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(54) **Opening ddevice for coplanar doors**

(57) An opening device (10) for coplanar doors of wardrobes and/or similar furnishing accessories suitable for being applied to a wardrobe (12), comprising a guide (18) attached above or below a frame (14) of the wardrobe (12), longitudinally extended and suitable for allowing the sliding of a mobile unit (19, 19') connected to a door (16) via a first lever (26, 26') and a second lever (28, 28') co-operating with mechanical means restrained to said guide (18) and mobile unit (19, 19') to define a jointed quadrilateral mechanism for the opening/closing of the door (16) with a rotary translation motion, said device comprising at least one carriage (54, 56) sliding with respect to a plate-guide (50, 52) secured to the door (16) and at least one hinge (60, 62) attached with one end to said at least one carriage (50, 56) and with the other end to a vertical shoulder (13) of the frame (14), with said at least one carriage and at least one hinge coordinated with the movement of said first and second lever (26, 26' and 28, 28') and provided with elements for locking/unlocking of the sliding movement of said door (16) parallel to the frame (14) defined by a locking element or hook (64) suitable for engaging with said at least one carriage (54, 56).

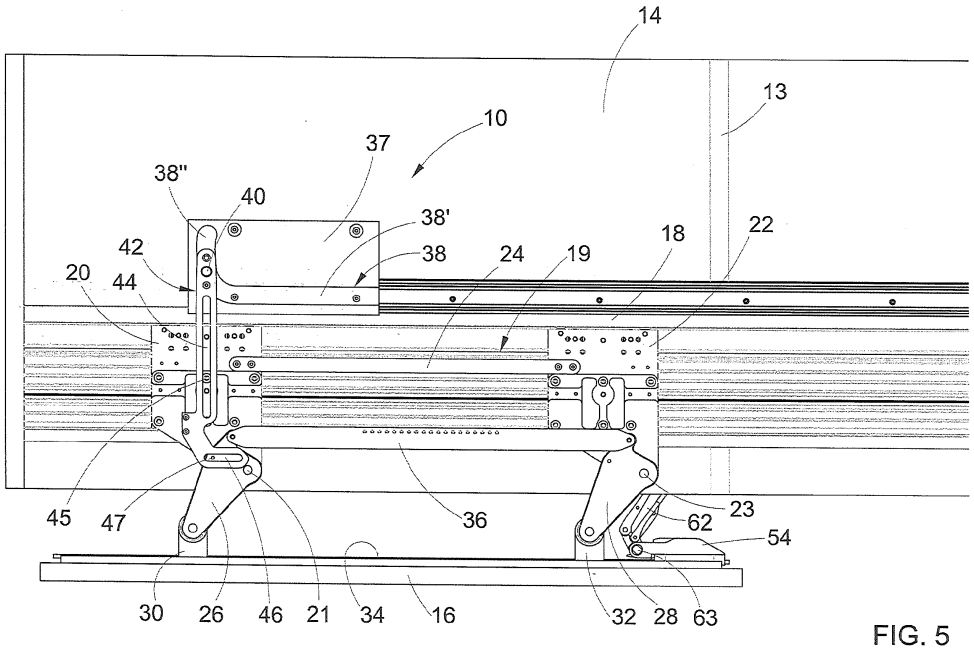


FIG. 5

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## Description

**[0001]** The object of the present invention is an opening device for coplanar doors.

**[0002]** More particularly the present invention relates to a rotary-translational device opening device for coplanar doors of wardrobes and similar furnishing accessories or, likewise, for partition walls of rooms with a view to a definition of the space in accordance with aesthetic and functional parameters.

**[0003]** As is known, furnishing accessories such as wardrobes, cupboards, walk-in closets and the like constitute an essential element of a home with the function not only of allowing the storing and protection of clothes, laundry and different further types of objects, but also of contributing to the definition and characterisation of the aesthetic aspect of the room or of the space wherein they are placed.

**[0004]** Traditionally wardrobes are positioned along the wall with a bridge or corner arrangement, can be sectional or modular and have doors with movement of opening/closing of the side-hinged, folding or sliding type. The choice among the different movements is a function of the management of the spaces and of the aesthetic of the room wherein the wardrobe or similar item of furniture is placed.

**[0005]** The side-hinged doors have features of high functionality in that they allow, for example, the application of a mirror or of accessories such as tie-holder or belt-holder or the like on the inner surface of the same door. However they have an important disadvantage linked to the overall dimensions of the doors which, in the case of reduced spaces, can interfere with other items of furniture such as beds or the like.

