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(54) **Horizontally sliding roll-up mosquito net for doors and windows**

(57) An automation device for a roll-up mosquito net for doors and windows with a device that allows the user to control the sliding and roll-up of the screen in the opening direction, but also enables to leave the screen inthe open position that it has reached or to actuate the automatic return of the screen to the closed position.

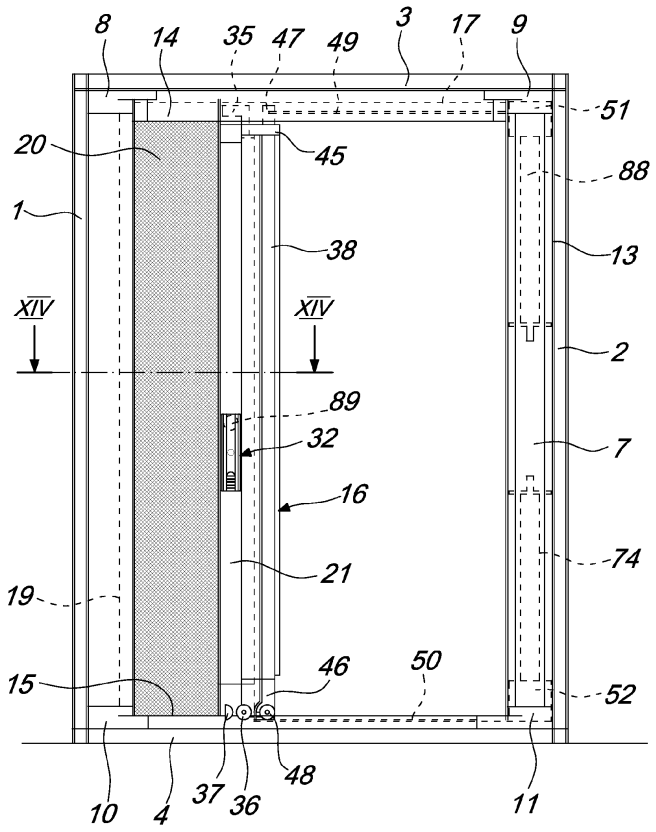

Fig. 2

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Description

[0001] The present invention relates to a horizontally sliding roll-up mosquito net for doors and windows.

[0002] In order to protect rooms from the entry of insects, mosquitoes in particular, mosquito nets are known which comprise a protective screen adapted to be gathered inside a box that is installed below the lintel of the window opening or on the post of the door opening in order to allow the horizontal or vertical sliding of the protective screen.

[0003] The protective screen is in general provided by means of a fine-mesh net, which is rolled up on a roller rotatably supported inside the box when one wishes to open the door or window or unrolled from the roller when instead one wishes to close the door or window. In this last case, the screen remains stretched, thus closing the door or the window. When instead the door or window must remain open, the screen remains rolled up on the roller inside the box. Screen roll-up is performed by means of a torsion spring, which is accommodated in the roller and which is loaded by the extraction of the screen from the box.

[0004] Mosquito nets with horizontally sliding screen suffer the drawback that the screen, once rolled up in the open position, is retained in this position by the preloading traction exerted by the spring. In this manner, the user can facilitate the entry of insects in the room if the door or window, for various reasons, remains open for a prolonged period of time or is not closed promptly.

[0005] The aim of the present invention is to devise an improvement of the actuation system of the screen of the mosquito net that makes it possible to avoid the cited drawbacks, particularly a device that allows the user to control the sliding and roll-up of the screen in the opening direction, but also enables, at the user's discretion, to leave the screen in the open position that it has reached or to actuate the automatic return of the screen to the closed position.

[0006] This aim and other objects which will become better apparent hereinafter are achieved by an automation device for a roll-up mosquito net for doors and windows, comprising a box-like vertical post fixable to a first shoulder of the door or window and defining a chamber which is connected to the outside through a longitudinal slot, a roller rotatable within said chamber, a flexible protective screen, which passes through said slot and has an edge within said chamber fixed to said roller and an outer edge connected to a bar provided with a handle, the upper end of said bar being slidable in a guide fixed horizontally to a lintel of the window or door, and the lower edge of said screen being guided by a track fixed to the lower surface of the door or window parallel to said guide, first elastic means accommodated within said roller to roll up said screen around said roller so as to apply a traction force to said bar, characterized in that it comprises a second box-like vertical post, mutually opposite and parallel to said first post and connected to the latter by said upper guide and by said lower track, a rod having opposite ends slidable within said guide and said track, means for connecting said rod to said bar, elements for separating said connecting means controllable manually in order to separate said bar from said rod, a pair of winders accommodated in the respective opposite ends of said second post and connected by respective cables to said rod, said winders being provided with elastic means adapted to pull said rod toward said second post with a traction force that is greater than and opposite to the traction force applied by said first elastic means, so as to pull the screen until said door or window closes when said bar and said rod are joined by said connecting means, and allow the rewinding of said screen on the roller of the first post when said rod and said bar are separated by said separation elements.

[0007] Further characteristics and advantages of the present invention will become better apparent from the following description of a preferred embodiment of the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a view of a mosquito net in the open position of a door or window, according to the present invention;
Figure 2 is a view of the mosquito net in an intermediate open position of the door or window;
Figure 3 is a view of the mosquito net in the closed position of the door or window;
Figure 4 is a view of the mosquito net in the initial position for reopening the door or window;
Figure 5 is a partial view of the lower ends of the rod and of the second post;
Figure 6 is a bottom exploded view, taken along the line VI-VI of Figure 5, of the lower end of the rod;
Figure 7 is a view taken along the line VII-VII of Figure 5;
Figure 8 is a view taken along the line VIII-VIII of Figure 5;
Figure 9 is a longitudinal sectional view of the second post;
Figure 10 is a sectional view of the lower end of the second post rotated through 180° with respect to the view of Figure 9;
Figure 11 is a view taken along the line XI-XI of Figure 10;
Figure 12 is a view taken along the line XII-XII of Figure 11;
Figure 13 is a view taken along the line XIII-XIII of Figure 9;
Figure 14 is a sectional view of the bar and the rod, taken along the line XIV-XIV of Figure 2;
Figure 15 is a view that highlights the initial step of the separation of the bar from the rod before the separation situation illustrated by the sectional view taken along the line XV-XV of Figure 4.

[0008] In Figure 1, the numerals 1, 2, 3 and 4 designate

respectively two vertical shoulders, a lintel and a sill that delimit an opening of a hypothetical window or door inside which a rectangular frame of a horizontally sliding mosquito net is installed, the sides of which are indicated by four arrows and generally designated by the numeral 5.

[0009] The frame 5 is composed of a first post 6 and a second post 7, which are fixed to the shoulders 1, 2 and have their opposite ends engaged in respective supporting plates, the upper ones being designated by the numerals 8, 9 and the lower ones being designated by numerals 10, 11, and by means of which they are locked against the lintel 3 and the sill 4. The posts 6, 7 and the plates 8-11 have a flat side 12, 13 (see Figure 1) with which they adhere hermetically to the walls of the shoulders 1, 2. A guide 14 and a track 15 (Figures 1-4, 8) are extended respectively between the upper plates 8, 9 and the lower plates 10, 11, and the traction assembly of the mosquito net, generally designated by the numeral 16 (see Figures 1-4), slides along such track. The guide 14 consists of a profiled element that adheres to the lintel 3 and has a slot 17 that opens downward, while the track 15 is constituted by a strip that rests on the sill 4 and has a U-shaped cross-section, with two ribs 18 which are bent upward (see Figure 8) and define the sliding rails of the assembly 16. The track 15 has the opposite ends engaged in recesses formed in the plates 10, 11 so as to be locked on the sill 4.

[0010] The posts 6, 7 are constituted by tubular profiled elements having a traditional structure. In particular, the first post 6 is provided frontally, i.e., on the side directed toward the second post 7, with a slot 19 (Figure 1), through which the protective screen 20 of the mosquito net exits (Figures 2, 3, 4), its dimensions corresponding to the region delimited by the frame. The protective screen 20 is constituted, for example, by a flexible net which, by means of the traction assembly 16, can be extracted progressively outside the post 6 until it closes the region delimited by the frame 5. When the traction assembly 16 is against the post 6, the protective screen 20 is completely gathered in the chamber defined in the post 6 and rolled up around a cylindrical roller that is supported rotatably inside the post. In order to wind and unwind the screen on the roller, advantageously there is a system that provides a torsion spring, which is accommodated inside the roller and is conveniently preloaded with a force sufficient to allow the screen to rewind autonomously on the roller. Such system, being widely known on the market, is not further illustrated hereinafter for economy in description.

