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(54) **Roller shutter device**

(57) A roller shutter device has a plurality of slats (2), sliding between two uprights (30), each thereof consisting of a tubular section bar provided with a longitudinal opening (30a), between an opening condition, wherein the slats (2) are wound round a revolving shaft, and a closing condition, wherein the slats (2) are unwound from the revolving shaft. The ends of each slat (2) engage almost entirely the longitudinal opening (30a) of each upright (30) in order to reduce the clearance therebetween, and they comprise hooking means (7) fit to slidingly bear against abutment surfaces (30b) of respective upright (30) in order to prevent the slat (2) from coming out from said upright (30). The slats (2) include a fin element (3), which has an extended flat shape and is rotatably on a respective longitudinal axis by rotating means (20). The fin element (3), in the closing condition of device (1), is rotated by the rotating means (20) between a shut condition (T) and a rotated condition (R), wherein said fin element (3) is positioned respectively almost coplanar and rotated with respect to the respective slat (2).

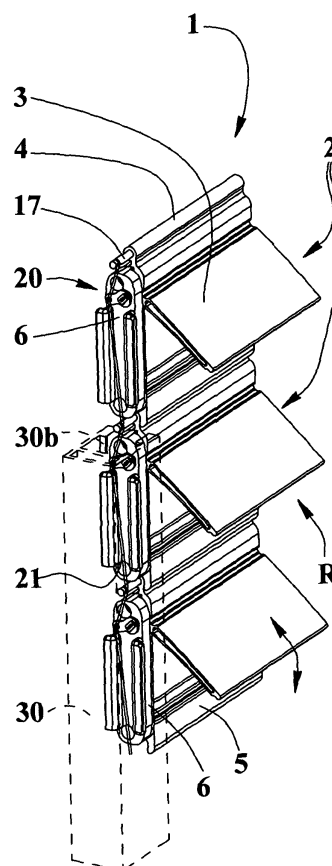


FIG.1

Description

[0001] The present invention relates to roller shutters for buildings and particularly it refers to a roller shutter device of burglar-resistant type and provided with shading fins, each thereof rotating on its axis.

[0002] There are several different types of roller shutter devices constituted by slats sideways sliding along suitable vertical guides, between a shut condition and an open condition, by unwinding and winding round a roller.

[0003] In some shutters, the slats can swivel or partially rotate on respective axes, assuring a partial and adjustable opening, likewise to the venetian blinds. The rotation is carried out by means of suitable mechanisms that are integral with the slats, with which said mechanisms translate when they are moved.

[0004] A drawback of said known roller shutters with swiveling slats consists in that they comprise many components and they include mechanisms for moving the slats which are complex and require long times and skilled labour for their manufacturing, assemblage and installation.

[0005] Other drawback of the known roller shutters consists in that the mechanisms for moving the slats are completely exposed and visible or only partially housed inside the vertical guides, which are longitudinally open. Consequently, the mechanisms are exposed to the inclemency of the weather, to possible bumps and hits and to attempts of burglary and effraction.

[0006] Further drawback consists in that such shutters have an aesthetical impact not always pleasant and acceptable.

[0007] An object of the present invention is to propose a roller shutter device provided with rotating shading fin elements and constituted by a small number of components, which can be easily manufactured and assembled.

[0008] Other object is that to propose a device provided with mechanisms for rotating the fin elements which are completely housed inside the vertical guides or the uprights, thus which are sheltered and protected from inclemency of the weather, bumps and hits and attempts of burglary and effraction.

[0009] Further object is to propose a device having a safe and reliable operation, requiring a minimal maintenance and guarantying a high resistance against the attempts of burglary and effraction, in any operational condition.

[0010] The above-mentioned objects are achieved in accordance with the claim content.

[0011] The characteristics of the invention are underlined in the following, with particular reference to the attached drawings, in which:

- figure 1 shows a perspective partial front view of the roller shutter device of the present invention, in a opening condition of fin elements, in which some

elements have been removed for better underlining others;

- figure 2 shows a perspective partial back view of device of figure 1;
- figure 3 shows a front view of device of figure 1;
- figures 4 and 5 show right side and left side views of device of figure 3;
- figure 6 shows an enlarged section view according to line VI-VI of figure 3;
- figure 7 shows a perspective view, partial and exploded, of a slat of device of figure 1;
- figure 8 shows a perspective partial front view of a variant of device of figure 1, in a opening condition of fin elements, in which some elements have been removed for better underlining others;
- figure 9 shows a front view of device of figure 8;
- figure 10 shows an enlarged top view of the device of figure 8;
- figure 11 shows an enlarged partial side view of a further variant of device of figure 1, in an opening condition of fin elements;
- figure 12 show a partial perspective view of a further variant of device of figure 1;
- figure 13 shows an enlarged top view of the device of figure 12;
- figure 14 shows a partial perspective view of a slat of the device of figure 12.

[0012] With reference to figures 1 to 7, numeral 1 indicates a roller shutter device provided with a plurality of slats 2, sideways sliding between two uprights 30 between an opening condition of said device, in which the slats 2 are wound round a revolving shaft and a closing condition, in which the slats 2 are partially or totally unwound from said revolving shaft.

[0013] Each upright 30 consists of a tubular hollow section bar provided with a longitudinal opening 30a, which is almost entirely engaged by the ends of each slat 2, in order to reduce the clearance therebetween, that is to say to minimize the passage of light and/or dust and/or rain through said opening 30a.

[0014] The ends of slats 2 comprise hooking means 7 fit to slidably bear against abutment surfaces 30b of respective upright 30 in order to prevent the slat 2 from coming out from said upright 30, both accidentally and in consequence of attempts of burglary and effraction.

