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(54) **ROLL-UP SHUTTER WITH ROTATABLE SLATS**

(57) A roll-up shutter, which can be installed at openings (A) such as windows, doors or the like and comprises an apparatus (2) for moving a plurality of slats (3a, 3b, 3c, 3d) which are arranged in series, are parallel and are mutually coupled even indirectly, for their transition from at least one first inactive configuration, in which the slats (3a, 3b, 3c, 3d) are spaced from the opening (A), to at least one second active configuration, in which the slats (3a, 3b, 3c, 3d) are distributed so as to be mutually side by side substantially along the entire extension of the opening (A), and vice versa. The apparatus (2) comprises at least one slider assembly (4), which can move integrally with the plurality of the slats (3a, 3b, 3c, 3d) during their movement between the configurations and meshes with at least one active slat (3a), which can rotate about a longitudinal axis (D). The slider assembly (4) is movable by a respective actuation cam (5), while the plurality of the slats (3a, 3b, 3c, 3d) is kept in the active configuration, for the consequent rotation of the active slat (3a) around the longitudinal axis (D) and for the definition, between the active slat (3a) and the contiguous slat (3a, 3b, 3c, 3d), of at least one slot (6).

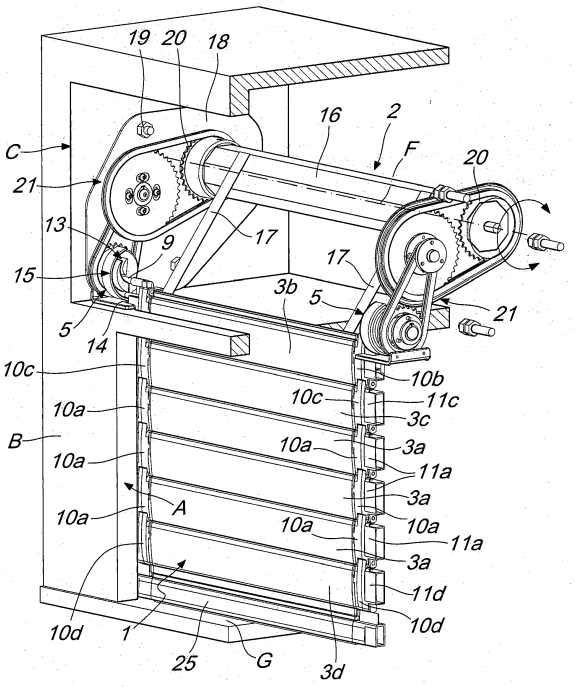

Fig. 4

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Description

[0001] The present invention relates to a roll-up shutter.

[0002] As is known, roll-up shutters, also known as blinds, are constructive solutions arranged so as to close windows (or other openings) of homes or buildings in general.

[0003] Typically, roll-up shutters comprise a plurality of mutually parallel slats arranged horizontally: in the configuration for use, the slats are arranged side by side and substantially in contact in pairs, so as to cover progressively the window (the opening) and achieve its desired closure. In this configuration, the shutter thus hinders the passage of light, atmospheric agents, insects and other animals, and also of people.

[0004] Moreover, the slats are mutually coupled so as to be able to actuate their winding around a roller, which is usually arranged above the window, in a compartment provided for this purpose in the wall.

[0005] Obviously, when they are wound around the roller, the slats define an inactive configuration, in which they do not obstruct the window in any way.

[0006] The movement of the slats between the two extreme configurations described above is indeed caused by the rotation of the roller about its own axis, which causes their unwinding and winding.

[0007] In turn, the roller can be moved manually (by using for example a belt that is associated with it and can be actuated directly by the user) or in an automated manner, for example by means of an electric motor.

[0008] Likewise, there are different constructive solutions, which are in any case intended to close windows or doors, which allow to orient the transverse elements that are responsible for closure so as to allow light to filter through in any case. These solutions are obviously appreciated when one wishes to achieve partial lighting of the room of the home or building to which the window is connected, further ensuring an adequate exchange of air.

[0009] Therefore, a limitation of known roll-up shutters is that it is impossible to achieve such a condition, since once they have reached the active configuration they arrange themselves so as to close the window completely, without the possibility of further adjustments and movements of the slats.

[0010] The aim of the present invention is to solve the problems described above, by providing a roll-up shutter that allows to vary the orientation of at least some of its slats.

[0011] Within this aim, an object of the invention is to provide a roll-up shutter that allows extensive possibilities of adjustment of the orientation of at least some of its slats.

[0012] Another object of the invention is to provide a roll-up shutter that is versatile and can be used easily to close windows or doors of any type, even in case of imperfections of the threshold and/or as a replacement of existing shutters.

[0013] Another object of the invention is to provide a roll-up shutter that ensures high reliability of operation and is capable of withstanding break-in attempts.

[0014] Another object of the invention is to devise a roll-up shutter that adopts a technical and structural architecture that is alternative to those of known types of shutter.

[0015] Another object of the invention is to provide a roll-up shutter that can be obtained easily starting from commonly commercially available elements and materials.

[0016] Another object of the invention is to provide a roll-up shutter that has low costs and is safe in application.

[0017] This aim and these and other objects that will become better apparent hereinafter are achieved by a roll-up shutter, which can be installed at openings such as windows, doors or the like, comprising an apparatus for moving a plurality of slats which are arranged in series, are parallel and are mutually coupled even indirectly, for their transition from at least a first inactive configuration, in which said slats are spaced from the opening, to at least a second active configuration, in which said slats are distributed so as to be mutually side by side substantially along the entire extension of the opening, and vice versa, characterized in that said apparatus comprises at least one slider assembly, which can move integrally with said plurality of said slats during their movement between said configurations and meshes with at least one said active slat, which can rotate about a longitudinal axis thereof, said at least one slider assembly being movable by a respective actuation cam, while said plurality of said slats is kept in said active configuration, for the consequent rotation of said at least one active slat around said longitudinal axis and for the definition, between said at least one active slat and said contiguous slat, of at least one slot.

[0018] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of a roll-up shutter according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view, taken from the right, in the active configuration, of a roll-up shutter according to the invention, installed at an opening provided in a wall of a building;

Figure 2 is a view of a detail of the roll-up shutter of Figure 1;

Figure 3 is a view of the detail of Figure 2, with some slats partially rotated;

Figure 4 is a view of the roll-up shutter of Figure 1, with the wall shown in cross-section to show the movement apparatus;

Figure 5 is a highly enlarged-scale view of a first detail of Figure 4;

Figure 6 is a highly enlarged-scale view of a second

detail of Figure 4;
Figure 7 is a highly enlarged-scale view of a third detail of Figure 4;
Figure 8 is a perspective view, taken from the right, of part of the movement apparatus of the shutter of Figure 1, with the wall in cross-section;
Figure 9 is a perspective view, taken from the left, of the roll-up shutter according to the invention in the active configuration;
Figure 10 is a perspective view, taken from the left, of a cam of the roll-up shutter of Figure 1;
Figure 11 is a partially exploded perspective view, taken from the right, of a first slat of the roll-up shutter of Figure 1 and of some associated components;
Figure 12 is a partially exploded perspective view, taken from the left, of the slat and of the other components of Figure 11;
Figure 13 is a partially exploded perspective view, taken from the right, of a second slat of the roll-up shutter of Figure 1 and of some associated components;
Figure 14 is a partially exploded perspective view, taken from the right, of a third slat of the roll-up shutter of Figure 1 and of some associated components;
Figure 15 is a partially exploded perspective view, taken from the right, of a fourth slat of the roll-up shutter of Figure 1 and of some associated components;
Figure 16 is a highly enlarged-scale perspective view of one of the components of Figure 15;
Figure 17 is a perspective view, taken from the right, of a further element of the roll-up shutter of Figure 1.

[0019] With particular reference to the cited figures, the reference numeral 1 generally designates a roll-up shutter, which can be installed at openings A such as windows, doors or the like.

[0020] The shutter 1 therefore comprises a movement apparatus 2 for moving a plurality of slats 3a, 3b, 3c, 3d, which are arranged in series and are parallel and mutually coupled (even indirectly).

[0021] The apparatus 2 allows to move the slats 3a, 3b, 3c, 3d to cause their transition from at least a first inactive configuration to a second active configuration and vice versa.

[0022] Even according to known methods, therefore, in the inactive configuration the slats 3a, 3b, 3c, 3d are spaced from the opening A, so as to not obstruct it and allow the free passage of air, light, atmospheric agents (or even insects and people). Obviously, even in this inactive configuration the opening A can still be closed by a window, a door or others.

[0023] In this inactive configuration, the slats 3a, 3b, 3c, 3d can be for example accommodated (and rolled up, as will become apparent) in a compartment B, which is provided in the wall C in which the opening A is provided and lies above the latter.

[0024] Moreover, the compartment B can also accommodate almost all of the elements that compose the movement apparatus 2.

[0025] In the active configuration (shown in Figures 1, 2, 3, 4 and 9), instead, the slats 3a, 3b, 3c, 3d are distributed so as to be mutually side by side substantially along the entire extension of the opening.

[0026] According to the invention, the apparatus 2 comprises a slider assembly 4, which moves integrally with the plurality of slats 3a, 3b, 3c, 3d during their movement between the configurations mentioned above.

[0027] Moreover, the slider assembly 4 meshes with at least one active slat 3a, which can rotate about a longitudinal axis D thereof (illustrated for the sake of simplicity only in Figure 14, which indeed shows such active slat 3a).

[0028] Moreover, the slider assembly 4 can be moved by an actuation cam 5, while the plurality of slats 3a, 3b, 3c, 3d is kept in the active configuration: indeed by way of the above cited meshing, the motion of the slider assembly 4 actuated by the cam 5 causes the consequent rotation of the active slat 3a around such longitudinal axis D.

[0029] This allows to vary the inclination of the active slat 3a and to define a slot 6 between it and the contiguous slat 3a, 3b, 3c, 3d, achieving the intended aim.

[0030] As can be seen from Figure 3, the rotation of the active slat 3a (or of the active slats 3a, as will become better apparent hereinafter) allows a variation of the orientation thereof and the possibility to allow light to filter through partially (and/or allow the passage of air) though keeping as a whole the slats 3a, 3b, 3c, 3d in the active configuration and therefore distributed along the entire extension of the opening A or in any case of a significant part thereof.

[0031] In particular, in the preferred embodiment, illustrated in the accompanying figures by way of non-limiting example of the application of the invention, the slider assembly 4 has at least one rack 7, which meshes with a respective pinion 8 that is integral with the corresponding active slat 3a (for example, Figures 9 and 14).

[0032] The meshing necessary for the rotation of the active slat 3a is therefore obtained indeed by way of the coupling between the rack 7 and the pinion 8.

[0033] Preferably, the slider assembly 4 has more than one rack 7, each of which meshes with a respective pinion 8, which is associated with a corresponding active slat 3a.

[0034] For example, in the solution of the accompanying figures it can be noticed easily that the roll-up shutter 1 comprises three active slats 3a, each therefore provided with the possibility to rotate, actuated by the slider assembly 4 by way of the meshing between respective racks 7 and corresponding pinions 8.

[0035] In any case, it is useful to specify that the number of active slats 3a, which can rotate about the respective longitudinal axis D, may be any according to the specific requirements and the dimensions of the opening A. Furthermore, the active slats 3a are preferably, but not exclusively, arranged consecutively in series;

as will become apparent in the pages that follow, different slats 3b, 3c, 3d having other functions are further arranged ahead or after them.