**[0006]** Sliding doors allow this disadvantage to be resolved by means of a relative sliding movement of the doors both frontal and lateral and, more particularly, the sliding doors of the coplanar type allow perfect alignment of the same doors when the item of furniture is closed and superimposed in the phase of opening. They do not have one door staggered with respect to the other when the item of furniture is closed (as occurs for traditional sliding doors) and, in this way, they ensure a highly clean shape with a view to observing aesthetic concepts of uniformity, essentiality, harmony and pleasing appearance.

**[0007]** Sliding doors with coplanar movement are, given what is stated above, widely used and are characterised, for example, by the presence of a movement device comprising a longitudinal sliding guide attached to the frame of the wardrobe or equivalent item of furniture and, for each door, a first slide sliding with respect to said guide and a second slide transversely sliding with respect to the first from a rest position or retracted position to a working position or extracted position, together with means of deviation having the function of allowing the movement of the second slide with respect to the first.

**[0008]** The deviation means are applied to the longitudinal slide guide by means of the removal of a section of the track of the same guide with the disadvantage of having to perform mechanical machining processes on the longitudinal guide with a consequent increase in times and costs.

**[0009]** The main disadvantage of these known devices for coplanar doors is represented by the fact that they, in addition to holding or supporting the door at its upper or lower end, require a sliding guide placed at the other end, normally attached to the structure of the item of furniture. This normally means that the door extends to the full height of the item of furniture, being extremely complicated, if not impossible, to make with these known devices coplanar doors extending only for a part of the height of the item of furniture in the case wherein the remaining part is used for other purposes, for example open compartments, shelves, drawer units and the like.

**[0010]** A further disadvantage of the traditional devices for coplanar doors is represented by the fact that the opening mechanisms have dimensions closely linked to the development both in height and in width of the door. Therefore it is necessary to have in stock different and multiple mechanisms of opening according to the different sizes of the doors, with consequent increases in the costs of storage and the like.

**[0011]** A further disadvantage is represented by the fact that the traditional slides, being positioned at one side of the door, tend to create undesirable unbalancing of the same which are more apparent the larger the size of the door.

**[0012]** These disadvantages and, in particular, those linked to the dimensions of development in height of the door, characterise, for example, the solution described in the document DE202009004802 which illustrates a guide system for sliding doors of items of furniture comprising a guide attached above and below the structure or frame of the item of furniture and slidingly positioned with respect thereto are a carriage, a pair of levers with one end hinged with respect to the carriage and with the opposite end hinged to the door of the item of furniture and with the guide provided, likewise, with a curved portion suitable for guiding the movement of one of said levers in order to impose a deviation of the door with respect to the position of closure prior to sliding of the same by means of the carriage mounted on the guide attached to the frame.

**[0013]** Similar disadvantages can likewise be found in a guide system for sliding doors of items of furniture described in the document CH702441 which refers to a guide system for doors comprising a device sliding with respect to a longitudinal guide attached, typically, on the upper front or top of the structure of the frame of the item of furniture and a vertical transmission shaft attached to a shoulder of the structure of said item of furniture with movement synchronised with that of the sliding device and suitable for transmitting the movement transmitted by said sliding device to support elements attached above and below a door of the item of furniture.

**[0014]** In addition to the other evident disadvantages

linked to the presence of said vertical shaft, the above-mentioned supports attached above and below the door are constituted by simple hinges which do not allow an adequate moving away of the door from the item of furniture before the movement of sliding during opening, so that they are suitable only for doors of small thickness.

**[0015]** The object of the present invention is that of obviating the disadvantages stated above. More particularly the object of the present invention is that of providing an opening device for coplanar doors with rotary translation movement of the door during its movement of opening/closing.

**[0016]** A further object of the present invention is that of providing a device for coplanar doors suitable for eliminating any restraint on the height of the item of furniture, which is not a function of the height and width development of the door and which is such as to allow the construction of items of furniture provided with doors with different height and width.

**[0017]** A further object of the present invention is to make available to users an opening device for coplanar doors of items of furniture suitable for ensuring a high level of resistance and reliability in time and such, moreover, as to be easily and economically produced.