[0015] In the preferred embodiment, each slat 2 is constituted by a fin element 3, two support elements, first 4 and second 5 and two link elements 6.

[0016] The fin element 3 has an extended and flat shape, is rotatably on a respective longitudinal axis and is coupled to adjacent fin elements 3 of respective slats 2 at one or both side edges thereof by rotating means 20. The fin elements 3 in the closing condition of device 1 are rotated by rotating means 20 between a shut condition T and a rotated condition R, in which the fin elements 3 are respectively almost coplanar and rotated with respect to the uprights 30.

[0017] The support elements, first 4 and second 5 have a prismatic and extended shape and are positioned parallel at a prearranged distance. Said support element 4, 5, at the respective side ends, are rotatably and removably connected by corresponding link elements 6, having a prismatic and extended shape as well, in such a way to form a kind of quadrangular frame, whose central opening thus can be closed by the fin element 3.

[0018] Each link element 6 has side portions 6a fit for mating the edges of the longitudinal opening 30a of the corresponding upright 30 to minimize the opening inside the upright 30. The width of opening 30a is between 1 and 4 mm bigger than the width of the cross section of each link element 6 or than the distance between opposed side portions 6a of the latter.

[0019] The hooking means 7 of each slat 2 are fixed to the corresponding link elements 6 and, in the preferred embodiment, they substantially consist of a couple of stop protuberances 7, approximately "L" shaped, which can slide against abutment surfaces 30b carried out in each upright 30, near the longitudinal opening 30a.

[0020] Said protrusions 7 prevent each link element 6 from coming out unintentionally or by force from the inside of upright 30, so guaranteeing a high safety degree with respect to burglary and effraction, both when the fin elements 3 are in rotated condition R and the device is in the full closing condition and when the fin elements 3 are in the shut condition T and the shutter device is partially wound.

[0021] The connection between the slats 2 is carried out by the connection between adjacent support elements 4 and 5. Particularly, the longitudinal edges of each first support element 4 have respectively a first seat 8 and a shaped protrusion 10. The latter, in an assemblage condition of device 1, is rotatably and removably housed in a second seat 26 of complementary shape, carried out on a longitudinal edge of a second element 4. The first seat 8 rotatably and removably accommodates a respective longitudinal and complementary shaped edge 9 of the respective fin element 3. The first seat 8 and second seat 26 are preferably rectilinear grooves having a concave section with circular sector shape. The shaped protrusion 10 and the complementary shaped edge 9 have convex sections with circular sector shape. Said coupling allows the relative rotation of elements 3, 4, 5 for the correct operation of device 1 and an easy assemblage and disassembly of each slat 2.

[0022] Each link element 6 has a shaped projection 11 for the abutment with the corresponding fin element 3 in the shut condition T. Similarly, each second support element 5 has a first abutment portion 12 fit to mate, in the shut condition T, a second abutment portion 14, which has complementary shape and is carried out in the corresponding fin element 3.

[0023] The rotating means 20 include a plurality of

connecting rod means 16, inserted inside one or both the uprights 30 and each of the connecting rod means 16 is connected to a corresponding prismatic tang 13, fixed to one of the two ends of the longitudinal complementary shaped edge 9 of each fin element 3. Preferably, each fin element 3 has two opposed tang 13, made integrally in single body with the fin element 3.

[0024] In the preferred embodiment, the connecting rod means 16 are reciprocally connected by flexible means 21 consisting of a inextensible cable or a chain or a belt, which can be operated by manual or motorized control means, known and not shown.

[0025] The flexible means are fixed to the connecting rod means 16, at the end thereof which is opposed to the end coupled to the tang 13 and they are partially wound round counter pivots 17, fixed to the side edges of first support elements 4. The counter pivots 17 are inserted inside suitable holes 18, carried out in the shaped protrusion 10 of first support element 4 and each pivot 17 has a race 19 fit to guide and to maintain in position the flexible means 21 during the operation.

[0026] Each fin element 3 has an approximately rectangular section and has one or more longitudinal cavities 15 capable to house inner stiffener elements, made of high strength metal, preferably steel, and constituted by plates or by cutproof revolving rods. In alternative, the longitudinal cavities 15 of the fin elements 3 can be filled with foams or insulating materials, which provide acoustic and heat insulation and increase the stiffness and the cut resistance of the fin elements 3.

[0027] Likewise, also the support elements 4 and 5 can be internally provided with high strength stiffener elements, such as bars or revolving rods made of cutproof steel, longitudinally positioned for the whole length of said elements.

[0028] It is provided that the support element 4, 5 and the link element 6 of each slat 2 can be manufactured integrally in a single body.

[0029] The slats 2 are made of plastic and/or metallic material. Particularly, the fin elements 3 can have a face made of plastic material and the other face made of metallic material in order to carry out a fire barrier function.

[0030] The device can include one or more conventional slats 2 that are unprovided with fin elements 3 and constituted by a single extended flat element, whose longitudinal edges are respectively provided with the first seat 8 and the shaped protrusion 10. Such slats 2 can be interposed as much as one likes between the slats 2 provided with fin elements 3, in order to create portions of the device 1 which cannot be opened.

[0031] The operation of the roller shutter device 1 of the present invention provides that in the closing condition of device 1, by driving the rotating means 20 it is possible to rotate the fin elements 3, at the same time and maintaining the parallelism thereof, moving from the shut condition T to the rotated condition R and vice versa.

