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(54) Roller shutter with tilting slats

(57) A roller shutter (20) with tilting slats, comprising a fixed frame (21) fitted with sliding guide elements for the shutter curtain comprising slats (24) with two closing plugs (25) inserted in its ends, wherein the fixed frame (21) is fitted with two guide channels (23) in which moving mechanism components (48) run in the vertical and angular direction of the slats (24), wherein said mechanism comprises links (49) joined to each other by hinge ele-

ments, wherein the links (49) act on the mechanism for automatically and simultaneously moving each plug (25) in the vertical and angular directions of the slats (24), and having a lock element (39) fixed inside the guide channel (23) which prevents the slats (24) from rotating during opening, wherein said shutter further comprises an end profile (55) having a "U" shape in which the last lower non-tilting slat (56) of the shutter curtain is inserted.

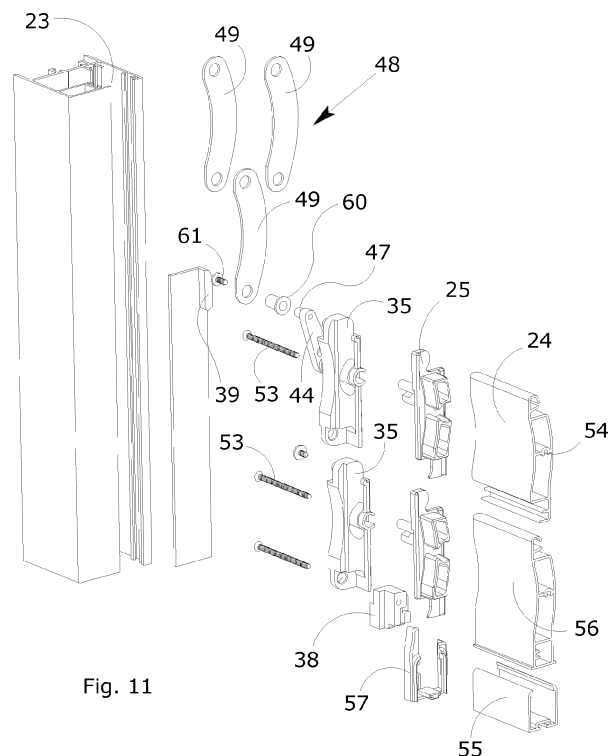


Fig. 11

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Description

TECHNICAL FIELD

[0001] The present invention relates to a roller shutter with tilting slats which can be inserted in openings, even large ones, in domestic, commercial or industrial premises.

[0002] In particular the present invention refers to a roller shutter, advantageously comprising metallic slats, which has a structure and a mechanism for tilting the slats in addition to rolling up or rolling down the shutter curtain like a traditional roller blind, using only an electric motor and/or mechanical devices able to rotate the roller tube of the shutter curtain.

[0003] The roller shutter with tilting slats according to the invention comprises a fixed supporting frame comprising two guide channels shaped to enable the vertical sliding of a roller curtain comprising a plurality of slats which can be tilted simultaneously by a mechanism operated by the roller tube. The roller tube is attached to the masonry structure above the opening where the roller shutter is inserted and is connected by a drive mechanism to a source of rotary power which rotates the roller and thereby enables rolling and unrolling of the shutter curtain on the roller tube.

[0004] The present invention can be employed in the industrial sector which produces door and window frames, roller blinds and roller shutters for use in homes or more generally in the commercial and industrial sectors.

BACKGROUND ART

[0005] The known types of roller shutter comprise a mobile structure supporting the slats, a rotor for winding the structure with its slats, a fixed frame fitted with supports for the rotor and guides in which the shutter curtain slides during raising and lowering.

[0006] In the interests of security and to prevent burglaries and intrusions, the slats are preferably made from a metal such as aluminium for example. This makes the complete shutter curtain heavy with the results that a source of motive power is needed to wind the shutter curtain onto the rotor and to control its movement during unwinding.

[0007] The source of motive power usually consists of an electric motor inserted in the roller tube and fixed to it. The motor is operated and controlled from a pushbutton panel, an infra-red remote controller or a radio control.

[0008] An alternative source of motive power is a mechanical device such as linkage rods with ball joint heads or equivalent solutions used to rotate the winding roller.

[0009] Up until the present time, the most common characteristic of roller shutters and the source of their problems has been the way that the slats are tilted. Preferably the slats have been oriented by mechanical devices with mechanisms which are connected to sources

of power other than the motor used to wind the shutter curtain.

[0010] The patent EP0687793 describes a known type and describes how each slat has side elements which have the twin functions of cooperating with the slats during raising of the curtain and rotating the slats themselves.

[0011] The first function, raising, is performed by a pair of hooking elements which cooperate with the hooking elements on the slats and which connect the individual slats to each other vertically when they move in the vertical direction during raising and lowering of the shutter curtain.

[0012] The second function, rotation, is performed by a flat element fixed to the slats and positioned at both ends of the slats and where this flat element has an axis of rotation aligned with the longitudinal axis of the slats. This flat element is linked to a rotor whose axis is ideally aligned with the axis of rotation of the slats and which is inserted in a fixed support fitted with spacers at whose ends the rotors are positioned with a fixed and ideally constant pitch in relation to each other.

[0013] This rotor is fitted with an angled arm which is mechanically connected to a mechanical device for moving all the rotors thereby simultaneously tilting all the slats to the same angle.

[0014] In addition to the high costs of production due to the large number of components and the complexity of the related assembly process, the major drawback to this solution is created by the unavoidable dimensional tolerances of the single components. These tolerances create an amount of play between the components which results in misalignment between the axis of rotation of the slats and the axis of rotation of the rotors which should in theory be aligned with each other.

[0015] As a consequence, it is necessary to eliminate all these misalignments before the slats can be rotated. This requires a notable amount of energy to move the slats vertically in relation to the rotors.

[0016] All the energy needed must be provided by the gear motors which drive the rotors. However, with medium- to large-size shutter curtains these gear motors cannot deliver the power needed to close the slats completely. In these circumstances the slats cannot hook to each other with the result that during raising of the curtain the weight is not supported by the hooking elements on the slats but is supported exclusively by the side hooking elements whose original design purpose was only to share part of the work of supporting the weight of the curtain. This improperly overloads the side hooking elements which can collapse and then break the shutter curtain in the position of the hooking elements which have failed.

[0017] A partial solution to the evident limits of the patent described above can be found in the patent for an industrial invention no. VR2002A000044 deposited by the same applicant and which describes a mechanism for tilting the slats which operates without linking ele-

ments to maintain the pitch between the slats.

[0018] This patent also has some evident shortcomings which will now be described.