**[0018]** These and other objects are achieved by the invention which has the features as claimed in claim 1.

**[0019]** According to the invention an opening device is provided for coplanar doors of wardrobes and/or similar furnishing accessories suitable for being applied to a wardrobe, comprising a guide attached above or below a frame of the wardrobe, longitudinally extended and suitable for allowing the sliding of a mobile unit connected to a door via a first lever and a second lever co-operating with mechanical means restrained to said guide and mobile unit to define a jointed quadrilateral mechanism for the opening/closing of the door with a rotary translation motion, said device being, likewise, provided with further mechanical means secured to the door, coordinated with the movement of said first and second lever and comprising elements for locking/unlocking of the sliding movement of said door parallel to the frame.

**[0020]** Advantageous embodiments of the invention are disclosed by the dependent claims. The constructional and functional features of the opening device for coplanar doors of the present invention will be made clearer by the following detailed description, in which reference is made to the accompanying drawings which represent a preferred and non-limiting embodiment thereof, in which:

Figure 1 shows schematically a side view of a wardrobe provided with the device for opening/closing of coplanar doors of the invention and with the door in position of opening;

Figure 2 shows schematically an axonometric view of a door of a wardrobe provided with the device for movement of the invention;

Figure 3 shows schematically in an axonometric view an enlarged detail of a portion of door as shown in Figure 2 circumscribed by the circle indicated by the letter X;

Figures 4 to 6 show at schematic level views from above of the device of the invention according to different and sequential phases of movement for the opening/closing of the door of the wardrobe;

Figure 7 represents schematically a side view of a portion of the device of the invention;

Figure 8 shows schematically an enlarged detail of a part as shown in Figure 7 circumscribed by the circle indicated by the letter Y;

Figure 8b shows in detail a component of the device of the invention;

Figures 9 and 10 show schematically different ways of application of the device of the invention to the doors of a wardrobe;

Figures 11 to 13 show schematically an alternative embodiment of the device of the invention and the sequential steps of actuation of the same for performing the opening/closing of the door of the wardrobe;

Figures 14 and 15 show schematically phases of movement of a component of the device of the invention as per Figures 7, 8, 8b.

**[0021]** Referring to the aforesaid drawings, the opening device for coplanar doors of the present invention, denoted overall by 10, is applied to a wardrobe 12 to allow the opening/closing movement of a door 16 with respect to a frame 14 of the same wardrobe.

**[0022]** The opening device 10 comprises a guide 18 longitudinally extended, attached to the frame 14 of the wardrobe 12 at its upper surface 14' or lower surface 14" and suitable for allowing the sliding of a mobile unit 19.

**[0023]** In the preferred embodiment shown in the drawings, said mobile unit 19 comprises a first carriage 20 and a second carriage 22, opposite and parallel, coupled and connected to the door 16 according to the ways detailed here below.

**[0024]** In an alternative embodiment said mobile unit is defined by a single carriage.

**[0025]** Referring to the embodiment as per the drawings, the first carriage 20 and the second carriage 22 are coupled and integral one with the other by means of a union bar 24 arranged transversely to said carriages in a direction, preferably, parallel to the guide one 18.

**[0026]** A first lever 26 and a second lever 28 (identical one to the other) are hinged, respectively, to the first carriage 20 by means of a first pin 21 and to the second carriage 22 by means of a second pin 23, to a first fork 30 and to a second fork 32 of a plate-shaped element 34 attached to the inside front of the door 16 turned in the direction of the frame 14 of the wardrobe 12.

**[0027]** A further connection bar 36 makes integral, with a hinge restraint, said first lever 26 and second lever 28 allowing the transmission of the motion with a coordinat-

ed movement according to what is detailed here below.

**[0028]** A guide block or element 37 is secured to the guide 18 and is provided with a shaped track or groove 38 which, from an end edge of said guide block 37, develops a first section 38' in a direction parallel to the guide 18 which extends, at the opposite end edge, in a second section 38" substantially perpendicular to said first section, with said first section 38' and second section 38" joined one to the other by means of a curved section 38"'. The track or groove 38 shaped in this way with an L shape substantially defines a cam whose function will be described in detail.

**[0029]** The track or groove 38 can have different shapes for an optimal control of the trajectory of opening of the door 16.

**[0030]** Moreover, in an alternative embodiment to the preferred one and the subject of description, said guide block or element 37 can be formed directly on the guide 18. Inside the track or guide 38 a slider 40 is slidingly placed integral with an arm 42 with a tendentially L shape and provided with a first through slot 44 developed in a direction perpendicular to that of the guide 18, inside of which a first rod 45 engages, integral with the first carriage 20, and a second slot 46, developed in a direction parallel to the guide 18, inside of which a second rod 47 engages, integral with the first lever 26. The function and the movement of said arm 42 will be detailed here below.