[0036] In the embodiment illustrated by way of nonlimiting example of the accompanying figures, the slider assembly 4 comprises a pusher pin 9, which engages automatically the cam 5 when the plurality of slats 3a, 3b, 3c, 3d-reaches the active configuration (extends so as to cover the opening A completely or almost completely).

[0037] Thus, when the cam 5 performs a subsequent rotation, the relative sliding of the slider assembly 4 with respect indeed to the plurality of slats 3a, 3b, 3c, 3d and the rotation of each active slat 3a are achieved automatically.

[0038] In particular, and as can be deduced from the accompanying figures (for example, but not only, from Figures 11, 12, 13, 14 and 15), each slat 3a, 3b, 3c, 3d comprises a lamina that has a rectangular contour and is associated with at least one head block that comprises at least one shoulder 10a, 10b, 10c, 10d (the letters in the reference numerals given here and hereinafter correspond to the ones used for the various slats 3a, 3b, 3c, 3d).

[0039] Each shoulder 10a, 10b, 10c, 10d is pivoted to the shoulder 10a, 10b, 10c, 10d of the contiguous head block and faces directly and is proximate to an end of the respective slat 3a, 3b, 3c, 3d (as can be deduced clearly for example from Figures 11, 12, 13, 14 and 15).

[0040] Furthermore (and with additional reference to Figures 11, 12, 13, 14 and 15), each head block comprises at least one respective slider 11a, 11b, 11c, 11d, which is pivoted to the slider 11a, 11b, 11c, 11d of the contiguous head block and can be inserted in a corresponding vertical track E (Figure 8).

[0041] The track E can be provided around the opening A (along one or both sides) so as to obtain the guided movement of the plurality of slats 3a, 3b, 3c, 3d between the inactive configuration and the active configuration. In other words, in practice it is the track E that imposes the trajectory to the slats 3a, 3b, 3c, 3d when they are moved so as to make them obstruct the opening A when they are subsequently moved away from it.

[0042] Likewise, it should be noted that the tracks E allow vertical translation but prevent any other movement of the sliders 11 a, 11b, 11c, 11d.

[0043] Although the possibility to provide shutters 1 that have a single slider assembly 4, and in which each slat 3a, 3b, 3c, 3d is associated with a single head block, with the respective slider 11 a, 11b, 11c, 11d inserted in a corresponding (single) track E, is not excluded and is in any case within the protective scope claimed herein, in the preferred embodiment (and in the accompanying figures) each slat 3a, 3b, 3c, 3d is associated with two respective head blocks.

[0044] In this preferred solution, the head blocks of each slat 3a, 3b, 3c, 3d are substantially mirror-symmetrical and face each other and are proximate, with their corresponding shoulders 10a, 10b, 10c, 10d, to corresponding ends of the lamina.

[0045] In practice, therefore, the structure of the shutter 1 is substantially symmetrical (also with respect to the components of the movement apparatus 2 that will be introduced in the pages that follow).

[0046] In the preferred embodiment, the slider assembly 4 comprises a plurality of slider elements 12a, 12b, 12c, which in turn are comprised within respective head blocks and are interposed between corresponding sliders 11a, 11b, 11c and corresponding shoulders 10a, 10b, 10c.

[0047] Each slider element 12a, 12b, 12c is pivoted to the slider element 12a, 12b, 12c of the contiguous head block and is guided slidingly with respect to the corresponding slat 3a, 3b, 3c, 3d by the corresponding sliders 11a, 11b, 11c and shoulders 10a, 10b, 10c (which indeed allow only a relative translational motion).

[0048] The pusher pin 9 is therefore shaped indeed by a first connecting slider element 12b, which is associated with a first connecting slat 3b (Figures 11 and 12), which transmits the relative translational motion to the other slider elements 12a, 12c.

[0049] In turn, each rack 7 is provided on a respective active slider element 12a, which is associated with a corresponding active slat 3a (while the slider element 12b is without racks 7, since one does not wish to impart rotation to the slat 3b).

[0050] Each slider assembly 4, therefore, has a shape that is similar to that of a chain, in which each link is constituted by a respective slider element 12a, 12b, 12c (which is indeed pivoted to the following one in order to ensure its continuity).

[0051] When the slats 3a, 3b, 3c, 3d move between the two mentioned configurations, each assembly 4 moves with them; when instead the shutter 1 (with its slats 3a, 3b, 3c, 3d) reaches the active configuration, the pusher pin 9 can be pushed downwardly by the cam 5 to produce the relative motion of the assembly 4 and therefore the rotation of the active slats 3a.

[0052] More particularly, upon reaching the active configuration the pusher pin engages a first slot 13 defined by the cam 5 (for example Figure 10).

[0053] Simultaneously, a reference pin 14, shaped by the slider 11b of the head block associated with the connecting slat 3b, engages a second slot 15 (again Figure 10, for example), which also is defined by the cam 5.

[0054] The second slot 15 is substantially concentric with respect to the cam 5, so as to keep the reference pin 14 motionless during its rotation and the motion of the pusher pin 9.

[0055] More particularly, the cam 5 and the slots 13, 15 are shaped so that the center distance between the latter decreases progressively: since the reference pin 14 is kept motionless, the guided sliding of the pins 9, 14 in the slots 13, 15 automatically causes the movement of the pusher pin 9 toward the reference pin 14 (during the further rotation of such cam 5).

[0056] Indeed by way of this constructive choice, one

achieves the desired relative sliding of the slider assembly 4, which is integral with the pusher pin 9, with respect to the plurality of slats 3a, 3b, 3c, 3d, which are instead kept in the active configuration by the reference pin 14 engaged in the second slot 15.

[0057] Vice versa, obviously, the rotation in the opposite direction of the cam 5 causes the spacing of the pusher pin 9 from the reference pin 14 and therefore the relative translation in the opposite direction of the slider assembly 4.

[0058] Moreover, it is convenient to note right now that in the inactive condition of the cam 5 (when it does not rotate), the slots 13, 15 between which the pins 9, 14 engage oppose their relative motion and therefore the relative sliding of the slider assembly 4 with respect to the slats 3a, 3b, 3c, 3d (with the advantageous effects that will be described hereinafter).

[0059] In the embodiment illustrated hereafter by way of nonlimiting application of the invention, the apparatus 2 comprises a motorized roller 16, for example by means of a respective electric motor, which can in turn be actuated by the user, with an external button or even in another manner, as a function of the specific practical requirements.

[0060] The roller 16 rotates about its own horizontal axis of symmetry F (shown for the sake of simplicity only in Figures 4 and 9); the roller 16 is coupled to the connecting slat 3b by means of at least one belt 17 (and preferably two), so as to actuate the movement of the plurality of slats 3a, 3b, 3c, 3d between the inactive and active configurations.

[0061] By imparting a rotation of the rotor 16, therefore, it is thus possible to raise or lower the slats 3a, 3b, 3c, 3d (each of which is pivoted to the next at the shoulders 10a, 10b, 10c, 10d and at the sliders 11a, 11b, 11c, 11d), providing the inactive configuration and/or the active configuration.

[0062] It should be noted that in the inactive configuration the slats 3a, 3b, 3c, 3d can in any case be arranged (at least partially) side by side in the compartment B or, preferably, wound (almost completely) around such roller 16, so as to be able to contain the dimensions of such compartment B.

[0063] In order to reduce the number of components required for the operation of the roll-up shutter 1 according to the invention, in the preferred solution the cam 5 also is rotated by the motorized roller 16 by way of respective transmission and speed reduction elements, which are supported by plates 18 that are fixed to the walls C by means of bolts 19.

[0064] For example, such elements can comprise a ring 20, which is coaxial to the roller 16 and is associated with a speed reduction block 21.

[0065] As can be deduced for example from Figures 11 to 15, each slat 3a, 3b, 3c, 3d has at least one axial shank 22a, 22b, 22c, 22d, which protrudes from a respective end portion; it should also be noted that in view of the preferably mirror-symmetrical structure of the shutter 1, equally preferably each slat 3a, 3b, 3c, 3d has two axial shanks 22a, 22b, 22c, 22d, each of which protrudes from a respective end portion.

[0066] Each pinion 8, which meshes with the respective rack 7, is therefore shaped by a respective shank 22a (Figure 14).

[0067] Furthermore, the shank 22b of the connecting slat 3b (Figures 11 and 12) has at least one portion 23b that has a prism-like transverse cross-section that is complementary to a respective orifice 24b provided in the corresponding slider 11b (Figure 11).

[0068] The shape mating provided by the portion 23b (which is integral with the connecting slat 3b) with the orifice 24b integral with the slider 11b (which is allowed only to slide in the track E) hinders (prevents) the rotation of such connecting slat 3b.

[0069] It has thus been shown already that the shutter 1 can comprise, in addition to one or more active rotating slats 3a, also a connecting slat 3b, which cannot rotate: it should be noted that it is intended to remain often concealed from view, sometimes even external to the opening A, in the active configuration, and therefore the possibility to rotate would be useless or detrimental. The connecting slat 3b indeed performs the role of connection interface with the speed reduction block 21 and the cam 5.

[0070] Conveniently, at least one intermediate slat 3c is interposed between the connecting slat 3b and the series of active slats 3a.

[0071] Such intermediate slat 3c is used to transfer the vertical stress imparted by the pusher pin 9 to the slider elements 12a (through the corresponding slider element 12c) and it is possible to resort to it when one wishes to keep the active slats 3a (the only ones that rotate) even more spaced from the connecting slat 3b.

[0072] Indeed to hinder (prevent) the rotation of the intermediate slat 3c, its shank 22c, also, has a portion 23c that has a prism-like transverse cross-section and is complementary with respect to a respective orifice 24c provided in the corresponding slider 11c (Figure 13).

[0073] Advantageously, the roll-up shutter 1 according to the invention also comprises an end slat 3d, which is arranged on the opposite side with respect to the connecting slat 3b and is coupled even indirectly, in a downward region, to a compensation bar 25. Although the possibility that the opening A might be closed completely by the slats 3a, 3b, 3c, 3d alone is not excluded, in the preferred embodiment it is indeed the compensation bar 25 that completes the closure of the opening A, by resting, in the active configuration, on the threshold G of such opening A.

[0074] Usefully, the shank 22d of the end slat 3d has a portion 23d that has a prism-like transverse cross-section which is complementary to a respective slit 24d (Figures 15 and 16) provided in the corresponding shoulder 10d (Figure 16), in order to hinder the rotation of the end slat 3d (indeed allowing only the active slat 3b to rotate, as can be deduced from Figure 3).

[0075] Positively, the compensation bar 25 has two protruding teeth 26 (Figure 17), which are inserted so that they can slide in respective elongated slots 27 provided along the shoulders 10d of the end slat 3d (Figures 15 and 16).

[0076] In this manner, the sliding coupling between the teeth 26 and the slots 27 allows the possibility of (free) variation of the relative position and inclination of the bar 25 with respect to the end slat 3d: therefore, when the bar 25 touches the threshold G, it can adapt automatically to any imperfections thereof, in any case ensuring complete closure (and without holes or gaps) of the opening A.