[0019] The transfer of motive power from the powered winding roller to the mechanism for tilting the slats is performed by an epicycloidal gearbox, a costly device, activated by a solenoid valve or equivalent electromechanical device which mechanically connects and disconnects it with the powered winding roller.

[0020] A critical factor is to guarantee that all the weight of the shutter curtain is, ideally, supported by the slats and that in order to do this all the slats should close perfectly with all the slats engaging with each other.

[0021] In the event that for whatever reason one of the slats does not close perfectly, all the weight of the shutter curtain below this slat will come to bear on the accessory components forming part of the slat rotation mechanism. However, these components are not designed to support vertical stresses such as the weight of the shutter curtain.

[0022] A further technical solution for a roller shutter with tilting slats is that described in the patent application no. MT2009A000001 by Benedetto Nicola.

[0023] The roller shutter described in this patent is **characterised in that** the tilting movement of the slats does not require any moving mechanism but rather to open a slat it employs the weight of the slats above that slat alone.

[0024] The first drawback of this principle for opening slats derives from the fact that the upper slats may not open because of the modest leverage provided by the weight and the low weight of the few slats above the slat to be opened.

[0025] Here we will only describe some of the more obvious drawbacks of this solution.

[0026] The first limitation concerns the fact that the slats do not tilt simultaneously but only one at a time in succession starting with the lower slats and working a slat at a time towards the upper slats. This solution therefore gives priority to the entry of light and air at the lower part of the shutter curtain thus going against the consolidated practice which gives priority to permitting the greater entry of light at the top.

[0027] A further negative aspect concerns the fact that the maximum opening angle of the slats is very limited being restricted to approximately 45°.

[0028] It should also be noted that the passage of the slats from the closed position to the fully open position takes place in one step without any intermediate tilting position.

[0029] A further shortcoming consists of the fact that when the shutter curtain is fully lowered and with the slats in the closed position a person working from the outside only has to apply a small amount of force to the zone below the slats to start rotating the shutter upwards towards the open position. This solution is therefore not secure. Also not to be overlooked is the fact that the stresses mentioned previously can also be caused by atmospheric events such as high winds. High winds also

cause the slats to vibrate and therefore create annoying vibrations and unnecessary noise.

[0030] It should also be considered that the entire weight of the shutter curtain has to be supported by the extruded aluminium stop strip on the last upper slat and in particular by the two small projections. It is clear that these projections have a limited capacity to resist shear stresses and that this shutter curtain cannot therefore be used on medium- to large-size roller shutters.

[0031] An overall examination of the shutter curtain and the guide profile geometry shows that this product has a limited efficiency in preventing the ingress of light.

[0032] Lastly, the patent MO97A000208 of DI.BI. PORTE BLINDATE S.r.l. also describes a system for raising and closing of roller shutter curtains where the opening angle of the single slats comprising the shutter curtain can be varied. The operating means for doing this are mechanically connected to the winding roller and comprise two or more strips of harmonic steel or other flexible material designed to support the entire weight of the shutter curtain and connected to all the slats. In practice, this solution repeats the known technology applied to the operation of Venetian blinds.

[0033] The principle drawback of this system is that these strips are positioned on the inside of the shutter curtain and are clearly visible during all stages of shutter operation. This harms the attractiveness of the shutter because the strips themselves are not of an attractive appearance.

DESCRIPTION OF THE INVENTION

[0034] The present invention provides a roller shutter with tilting slats which makes it possible to eliminate or at least reduce the drawbacks described above.

[0035] The present invention also proposes a roller shutter which is simple to manufacture, has a small number of components and is therefore cost-effective to produce.

[0036] This is achieved by means of a roller shutter with tilting slats with the features described in the main claim.

[0037] The dependent claims describe advantageous embodiments of the invention.

[0038] The roller shutter with tilting slats according to the invention comprises a fixed supporting frame comprising two guide channels shaped to enable the vertical sliding of a roller curtain itself comprising a plurality of slats which can be tilted simultaneously by a mechanism operated by the roller tube. The roller tube is attached to the masonry structure above the opening where the roller shutter is inserted and is connected by a drive mechanism to a source of rotary power which rotates the roller and thereby enables winding and unwinding of the roller curtain on the roller tube.

[0039] Two chains positioned at the opposite ends of the slats enable simultaneous movement of the slats in the vertical direction during winding and unwinding of the

shutter curtain. These chains comprise components connected to each other with hinges and where each component has a hole inside which a pin rotates and where this pin is connected to an end plug which is fixed on the end of each slat so as to enable tilting of the slats.

[0040] The pin is fixed to the plug inserted in the ends of the slats and on the side opposite to the plug has a suitably shaped seat which is solidly attached to an arm which has a circular element which acts on another element, preferably metallic, which forms a link of the mechanism for tilting the slats.

[0041] This mechanism, consisting of links hinged to each other, is mechanically connected permanently to the rotor tube. When the shutter curtain is fully lowered, when the rotor rotates in the curtain unwinding direction, the mechanism is moved and in turn transmits the motion to the arms and from these to the pins fixed to the plugs fixed to the slats which then begin to rotate to the open position rotating to a maximum angle of over 90°. When the rotor rotates in the winding direction, the slats rotate in the opposite direction to previously until they are completely closed.

DESCRIPTION OF THE DRAWINGS

[0042] Other features and advantages of the invention will become clear on reading the description given below of one embodiment, provided as a non-binding example, with the help of the accompanying drawings, in which:

- Figure 1 is a perspective view of the roller shutter according to the present invention with the slats closed;
- Figure 2 is a perspective view of the roller shutter according to the present invention with the slats open
- Figure 3 is a side view of the roller shutter with the slats closed;
- Figure 4 is a plan view of the present invention;
- Figure 5 is an exploded view showing all the components of the roller shutter according to the present invention;
- Figures 6 to 10 are detailed views of the components comprising the roller shutter;
- Figure 11 is an exploded view of the roller shutter showing the lower end section and the security system;
- Figure 12 shows the special chain which connects the roller to the components operating shutter movements.

DESCRIPTION OF ONE EMBODIMENT OF THE INVENTION

[0043] In the annexed figures and in particular in Figure 1, the number 20 refers generally to a roller shutter and in particular to a roller shutter with tilting slats.

[0044] The roller shutter 20 comprises a fixed frame 21 comprising two guide channels 23 each having sliding

guide elements for the shutter curtain.

[0045] Figure 5 shows the shutter curtain consisting of slats 24 with two closing elements 25 inserted into the ends.