**[0031]** On the inside front of the single door 16, turned in the direction of the frame 14 of the wardrobe 12, are attached along the height development of the door an upper plate-guide 50 and a lower plate-guide 52, opposite and parallel one to the other, developed substantially along the entire width of the single door 16 and suitable for allowing the sliding, respectively, of an upper carriage 54 and of a lower carriage 56 integral one with the other by means of a bar or crosspiece 58.

**[0032]** An upper hinge 60 and a lower hinge 62, opposite one to the other, have one end attached with a hinge restraint 63, respectively, to the upper carriage 54 and to the lower carriage 56 and an opposite end attached, by means of a further hinge restraint 65, with respect to a shoulder attachment element 61 rigidly attached to a vertical shoulder 13 of the wardrobe 12 (as schematised in Figures 3, 7 and 14, 15, respectively for a right shoulder and a left shoulder of an item of furniture).

**[0033]** The upper hinge 60 and the lower hinge 62 each comprise a load-bearing lever 70 and a secondary lever 72 placed below said load-bearing lever 70, both said levers hinged with one end to a connecting rod 74 in turn hinged respectively to the upper carriage 54 and to the lower carriage 56 and with an opposite end hinged to the shoulder attachment element 61.

**[0034]** A locking element or hook 64 is attached at one of the ends of the upper plate-guide 50 or of the lower plate-guide 52 or of both and is suitable for engaging with the upper carriage 54 or with the lower carriage 56 or with both to define a temporary lock for the regulation and actuation of the movement of opening/closing of the door 16 as detailed here below. In accordance with the preferred embodiment said locking element, when the door 16 is in a closure position, is contained inside the upper carriage 54 or the lower carriage 56 or both.

**[0035]** For this purpose said locking element or hook 64, at one of the ends, has two opposite projecting portions 67 which define a transverse opening 68 which extends and widens, inside the body of the locking element or hook 64, in a pocket 68' with a substantially circular profile suitable for receiving a pin 69 projecting from the lower carriage 56 or upper carriage 54 with a substantially rectangular section (as schematised in Figures 8 and 8b).

**[0036]** The device of the invention likewise comprises an optional return spring (not shown in the drawing) having the function of exerting the elastic function during the phase of closing of the door 16 damping the movement of the same.

**[0037]** The first carriage 20 and the second carriage 22 can, as described above, be attached above or below the frame 14 as a function of the position of the guide 18 and of the dimensions of the doors, so as to allow the door to be supported, maintaining a symmetry with respect to the vertical middle line and, at the same time, optimising the distribution of the weights bearing on the system and allowing the use of doors with different heights, as schematised in the example configurations of Figure 9.

**[0038]** Referring to Figure 10 two configurations are, instead, schematised wherein the device of the invention comprises the mobile unit with one single carriage or with two adjacent carriages positioned not symmetrically with respect to the vertical middle line of the door.

**[0039]** Figures 11 to 13 schematise an alternative embodiment of the device of the invention described above.

**[0040]** More particularly the device comprises a mobile unit 19' sliding with respect to the guide 18 and comprising a first carriage 20' and a second carriage 22' made integral one with the other by means of a transverse union bar (not visible in the drawings), a first lever 26' and a second lever 28' identical one with the other and, respectively, hinged with one end to the first carriage 20' and to the second carriage 22' and with the opposite end to a first fork 30' and to a second fork 32'.

**[0041]** Moreover the ends of the first lever 26' and of the second lever 28', hinged with respect to the first and second carriage, have a cogged wheel profile 80 and 81 respectively suitable for meshing with a conjoined cogged profile 82 and 83 formed on one end of a first connecting rod 84 and of a second connecting rod 85 pivoted, respectively, to the first carriage 20' and to the second carriage 22'.

**[0042]** The ends of said first connecting rod 84 and second connecting rod 85, opposite those provided with cogged profile, are made integral one with the other by means of a union bar 25 having the function of transmitting the motion between the two connecting rods as detailed here below.

**[0043]** The second connecting rod 85 of the second

carriage 22' is likewise provided with a projecting appendage 86 whose end is provided with a roller or slider 87 sliding inside a shaped track or groove 88 made in the guide 18. Said track or groove 88 develops along a substantially right-angled path with one closed end defining a stop portion for the roller or slider 87 of the projecting appendage 86 and wherefrom a first section 88' develops, joined to a second section 88" perpendicularly arranged with respect to the first section and with an open end.