[0077] Operation of the roll-up shutter has therefore already been described in advance to a large extent in the preceding pages.

[0078] It has in fact already been shown that the actuated rotation of the motorized roller 16 allows to raise or lower the slats 3a, 3b, 3c, 3d and to provide the inactive configuration and/or the active configuration; the connecting slat 3b is in fact coupled to the roller 16 by means of the belts 17, while the other slats 3a, 3c, 3d move with the connecting slat 3b by way of the (rotary) coupling provided at the shoulders 10a, 10b, 10c, 10d and at the sliders 11a, 11b, 11c, 11d.

[0079] Upon reaching the active configuration, the pins 9, 14 are located respectively at the inlet of the slots 13, 15 provided on the cam 5 (which also is moved by the roller 16).

[0080] A further rotation of the roller 16 then causes the pusher pin 9 to approach progressively the reference pin 14 (which in practice is kept stationary by the shape of the respective second slot 15).

[0081] The relative motion is transmitted to the entire slider assembly 4, since the pusher pin 9 is formed directly by the slider element 12b of the connecting slat 3b, and the other slider elements 12a, 12c are coupled (rotatably) to the first one, without the possibility to perform other movements (except indeed the sliding motion).

[0082] The relative motion of the slider elements 12a of the active slats 3a thus causes their rotation (while they are kept in the active configuration), achieving the desired result (the forming of the slots 6). By way of this particular choice, in the roll-up shutter 1 it is in fact possible to vary the orientation of the active slats 3a, while the shutter 1 proper is kept in the active configuration, so as to close the opening A.

[0083] Obviously, the rotation angle allowed to the active slats 3a can be chosen freely, by varying the dimensions and in general the dimensional parameters of the components involved; for example, an oscillation about the longitudinal axis D of an angular breadth equal to 120° is allowed. Other constructive choices, as a function of the specific requirements, are in any case not excluded.

[0084] Obviously, a rotation in the opposite direction of the roller 16 initially causes the sliding of the pins 9, 14 in the opposite direction, along the slots 13, 15, with consequent reclosure of the slots 6. The additional rotation lifts the slats 3a, 3b, 3c, 3d, sending them again toward the inactive configuration.

[0085] The high versatility of the shutter 1 according to the invention is further increased by resorting to the compensation bar 25 and to the sliding coupling between its teeth 26 and the slots 27 provided along the shoulders 10d: the bar 25 can in fact easily close even openings A the thresholds G of which are uneven or have geometric imperfections.

[0086] It is indeed the possibility to adapt to geometric imperfections or in any case to more or less uneven and/or inclined thresholds G that makes the roll-up shutter 1 absolutely suitable for the replacement of shutters that are already installed and are by now obsolete or in any case for which removal is sought.

[0087] In a situation of this kind it is in fact possible to remove the existing shutter and utilize the compartments B and the tracks E that are usually already provided to install the shutter 1 according to the invention, in an entirely practical and easy manner. It is in fact possible to insert the components of the apparatus 2 in the existing compartment B (which accommodated the components of the previous shutter, now removed at least partially). Likewise, the sliders 11a, 11b, 11c, 11d can be inserted in the already provided track E in which the transverse elements of the preceding shutter used to slide.

[0088] The compensation bar 25 ensures complete closure of the opening A, even in case of irregularities, while obviously the number of slats 3a, 3b, 3c, 3d can be chosen easily, as a function of the dimensions of such opening A and of the specific requirements, ensuring optimum replacement.

[0089] Finally, while the rotation of the cam 5, actuated by the roller 16, transmits the rotary motion to the active slats 3a by way of the meshing between the racks 7 and the pinions 8, when the roller 16 is motionless, such cam 5 contrasts an attempt to force such active slats 3a from the outside.

[0090] If in fact an ill-intentioned individual attempts to force the rotation of the active slats 3a, while the shutter 1 is in the active configuration (but obviously the roller 16 and the cam 5 are motionless), the (attempted) rotation is transmitted, through the racks 7 and the pinions 8, to the pusher pin 9, which however, when the cam 5 is stationary, cannot translate, since the first slot 13 proper hinders its motion.

[0091] At the same time, the second slot 15 contrasts the movement of the reference pin 14 and therefore also any attempt to lift the entire shutter 1, which turns out to be reliable and capable of withstanding break-in attempts.

[0092] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0093] In the examples of embodiment shown, individ-

ual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0094] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0095] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A roll-up shutter, which can be installed at openings (A) such as windows, doors or the like, comprising an apparatus (2) for moving a plurality of slats (3a, 3b, 3c, 3d) which are arranged in series, are parallel and are mutually coupled even indirectly, for their transition from at least a first inactive configuration, in which said slats (3a, 3b, 3c, 3d) are spaced from the opening (A), to at least a second active configuration, in which said slats (3a, 3b, 3c, 3d) are distributed so as to be mutually side by side substantially along the entire extension of the opening (A), and vice versa, **characterized in that** said apparatus (2) comprises at least one slider assembly (4), which can move integrally with said plurality of said slats (3a, 3b, 3c, 3d) during their movement between said configurations and meshes with at least one said active slat (3a), which can rotate about a longitudinal axis (D) thereof, said at least one slider assembly (4) being movable by a respective actuation cam (5), while said plurality of said slats (3a, 3b, 3c, 3d) is kept in said active configuration, for the consequent rotation of said at least one active slat (3a) around said longitudinal axis (D) and for the definition, between said at least one active slat (3a) and said contiguous slat (3a, 3b, 3c, 3d), of at least one slot (6).

2. The roll-up shutter according to claim 1, **characterized in that** said slider assembly (4) has at least one rack (7), which meshes with a respective pinion (8) that is integral with the corresponding said active slat (3a).

3. The roll-up shutter according to claim 2, **characterized in that** said slider assembly (4) has more than one said rack (7), each one of said racks (7) meshing with a respective said pinion (8), which is associated with a corresponding said active slat (3a).

4. The roll-up shutter according to one or more of the preceding claims, **characterized in that** said slider assembly (4) comprises a pusher pin (9), which can engage automatically said cam (5) when said plurality of slats (3a, 3b, 3c, 3d) reaches said active configuration, a subsequent rotation of said cam (5) causing the relative sliding of said slider assembly (4) with respect to said plurality of said slats (3a, 3b, 3c, 3d) and the rotation of said at least one active slat (3a).

5. The roll-up shutter according to one or more of the preceding claims, **characterized in that** each one of said slats (3a, 3b, 3c, 3d) comprises a lamina with a rectangular contour and is associated with at least one head block, which comprises at least one shoulder (10a, 10b, 10c, 10d) that is pivoted to said shoulder (10a, 10b, 10c, 10d) of said contiguous head block and directly faces and is proximate to one end of the respective said slat (3a, 3b, 3c, 3d), and at least one respective slider (11a, lib, 11c, 11d) that is pivoted to said slider (11a, 11b, 11c, 11d) of said contiguous head block and can be inserted in a corresponding vertical track (E), which can be provided around the opening (A), for the guided movement of said plurality of said slats (3a, 3b, 3c, 3d) between said configurations.

6. The roll-up shutter according to claim 5, **characterized in that** each said slat (3a, 3b, 3c, 3d) is associated with two respective head blocks, which are substantially mirror-symmetrical, face each other and are proximate, with the corresponding said shoulders (10a, 10b, 10c, 10d), to corresponding said ends of said lamina.

7. The roll-up shutter according to one or more of the preceding claims, **characterized in that** said slider assembly (4) comprises a plurality of slider elements (12a, 12b, 12c), which are comprised in respective said head blocks and are interposed between corresponding said sliders (11a, 11b, 11c) and corresponding said shoulders (10a, 10b, 10c), each one of said slider elements (12a, 12b, 12c) being pivoted to said slider element (12a, 12b, 12c) of said contiguous head block and being guided slidingly with respect to the corresponding said slat (3a, 3b, 3c) by the corresponding said sliders (11a, 11b, 11c) and said shoulders (10a, 10b, 10c), said pusher pin (9) being shaped by a first connecting slider element (12b), which is associated with a first said connecting slat (3b), said at least one rack (7) being provided on a respective said active slider element (12a), which is associated with a corresponding said active slat (3a).

8. The roll-up shutter according to claim 7, **characterized in that** upon reaching said active configuration said pusher pin (9) engages a first slot (13) that is defined by said cam (5) and a reference pin (14), which is shaped by said slider (11b) of said head

block associated with said connecting slat (3b), engages in a second slot (15), which is defined by said cam (5) and is substantially concentric thereto, the center distance between said slots (13, 15) decreasing progressively for the approach of said pusher pin (9) to said reference pin (14), during the further rotation of said cam (5), with consequent relative sliding of said slider assembly (4), which is integral with said pusher pin (9), with respect to said plurality of said slats (3a, 3b, 3c, 3d), which are kept in said active configuration by said reference pin (14) engaged in said second slot (15) and vice versa, in the inactive condition of said cam (5) said slots (13, 15) contrasting the relative sliding of said slider assembly (4) with respect to said slats (3a, 3b, 3c, 3d).

9. The roll-up shutter according to claim 7 or 8, **characterized in that** said apparatus (2) comprises a motorized roller (16), which rotates about a horizontal axis of symmetry (F) and is coupled to said connecting slat (3b) by means of at least one belt (17), for the actuation of the movement of said plurality of said slats (3a, 3b, 3c, 3d) between said configurations, said cam (5) being rotated by said motorized roller (16) by way of respective transmission and speed reduction elements.

10. The roll-up shutter according to one or more of the preceding claims, **characterized in that** each one of said slats (3a, 3b, 3c, 3d) has at least one axial shank (22a, 22b, 22c, 22d), each one of said pinions (8) being shaped by a respective said shank (22a).

11. The roll-up shutter according to claim 10, **characterized in that** said shank (22b) of said connecting slat (3b) has at least one portion (23b) that has a prism-like transverse cross-section which is complementary to a respective orifice (24b) provided in the corresponding said slider (11b) in order to hinder the rotation of said connecting slat (3b).

12. The roll-up shutter according to claim 10 or 11, **characterized in that** at least one said intermediate slat (3c) is interposed between said connecting slat (3b) and said at least one active slat (3a), said shank (22c) of said at least one intermediate slat (3c) having a portion (23c) that has a prism-like transverse cross-section, which is shaped complementarily to a respective orifice (24c) provided in the corresponding said slider (11c), for hindering the rotation of said intermediate slat (3c).

13. The roll-up shutter according to one or more of the preceding claims, **characterized in that** it comprises a said end slat (3d), which is arranged opposite said connecting slat (3b), which is coupled even indirectly, in a downward region, to a compensation bar (25), which can rest on the threshold (G) of the opening (A) in said active configuration, said shank (22d) of said at least one end slat (3d) having a portion (23d) that has a prism-like transverse cross-section, which is shaped complementarily to a respective said slit provided in the corresponding said shoulder (10d), in order to hinder the rotation of said end slat (3d).

14. The roll-up shutter according to claim 13, **characterized in that** said compensation bar (25) has two protruding teeth (26), which are inserted so that they can slide in respective elongated slots (27) provided along said shoulders (10d) of said end slat (3d), in order to vary the relative position and inclination of said bar (25) with respect to said end slat (3d) and adapt said bar (25) to any imperfections of the threshold (G).