[0032] It is opportune to highlight that the stiffener el-

elements inside the fin elements 3 and the stop protuberances 7 of link elements 6 guarantee high safety of the device 1 against burglary and effraction also in rotated condition R of fin elements 3. Particularly, the stop prominences 7 do not allow the passage of the link elements 6 through the opening 30a, stopping their extraction from the upright 30.

[0033] In the preferred embodiment, it is possible to assemble the slats 2 and the rotating means 20 before the final installation on the frame, remarkably simplifying the procedures.

[0034] In the variant of device 1 shown in the figures 8 to 10, the rotating means 20 inserted in each upright 30 include a rod means 22, to which the connecting rod means 16 are rotatably connected. Particularly, the rod means 22 consists of an extended section bar, with a longitudinal groove 23, in which roller means 24 are slidably housed, each thereof being rotatably fixed to a corresponding connecting rod 16. One or both the ends of the rod means 22 are connected to link rods 25, in order to constitute, with the connecting rod means 16, an articulated quadrilateral, which can be operated by manual or motorized control means, known and not shown.

[0035] The variant further includes seal means 34 fixed to each upright 30 at both sides of the opening 30a and constituted for instance by linear lip gaskets, which bear against the side portions 6a of the link elements 6. The seal means 34 prevent water, dust and foreign matter from entering the uprights 30.

[0036] In the operation of this variant the roller means 24, which can slide inside the groove 23, allow the free vertical movement of slats 2 in the winding/unwinding phases and, at the same time, they allow driving the connecting rod means 16, for the rotation of fin elements 3 from the shut condition T to the rotated condition R and vice versa.

[0037] There are provided besides suitable tapered portions, known and not shown, that allow the correct insertion of the roller means 24 into the groove 23 of each rod means 22 during the descent of slats 2 along the uprights 30, in the passage from the opening condition to the closing condition of device 1.

[0038] In a further variant of the roller shutter device 1, shown in the figure 11, the rotating means 20 include a plurality of lever means 35; a first end of each lever means 35 is rotatably coupled to a side edge of the respective fin element 3, while the remaining end is rotatably coupled to the adjacent lever means 35, by linking means 36, slidably supported by the upright 30.

[0039] The linking means 36 include a rod or an extended section bar or a flexible inextensible element 37, for instance a steel cable to which guide elements 38 are connected, each thereof being rotatably coupled to a respective lever means 35. The connection between the guide element 38 and the flexible element 37 can be carried out also by interposing elastic means, such as springs or similar, which allow a relative and revers-

ible translation of said guide element 38 with respect to the flexible element 37. Said translation, of predefined dimension, is useful to recover possible assemblage clearance of the device and to damp sudden oscillations of the fin element 3, due for instance to hits, wind, etc.

[0040] The guide elements 38 are slidably housed inside suitable prismatic seats 39 carried out in the link elements 6.

[0041] The vertical translation of flexible element 37, which can be executed both manually and by means of electric actuators, causes the contemporaneous translation of guide elements 38 and, therefore, the rotation of the lever means 35, which move the fin elements 3 in the rotated condition R and in the shut conditions T, respectively.

[0042] The figure 12 to 14 show a further variant of the roller shutter device 1 wherein the hooking means 7 of each link element 6 consists of a double "C" channel portion engaging the abutment surfaces 30b of a "T" section rib 30c.

[0043] In said variant, each slat 2 includes one or more rib elements 27, which interconnects the support element 4, 5 in order to stiffen said slat 2.

[0044] An advantage of the present invention is to provide a roller shutter device provided with rotating fin elements and constituted by a small number of components, which can be easily manufactured and assembled.

[0045] Other advantage is to provide a device provided with mechanisms for rotating the fin elements which are completely housed inside the uprights, thus sheltered and protected from inclemency of the weather, bumps and hits and attempts of burglary and effraction.

[0046] Further advantage is to provide a device having a safe and reliable operation, requiring a minimal maintenance and guarantying a high resistance against the attempts of burglary and effraction, in any operational condition.

Claims

1. Roller shutter device having a plurality of slats (2), sliding between at least two uprights (30), each thereof consisting of a tubular section bar provided with a longitudinal opening (30a), between an opening condition, wherein the slats (2) are wound round a revolving shaft, and a closing condition, wherein the slats (2) are unwound from the revolving shaft; said device (1) being **characterized in that** the ends of each slat (2) engage almost entirely the longitudinal opening (30a) of each upright (30) in order to reduce the clearance therebetween, and they comprise hooking means (7) fit to slidably bear against abutment surfaces (30b) of respective upright (30) in order to prevent the slat (2) from coming out from said upright (30); at least one of the slats (2) includes at least a fin element (3), which has an

extended flat shape and is rotatably on a respective longitudinal axis by rotating means (20); the fin element (3), in the closing condition of device (1), is rotated by the rotating means (20) between a shut condition (T) and a rotated condition (R), wherein said fin element (3) is positioned respectively almost coplanar and rotated with respect to the respective slat (2).