**[0044]** The projecting appendage 86, in an alternative embodiment, can be formed on the first connecting rod 84.

**[0045]** The device of the invention can be with manual actuation or automatic actuation by means of an electric motor.

**[0046]** The functioning of the opening device for coplanar doors of the invention, described in detail above with reference to its constructional features, is here below illustrated with particular reference to Figures 4 to 6 as regards the first embodiment and with reference to Figures 11 to 13 as regards the alternative embodiment.

**[0047]** Figure 4 illustrates the condition of closure of the door 16 wherein the pin 40 of the shaped arm 42 is at the second section 38" of the track or groove 38 of the guide block 37 and the first lever 26 and the second lever 28 are in a rest position with an orientation substantially parallel to the guide 18.

**[0048]** Figure 5 illustrates the first phase of opening of the door 16 during which said door is moved away from the frame 14 and parallel thereto with the first lever 26 and the second lever 28 which rotate in a coordinated manner with respect to the first pin 21 and to the second pin 23 and with the second rod 47 of the first lever 26 which, sliding inside the second slot 46 of the arm 42, causes the translation movement of said arm 42 with the slider 40 which slides along the second section 38" of the track or groove 38 of the guide block 37 in the direction of the first section 38' (the first rod 45 which engages with the first slot 44 sustains and regularises the movement of the arm 42).

**[0049]** Moreover, coordinatedly with the movement of the first lever 26 and of the second lever 28, the upper hinge 60 and the lower hinge 62, which in conditions of door closure (Figure 4) are in contact, respectively, with the upper carriage 54 and the lower carriage 56, rotate with respect to said latter given the presence of the hinge restraint 63, as illustrated in Figure 5.

**[0050]** In this phase, further, the upper carriage 54 (or the lower carriage 56) is coupled to the locking element or hook 64; in fact the pin 69 is housed in the pocket 68' and partially rotated with the larger axis rotated through an angle comprised between 45° and 90° with respect to the longitudinal axis of the locking element or hook 64 so as to prevent the withdrawal thereof through the transverse opening 68.

**[0051]** Taking account of the fact that the first lever 26 and the second lever 28, restrained as described with respect to the first carriage 20, to the second carriage 22, to the first fork 30 and to the second fork 32 and connected by means of the further connection bar 36, define a mechanism of the jointed quadrilateral type and, since said first and second lever have the same dimensions, the door 16 moves away from the frame 14 with a rotary translation movement remaining parallel to the same frame. The movement transmitted by the shaped arm 42 to the first lever 26 is transmitted to the second lever 28 by means of the aforesaid further connection bar 36.

**[0052]** The further rotation of the first lever 26 and of the second lever 28 imposes a further rotary movement of the upper hinge 60 and of the lower hinge 62 which determines the coordinated rotation of the pin 69 which, moving with the larger axis parallel to the longitudinal axis of the locking element or hook 64, disengages with respect to the pocket 68' and to the opening 68 to allow the condition wherein the door 16, moved away from the surface of the frame 14, as described previously, is made to slide parallel to the same and, superimposing on another door (not shown in the drawings), makes the space inside the same frame accessible.

**[0053]** More particularly during this phase the upper carriage 54 (and/or the lower carriage 56), through the action of rotation of the first lever 20 and of the second lever 22, disengages with respect to the locking element or hook 64, allowing the movement of the door 16 by means of a sliding of the upper carriage 54 and of the lower carriage 56 along the upper plate-guide 50 and the lower plate-guide 52.

**[0054]** During this phase, moreover, the first carriage 20 and the second carriage 22 slide with respect to the guide 18 with the slider 40 of the arm 42 which runs along the first section 38' of the track or groove 38 of the guide block 37 and exits from the same.

**[0055]** Similarly, by implementing backwards the movements illustrated above, the movement of closure of the door 16 is performed.

**[0056]** In a similar way to what is described above the movement of opening/closing of the door 16 is performed in the case of the alternative embodiment described in detail with reference to its technical and functional components in Figures 11 to 13.

**[0057]** More particularly, starting from the position of closure of the door illustrated in Figure 11, wherein the first lever 26' and the second lever 28' are in a rest position with orientation substantially parallel to the guide 18, the door 16 is moved away from the frame of the item of furniture and parallel thereto with the first lever 26' and the second lever 28' which rotate in a coordinated manner with respect to own hinge restraint with the first carriage and second carriage and with the motion which is transmitted from the second lever 28' to the first lever 26' by means of conjoined cogged profiles (the cogged profile crown 81 of the second lever 28' with the cogged profile 83 of the second connecting rod 85 and the cogged profile crown 80 of the first lever 20' with the cogged profile 82

of the first connecting rod 84) and of the union bar 25.