5 **[0046]** Figure 6 shows that each closing element 25 has, on the slat side, projecting elements 26 which are inserted into corresponding cavities 27 of the slat 24 (in Figure 7) and a support seat 28 of the slat defined on the perimeter by raised surfaces 29 raised with respect to the support seat and having a geometry which matches the external geometry of the slat so as to create an effective link between the closing element and the slat which is without any play.

10 **[0047]** On the side opposite to the slat, each plug 25 has a first pin 30 around which the plug rotates, and a second pin 31 which acts together with the first pin to transmit the rotary motion of the moving mechanism to the plug and to the slat joined to the plug.

15 **[0048]** On the same side there is a circular groove 32 and two projections 33 and 34 which when the slats are closed have the function of preventing the ingress of light. They do this by stopping against the elements present on the support component described below and by closing the spaces created at the rotation pin.

20 **[0049]** Figures 5, 8 and 11 shows that the structure of the shutter curtain has, alongside the slat plugs, support components 35 which have a passing hole 36 in which the pin 30 of the slat plug 25 is inserted and a passing semi-circular slot 37 which is wide enough to permit the complete rotation of the second pin 31 of the slat plug 25 in the tilting movement of the plug and its slat.

25 **[0050]** Figure 8a shows that the support components 35 have elements, located to the side of the slat plug 25, designed to protect against the ingress of light and comprising two projections 38 and 39 which, when the slats are closed, stop against the corresponding projections 33 and 34 present on the slat plug 25 and a semi-circular projection 40 (Figure 8) which is inserted in the circular groove 32 of the slat plug.

30 **[0051]** The support components 35 are connected to each other with hinged links thereby comprising a true and proper chain, each present on the opposing ends of the slats, so as to connect all the slats to each other and thereby create the shutter curtain structure.

35 **[0052]** The hinged connections between the various components comprise a pin 41 located on the upper part of the support 35 which is inserted in a hole 42 located on the lower part of the support. A screw 43 inserted in the hole in the pin 41 prevents the various supports from detaching from each other.

40 **[0053]** Each individual structural component of the shutter curtain is completed by an arm 44, shown in Figure 9, which is inserted on the two pins 30 and 31 of the slat plug 25 from the opposite side of the slat and after insertion of the slat plug in the chain support 35.

45 **[0054]** In particular the arm 44 has a recess 45 designed and suitably shaped to provide a seat for the end part of the pin 30 of the slat plug 25 which has a shape

complementary to the recess. The second pin 31 of the slat plug 25 is seated in the circular seat 46 located on the same side as the recess 45 and which acts together with the rotation pin 31 to transmit rotary motion to the slat plug 25 and to the slat 24 to which it is connected.

[0055] On the other end and on the opposite side of the arm 44 to the shaped recess 45 there is a drilled pin 47 which is inserted in a corresponding hole of a component of the moving mechanism indicated in its entirety as 48 and described below.

[0056] The moving mechanism 48 (Figures 5 and 10) comprises links 49, preferably metallic, connected to each other by hinged elements.

[0057] In particular, the individual links 49 are connected to each other by inserting the pin 47 of the arms 44. This insertion is made possible by the presence of holes 50 on the ends of each link 49 and the links are then fastened by a screw 51 which prevents the individual links from detaching from each other and from the pin 47 in turn which is fitted with a metallic bush 52 provided in order to prevent any wear of the pin 47 resulting from rotation of the metallic links 49.

[0058] The mechanism described is mechanically connected to the roller tube (not shown) and fastened there by special terminal links 49' (Figure 12) which have components fixed to the roller tube (not shown).

[0059] It should be noted that the links 49 of the mechanism and the special terminal links 49' are made from metallic materials and have been designed and calculated to alone support the entire weight of the entire shutter curtain and to withstand any mechanical stresses which may occur during the various movements of the shutter curtain.

[0060] The special terminal links (not shown), preferably metallic, have shapes and link elements which are able to transform the rotary motion of the roller tube into a traversing motion of the moving mechanism 48 which in turn transmits the movement to all the arms 44 and simultaneously rotates all the slat plugs 25 and related slats 24 of the shutter curtain.

[0061] The shutter curtain comprises slats 24, slat plugs 25, support components 35 forming the chain, arms 44 and the moving mechanism 48 so that the shutter curtain can be rolled and unrolled on the roller tube (not shown) which in turn is connected to any energy source such as an electric motor (not shown) or a mechanical device such as drive pulleys and crank mechanisms (not shown) widely available on the market.

[0062] In cases where an electric motor is used, the electric motor can be controlled from the standard push-button panel and also from electronic remote controls, infra-red remote controls or radio controls. All these devices can control the raising and lowering of the shutter curtain and the angle of the slats.

[0063] Lowering and raising of the shutter operates in exactly the same way as with traditional roller shutters. With the slats closed, the shutter curtain complete with all its components described above is wound onto and

wound off the roller tube.

[0064] The tilting function of the shutter can only be operated when the shutter curtain is completely lowered and the slats 24 are closed. In this situation a rotation of the roller in the unwinding direction will start the mechanism 48 mechanically connected to the roller which simultaneously moves all the arms 44, the slat plugs 25 fixed to these and lastly, the slats 24 with slat plugs 25 fixed to their ends. By rotating the roller it is possible to block the slats at any intermediate opening angle up to a maximum angle of approximately 120°.

[0065] With the slats 24 in the open position, rotating the roller in the winding direction has the effect of winding the terminal links of the moving mechanism onto the roller to start a movement in the opposite direction to that described above of the mechanism 48, the arms 44, the slat plugs 25 fixed to these and the related slats 24. All these components rotate until they reach their closed positions. The shutter curtain can now be raised as required.

[0066] The present invention also introduces devices designed to provide a greater degree of security and protection against intrusion in comparison with products considered to be state-of-the-art.

[0067] In order to increase security and protection against intrusion the invention creates a more efficient system for locking the slats to their plugs. This locking system comprises a screw 53 (Figure 11) inserted in the hole present in the pin 30 of the slat plug 24. The screw 53 is to be inserted in the hole 54 provided in each slat 24 is of the self-tapping type. When it is screwed in it taps the thread of the hole 54, thereby fixing the hole to the plug 24 and creating a fastening very similar to an interlocking joint. This will reduce any deformation created by attempts at intrusion when the curtain is closed and any deformation caused by the weight of the slats when they are in the open position and in particular in the horizontal position.

[0068] The present invention also provides for the use of an end profile 55 (Figure 11) needed to actuate the locking device which prevents the slats 24 from being forcibly rotated into the open position by the wind or other factors, when the shutter curtain is fully lowered and the slats are in the closed position.

[0069] The end profile 55 has a "U" shape and inside can contain the last lower slat 56 of the shutter curtain which is non-tilting and has a different shape from the tilting slats 24.