[0011] The traction assembly 16 has a structure that comprises two parts that can be separated. A first part is composed of a bar 21 (Figures 1-4, 14, 15) constituted by a substantially rectangular profiled element, which has in the front edge 22 a channel 23 provided with undercuts that define a seat for accommodating and retaining a rod 24 made of ferromagnetic material that extends over a substantial length of the bar. The bar 21 comprises two flat and parallel walls 25 provided with slots 26 which open outward and, inside, two pairs of opposite wings 27, 28. A first pair of wings 27 defines a seat 29 for accommodating and retaining the ridge 30 applied to the front edge of the screen 20 that protrudes from the post 6. The wings 28 of the second pair are bent one toward each other, defining, with undercut ribs 31 of the seats 26, engagement elements for a handle 32 provided with a cam 89 (see also Figures 1-4) for the actuation of the traction assembly 16. The drawings show a single handle, but the application of a second handle on the opposite side of the bar 21 is provided.

[0012] At the opposite ends of the bar 21, as shown more clearly in Figure 4, respective bodies 33, 34 are coupled, the upper one 33 being provided with a shank 35 which, through the slot 17, engages in the guide 14, while on the opposite sides of the lower body 34 two wheels 36 are supported which are provided perimetrically with annular beads which, together with lateral teeth 37, keep the wheels 36 guided on the two rails 18 of the track 15.

[0013] The second part of the traction assembly 16 is composed of a rod 38 (Figures 1-4, 5-7, 14, 15) constituted by a profiled element composed of two flat and parallel walls 39, 40, which are joined in a U-shape by a front piece 41, on the outside of which a rule 42 is jointly connected, such rule 42 being covered by a brush 43, which is adapted to close any gap created when the rod 38 abuts against the post 7. The walls 39, 40 have a mutual distance equal to the thickness of the bar 21, so as to define a seat adapted to receive with minimal clearance the front portion of the bar 21. The rod 44 of magnetic material is fixed to the inner face of the front piece 41 and, by superimposing the rod 38 on the bar 21 until contact of the rod 24 with the rod 44 occurs, causes by magnetic attraction the joining of the bar 21 with the rod 38. In order to separate the rod 38 from the bar 21, the handle 32 can be pivoted on the bar 21 and provided at one end with a cam 89 which, by actuating the handle, acts on the rod 38, spacing it from the bar.

[0014] Two blocks 45, 46 (Figures 1, 2) are associated with the opposite ends of the rod 38; the upper block 45 is provided with a shank 47, which is guided in the guide 14 like the shank 35 of the bar 21, and the lower one 46 supports a pair of wheels 48 that can slide on the rails 18 of the track 15 (Figure 8). The ends of two cables 49, 50 are fixed to the blocks 45, 46 and are connected to two winders 51, 52 (Figures 1, 9) accommodated at the opposite ends of the post 7.

[0015] As will become apparent hereinafter, the two winders 51, 52 have the function of winding up the cables 49, 50 and of pulling the rod 38 toward the post 7.

[0016] The lower cable 50 is guided to the winder 52 so as to extend in the channel delimited by the ribs 18, so as to prevent the users from being hindered when they cross the door or window threshold. For this purpose, the lower block 46 of the rod 38 is composed of two elements 54, 55 (Figures 5-8), of which one 54 has a stirrup-like shape that mimics the cross-section of the rod 38 and

the other one 55 is provided with a pair of jaws 56 adapted to engage in notches 57 of the element 54 in order to interlock with the latter. The element 55 is rigidly coupled to the lower end of the rod 38 by means of a prismatic shank 58 that rises from the element 55 and is inserted in the cavity 53 of the rod 38 delimited by the walls 39, 40 and by the front piece 41. In order to safeguard the integrity of the cable 50, below the elements 54, 55 two protrusions 59, 60 are provided, which are shaped in such a way that, when they are mutually adjacent, they can divert the cable 50 laterally adjacent to a rib 18 of the track 15, in order to protect it against breaking. It should be noted, as shown more clearly in Figures 5, 6, that the element 55 can be disengaged from the element 54 in order to facilitate the removal of the fixing screw 61 of the cable 50 and provide quick and easy replacement of the cable 50 in case of breakage or wear.

[0017] In order to allow the cable 50 to remain hidden and protected in the channel defined by the ribs 18 of the track 15 and to apply the traction force to the rod 38, the block 46 (Figures 5, 9-12) is composed of a hollow body that defines a sort of cylindrical cup 62, which is accommodated in the lower portion of the post 7 and is closed by a bottom 63 that abuts against the edge of the post and rests against the plate 11. A pivot 64 rises from the center of the cup 62, and a pulley 65 is rotatable thereon and provided peripherally with a groove 66 whose depth is such as to be able to accommodate a sufficient number of turns of the cable 50. Laterally to the cup 62 (Figure 12), but at a height below the pulley 65, there is a wall 67 from which two pivots protrude outward for the rotatable support of a pair of pulleys 68, 69, which are mutually coplanar and mutually offset. The upper pulley 68 is peripherally tangent to the pulley 65 but arranged at right angles with respect to it; the lower pulley 69 is, instead, aligned tangentially with a hole 70 provided in a protrusion 71 below the bottom 63. The hole 70 is aligned with the cable 50 so that the hole remains guided within the channel defined by the rails 18 of the track 15.

[0018] When the rod 38 approaches the post 7, the cable 50, once it has passed through the hole 70 and by following the S-shaped path imposed by the pulleys 69, 68, is wound on the pulley 65 and gathered so as to form a spool in the groove 66. In order to arrange the pulley 65 at the level of tangency with the pulley 68, two bushes 72, 73 are provided (see Figure 9), that are jointly connected coaxially to the opposite faces of the pulley 65 and are rotatably supported on the pivot 64. The pulley 65, by means of the bush 72, rests against the inner face of the bottom 63; the other bush 73 lies above the pulley 65 inside a tube 74 which is coaxial thereto and whose opposite ends abut against the pulley 65 and a flange 75 arranged inside the post 7. The flange 75 is shaped perimetrically so as to be inserted and locked rotationally in the post 7, for example by means of a prismatic coupling. Two respective pivots 76, 77 provided with threads which are reverse and coaxial to the pivot 64 are jointly connected on the opposite faces of the flange 75. The bush 73 and the pivot 77 have threads with concordant direction in order to enable to screw thereon a torsion spring 78 adapted to be preloaded manually by rotation of the block 62 with respect to the flange 75, after locking the pulley 65 on the pivot 64 by means of a screw (not shown) which is driven through the cup 62 and engages radially in the bush 72. Conveniently, the spring 78 is shorter than the tube 74 and long enough for the turns to remain mutually spaced for the entire spring loading step, so as to avoid the inevitable deformations that are a consequence of the friction due to the tightening to which the turns are subjected by the loading torsion.

[0019] It should be noted that the locking screw of the pulley is released when the torsion spring must be released in order to subject the cable 50 to the traction force.

[0020] Similarly to the winder 52, the upper winder 51 comprises a bottom 77a for closing the upper part of the post 7, to which a cylindrical cup 78 accommodated inside the post itself is jointly connected. A pivot 79 protrudes from the bottom 77a and is concentric to the cup 78 and coaxial to the pivot 64 of the winder 52. A spool 80 is supported rotatably on the pivot 79 and a bush 81 provided with a thread is jointly connected thereto, the screwing direction of the thread being opposite to the one of the bush 73 of the lower winder 52.

[0021] The spool 80 is constituted by a sort of drum, externally to which a helical slot 82 is provided which defines adjacent turns.

[0022] The turns are deep enough to accommodate the cable 49, which, as mentioned above, has an end connected to the shank 47 at the top of the rod 38. The cable 49 is guided and remains hidden in the slot 17 and accesses the spool 80 through a slot 83 defined in the wall of the cup 78. The end of a spring 84 is screwed onto the bush 81 and follows the screwing direction of the thread of the bush; its opposite end is screwed onto a pivot 85, which is jointly connected to a flange 86, which is arranged and locked rotationally inside the post 7. A second threaded pivot 87 is jointly connected to the flange 86 and is coaxial to the pivot 85 but has a reverse thread, so that the flange and the pivots constitute a component that is identical to the one composed of the flange 75 and the pivots 76, 77. In practice, this component allows the screwing of both springs 74, 84 in the same loading direction. The spring 84 is accommodated in a tube 88 which abuts with one end against the spool 80 and with the opposite end against the flange 86.

[0023] The tube 88 is longer than the spring 84, so that the turns, like the spring 78, remain mutually spaced in order to avoid the deformations caused by torsion during loading.

[0024] Operation of the mosquito net, although evident from the preceding description, is as follows.