2. Device according to claim 1 **characterized in that** each slat (2), which is provided with a respective fin element (3), includes a first (4) support element and a second support element (5), both having an extended prismatic shape and being parallelly positioned at a prearranged mutual distance; the side ends of said support elements (4, 5) are connected by corresponding link elements (6), having extended prismatic shape. 10
3. Device according to claim 2 **characterized in that** each link element (6) has side portions (6a) fit for mating the edges of the longitudinal opening (30a) of the corresponding upright (30). 15
4. Device according to claim 2 **characterized in that** the hooking means (7) of each end of slat (2) are fixed to the corresponding link element (6). 20
5. Device according to claim 4 **characterized in that** the hooking means (7) comprise at least one stop protuberance (7), carried out in the corresponding link element (6). 25
6. Device according to claim 1 or 3 **characterized in that** the opening (30a) has a width 1 mm to 4 mm wider than the width of the cross section of slat (2) or link element (6). 30
7. Device according to claim 2 **characterized in that** the longitudinal edges of each support element (4) respectively have at least a first seat (8), for rotatably and removably accommodating a complementary longitudinal shaped edge (9) of the respective fin element (3), and at least a shaped protrusion (10), fit to be rotatably and removably housed in a complementary second seat (26) carried out in a longitudinal edge of an adjacent slat (2). 35
8. Device according to claim 2 **characterized in that** each link element (6) includes at least a shaped protrusion (11) for the abutment with the corresponding fin element (3) in the shut condition (T). 40
9. Device according to claim 7 **characterized in that** each second support element (5) includes at least a complementary second seat (26) and a first abutment portion (12) fit to mate a complementary second abutment portion (14) of the corresponding fin 45

element (3), in the shut condition (T).

10. Device according to claim 1 **characterized in that** the rotating means (20) include a plurality of connecting rod means (16), each thereof engaging a corresponding prismatic tang (13) of a fin element (3). 5
11. Device according to claims 2 and 10 **characterized in that** the rotating means (20) include at least a flexible means (21), fixed to the plurality of connecting rod means (16) and partially wound round counter-pivots (17), each thereof fixed to a side edge of the first support elements (4). 10
12. Device according to claim 11 **characterized in that** the at least flexible means (21) consists of an inextensible cable or a chain or a belt. 15
13. Device according to claim 10 **characterized in that** the rotating means (20) include at least a rod means (22) to which the connecting rod means (16) are rotatably connected. 20
14. Device according to claim 13 **characterized in that** the rod means (22) consists of an extended section bar provided with a longitudinal groove (23), fit for slidably housing roller means (24), each thereof is rotatably coupled to a corresponding connecting rod (16). 25
15. Device according to claim 1 **characterized in that** at least a side edge of each fin element (3) is rotatably connected to an end of a lever means (35) of rotating means (20); the remaining end of the lever means (35) being rotatably connected to linking means (36) of rotating means (20). 30
16. Device according to claim 1 **characterized in that** each fin element (3) is provided with at least a longitudinal cavity (15) for housing stiffener elements made of high strength metal or foams or insulating material. 35
17. Device according to claim 2 **characterized in that** each support element (4, 5) is internally provided with high strength stiffener means. 40
18. Device according to claim 2 **characterized in that** the support element (4, 5) and the link element (6) of each slat (2) are made in a single body. 45
19. Device according to claim 2 **characterized in that** each slat (2) includes at least one rib element (27) which interconnects the support element (4, 5), in order to stiffen said slat (2). 50
20. Device according to claim 2 **characterized in that**

includes seal means (34) fixed to each upright (30) near the opening (30a) for the at least partial seal with the slats (2) or the link elements (6).

21. Device according to claim 1 **characterized in that** each slat (2) is made of plastic and/or metallic material.

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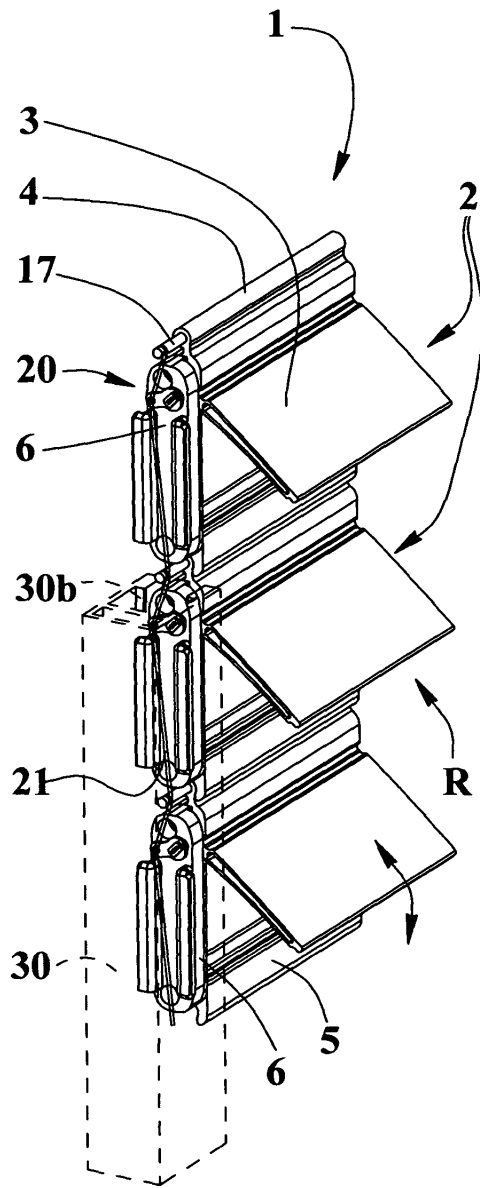