[0070] The two ends of the end profile 55 have a plug 57 whose function is to close and support the profile. The plug 57 also has an opening which enables vertical sliding with respect to the additional plug 38 together with the end profile 55 which runs vertically with respect to the last lower non-tilting slat 56.

[0071] In order to ensure efficient operation of the locking system which prevents rotation of the slats when they are in their closed position, when the curtain is in the lowered position, the lower non-tilting slat 56 is inserted in the end profile 55 for a minimum length which is not

greater than approximately 10 mm.

[0072] In this situation, the first lower tilting slat cannot rotate to the open position because there is a lock element 39 fixed inside the guide channel 23 in a position corresponding to a projecting element 60 locked in position by a screw 61 at the end of the pin 47 of the arm 44 on which the first lower link 49 of the moving mechanism 48 hinges.

[0073] Given that all the tilting slats 24 are attached to the arms 44 which in turn are connected to the moving mechanism 48, when one of the slats is prevented from rotating all the remaining slats will also be prevented from rotating.

[0074] When the last lower non-tilting slat 56 is further lowered inside the end closing profile 55, the entire shutter curtain will travel downwards by the same amount and the projecting element 60 will pass over the lock element 39 thereby enabling the arm 44 to rotate and the moving mechanism 48 to rotate the remaining slats.

[0075] In order to lock slat rotation when the slats are in the closed position, it is necessary for the last lower non-tilting slat 56 to return to its initial position with respect to the lower end profile 55 thereby reproducing the slat rotation locking system described previously.

[0076] The system for locking the first lower tilting slat 56 can also be used for all the tilting slats so as to increase the degree of resistance of the shutter curtain to any attempts at intrusion.

[0077] The invention as described above refers to a preferred embodiment.

[0078] It is nevertheless clear that the invention is susceptible to numerous variations which lie within the framework of technical equivalents.

[0079] For example, other solutions are possible which do not alter the functions of the product but which use profiles made from other materials such as aluminium, steel, press bent metal, profile section, plastic or wood.

Claims

1. A roller shutter (20) with tilting slats, comprising a fixed frame (21) fitted with sliding guide elements for the shutter curtain comprising slats (24) with closing plugs (25) inserted in the ends, and where the roller shutter is **characterised in that** the fixed frame (21) is fitted with two guide channels (23) in which the moving mechanism components (48) run in the vertical and angular direction of the slats (24), where the mechanism comprises links (49) joined to each other by hinge elements, where the links (49) act on the mechanism for automatically and simultaneously moving each plug (25) in the vertical and angular directions of the slats (24), and having a lock element (39) fixed inside the guide channel (23) which prevents the slats (24) from rotating during opening, and where the lock element (39) is fixed inside the guide channel (23) in a position corresponding to a pro-

jecting element (60) locked in position by a screw (61) at the end of the pin (47) of the arm (44) on which the first lower link (49) of the moving mechanism (48) hinges, and where the lock element (39) prevents the rotation of the slats (24) thanks to an end profile (55) and a special slat (56), and where the end profile (55) has a "U" shape in which the last lower non-tilting slat (56) of the shutter curtain is inserted and also thanks to the two ends of the profile (55) which are fitted with a plug (57) comprising an opening which enables vertical sliding with respect to the additional plug (38) together with the end profile (55) which runs vertically with respect to the last lower non-tilting slat (56), and which prevent the rotation of the last lower tilting slat and all the remaining slats mechanically connected to the mechanism (48) when the profile (56) is inserted in the upper zone of the profile (55) and permits the rotation of all the slats when the profile (56) reaches the lower part of the profile (55), thereby permitting the projecting element (60) to pass over the lock element (39).

2. The roller shutter (20) with tilting slats according to the previous claim, **characterised in that** each closing element (25) has projecting elements (26) which are inserted into corresponding cavities (27) of the slat (24) and a support seat (28) of the slat defined on the perimeter by raised surfaces (29) raised with respect to the support seat and having a geometry which matches the external geometry of the slat, and also **characterised in that**, on the side opposite to the slat, each plug (25) has a first pin (30) around which the plug rotates, and a second pin (31) which acts together with the first pin to transmit the rotary motion of the moving mechanism to the plug and to the slat joined to the plug; close to the same side there is a circular groove (32) and two projections (33, 34) which when the slats are closed have the function of preventing the ingress of light.

3. The roller shutter (20) with tilting slats according to one of the foregoing claims, **characterised in that** the structure of the shutter curtain has, alongside the slat plugs, support components (35) which have a passing hole (36) in which the pin (30) of the slat plug (25) is inserted and a passing semi-circular slot (37) which is wide enough to permit the complete rotation of the second pin (31) of the slat plug (25) in the orienting movement of the plug and its slat.

4. The roller shutter (20) with tilting slats according to one of the foregoing claims, **characterised in that** the support components (35) have, located to the side of the slat plug (25), elements designed to protect against the ingress of light and comprising two projections (38, 39) which, when the slats are closed, stop against the corresponding projections (33, 34) present on the slat plug (25) and a semi-circular pro-

jection (40) which is inserted in the circular groove (32) of the slat plug, and where the support components (35) are connected to each other with hinged links thereby comprising a true and proper chain, each present on the opposing ends of the slats, so as to connect all the slats to each other and thereby create the shutter curtain structure; the hinged links between the various components comprise a pin (41) located on the upper part of the support (35), which is inserted in a hole (42) located on the lower part of the support, a screw (43) in the hole in the pin (41) preventing the various supports from detaching from each other.