[0025] In closed conditions, the mosquito net has, as shown in Figure 3, the traction assembly 16 in abutment against the post 7 due to the traction force that the springs 78, 84 of the winders 51, 52 apply to the rod 38, and

which is greater than the rewinding force of the screen 20 on the roller (not shown) that is accommodated in the post 6 and is caused by the torsion spring by means of which it is loaded. The bar 21 and the rod 38 are associated so that the former is between the walls 39, 40 of the latter due to the magnetic attraction that keeps the rods 24, 44 joined with a greater force than the one applied by the winders 51, 52. With the mosquito net in the closed position, the user has two possibilities for opening the mosquito net. In a first possibility, the mosquito net assumes a condition of temporary opening in order to allow the user to pass, for example, from the inside of a room to the outside. In this case the user, by operating the handle 32 (Figure 2), can move the traction assembly 16 toward the post 6, overcoming the opposite force applied by the springs 78, 84, and then, after passing, can let the traction assembly 16 and the screen 20 go back to the closed position of Figure 3 thanks to the return action applied by the springs 78, 84.

[0026] In the second possibility available to the user, the mosquito net assumes a constant open condition. In this case, the user, by means of a rotation of the handle (see Figure 4), can act with the cam 89 of the handle 32 on the rod 38, separating it from the bar 21 and allowing the rewinding and retention of the screen 20 on the roller in the post 6 (Figure 4), while the rod 21 remains in abutment against the post 7. In order to restore the closing of the mosquito net, it is sufficient for the user to drag the bar 21 until contact occurs with the rod 38, against which it will stay jointed due to the magnetic attraction between the rods 24, 44.

[0027] The described mosquito net thus achieves the intended aim. The winders 51, 52 are to be considered particularly advantageous: the upper one 51 makes it possible to distribute in an orderly fashion on a cylindrical surface the turns of the cable 49 so as to avoid the onset of possible tangles of the cable. Likewise, the lower winder 52 makes it possible to lay the cable 50 along a practically inaccessible path, protecting it against accidental catching and trampling by the user.

[0028] The invention is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. According to a variation, in order to keep the bar 21 and the rod 38 connected, instead of using magnetic attraction with rods 24, 44, it is possible to provide for the use of a handle that is provided with a mechanism that comprises a mechanical element (for example a hook), which keeps the bar coupled to the rod and which can be controlled manually when instead the release of the bar from the rod is required.

[0029] The disclosures in Italian Patent Application No. BO2010A00039 from which this application claims priority are incorporated herein by reference.

[0030] 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. An automation device for a roll-up mosquito net for doors and windows, comprising a box-like vertical post (6) fixable to a first shoulder (1) of the door or window and defining a chamber which is connected to the outside through a longitudinal slot (19), a roller rotatable within said chamber, a flexible protective screen (20), which passes through said slot and has an edge within said chamber fixed to said roller and an outer edge connected to a bar (21) provided with a handle, the upper end of said bar (21) being slidable in a guide (14) fixed horizontally to a lintel (3) of the window or door, and the lower edge of said screen (20) being guided by a track (15) fixed to the lower surface (4) of the door or window parallel to said guide (14), first elastic means accommodated within said roller to roll up said screen around said roller so as to apply a traction force to said bar (21), **characterized in that** it comprises a second box-like vertical post (7), mutually opposite and parallel to said first post (6) and connected to the latter by said upper guide (14) and by said lower track (15), a rod (38) having opposite ends slidable within said guide (14) and said track (15), means (24, 44) for connecting said rod (38) to said bar (21), elements (32) for separating said connecting means manually controllable to separate said bar from said rod, a pair of winders (51, 52) accommodated in the respective opposite ends of said second post (7) and connected by respective cables (49, 50) to said rod (38), said winders (51, 52) being provided with elastic means (78, 84) adapted to pull said rod (38) toward said second post (7) with a traction force that is greater than and opposite to the traction force applied by said first elastic means, so as to pull the screen (20) until said door or window closes when said bar (21) and said rod (38) are joined by said connecting means (24, 44), and allow the rewinding of said screen on the roller of the first post when said rod (38) and said bar (21) are separated by said separation elements (32).

2. The device according to claim 1, **characterized in that** said track (15) is provided with a pair of rails (18) that define a channel for the sliding of the lower traction cable (50).

3. The device according to claim 1, **characterized in that** the lower winder (52) comprises a hollow body (62) accommodated in the lower portion of the second post (7), a pivot (64) vertically supported inside said hollow body (62), a pulley (65) rotatably supported on said pivot (64) and provided peripherally

with a groove (66) that is adapted to accommodate in coiled turns the traction cable (50) of the rod (38), a pair of pulleys (68, 69) which are mutually coplanar on a vertical plane and are mutually offset, the upper pulley (68) being arranged tangentially at right angles to the pulley (65) and the lower pulley (69) being aligned tangentially with a guiding hole (70) for the cable (50) provided in said body so that the cable (50) remains guided within the channel defined between the rails (18) of said track (15), one end of a torsion spring (78) being rotationally mated with said pulley (65), being accommodated within said second post (7) and having its opposite end jointly connected to said second post (7).

4. The device according to one of claims 1-3, **characterized in that** the upper winder (51) comprises a hollow body (62) accommodated in the upper portion of the second post (7), a pivot (79) vertically supported within said body (62), a drum-like spool (80) rotatably supported on said pivot and provided externally with a helical slot (82) having a depth sufficient to accommodate the upper cable (49) for pulling the rod (38), said cable (49) extending within said guide (14) and having an end connected to the top of said rod (38) and the opposite end connected to said drum-like spool (80), there being also a torsion spring (84) accommodated within said second post (7) and having an end connected to said drum-like spool and the opposite end fixed to said post (7).

5. The device according to one of claims 1-4, **characterized in that** each torsion spring (78, 84) has an end locked by screwing onto a bush (73, 81) which is provided with a thread and is jointly connected to said pulley (65) and respectively to said drum-like spool (80), and the opposite end locked by screwing on a respective threaded pivot (77, 87), each pivot being rotationally jointly connected to a respective flange (75, 86) which is coupled rotationally within said second post (7).

6. The device according to claim 5, **characterized in that** a second pivot (76, 87) having a reverse thread is jointly connected coaxially to said flange (75, 86), on the opposite side with respect to said threaded pivot.

7. The device according to one of the preceding claims, **characterized in that** said connecting means (24, 44) are constituted by rods of magnetic material, which are accommodated in channels of said bar (21) and of said rod (16).

8. The device according to one of the preceding claims, **characterized in that** said separation element is constituted by a manually operated handle (32) rotatably supported within the bar (21) and provided with a cam (89) that is adapted to act on said rod (38) to detach it from said bar.

9. The device according to one of the preceding claims, **characterized in that** said bar (21) is constituted by a profile which has two flat and parallel opposite walls (25), and **in that** said rod (38) is constituted by a U-shaped profile composed of two mutually parallel walls (39, 40) which are joined in a U-shape by a front piece (41) externally covered by a strip provided with a brush (43), said walls (39, 40) having a mutual distance that is adapted to receive said bar (21).

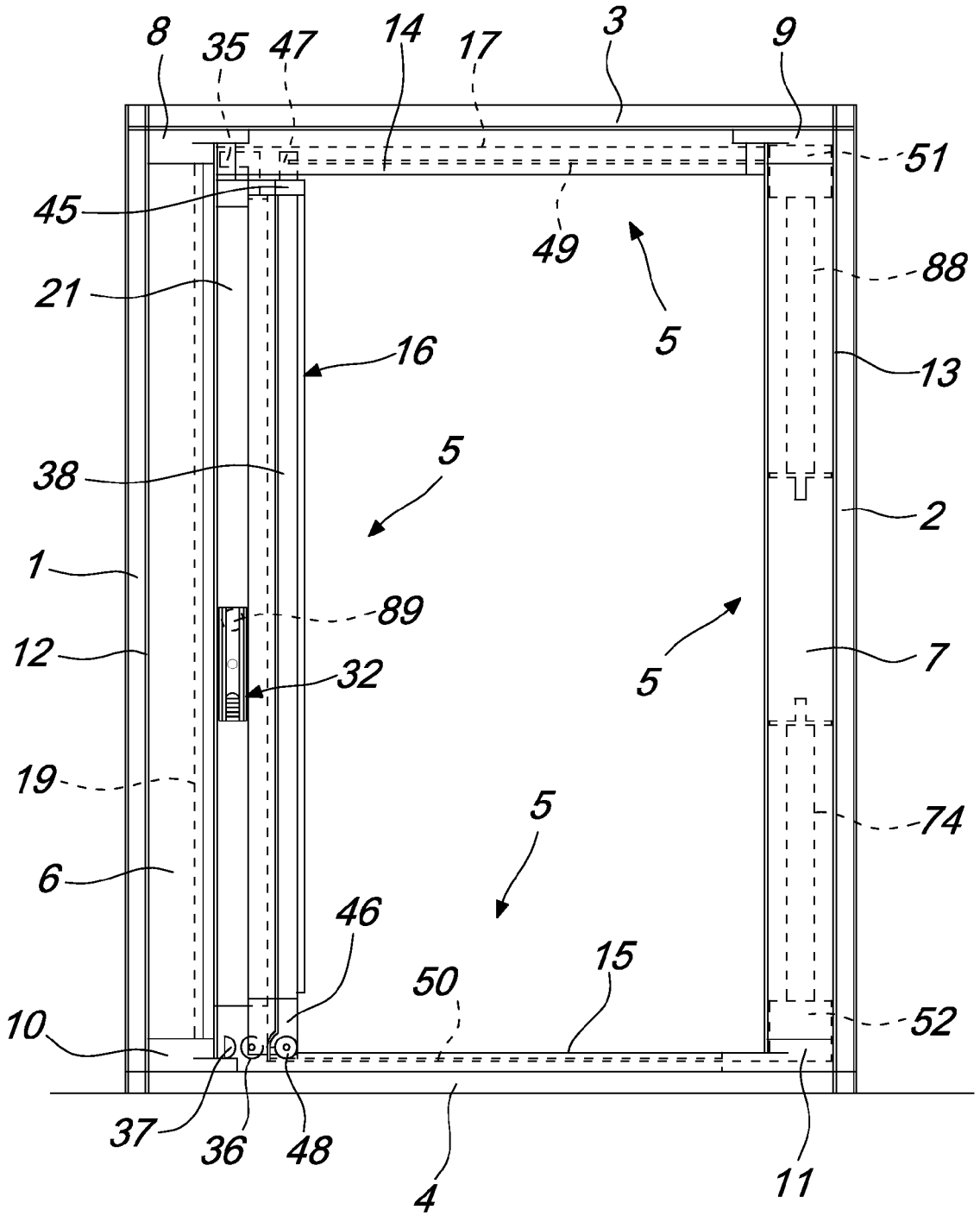
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Fig. 1

