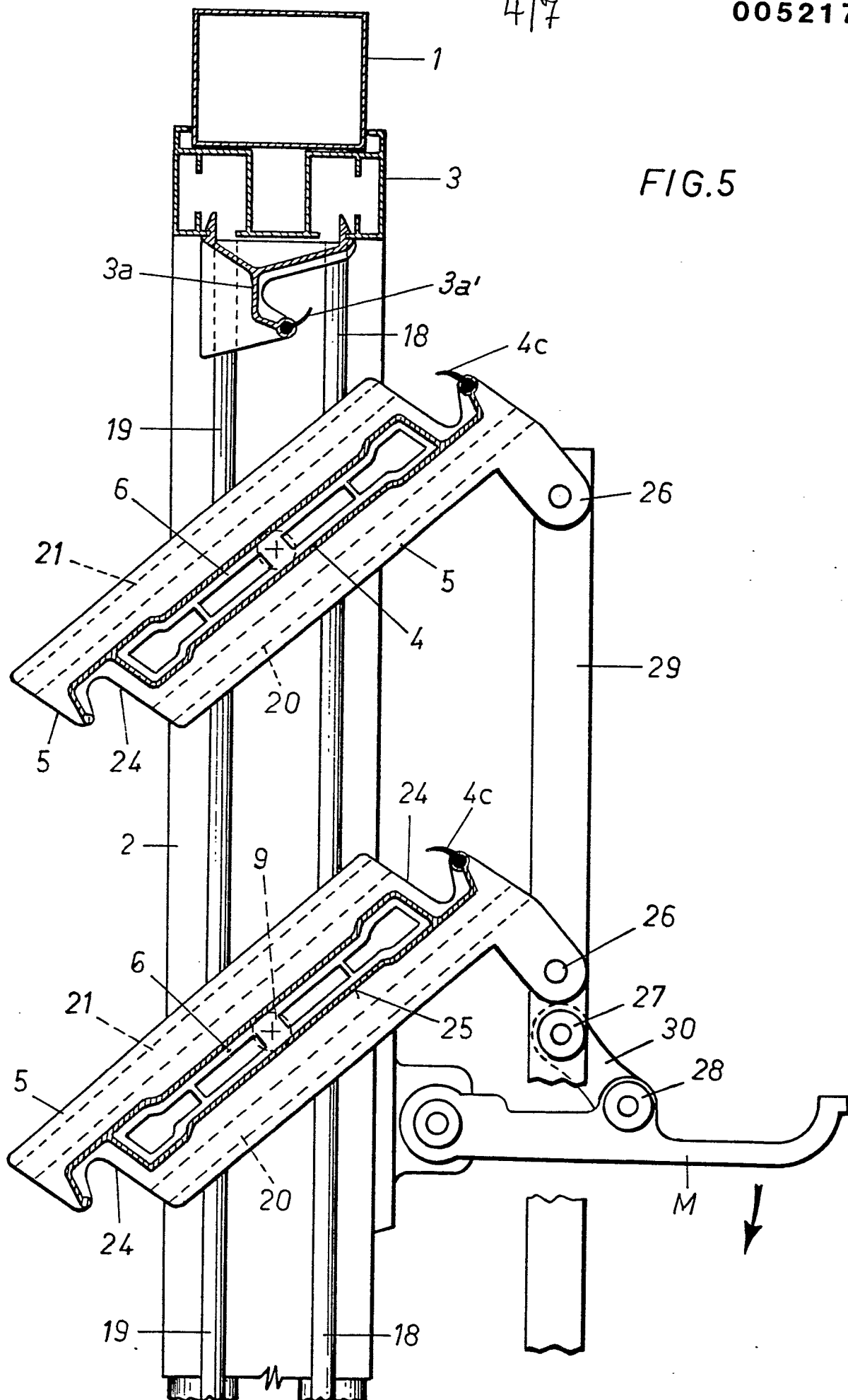


FIG.5



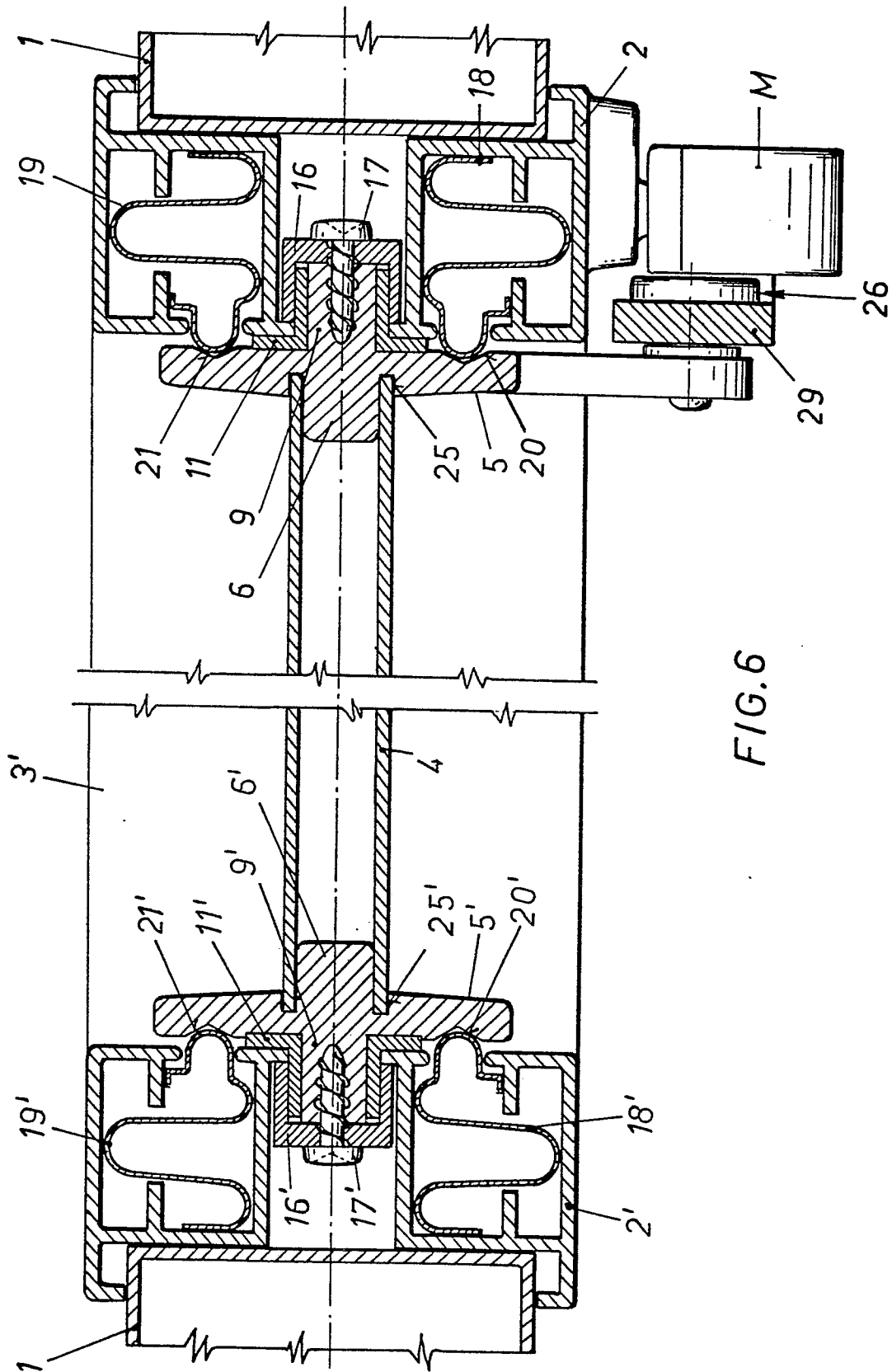


FIG. 7

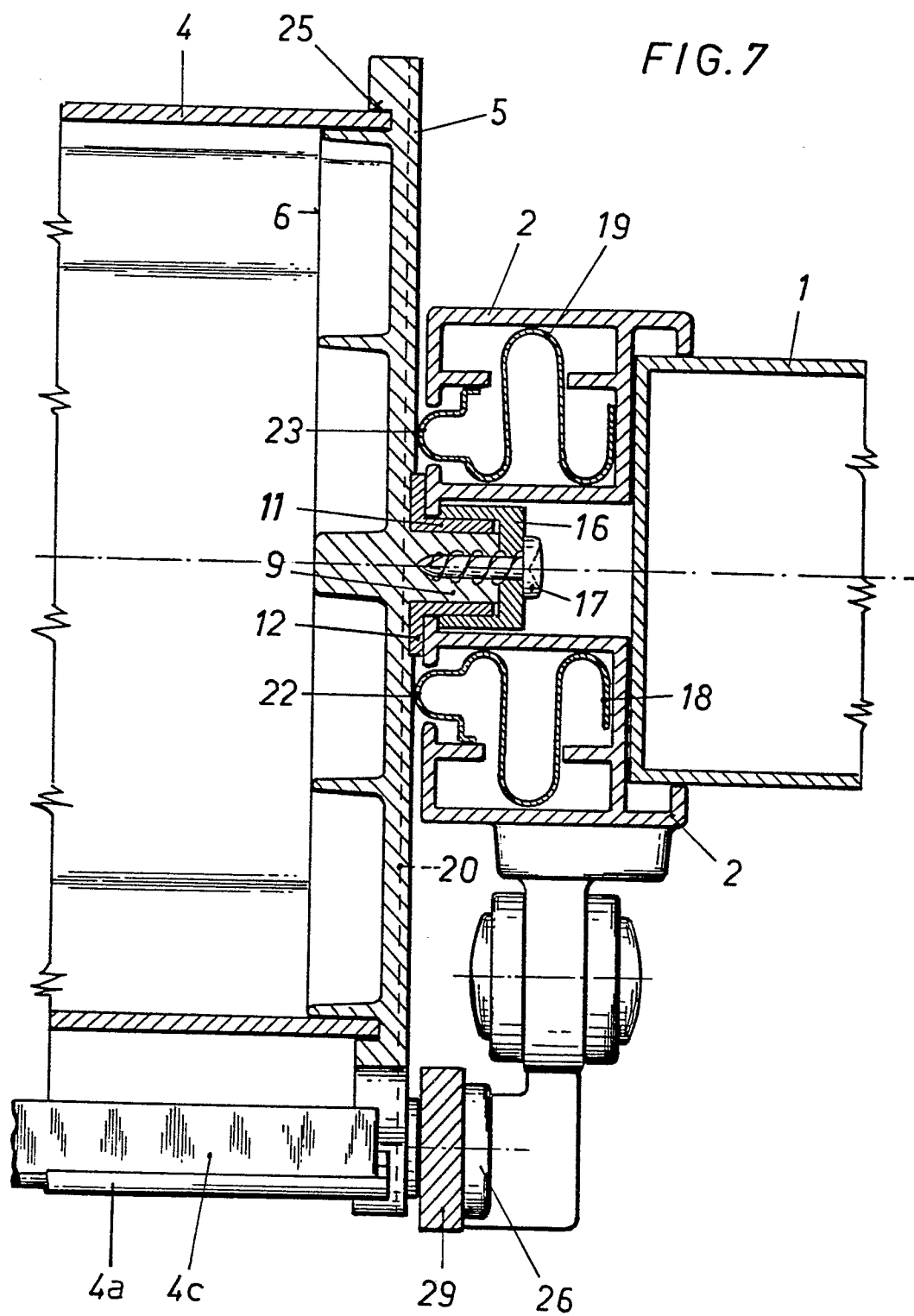


FIG. 10

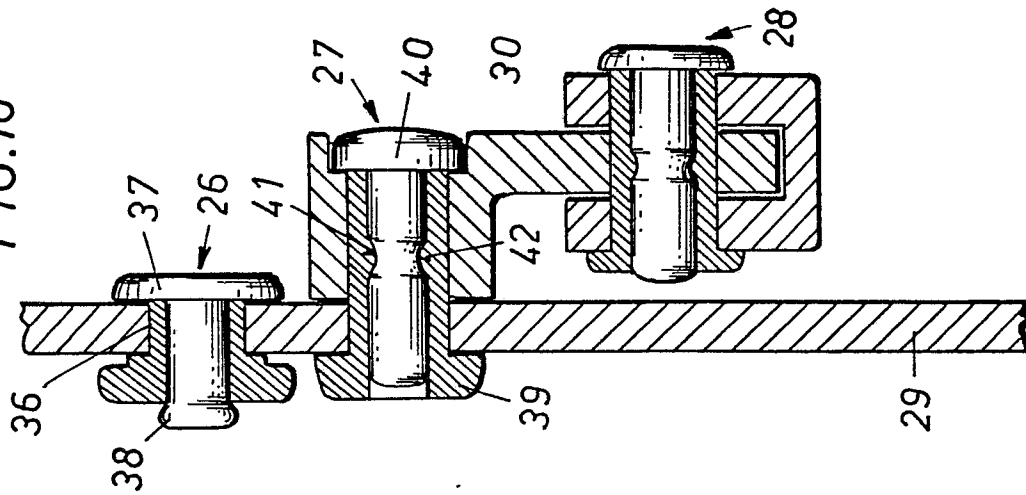


FIG. 9

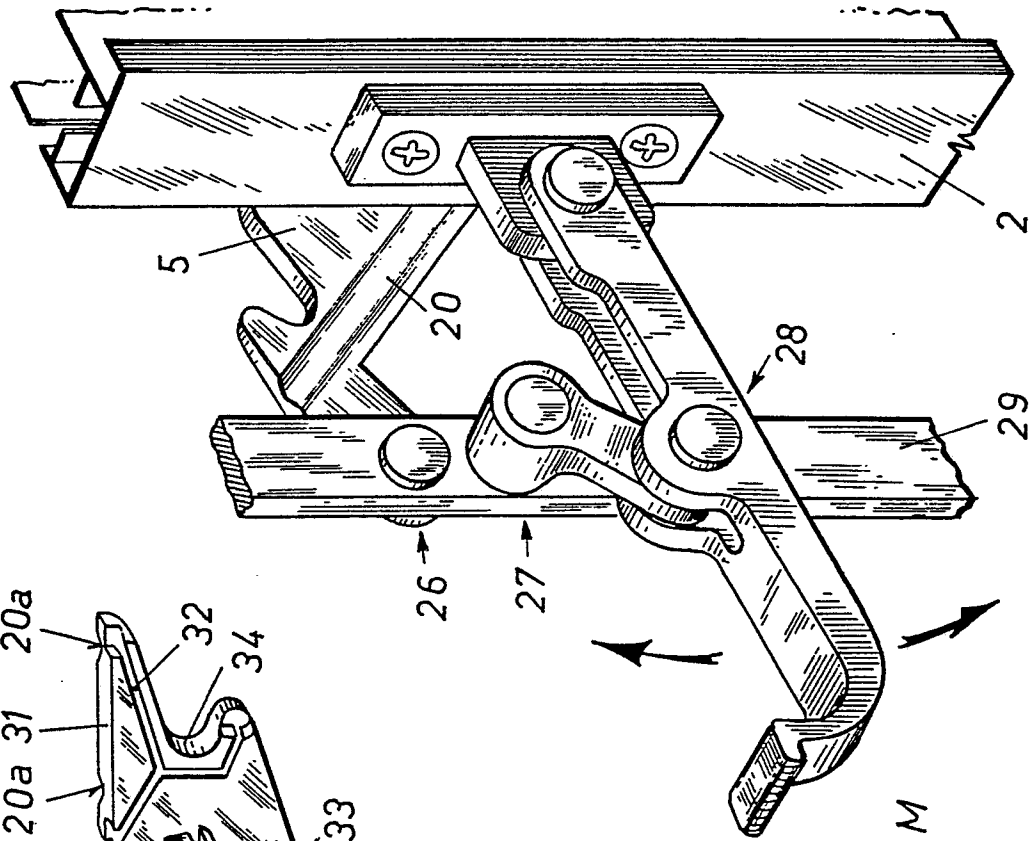
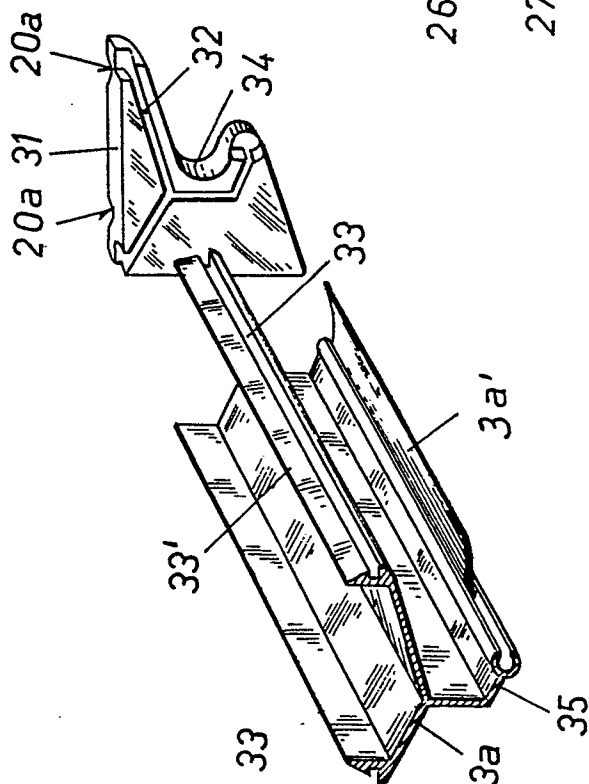


FIG. 8





European Patent
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EUROPEAN SEARCH REPORT

0052173

Application number

EP 80 83 0105

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>US - A - 2 610 371</u> (HITE) * column 2, lines 44-55; column 3, lines 1-11 * ---	1	E 06 B 9/04 E 06 B 7/084
A	<u>US - A - 4 038 781</u> (GRAHAM) * column 4, lines 24-68; column 5; column 6, lines 1-35; figures 1-4 * ---	1,5,7	
A	<u>FR - A - 1 384 213</u> (RUPPRECHT) * page 3, column 1, paragraphs 3-6; column 2; page 4; page 5, paragraphs 1 and 2; figures 1-7 * ---	1,5,7	TECHNICAL FIELDS SEARCHED (Int.Cl. 3) E 06 B
A	<u>FR - A - 1 441 925</u> (BETA AL. PRODUCTS) * page 2; column 1, paragraphs 1 to 7; column 2; page 3, column 1, paragraphs 1-3; figures 1-6 * ---	1,2	
A	<u>AU - B - 481 137</u> (ZANINI) * page 7, last paragraph; page 8, to paragraph 10; figures 7-10 * -----	1,3	CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search		Date of completion of the search	Examiner
The Hague		13.02.1982	VIJVERMAN