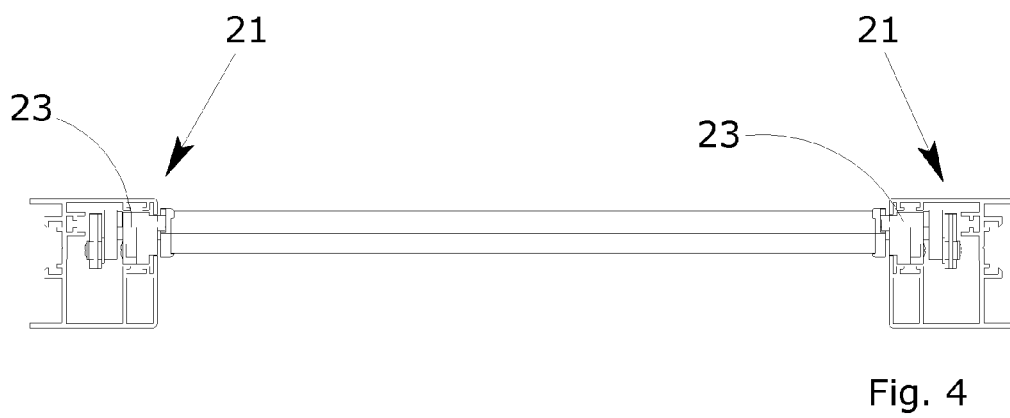
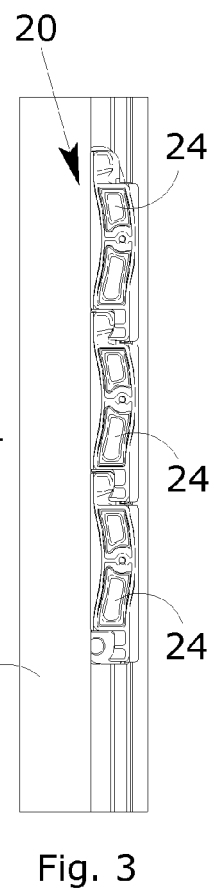
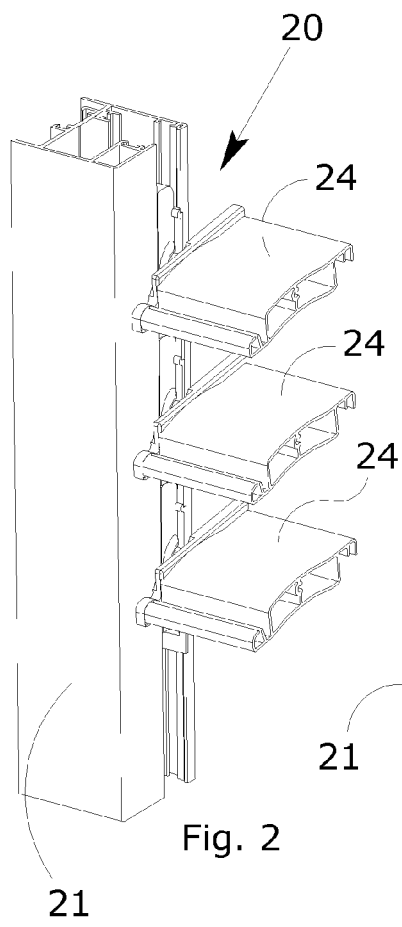
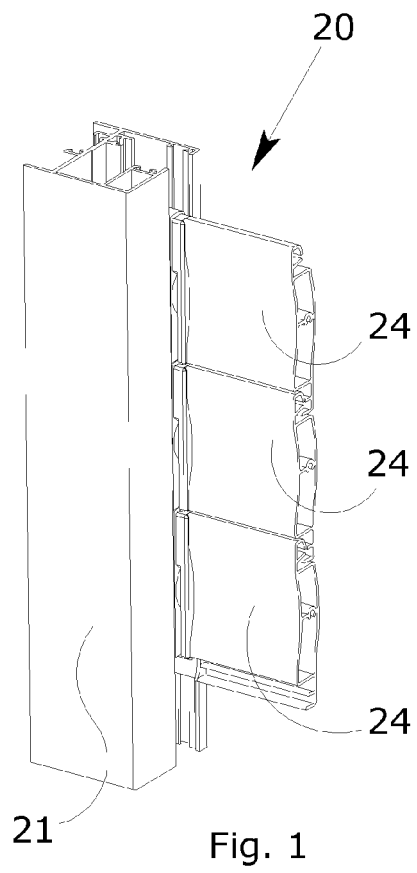
5. The roller shutter (20) with tilting slats according to one of the foregoing claims, **characterised in that** it has an arm (44) which is inserted on the two pins (30, 31) of the slat plug (25) from the opposite side of the slat and after insertion of the slat plug in the chain support (35), and where the arm (44) has a recess (45) designed and suitably shaped to provide a seat for the end part of the pin (30) of the slat plug (25) which has a shape complementary to the recess, where the second pin (31) of the slat plug (25) is seated in the circular seat (46) located on the same side as the recess (45) and which acts together with the rotation pin (31) to transmit rotary motion to the slat plug (25) and to the slat (24) to which this is connected; on the other end and on the opposite side of the arm (44) to the shaped recess (45) there is a drilled pin (47) which is inserted in a corresponding hole of a component of the moving mechanism (48) comprising links (49), preferably metallic, connected to each other by hinged elements; the individual links (49) are connected to each other by inserting the pin (47) of the arm (44) into the holes (50) on the ends of each link (49) and then fastening the links with a screw (51); the pin (47) has a metallic bush insert (52) provided in order to prevent wear of the pin (47) resulting from rotation of the metallic links (49), and where the mechanism is mechanically connected to the roller tube and fastened there by special terminal links (49') which have components fixed to the roller tube.

6. The roller shutter (20) with tilting slats according to one of the foregoing claims, **characterised in that** the links (49, 49') of the mechanism have an arched shape, that is they have shapes and link elements which are able to transform the rotary motion of the roller tube into a traversing motion of the moving mechanism (48) which in turn transmits the movement to all the arms (44) at the same time as rotating all the slat plugs (25) and related slats (24) of the shutter curtain.

7. The roller shutter (20) with tilting slats according to one of the foregoing claims, **characterised in that**

the shutter curtain comprises slats (24), slat plugs (25), support components (35) forming the chain, arms (44) and the moving mechanism (48), where the shutter curtain can be rolled and unrolled on the roller tube which in turn is connected any energy source such as an electric motor or a mechanical device such as known drive pulleys, and where there is a link between the slats (24) and the related slat plugs (25) comprising a screw (53) inserted in the hole of the pin (30) of the slat plug (24).

8. The roller shutter (20) with tilting slats according to one of the foregoing claims, **characterised in that** the use of an end profile (55) is necessary, together with other components, to prevent the slats (24) from rotating to the open position when the shutter curtain is fully lowered and with the slats in the closed position, and where the end profile (55) has a "U" shape, and inside can contain the last lower slat (56), which is non-tilting and has a different shape from the tilting slats (24), and where the two ends of the end profile (55) are fitted with a plug (57) which has an opening which allows it to run vertically with respect to the additional plug (38) together with the end profile (55) which runs vertically with respect to the last non-tilting lower slat (56), and that all the tilting slats (24) are attached to the arms (44) which in turn are attached to the moving mechanism (48) so that when one of the slats is prevented from rotating all the remaining slats are also prevented from rotating.
9. The roller shutter (20) with tilting slats according to one of the foregoing claims, **characterised in that** the system for locking the first lower tilting slat (54) can also be used for all the tilting slats so as to increase the degree of resistance of the shutter curtain to any attempts at intrusion.