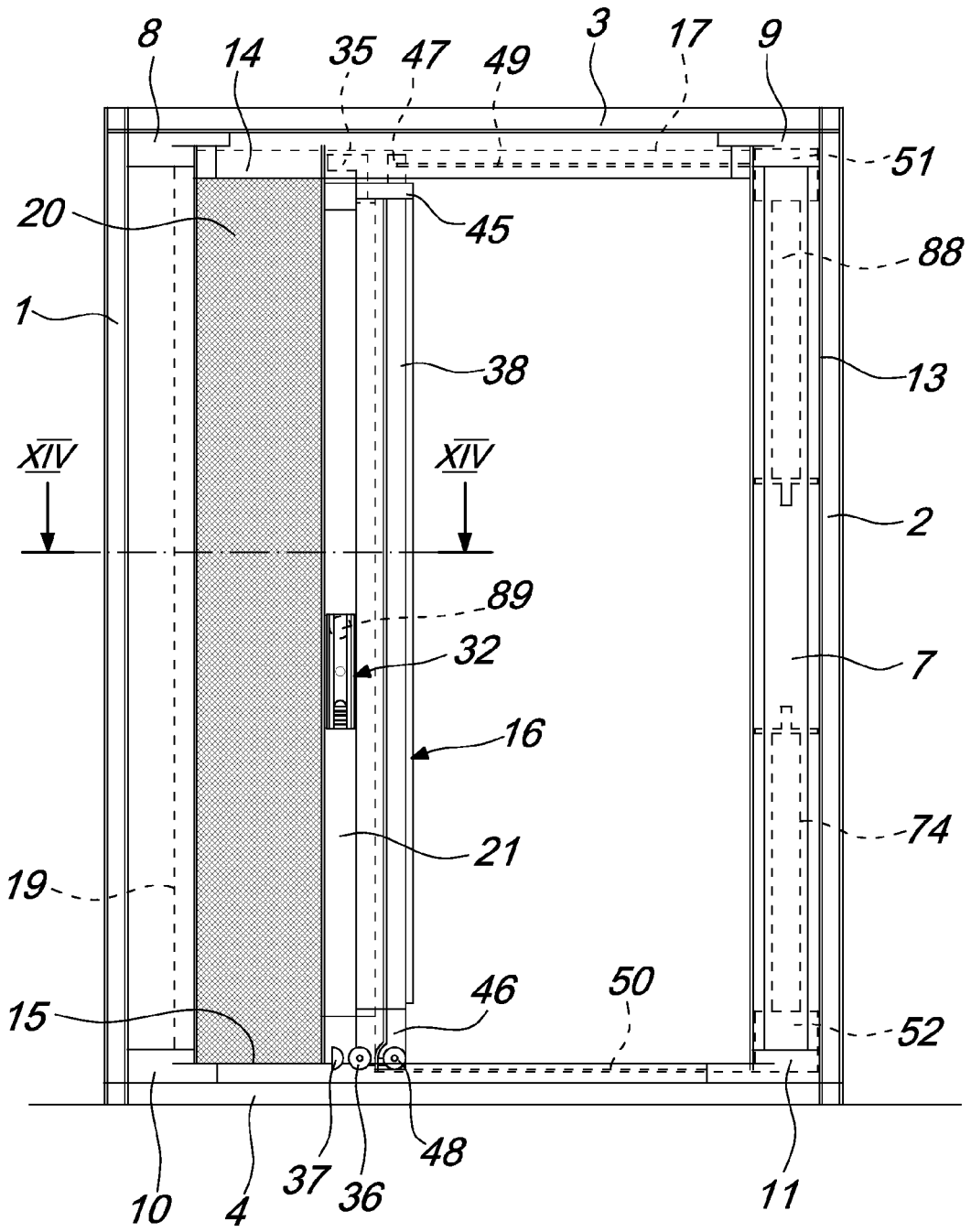
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Fig. 2