FIG.1

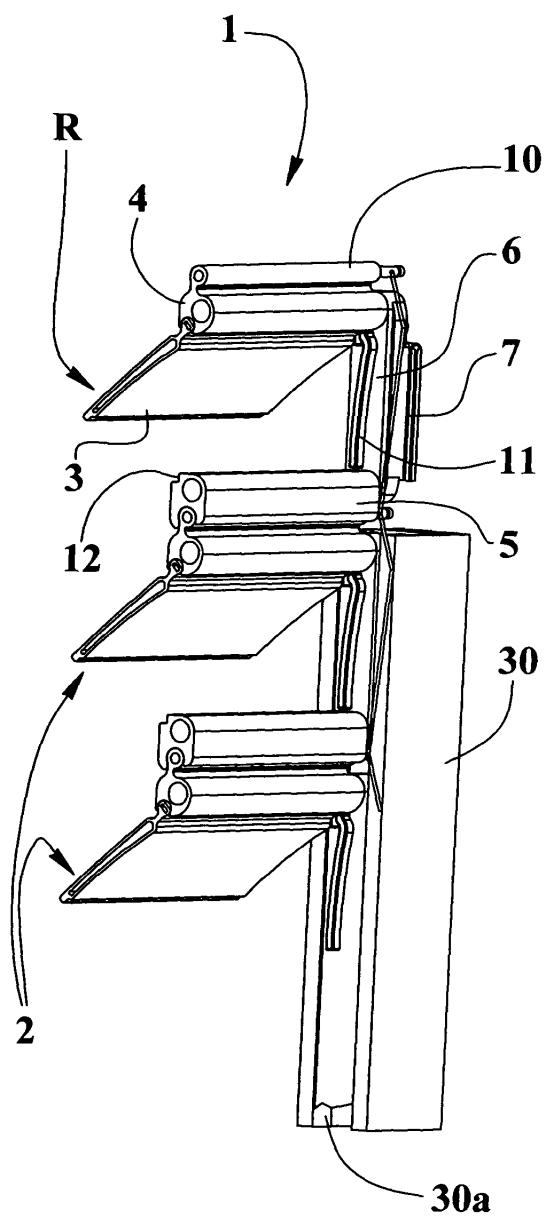


FIG.2

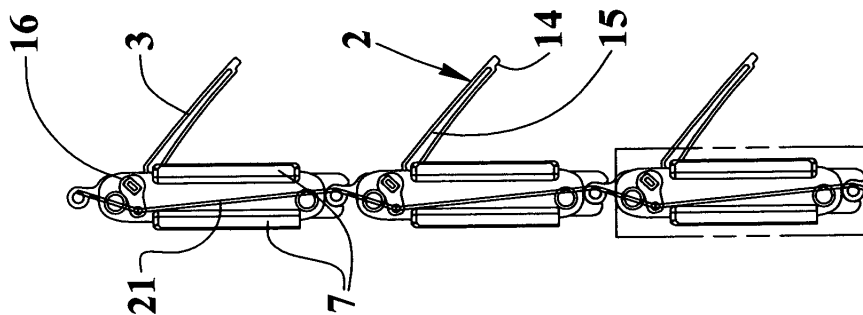


FIG. 5

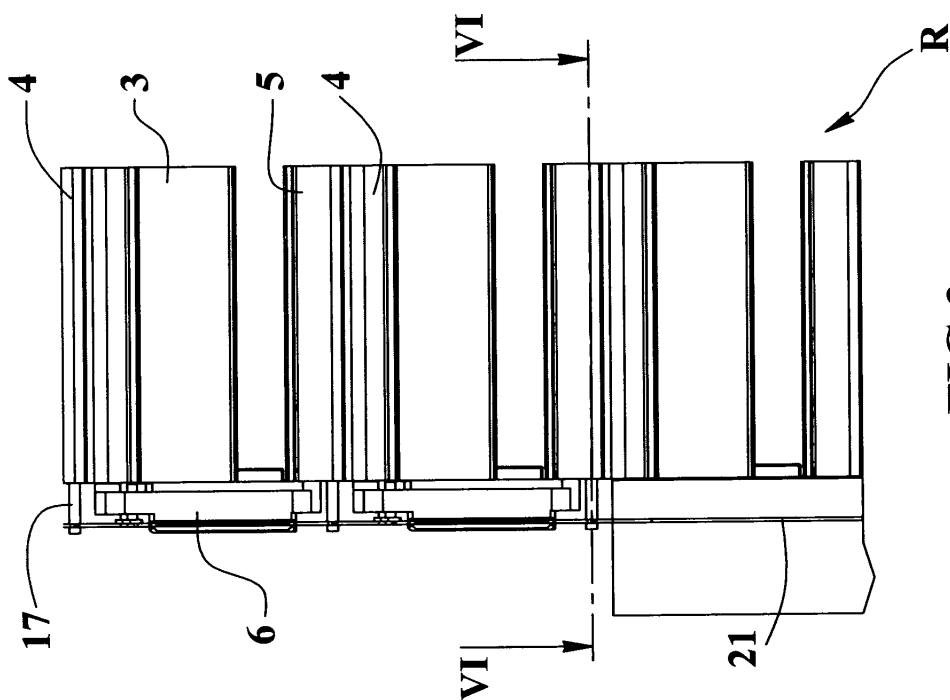