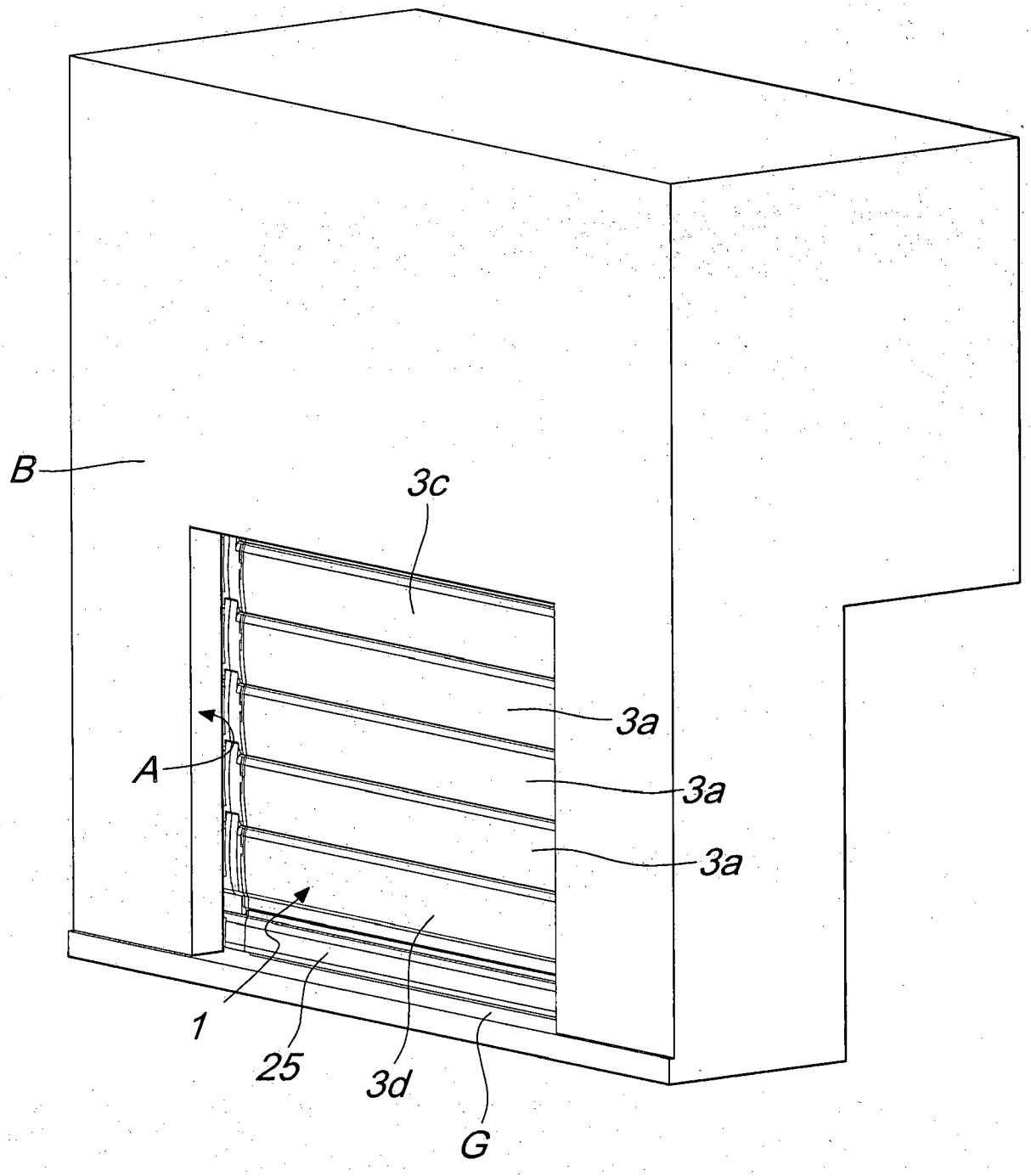
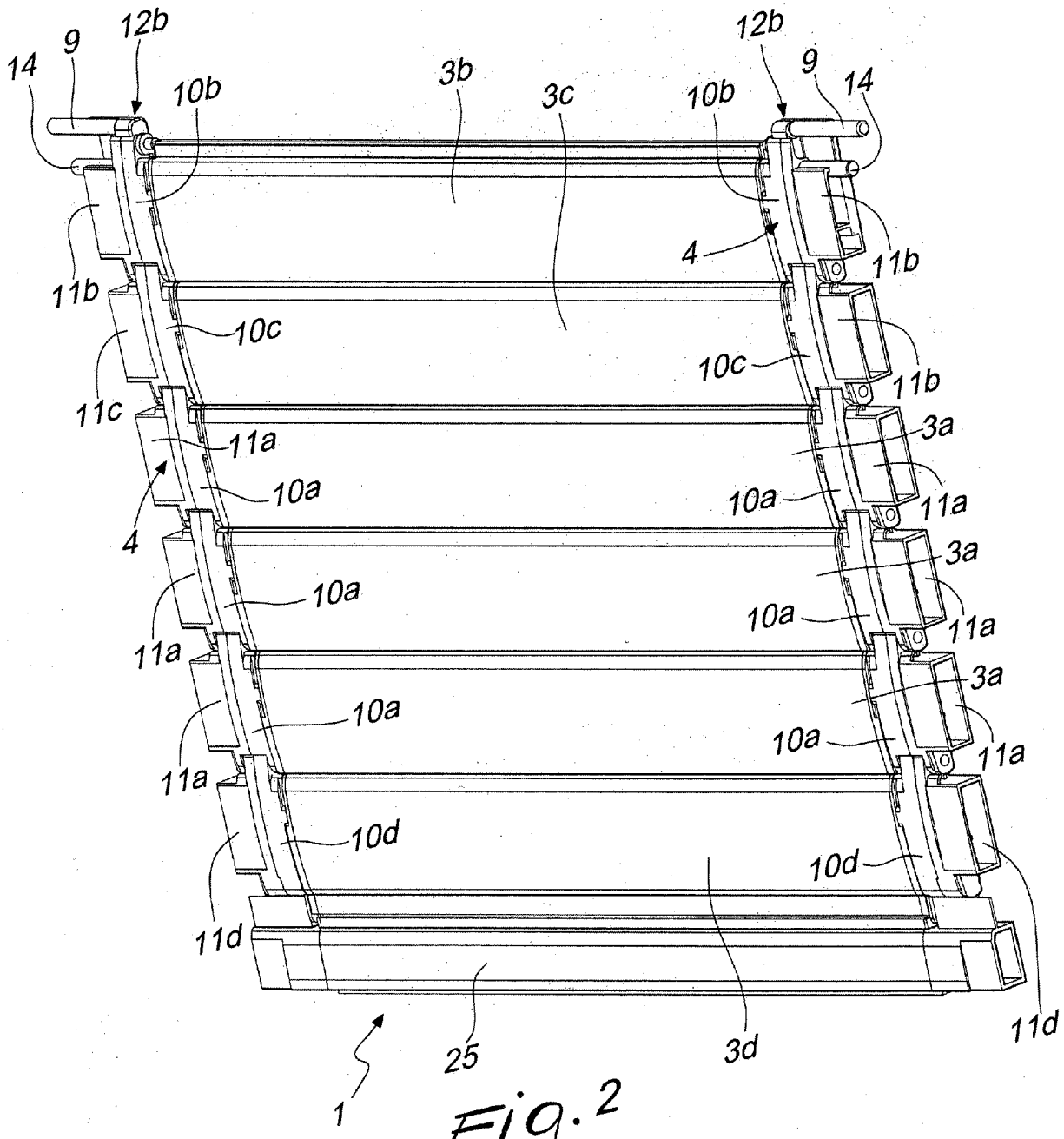


Fig. 1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9
12b
10b
3b
3c
10b
12b
9
14
11b
4
11b
10c
10c
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3a
11a
10a
10a
11a
4
3a
10a
10a
11a
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10a
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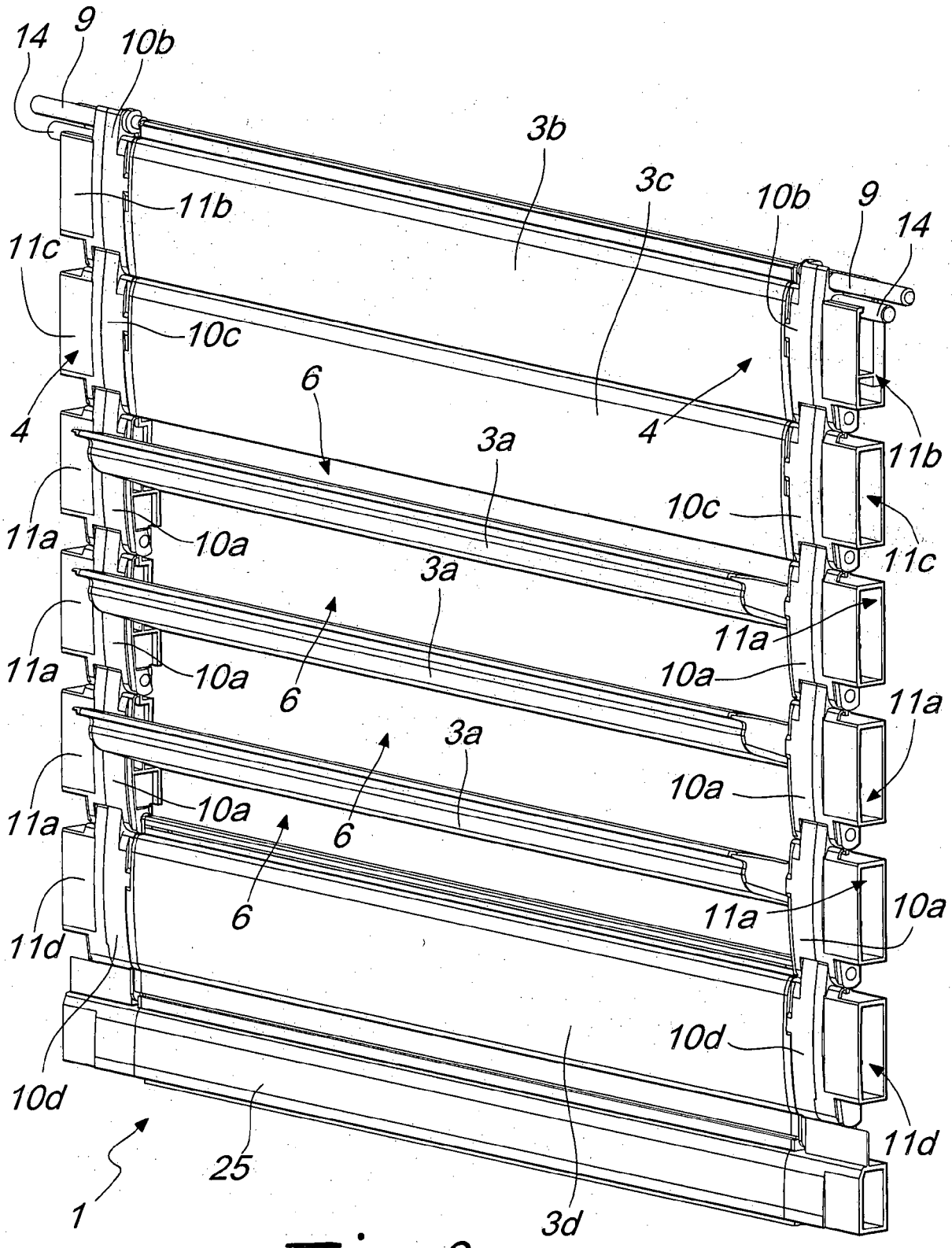
11a
10d
10d
11d
11d
25
3d
1