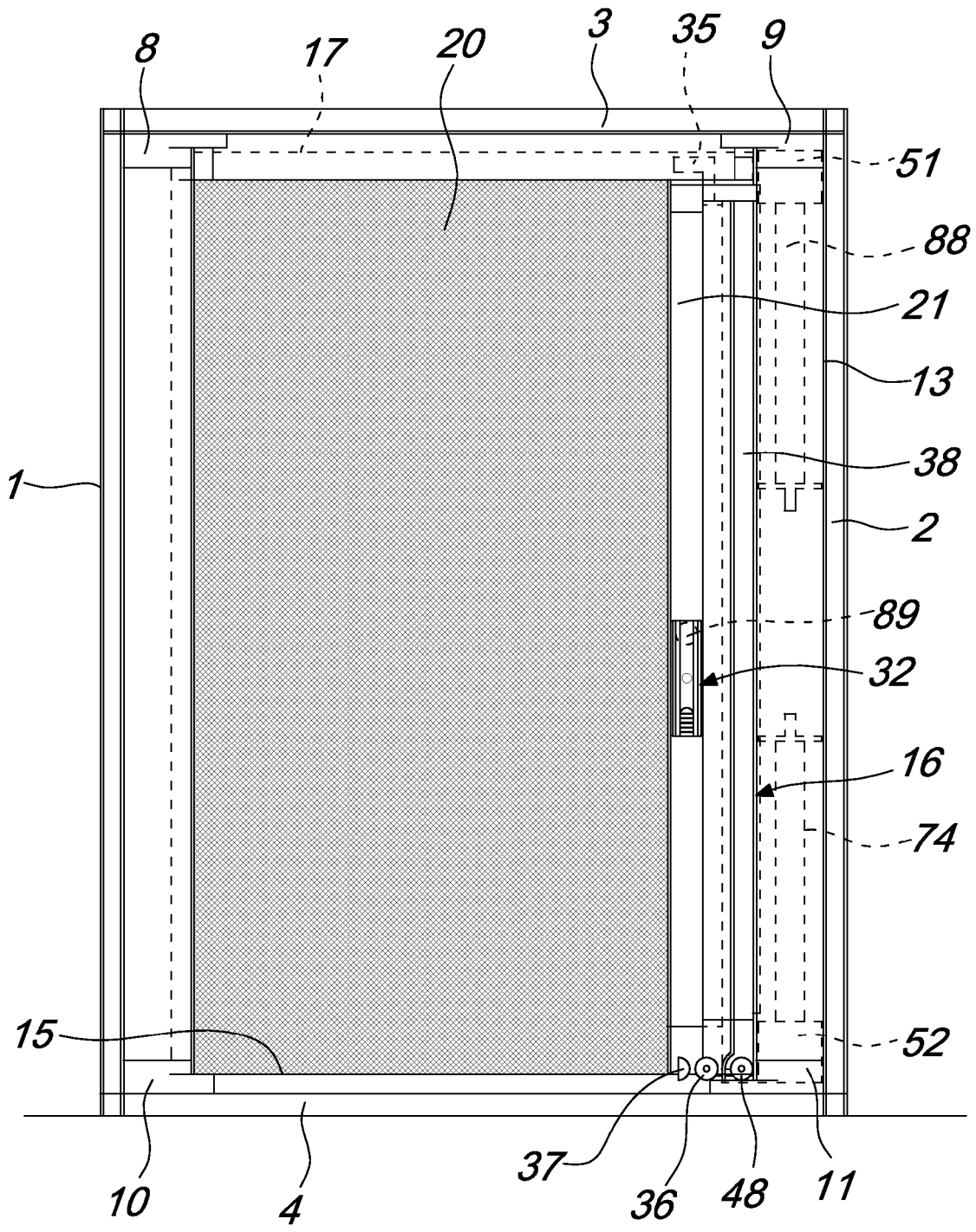

Fig. 3

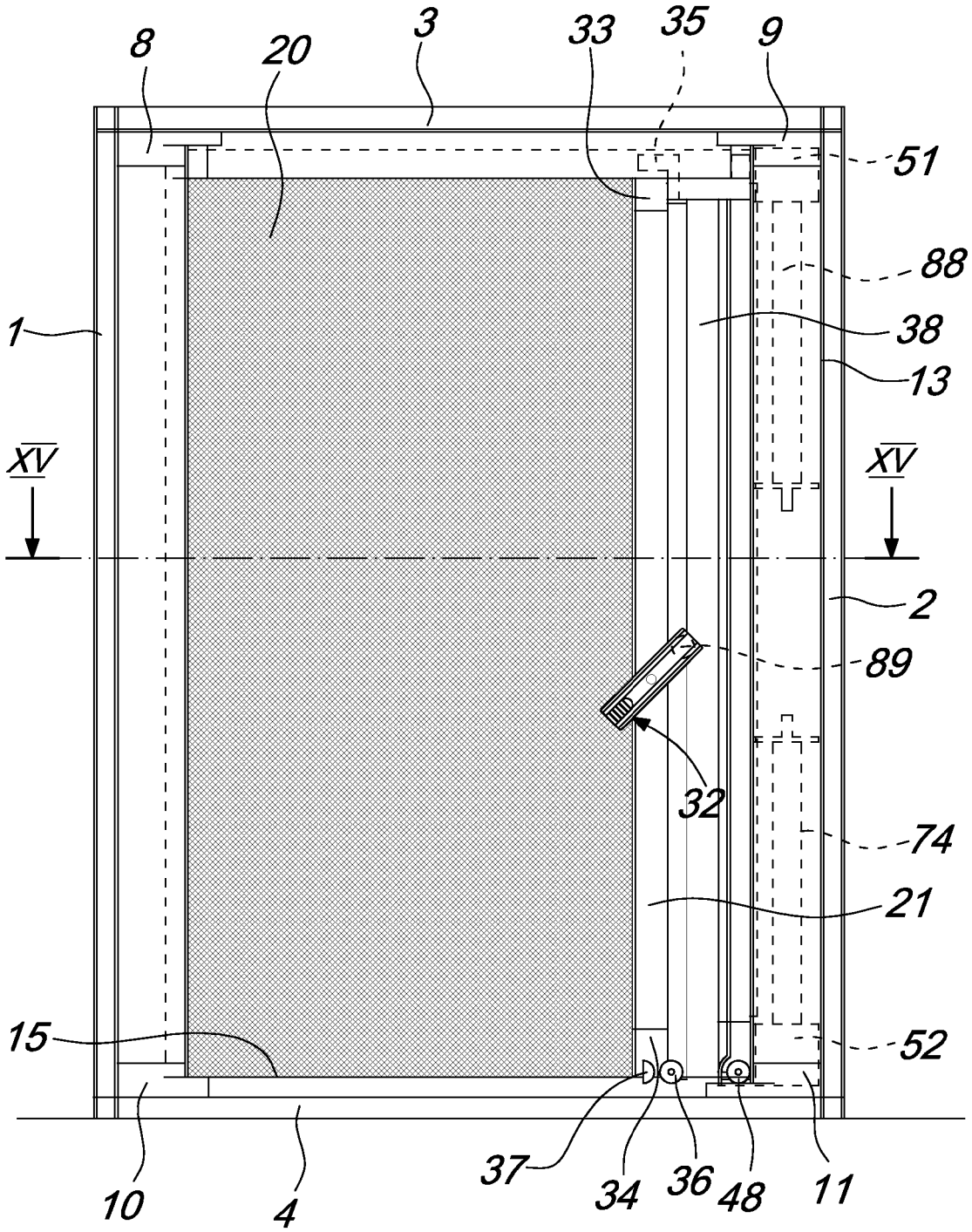

Fig. 4

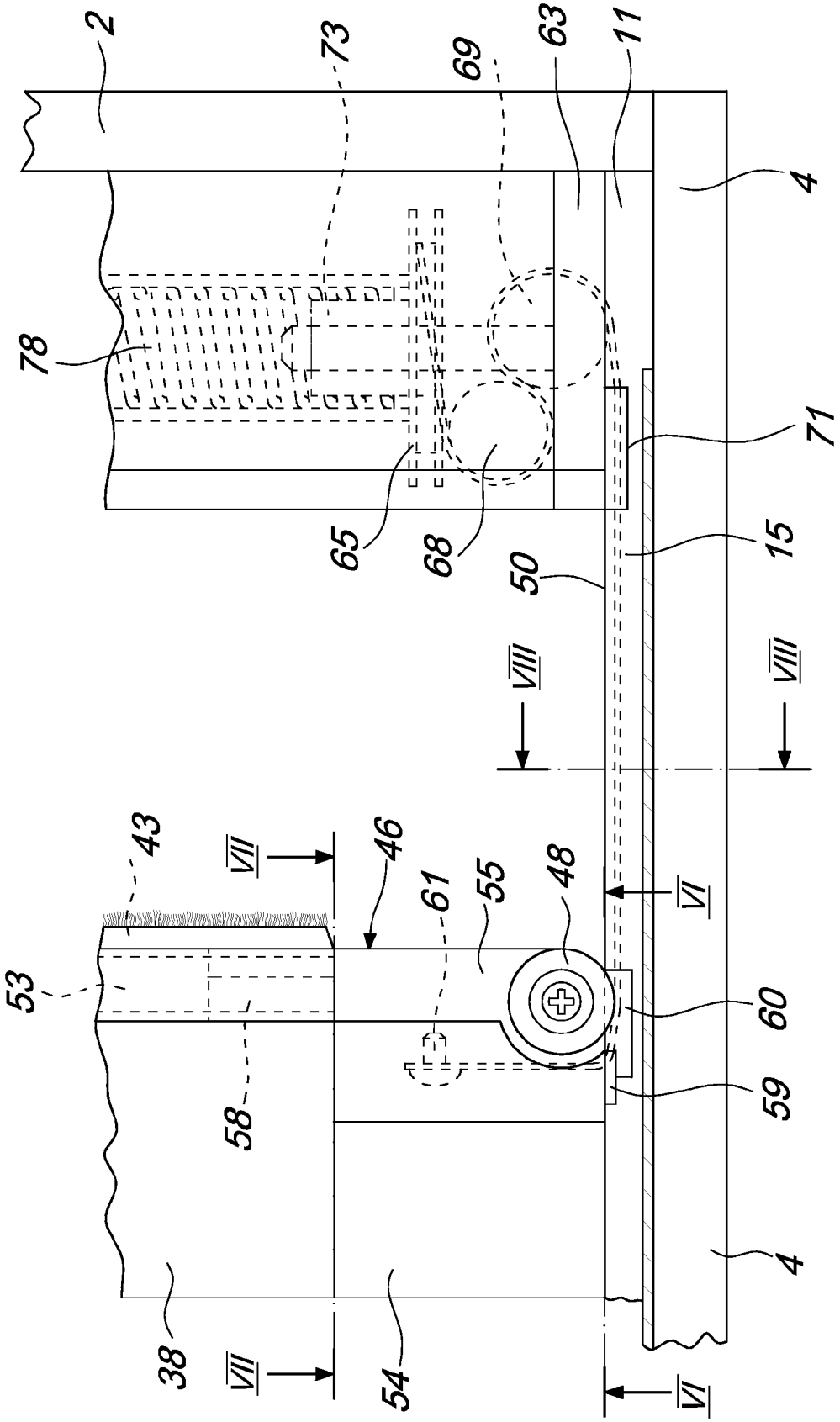
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Fig. 5