**[0058]** The movement of the second lever 28', imposing the rotation of the second connecting rod 85 with respect to its fulcrum point, also causes the coordinated sliding of the roller or slider 87 of the projecting appendage 86 inside the track or groove 88 with the unhooking or disengaging of the pin 69 of the upper carriage 54 (or lower 56) with respect to the locking element or hook 64, with said disengaging which takes place when the roller or slider 87 has run along the entire groove 88 abandoning the section 88" (as schematised in Figure 13 and in Figure 15) and with the consequent possibility of moving the door during sliding by means of a sliding of the upper carriage 54 and lower carriage 56 with respect to the upper guide 50 and lower guide 52.

**[0059]** As can be seen from the above the advantages that the device of the invention achieves are clear.

**[0060]** The opening device for coplanar doors of the invention allows advantageously the performing of a rotary translation movement and control of the trajectory of the door during its movement of opening/closing.

**[0061]** An important advantage of the opening device for coplanar doors of the invention is represented by the upper carriage 54 and lower carriage 56 sliding with respect to the respective upper plate-guide 50 and lower plate-guide 52 which can be attached parallel one to the other at different distances along the height development of the door. This allows the use of doors having different heights and attaching of the guide for the mobile unit assembly above or below the frame independently of the height dimensions of the door, which is not bound to the height of the item of furniture.

**[0062]** A further advantage is represented by the fact that the presence of the guide block or element 37 allows the breakdown of the rotational movement of the lever connected to the carriage (sliding with respect to the guide 18) according to two linear components, a horizontal component and a vertical component, in such a way as to create, in combination with the features of the guide block, a controlled trajectory of the door during its movement of opening.

**[0063]** Although the invention has been described above with particular reference to one of its embodiments given solely by way of a non-limiting example, numerous changes and variations will appear clear to a person skilled in the art in light of the description given above. The present invention therefore intends to embrace all the changes and variations which come within the scope of the following claims.

## Claims

1. An opening device (10) for coplanar doors of wardrobes and/or similar furnishing accessories suitable for being applied to a wardrobe (12), comprising a guide (18) attached above or below a frame (14) of the wardrobe (12), longitudinally extended and suitable for allowing the sliding of a mobile unit (19, 19') connected to a door (16) via a first lever (26, 26') and a second lever (28, 28') co-operating with mechanical means restrained to said guide (18) and mobile unit (19, 19') to define a jointed quadrilateral mechanism for the opening/closing of the door (16) with a rotary translation motion, said device comprising at least one carriage (54, 56) sliding with respect to a plate-guide (50, 52) secured to the door (16) and at least one hinge (60, 62) attached with one end to said at least one carriage (50, 56) and with the other end to a vertical shoulder (13) of the frame (14), with said at least one carriage and at least one hinge coordinated with the movement of said first and second lever (26, 26' and 28, 28') and provided with elements for locking/unlocking of the sliding movement of said door (16) parallel to the frame (14) defined by a locking element or hook (64) suitable for engaging with said at least one carriage (54, 56).

2. The opening device according to claim 1, **characterised in that** said locking element or hook (64) is provided, at one of its ends, with two opposite projecting portions (67) defining a transverse opening (68) which extends and widens, inside the body of the hook (64), in a pocket (68') with a substantially circular profile suitable for receiving a pin (69) projecting from the carriage (54, 56) and having a substantially rectangular cross-sectional profile.

3. The opening device according to claim 1 or 2, **characterised in that** the carriage (54) or upper carriage and the carriage (56) or lower carriage are, respectively, sliding along an upper plate-guide (50) and a lower plate-guide (52), parallel and opposite, transversely attached on the internal front and along the height development of the door (16), the hinge (60) or upper hinge and the hinge (62) or lower hinge respectively hinged with one end to the upper carriage (54) and to the lower carriage (56) and with another end to a vertical shoulder (13) of the frame (14).

4. The opening device according to claim 3, **characterised in that** the upper hinge (60) and the lower hinge (62) comprise a load-bearing lever (70) and a secondary lever (72) placed below said load-bearing lever (70), with said levers which are both hinged with one end to a connecting rod (74) in turn hinged respectively to the carriage (54, 56) and with an opposite end hinged to a shoulder attachment element (61) rigidly attached to a vertical shoulder (13) of the wardrobe (12).