Fig. 2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3c
10b
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4
6
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10a
3a
11c
11a
11a
10a
6
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3a
11a
10a
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11a
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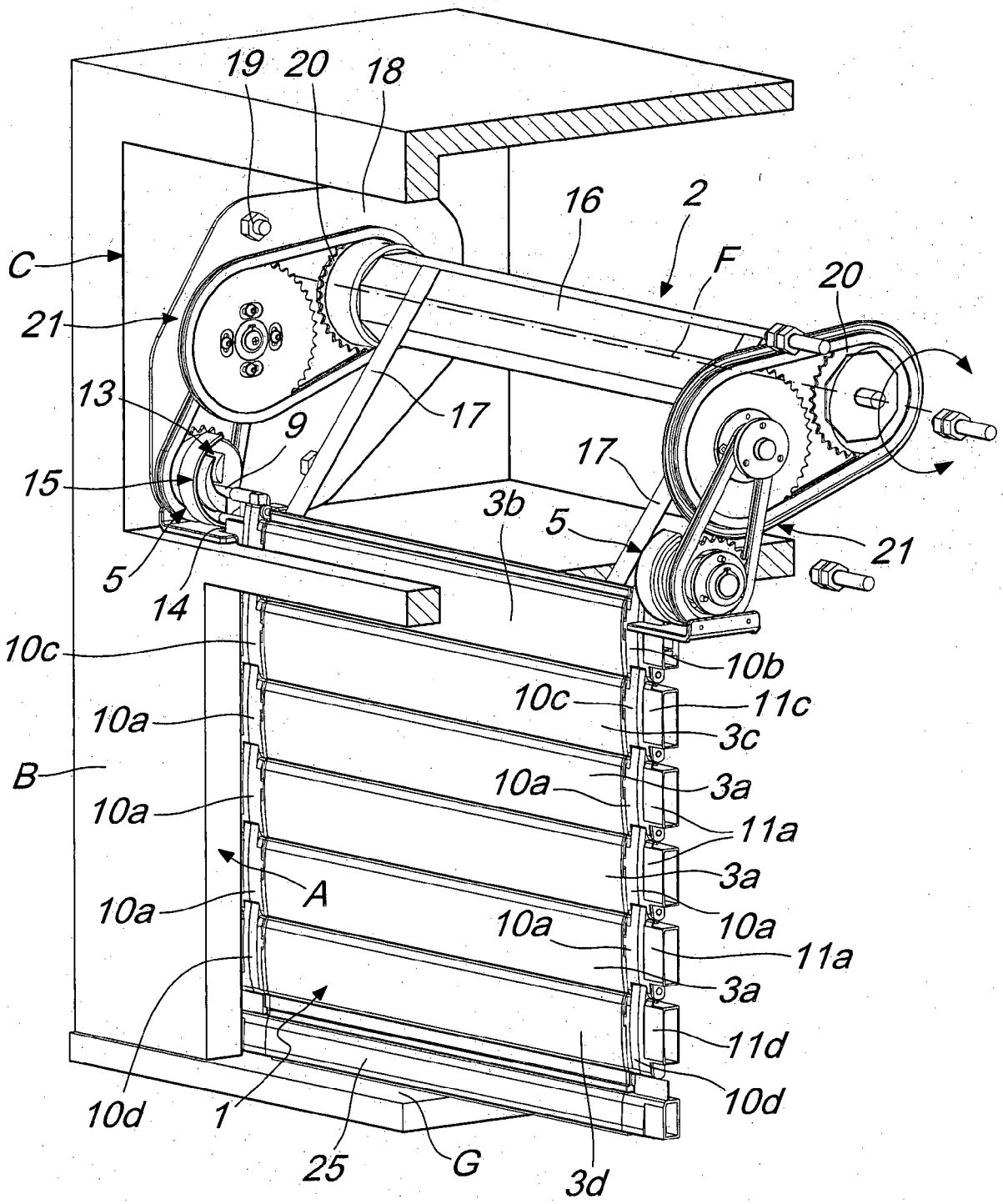
3d
11d
1

Fig. 3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10c
11c
10a
3c
B
10a
3a
10a
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1
25
G
3d