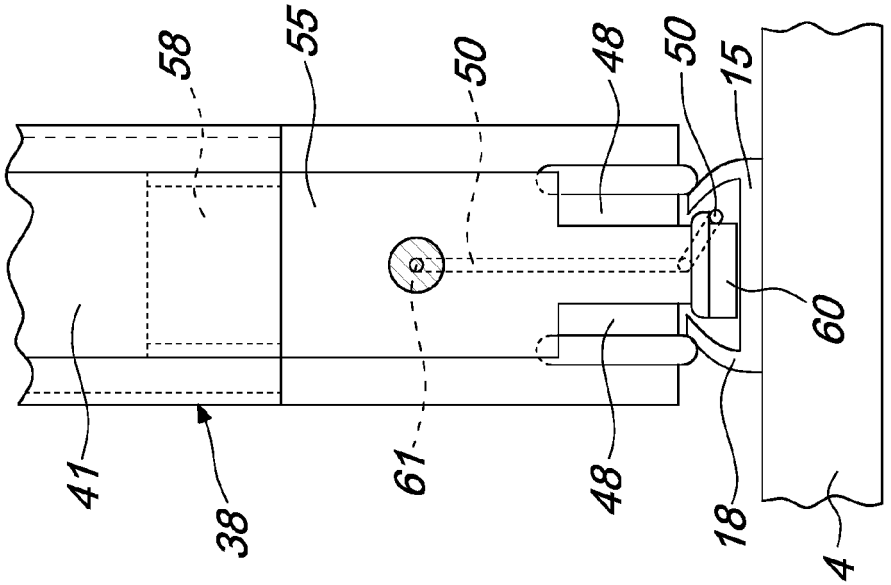

Fig. 8

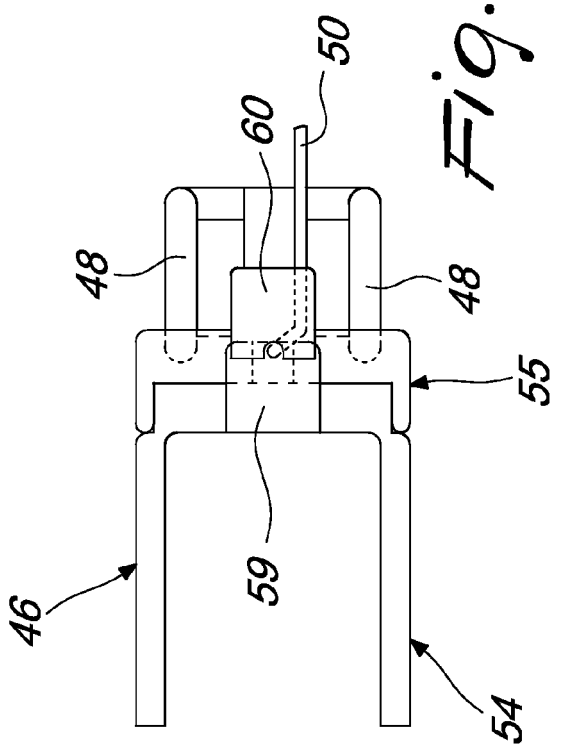

Fig. 6

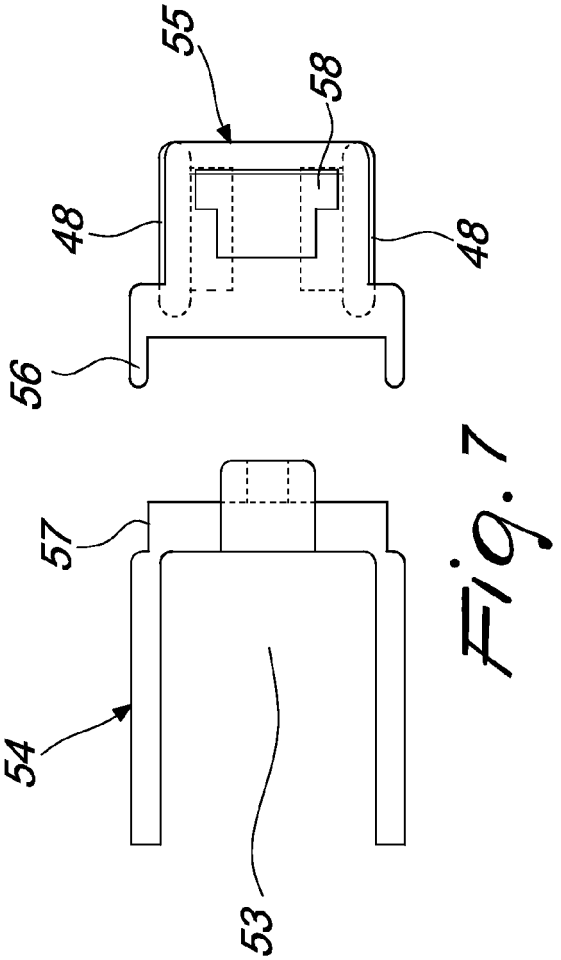

Fig. 7

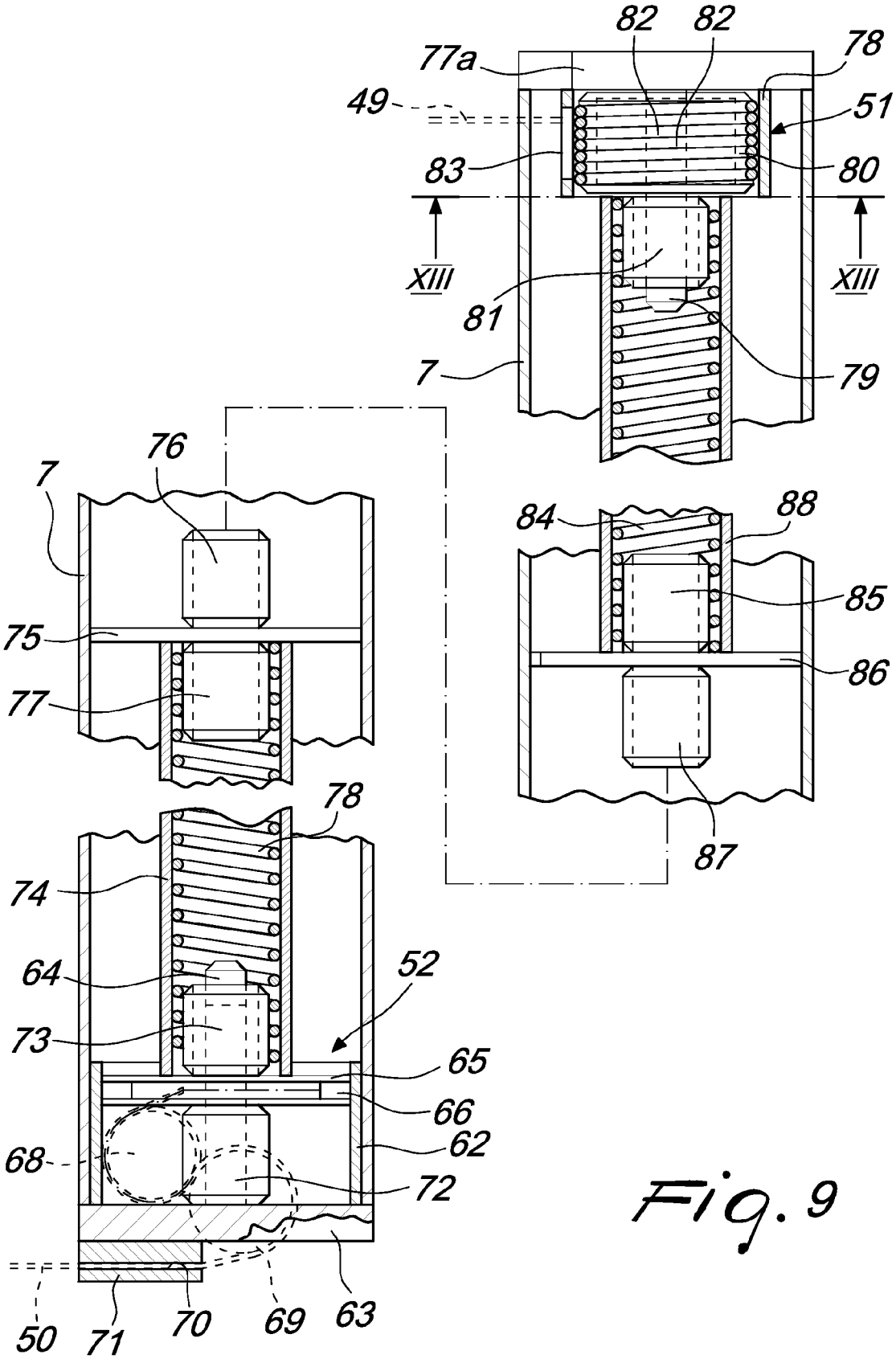
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Fig. 9