5. The opening device according to claim 1, **characterised in that** the upper carriage (54) and the lower carriage (56) are integral one with the other by means of a bar or crosspiece (58).

6. The opening device according to claim 1, **characterised in that** the mobile unit (19), sliding with respect to the guide (18), comprises a first carriage (20, 20') and a second carriage (22, 22'), opposite and parallel, coupled and joined one to the other by means of a union bar placed transversely to said carriages.

7. The opening device according to claim 1, **characterised in that** the mobile unit (19) sliding with respect to the guide (18) comprises a single carriage.

8. The opening device according to claim 1, **characterised in that** the mechanical means restrained to the guide (18) and to the mobile unit (19) and co-operating with the first lever (26) and the second lever (28) comprise a guide block or element (37) and an arm (42) co-operating with said guide block and mobile unit for moving said first and second lever opposite and integral one with the other by means of a further connection bar (36).

9. The opening device according to claim 8, **characterised in that** the guide block or element (37) is secured to the guide (18) or formed directly thereon and is provided with a shaped track or groove (38) which, from an end edge of said guide block (37), develops a first section (38') in a direction parallel to the guide (18) which extends, at the opposite end edge, in a second section (38") substantially perpendicular to said first section, with said first section (38') and second section (38") joined one to the other by means of a curved section (38'") so as to define a cam.

10. The opening device according to claim 8, **characterised in that** the arm (42) is tendentially L-shaped and is provided with a slider (40) suitable for engaging with the track or groove (38) of the guide block (37), with a first through slot (44) developed in a direction perpendicular to that of the guide (18) and inside of which a first rod (45) is slidingly engaged, integral with the mobile unit (19) and a second through slot (46) developed in a direction parallel to the guide (18) inside of which a second rod (47) is slidingly engaged, integral with the first lever (26).

11. The opening device according to claim 1, **characterised in that** the mechanical means restrained to the guide (18) and to the mobile unit (19') and co-operating with the first lever (26') and the second lever (28') comprise a first connecting rod (84) and a second connecting rod (85) coupled to said first lever (26') and second lever (28'), pivoted respectively to the first carriage (20') and to the second carriage (22') and made integral one with the other by means of a union bar (25) and a shaped groove or track (88) developed along a path substantially with right angle and formed in the guide (18) for the sliding of a roller or slider (87) of a projecting appendage (86) of one of said connecting rods, said shaped groove or track (88) comprising a first section (88') closed at one end, joined to a second section (88") perpendicularly arranged with respect to said first section and with an open end.

12. The opening device according to claim 11, **characterised in that** the coupling between the first lever (26') and the first connecting rod (84) and between the second lever (28') and the second connecting rod (85) is made by means of conjoined profiles defined, respectively, by a crown with cogged profile (80) of the first lever (26') which meshes with a cogged profile (82) of the first connecting rod (84) and by a crown with cogged profile (81) of the second lever (28') which meshes with a cogged profile (83) of the second connecting rod (85).

13. Method for the opening/closing of coplanar doors with rotary translation movement by means of the opening device according to one or more of the preceding claims, **characterised in that** it comprises the steps of:

    - moving of the door (16) away from the frame (14) by means of a coordinated rotation of the first lever (26, 26') and of the second lever (28, 28') with respect to the mobile unit (19) with the slider (40, 87) that slides along the section (38", 88') of the track or groove (38, 88) in the direction of the section (38', 88") and with the second rod (47) of the first lever (26) that slides inside the second slot (46) of the same arm (42);
    - disengaging of the upper carriage (54) and/or of the lower carriage (56) with respect to the locking element or hook (64) by means of the outstroke of the pin (69) with respect to the pocket (68') of said hook;
    - moving of the door (16) parallel to the frame (14) by means of a sliding of the upper carriage (54) and of the lower carriage (56) along the upper plate-guide (50) and the lower plate-guide (52) and simultaneous sliding of the first carriage (20, 20') and of the second carriage (22, 22') with respect to the guide (18) and of the slider (40, 87) along the section (38', 88") of the track or groove (38, 88).