Fig. 4

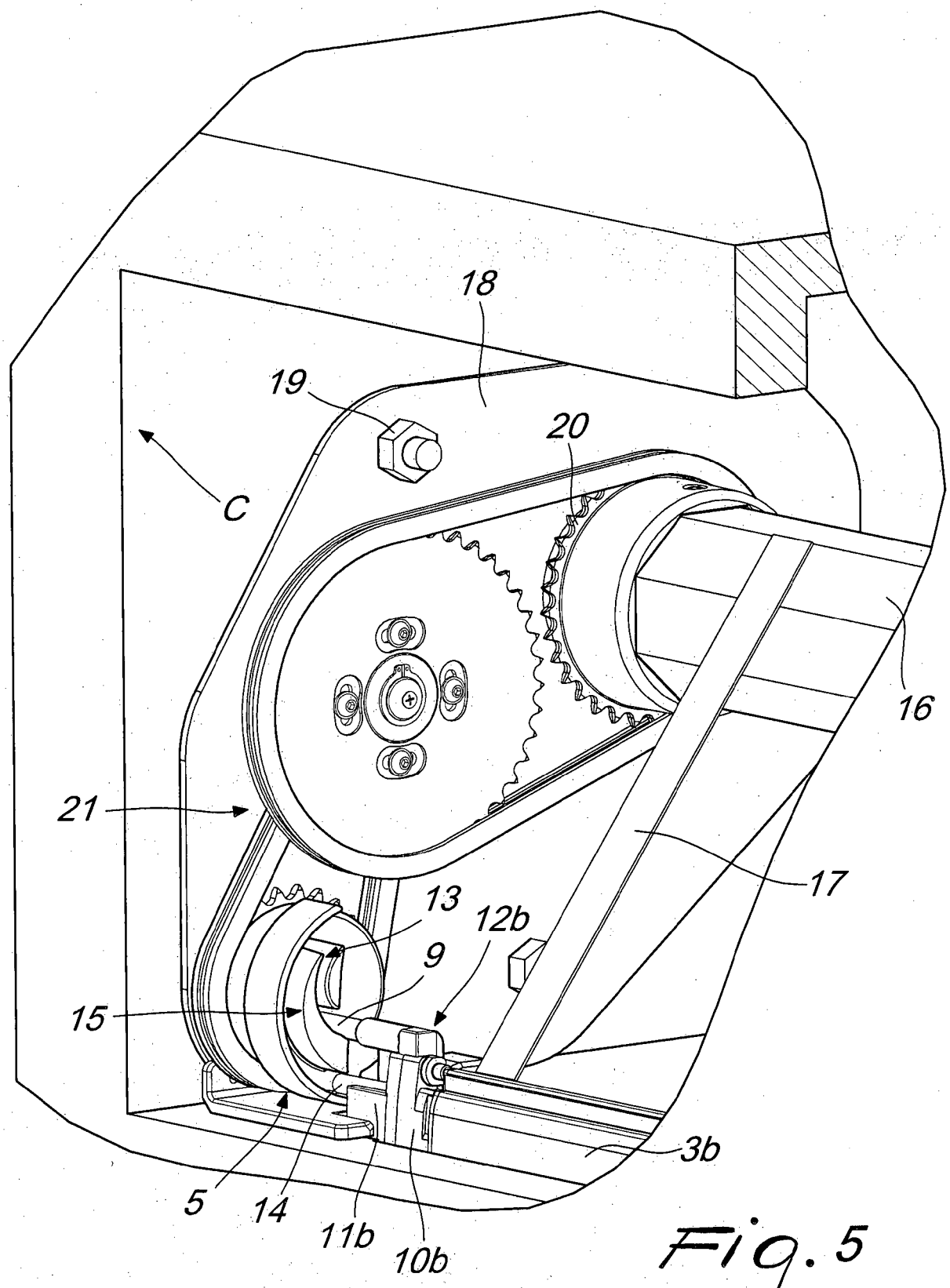


Fig. 5

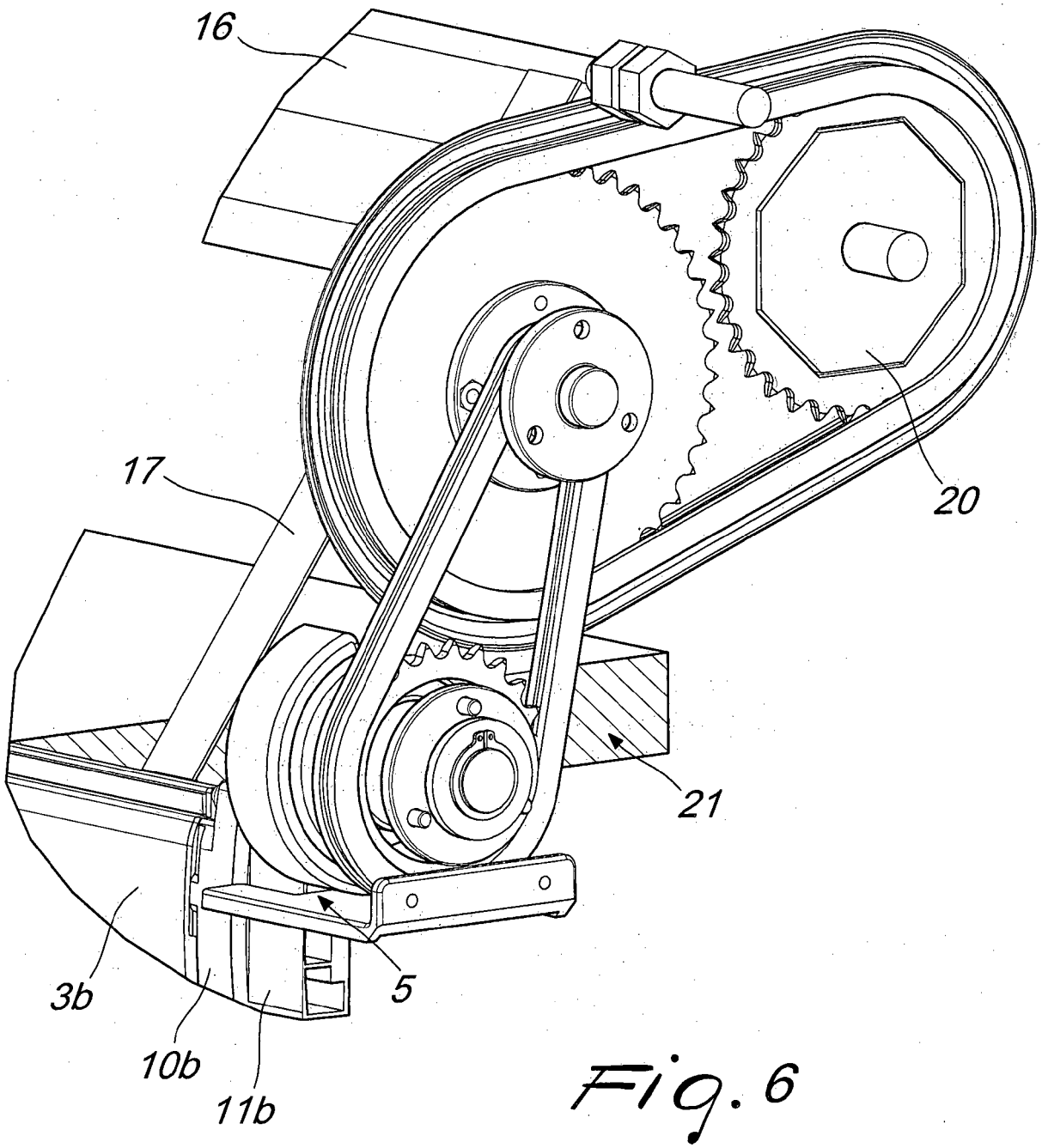


Fig. 6

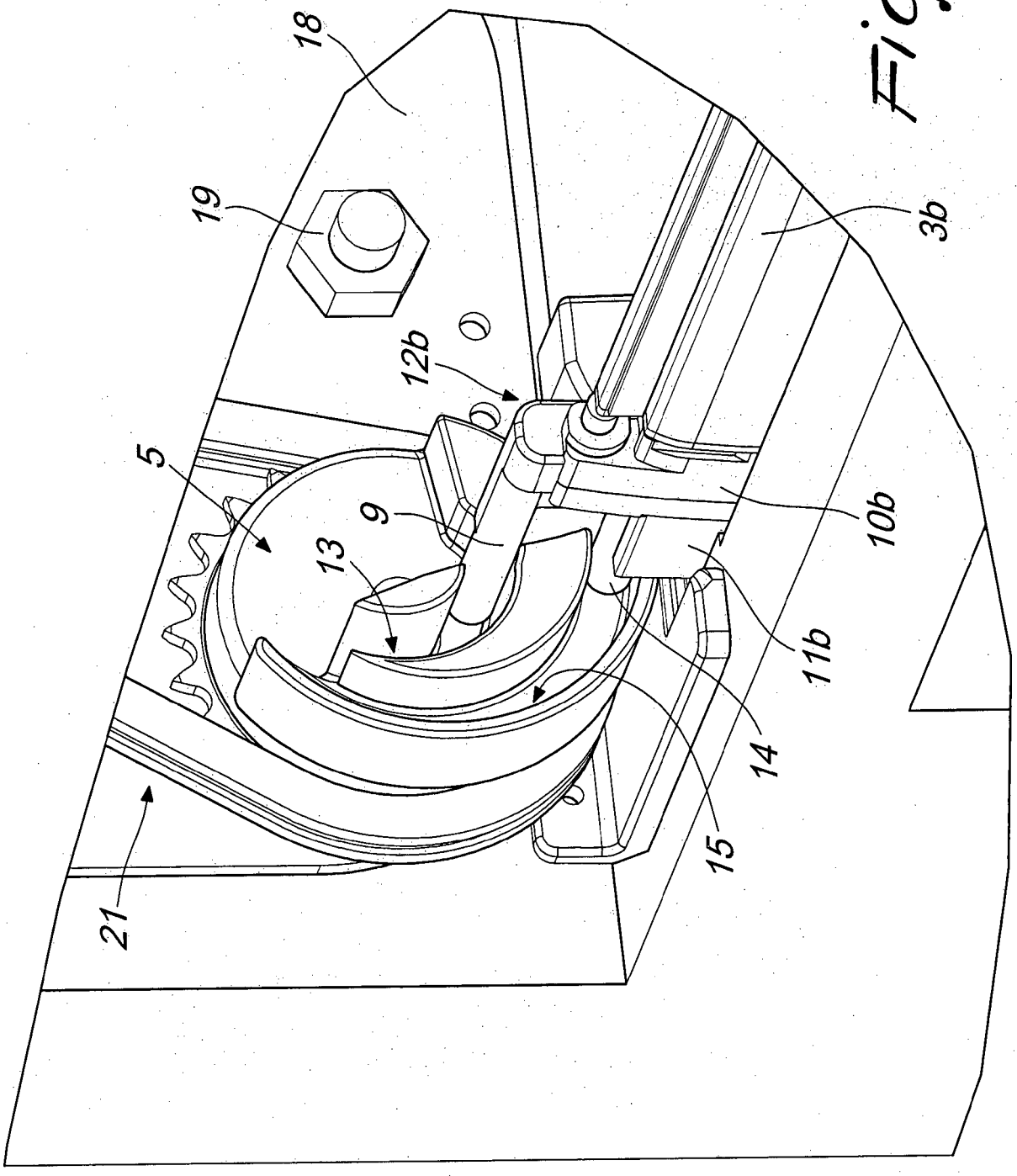


Fig. 7

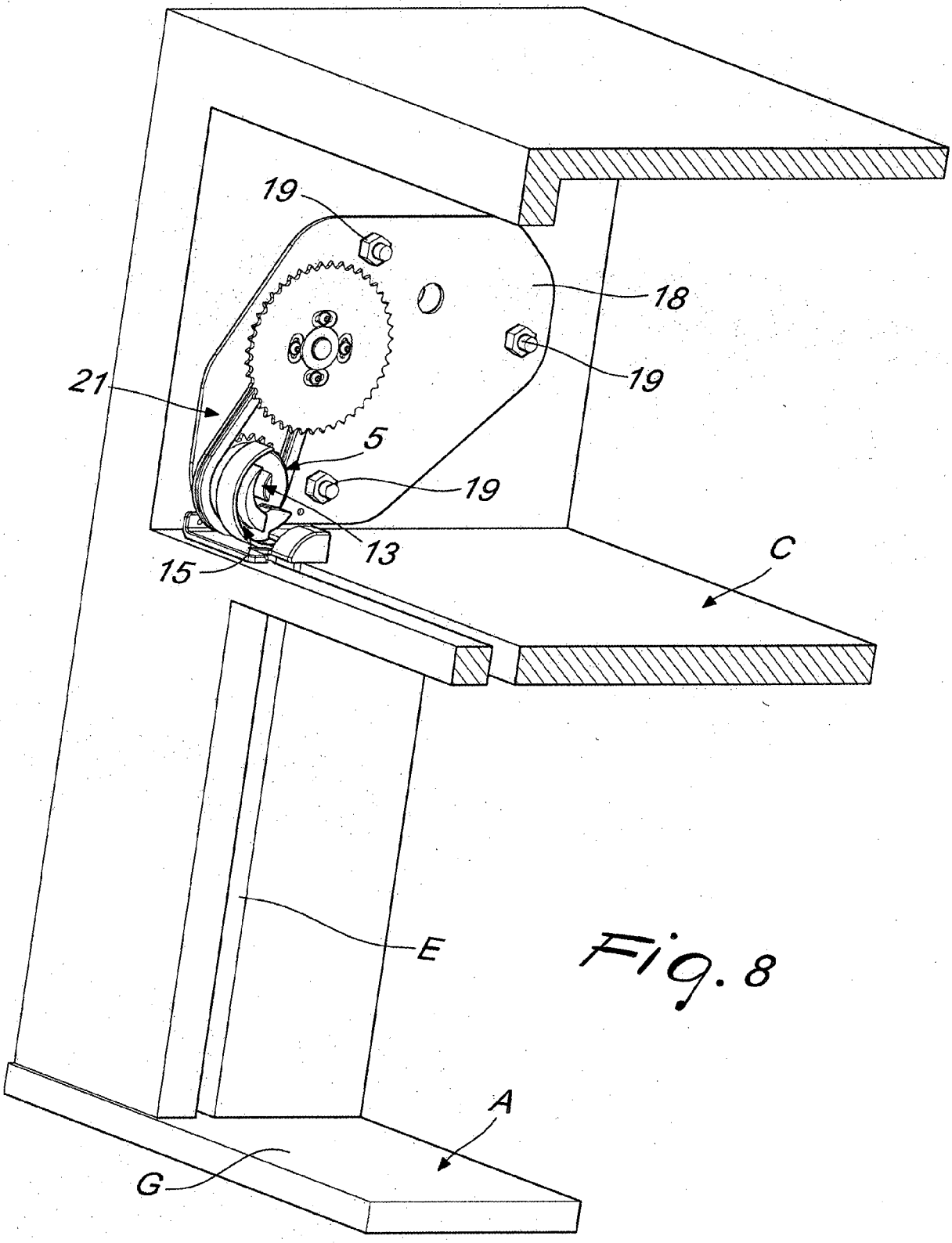
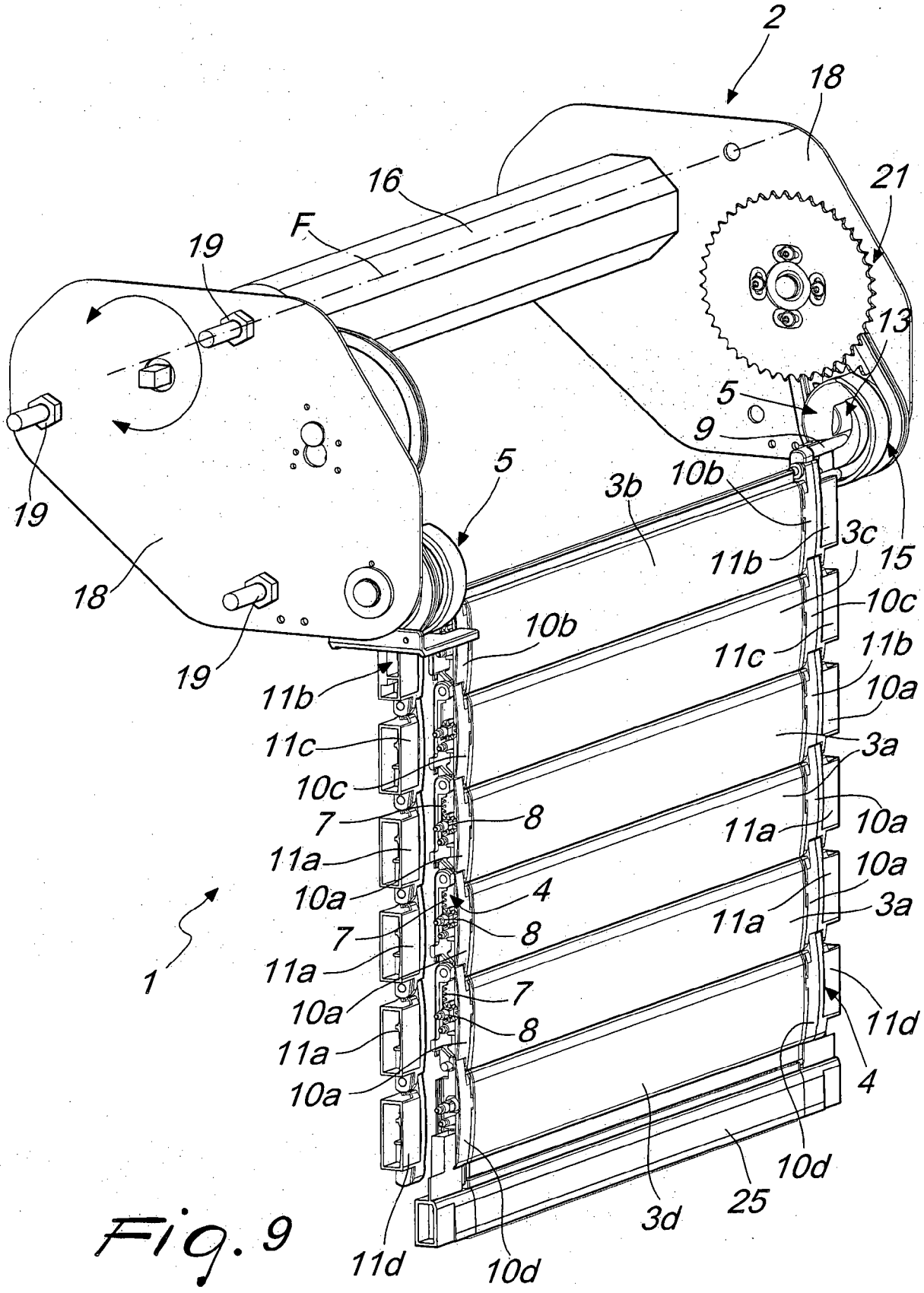