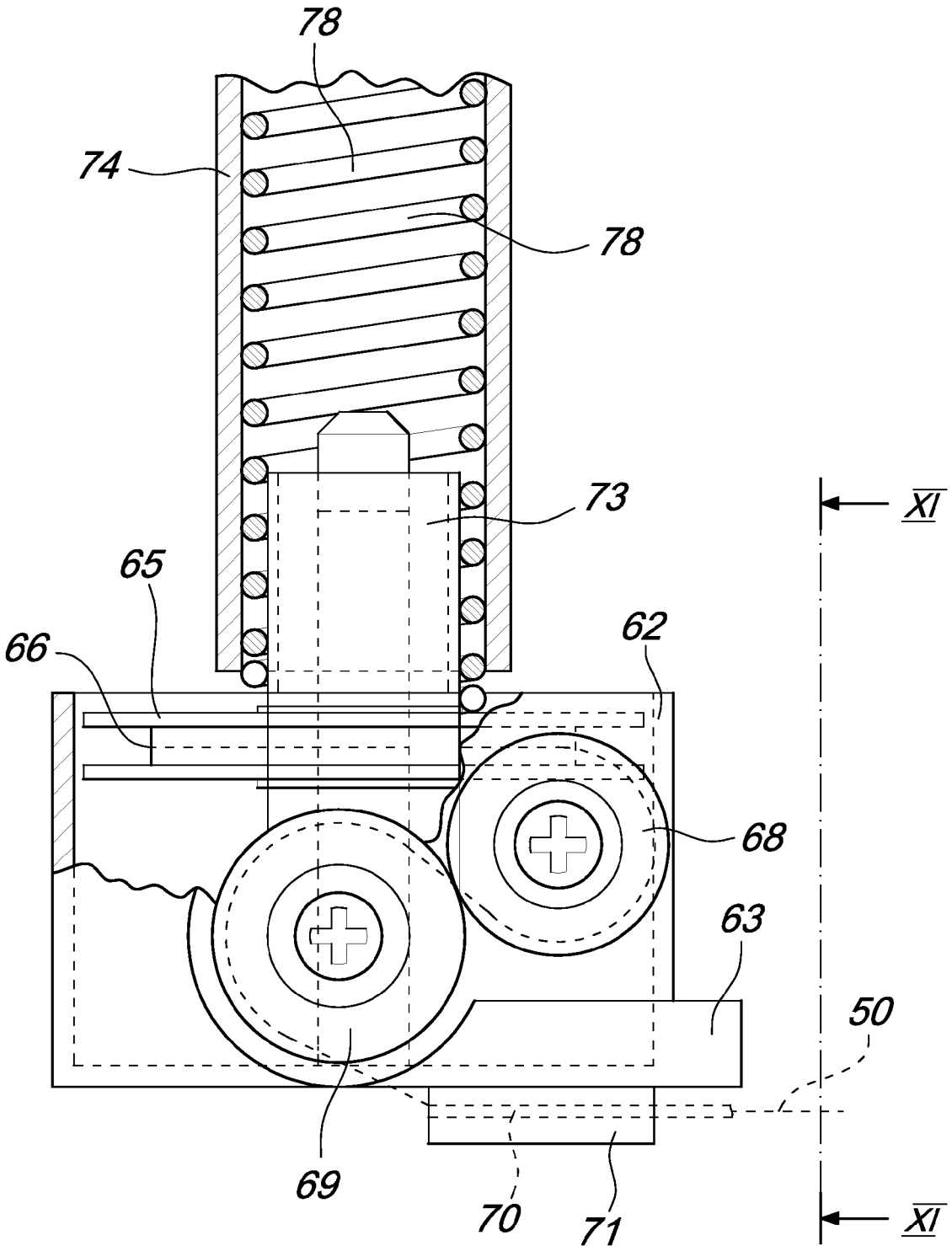

Fig. 10

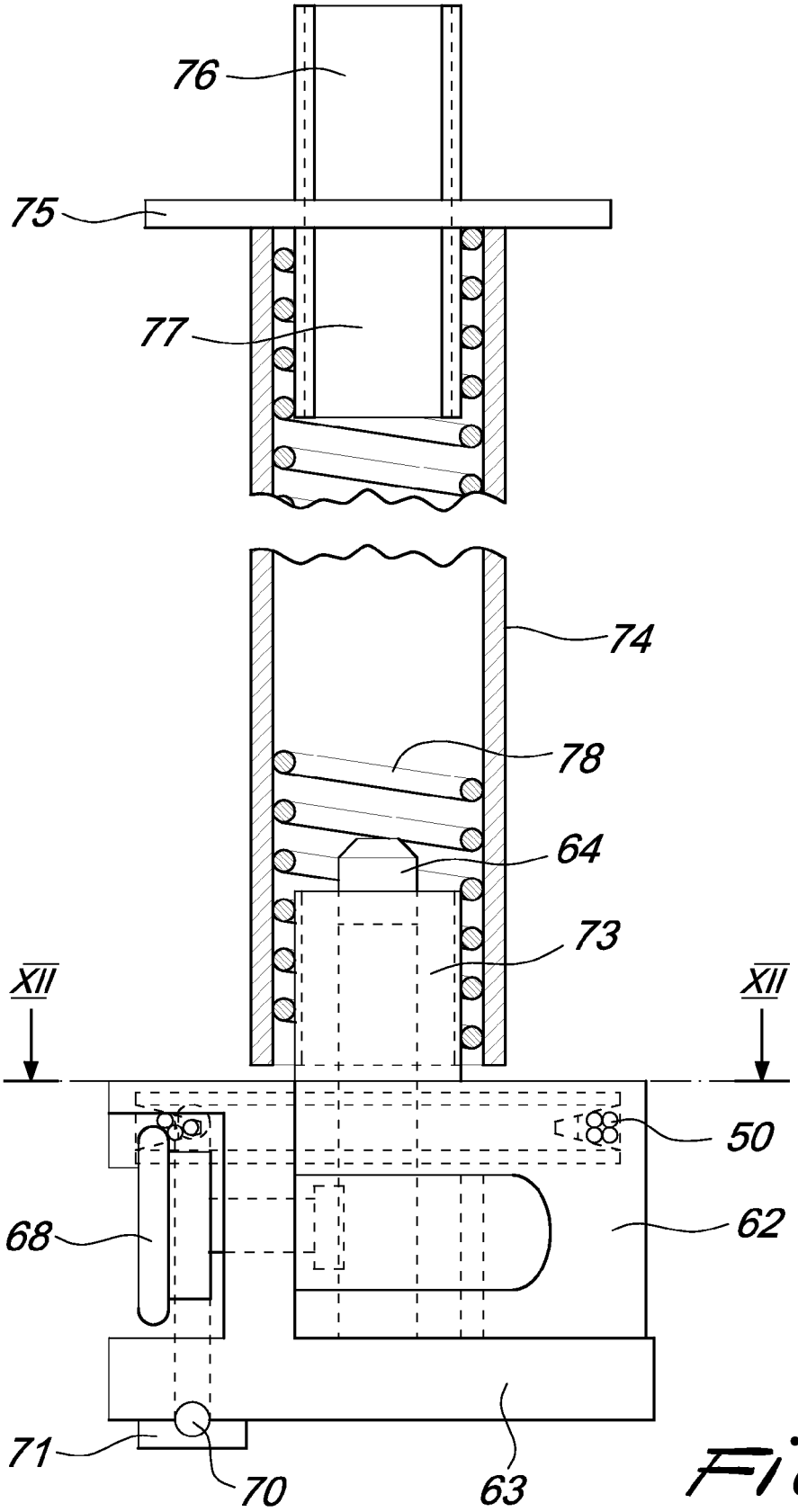

Fig. 11

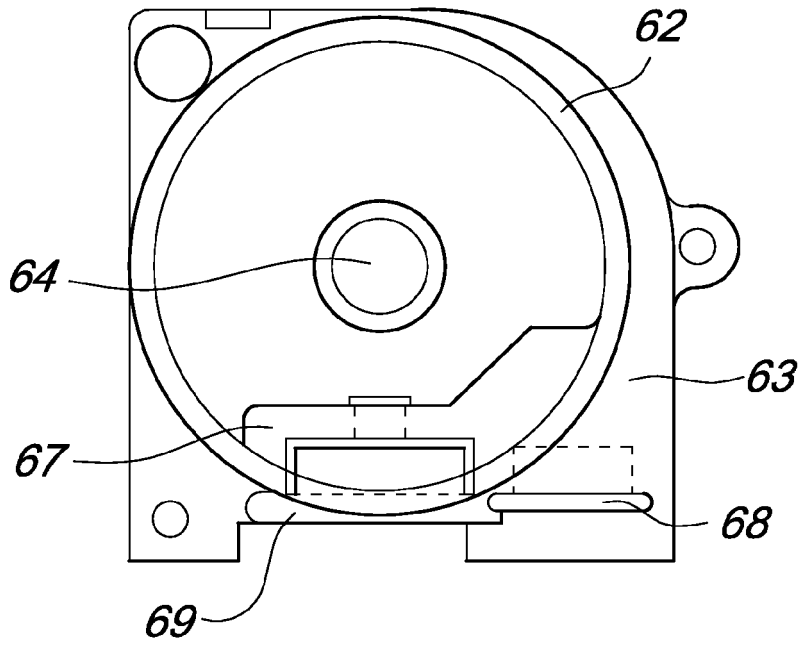

Fig. 12

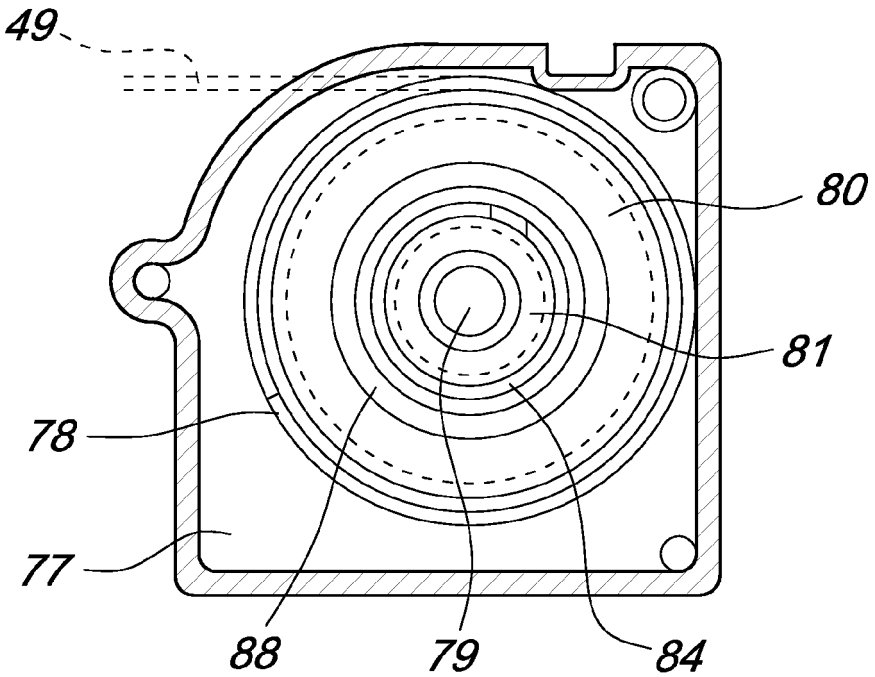

Fig. 13