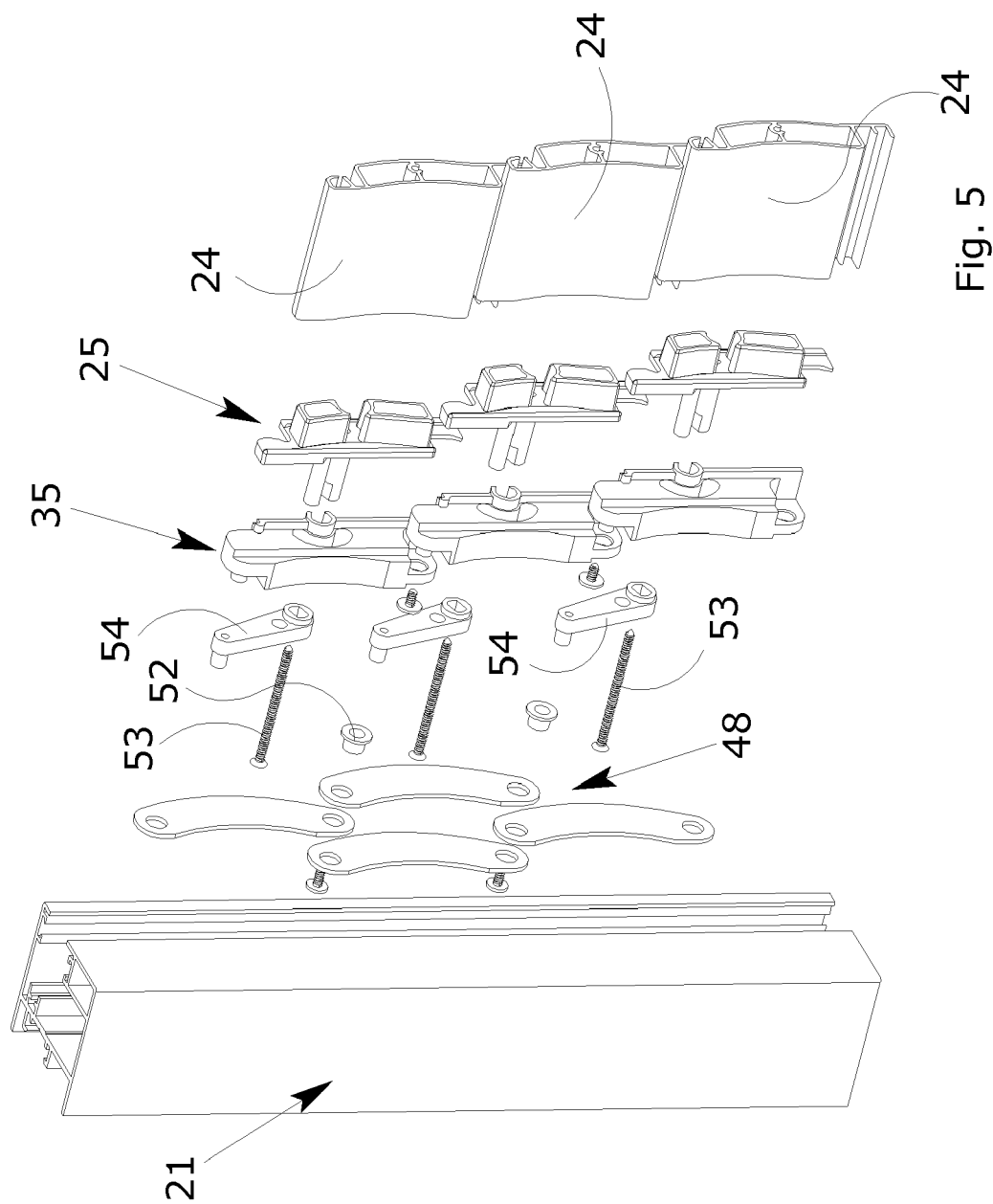
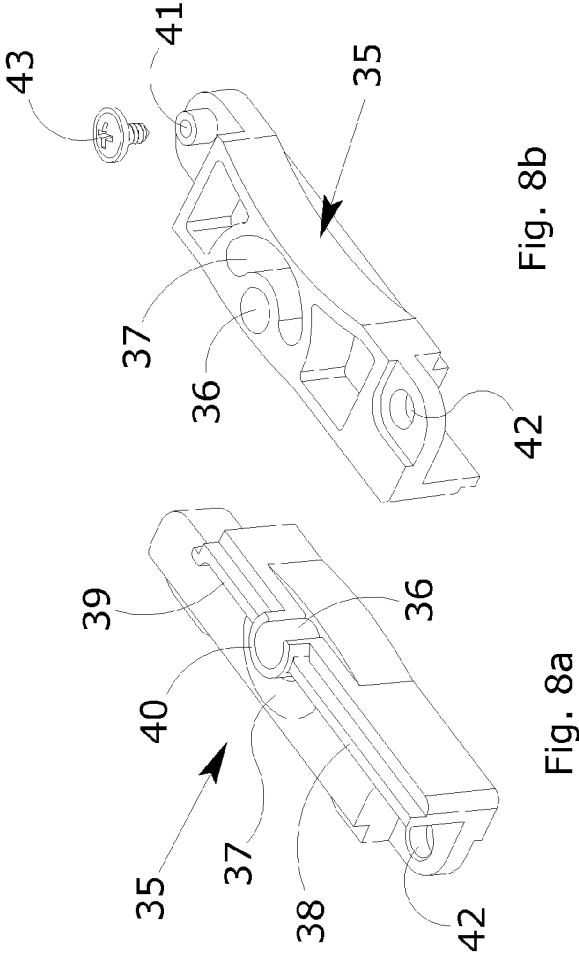
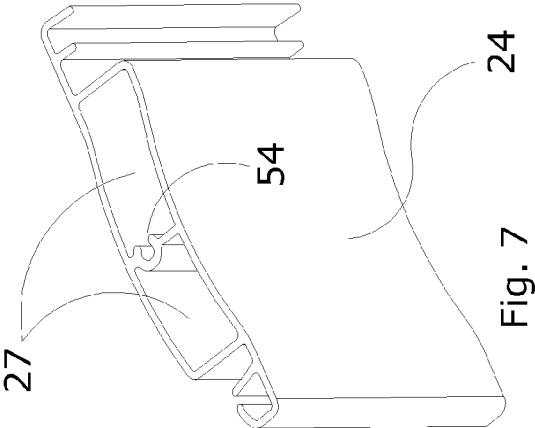