FIG. 3

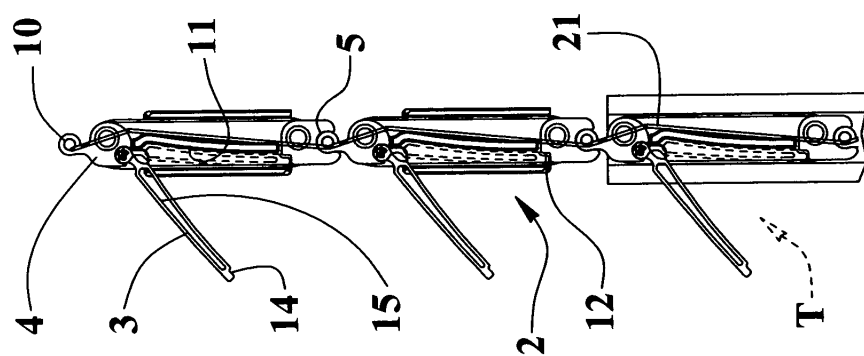


FIG. 4

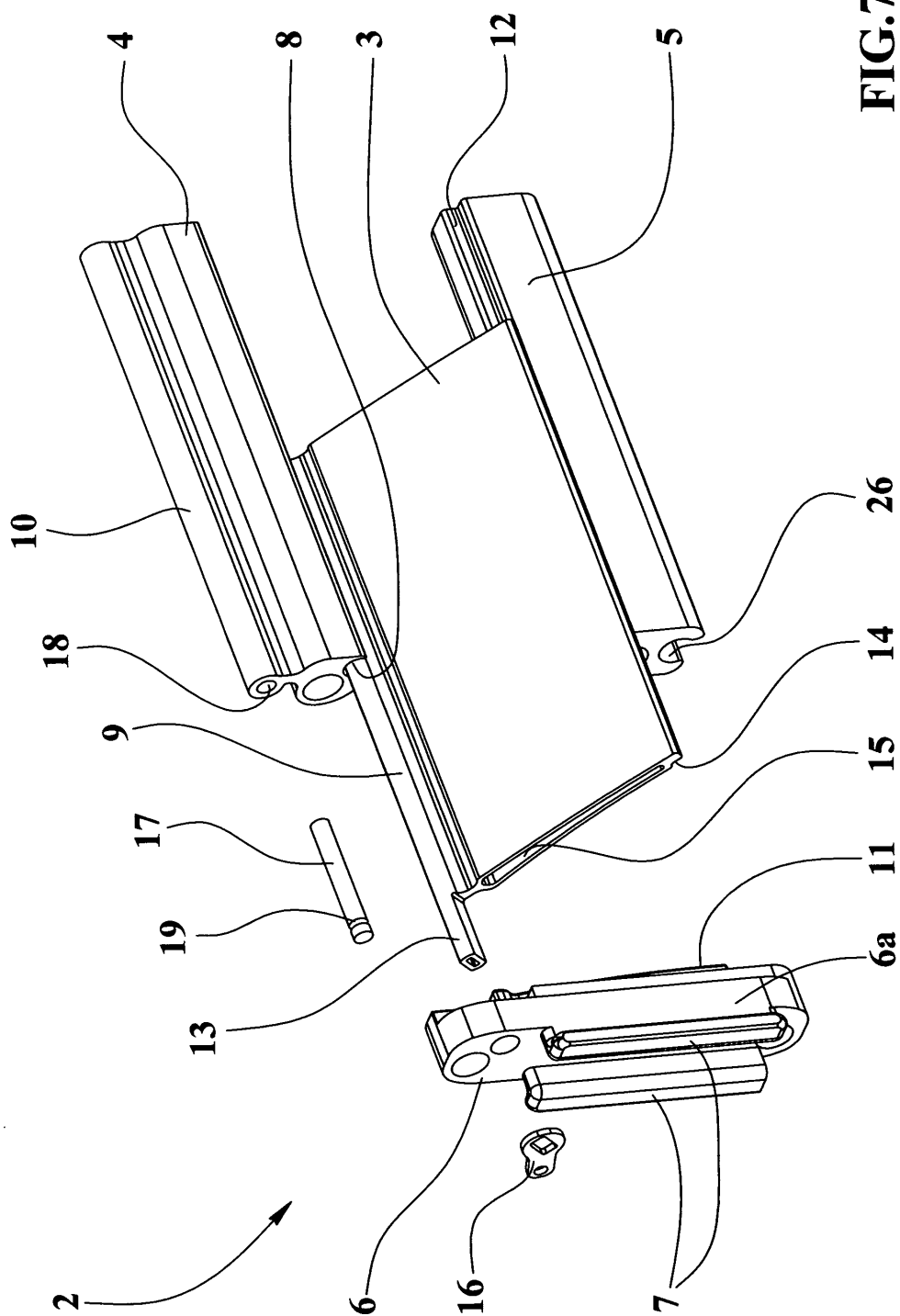


FIG. 7

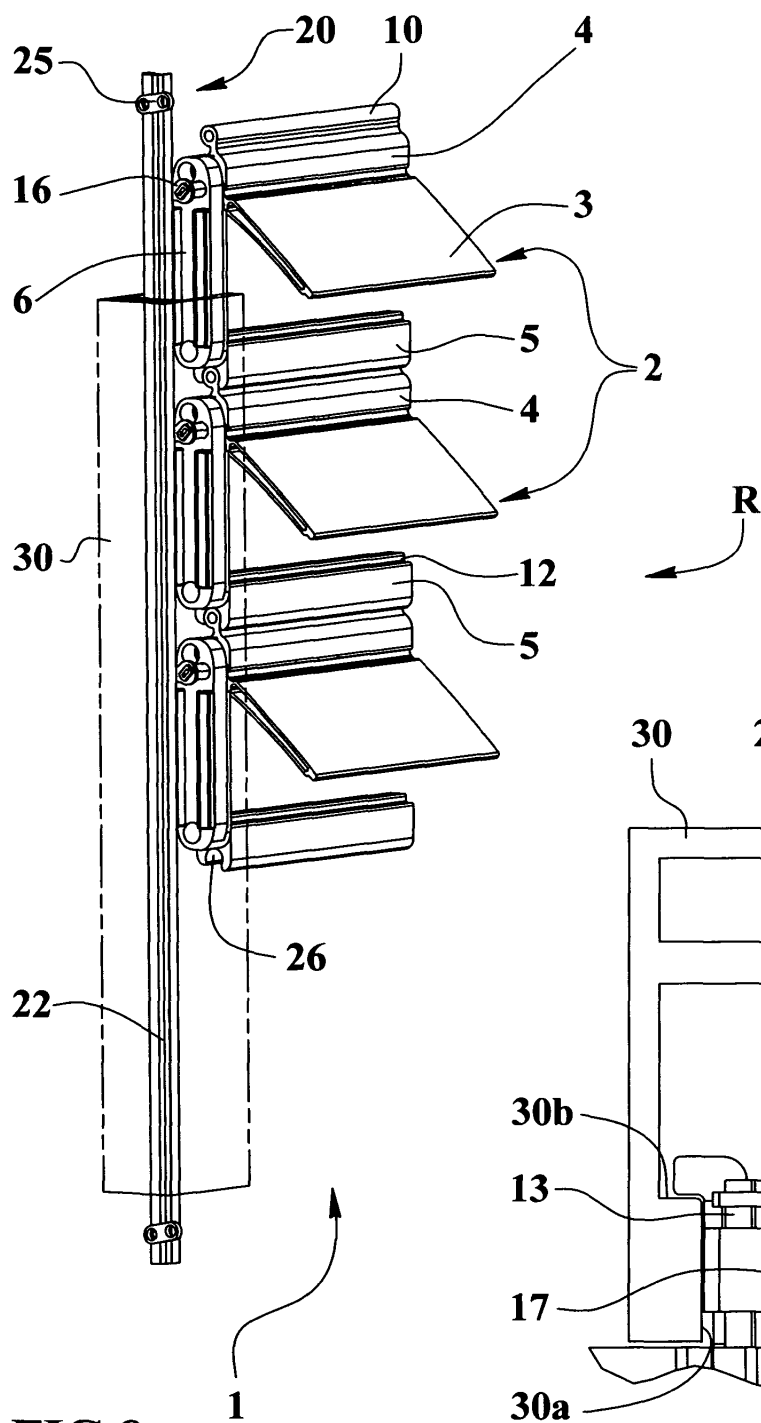