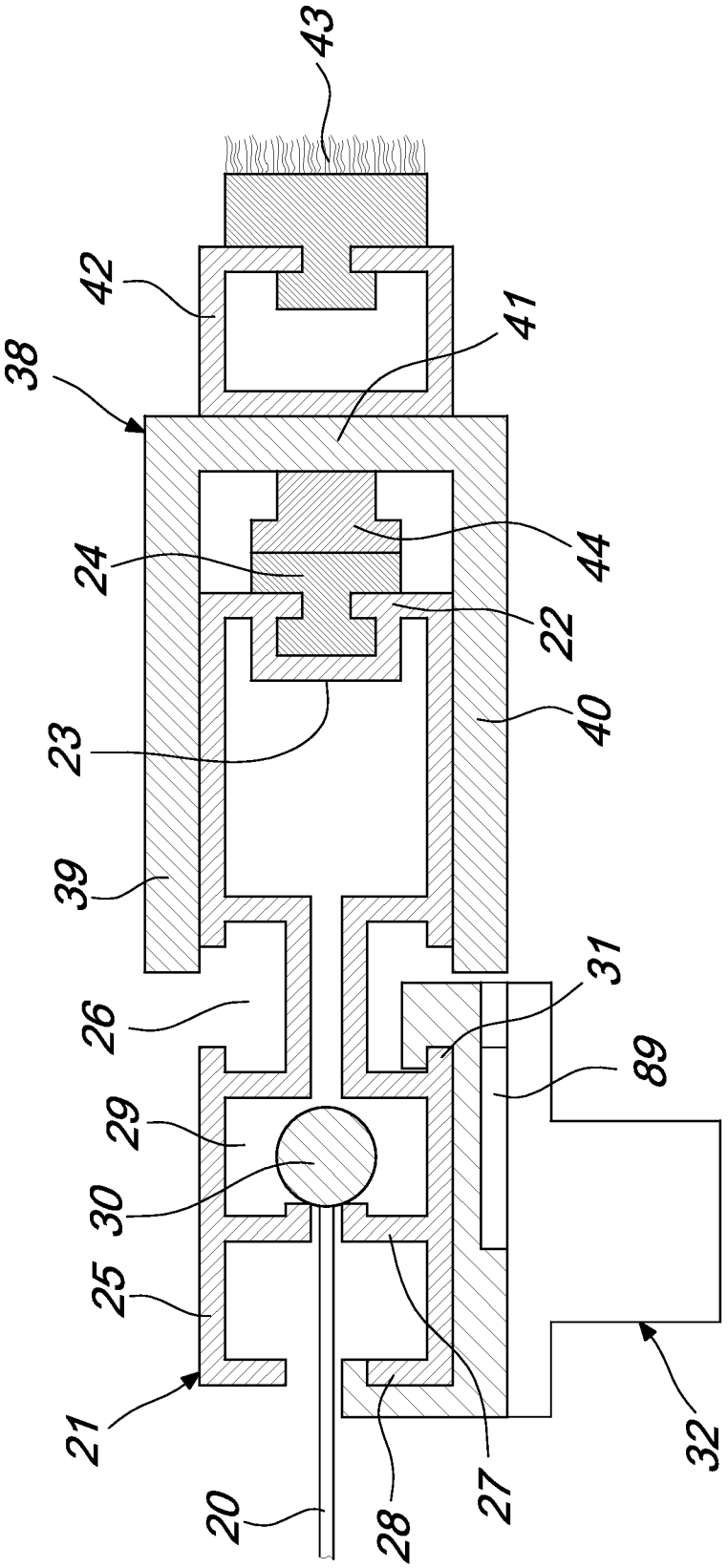

Fig. 14

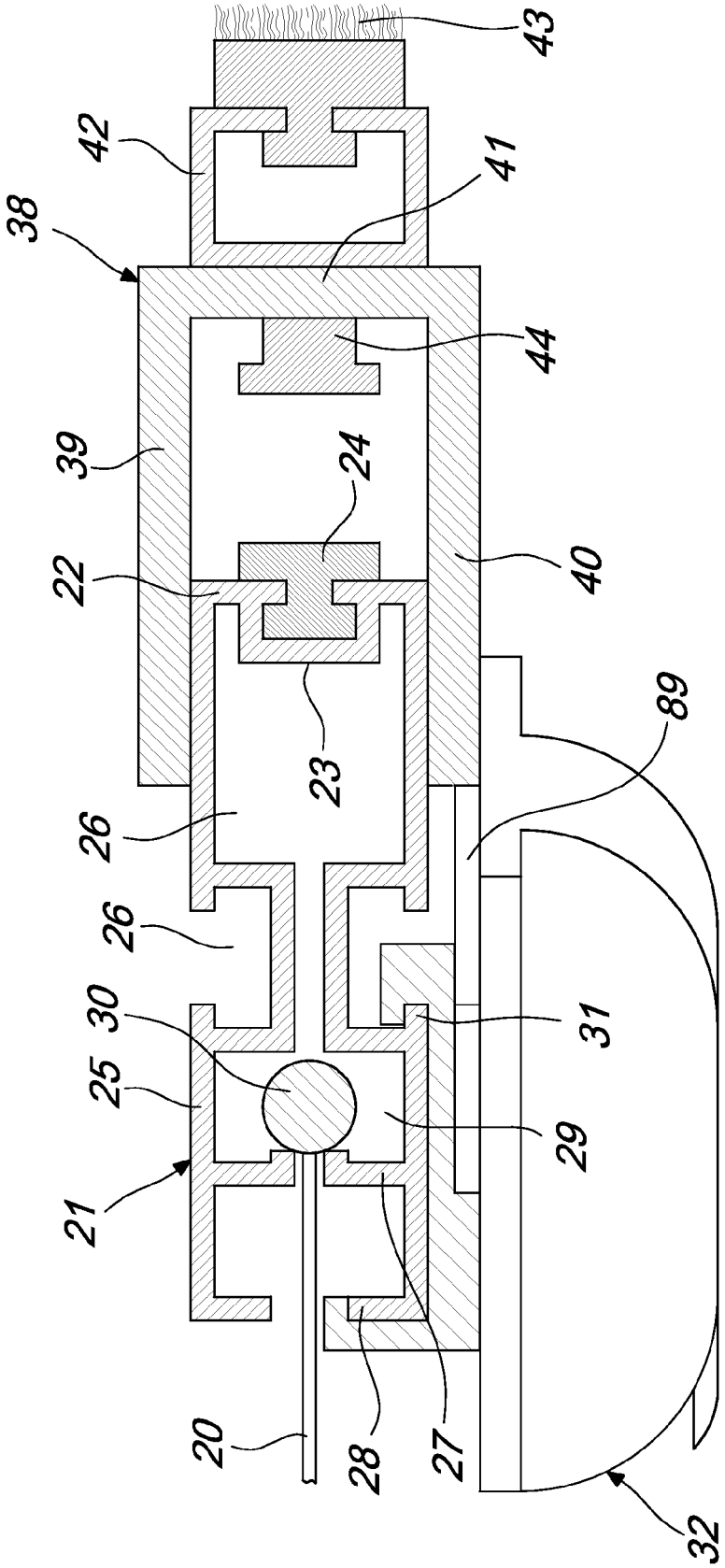

Fig. 15

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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