Fig. 8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F
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11b
19
10a
11b
3a
11c
10c
7
8
11a
10a
11a
10a
4
7
8
11a
3a
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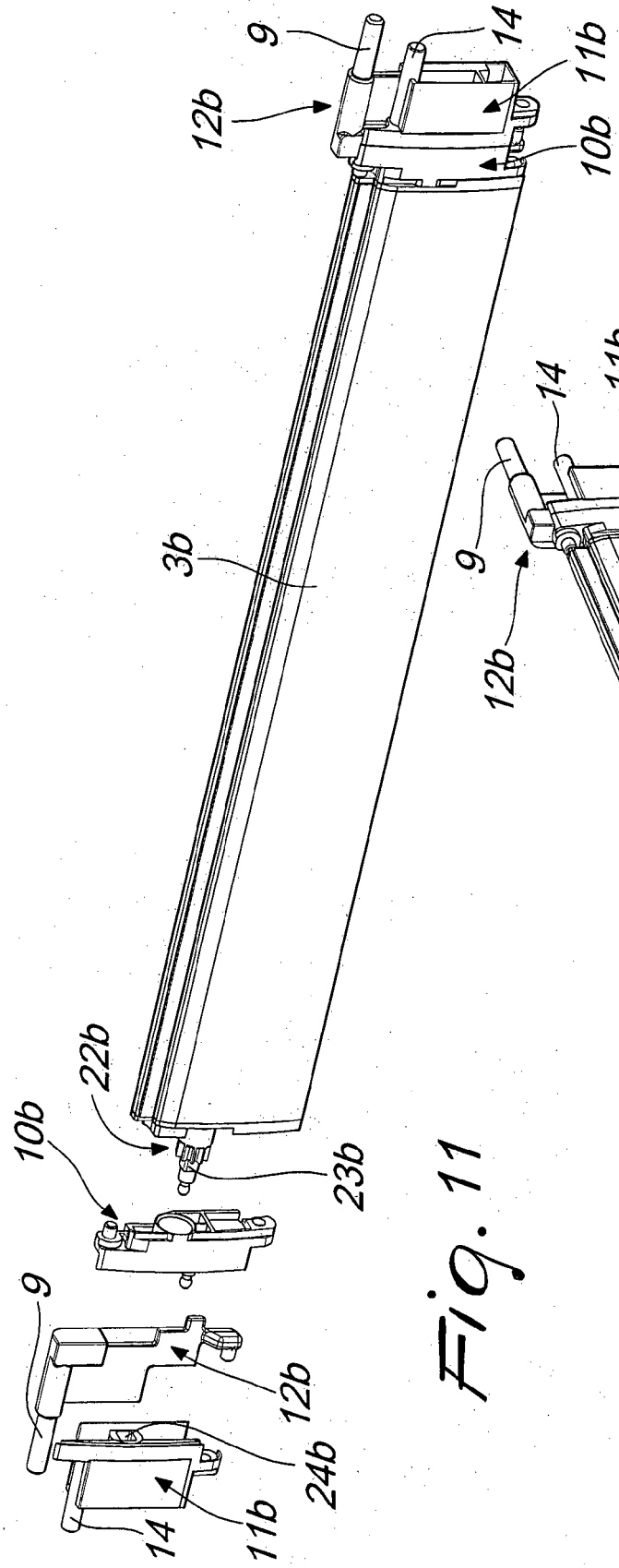
7
10a
8
11d
11a
4
10a
10d
3d
25
11d
10d

Fig. 9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3b
22b
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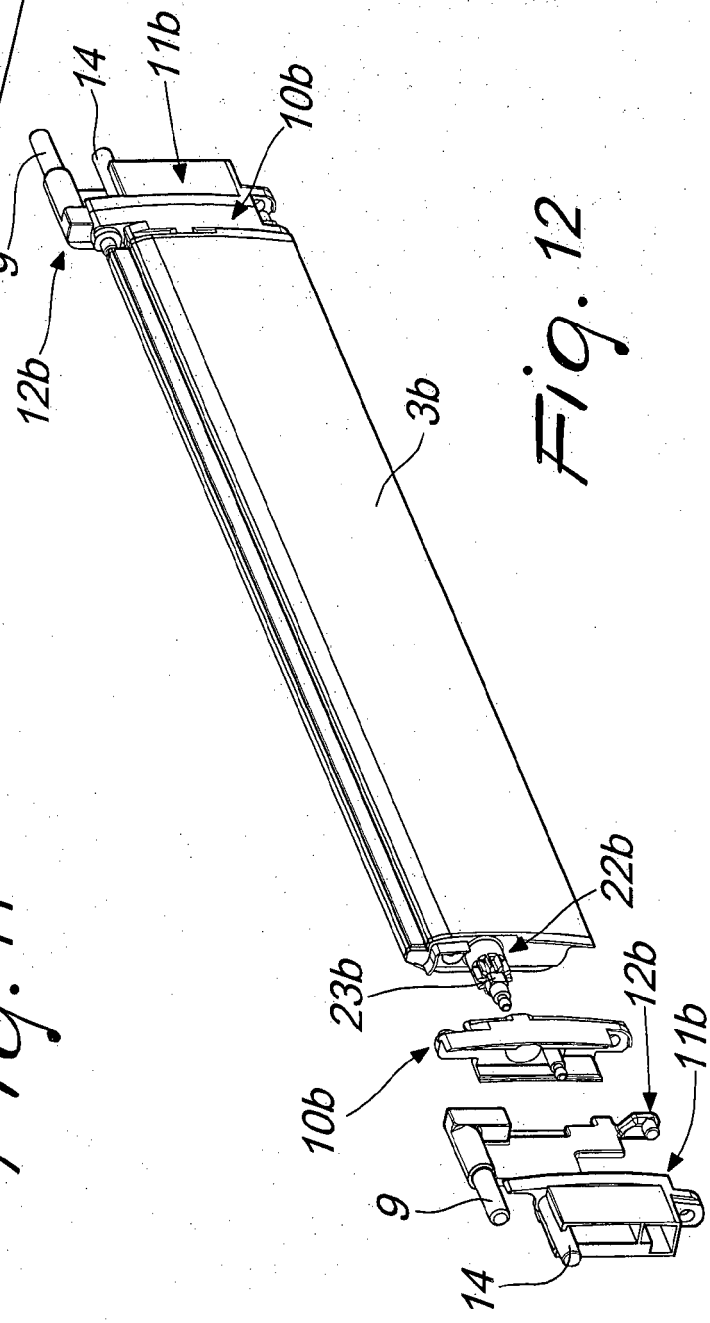
23b
9
12b
24b
14
11b

Fig. 11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12b
3b
22b
23b
12b
11b
10b
9
14