FIG. 8

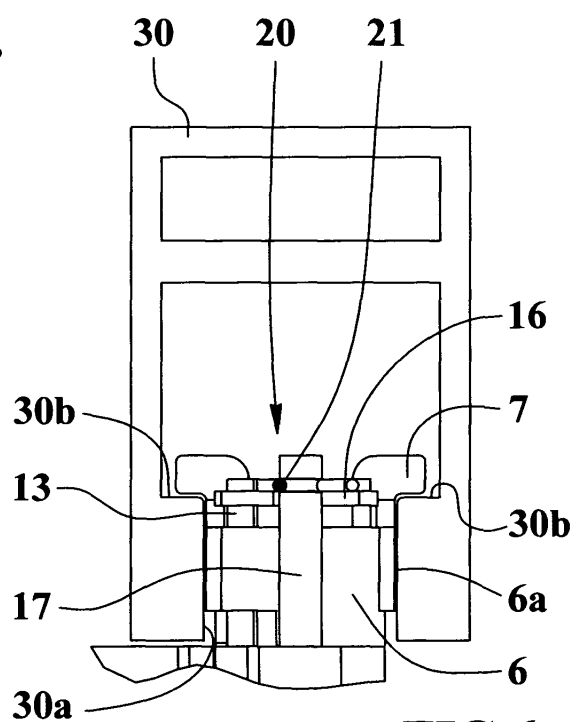


FIG. 6

FIG.9

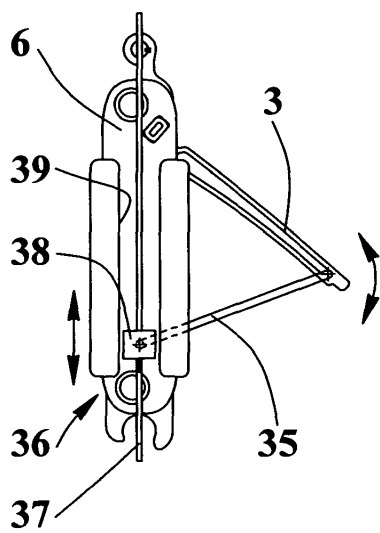
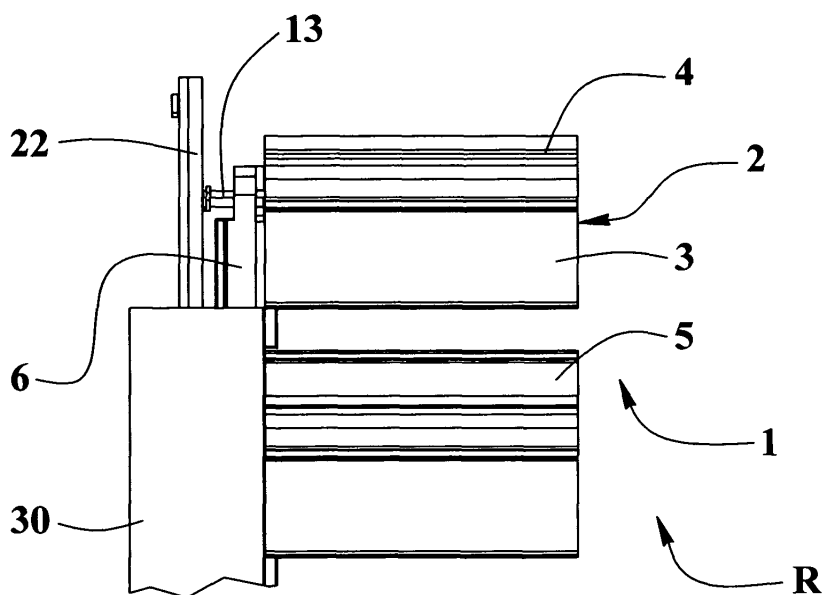