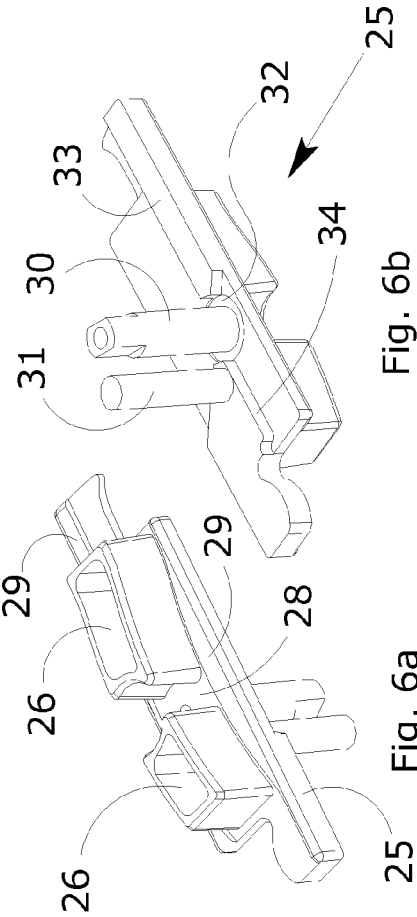
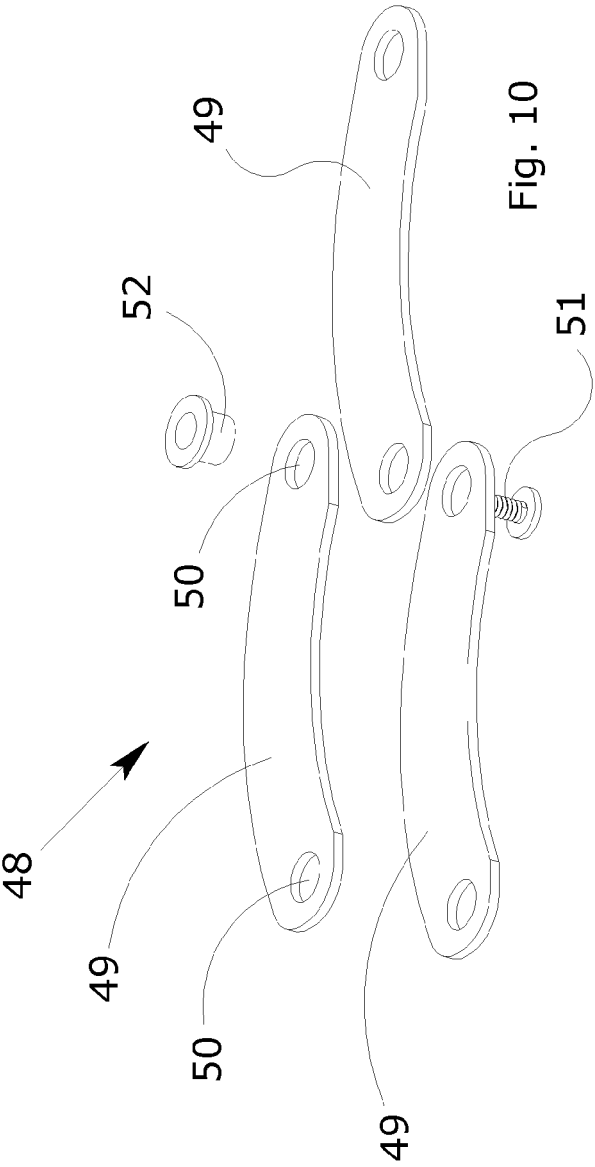
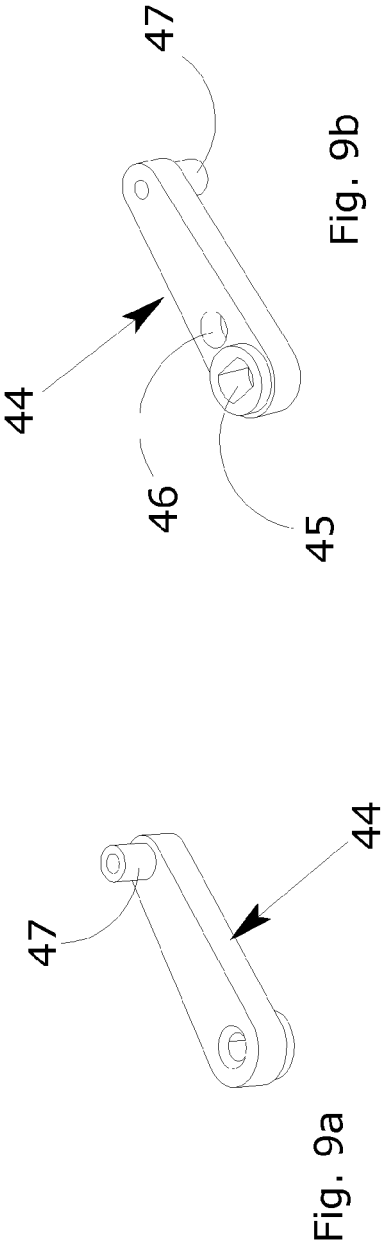