Fig. 12

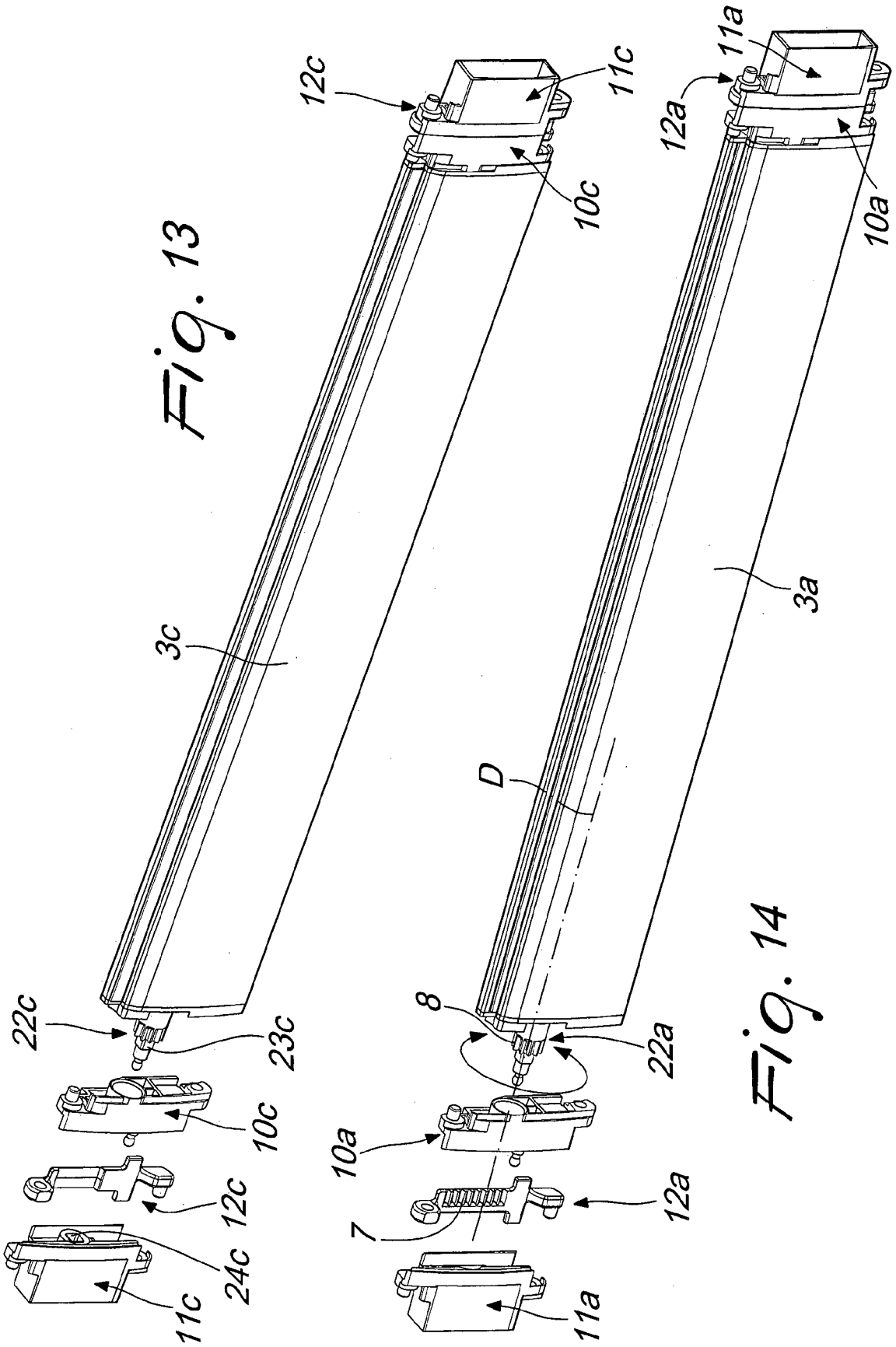
12c
11c
10c
3c
22c
23c
10c
12c
24c
11c

Fig. 13

11a
12a
10a
3a
D
8
22a
10a
12a
7
11a

Fig. 14

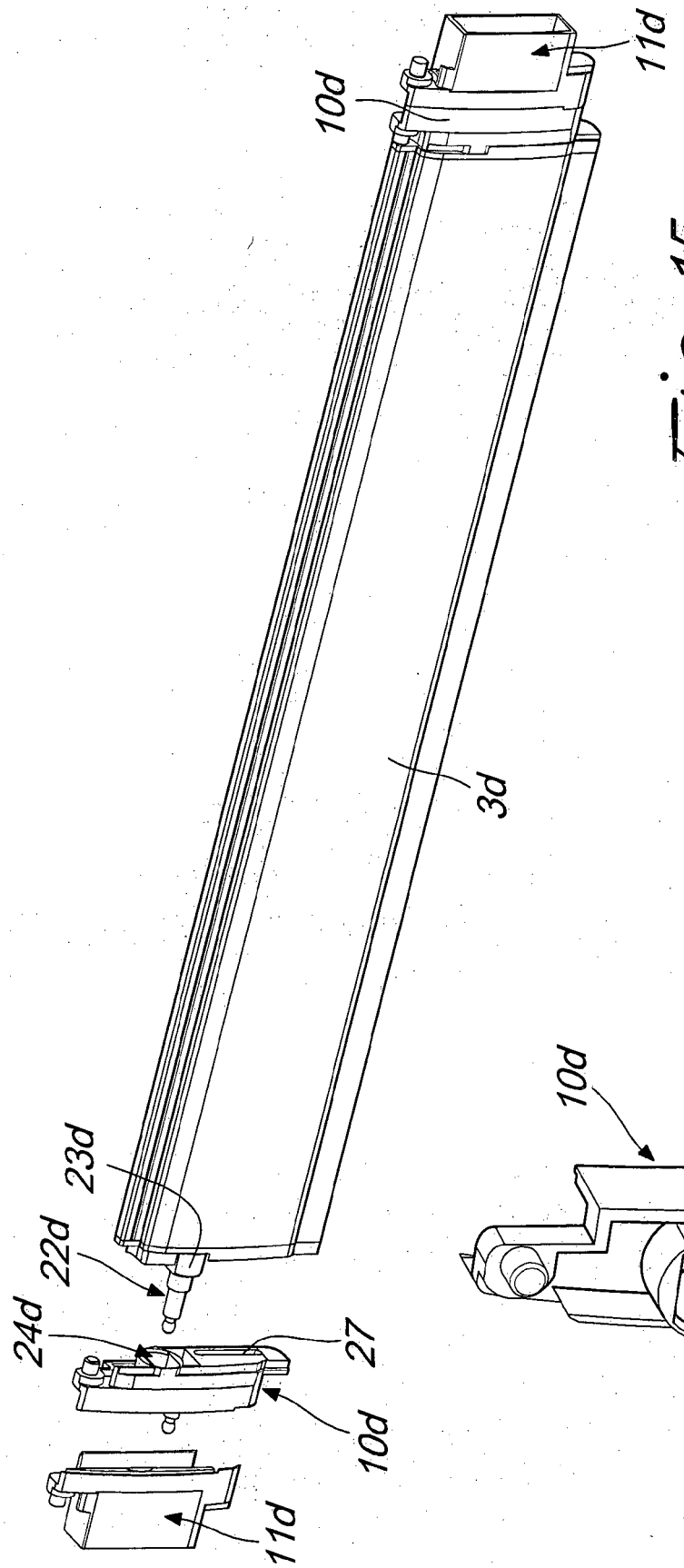

Fig. 15

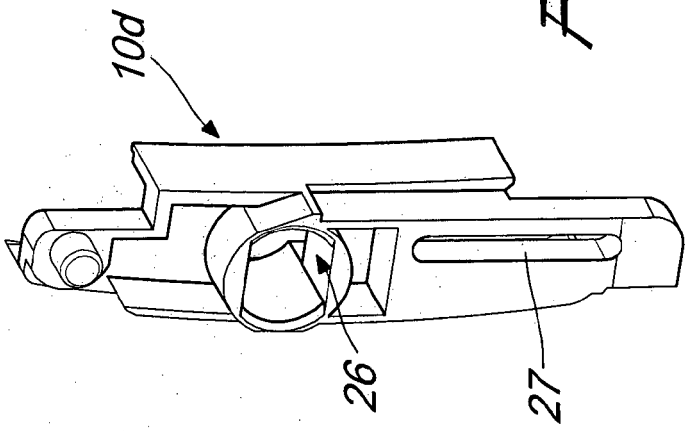

Fig. 16

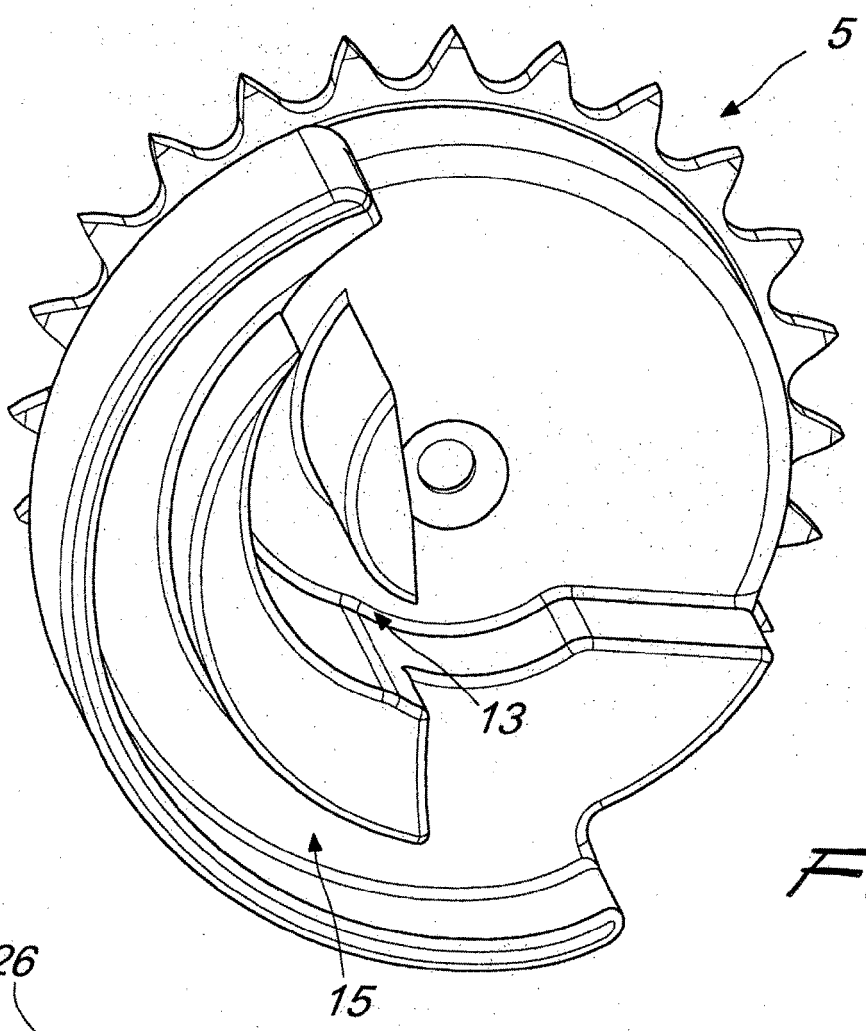

Fig. 10

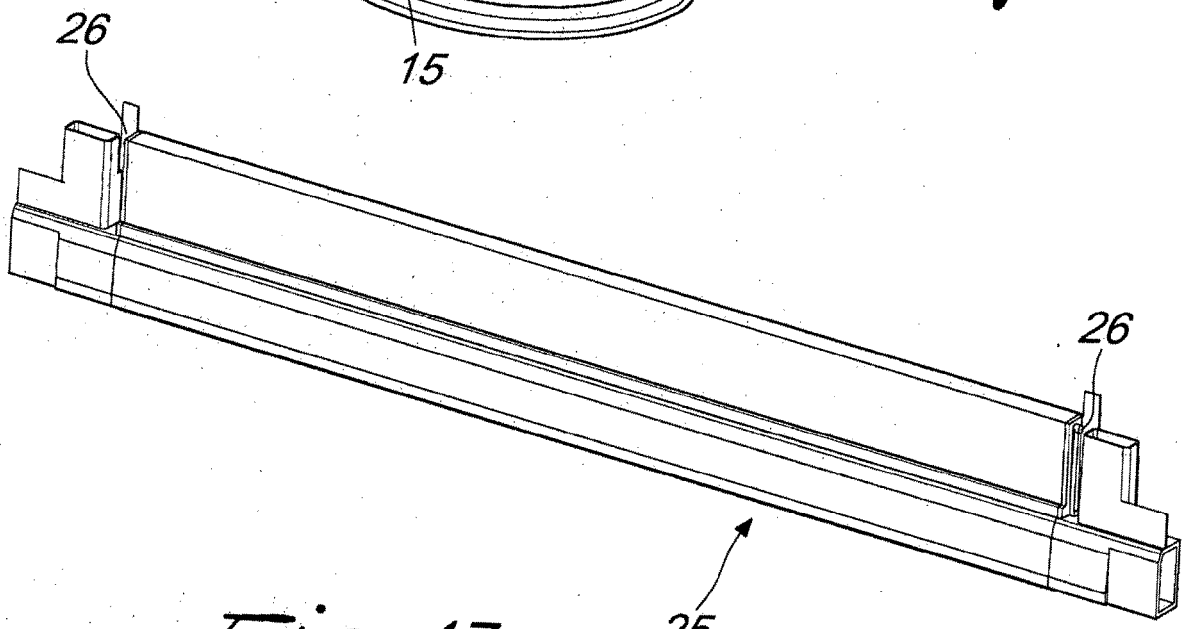

Fig. 17

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EUROPEAN SEARCH REPORT

Application Number
EP 16 42 5010

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	DE 198 42 502 A1 (FENNEL GMBH [DE]) 25 May 2000 (2000-05-25) * column 2, line 26 - column 3, line 38; figures 1-4 *	1,4 2,3,5,6, 9,10	INV. E06B9/34
Y	WO 2012/065917 A1 (LUXE PERFIL S L [ES]; MENGUAL MENGUAL JOAQUIN [ES]) 24 May 2012 (2012-05-24) * page 3, line 20 - page 6, line 5; figures 1-7 *	2,3,5,6, 10	
Y	EP 2 722 475 A1 (TEKNALSYSTEM S R L [IT]) 23 April 2014 (2014-04-23) * paragraph [0061] - paragraph [0062] *	9	
			TECHNICAL FIELDS SEARCHED (IPC) E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 August 2016	Knerr, Gerhard

CATEGORY OF CITED DOCUMENTS

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19-08-2016

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		WO 2012065917 A1	24-05-2012
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		PT 2722475 E	14-10-2015

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