FIG.11

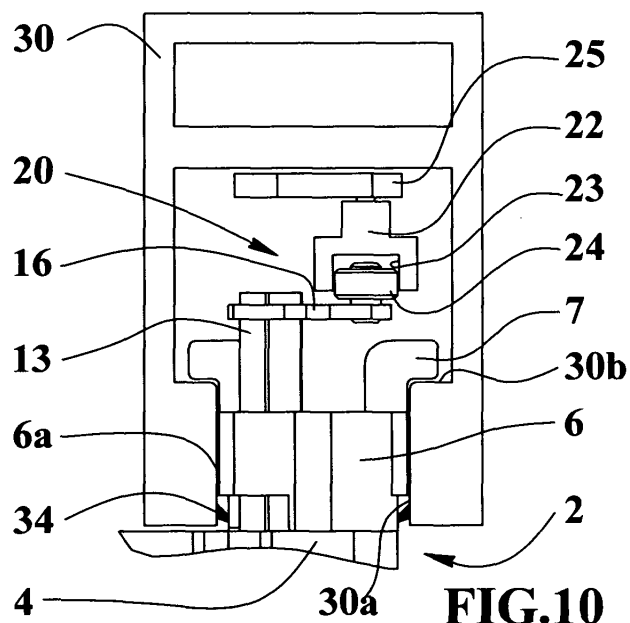


FIG.10

FIG.14

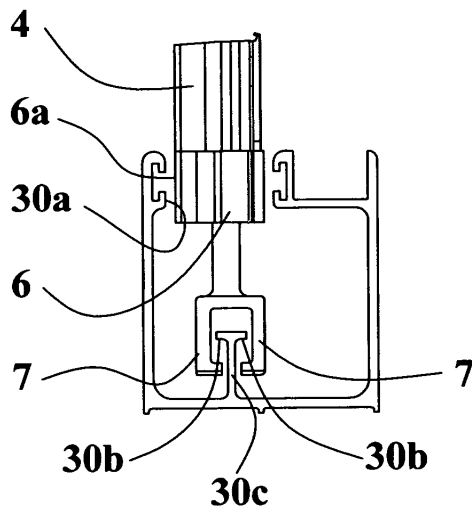
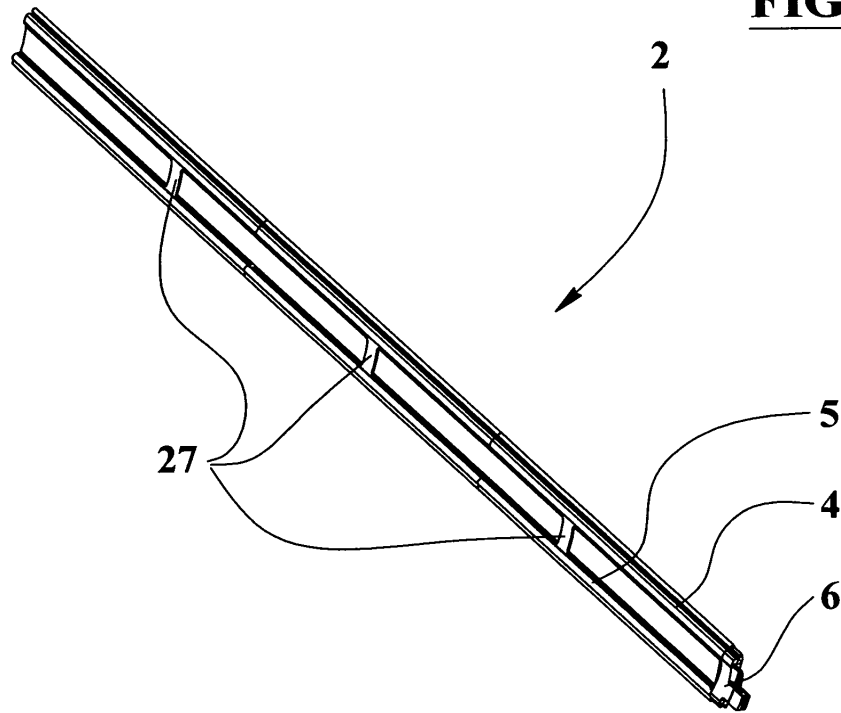


FIG.13

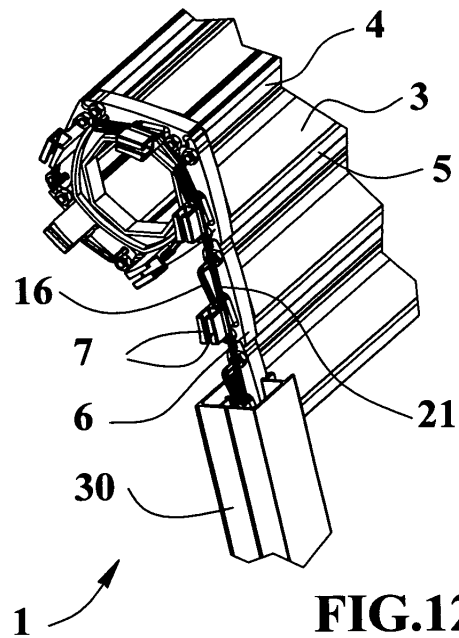


FIG.12