Fig. 5





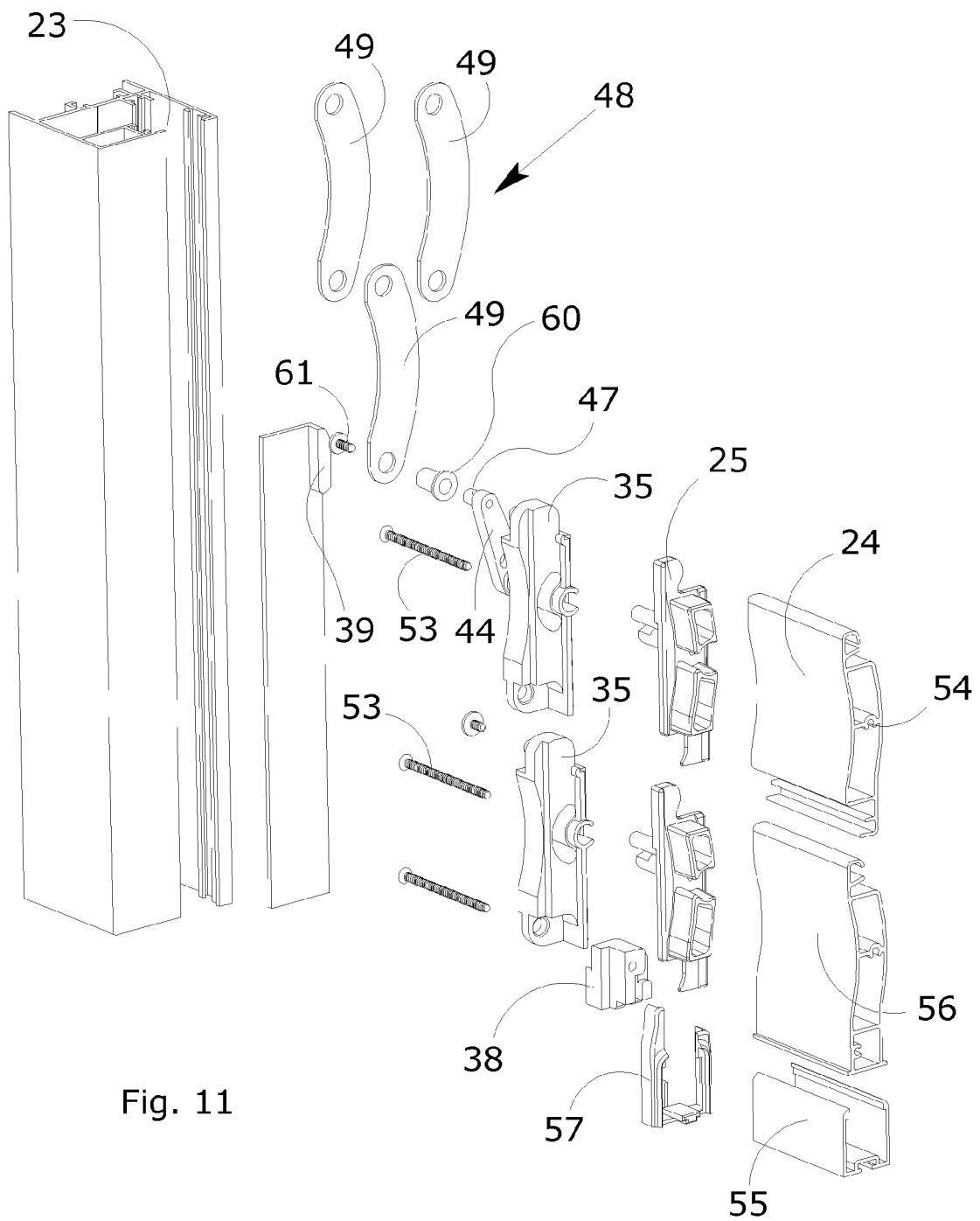


Fig. 11

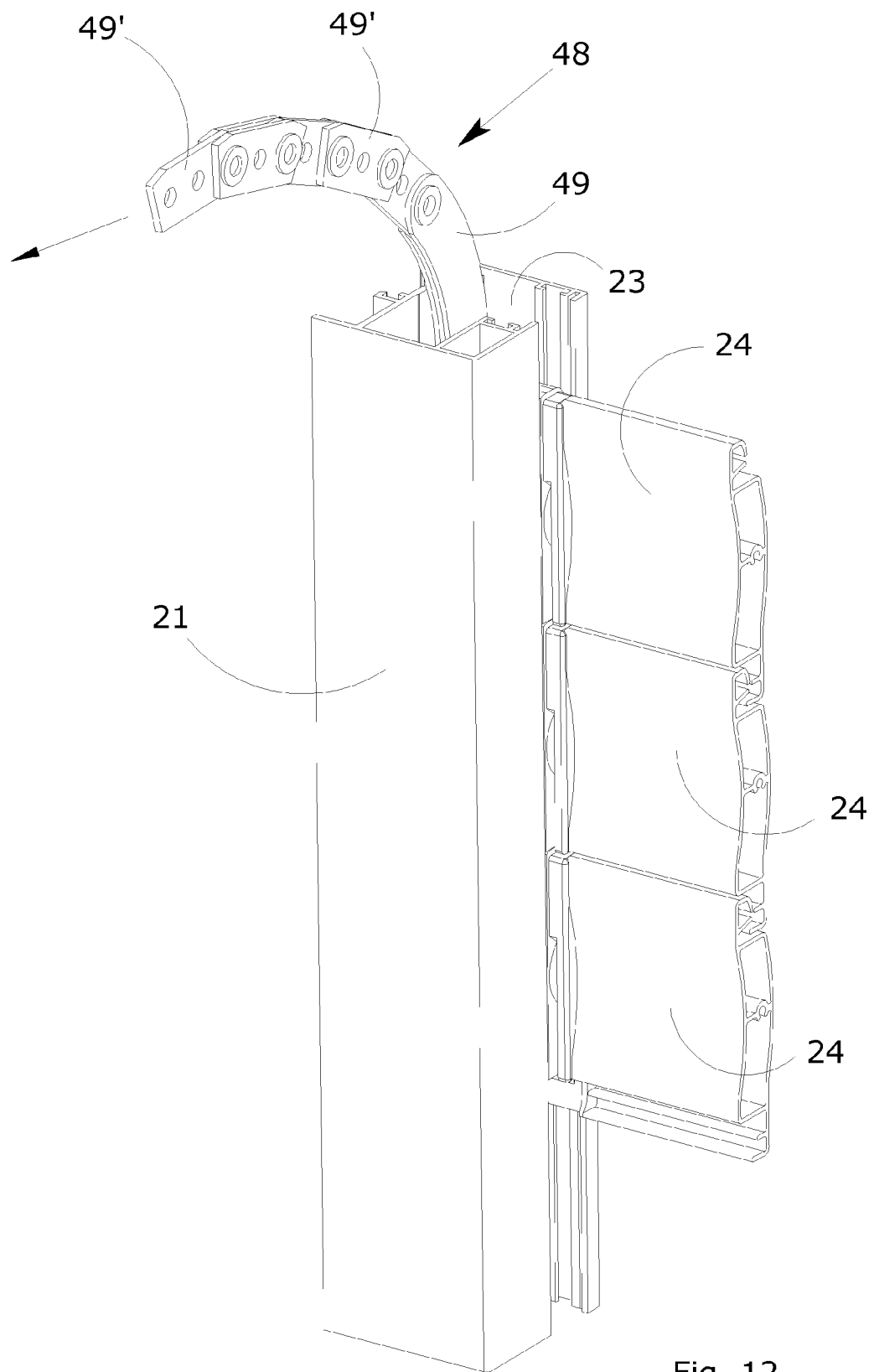


Fig. 12



EUROPEAN SEARCH REPORT

Application Number
EP 12 18 9350

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	WO 2010/082227 A2 (BENEDETTO NICOLA [IT]) 22 July 2010 (2010-07-22) * page 7, line 6 - page 9, line 17; figures 1,5-8 * -----	1-9	INV. E06B9/34
			TECHNICAL FIELDS SEARCHED (IPC)
			E06B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 March 2013	Examiner Koulo, G
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 & : member of the same patent family, corresponding document			

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14-03-2013

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