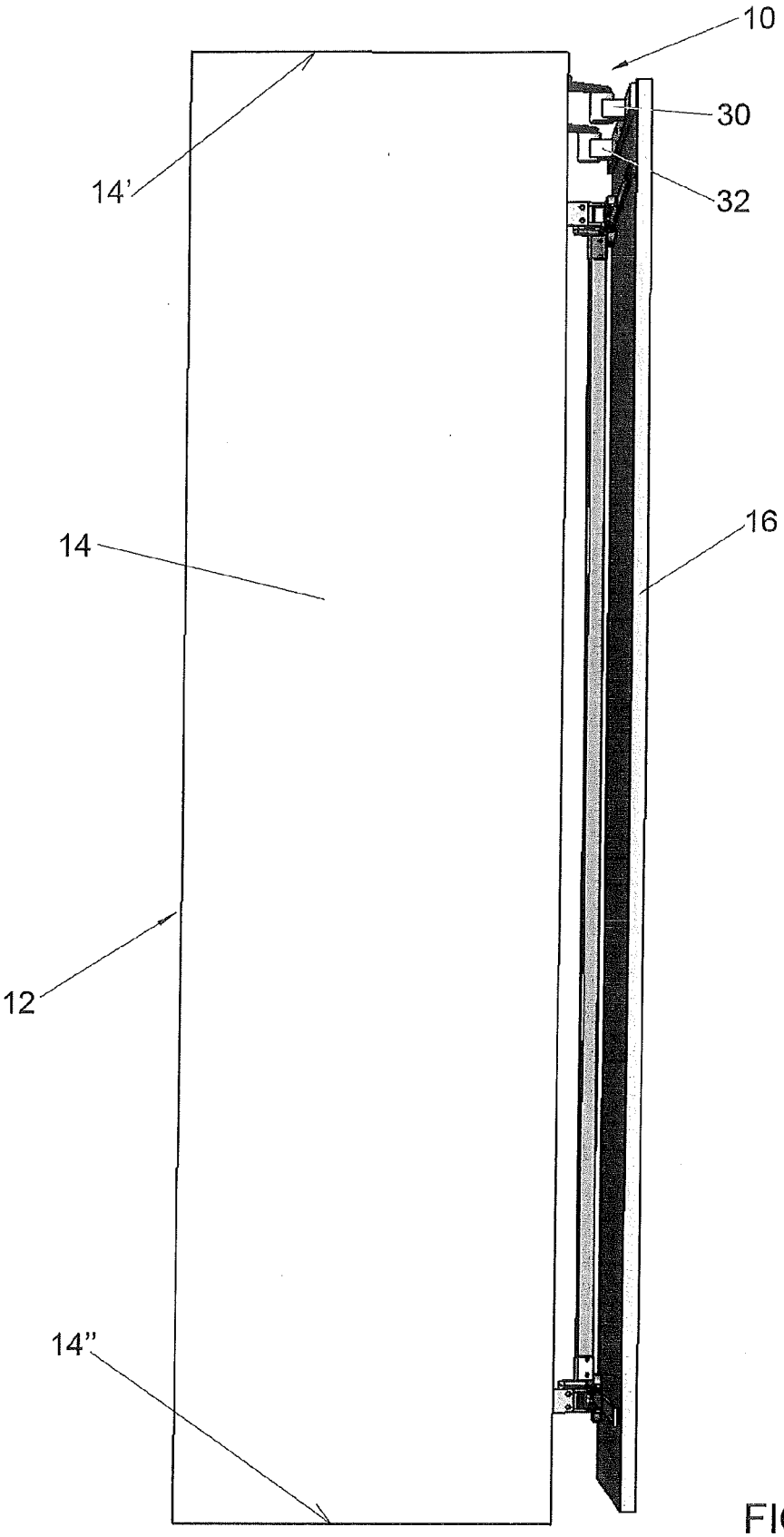



FIG. 1

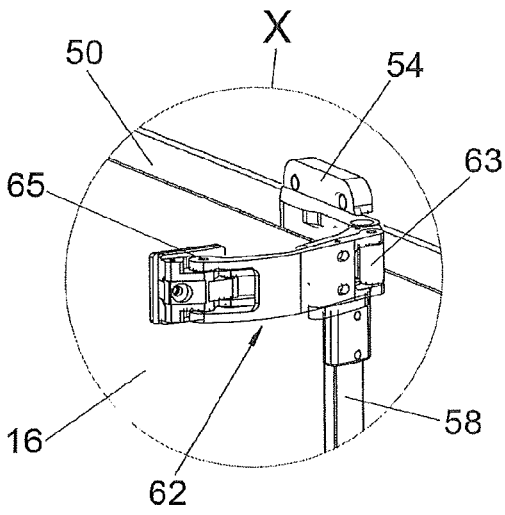



FIG. 3

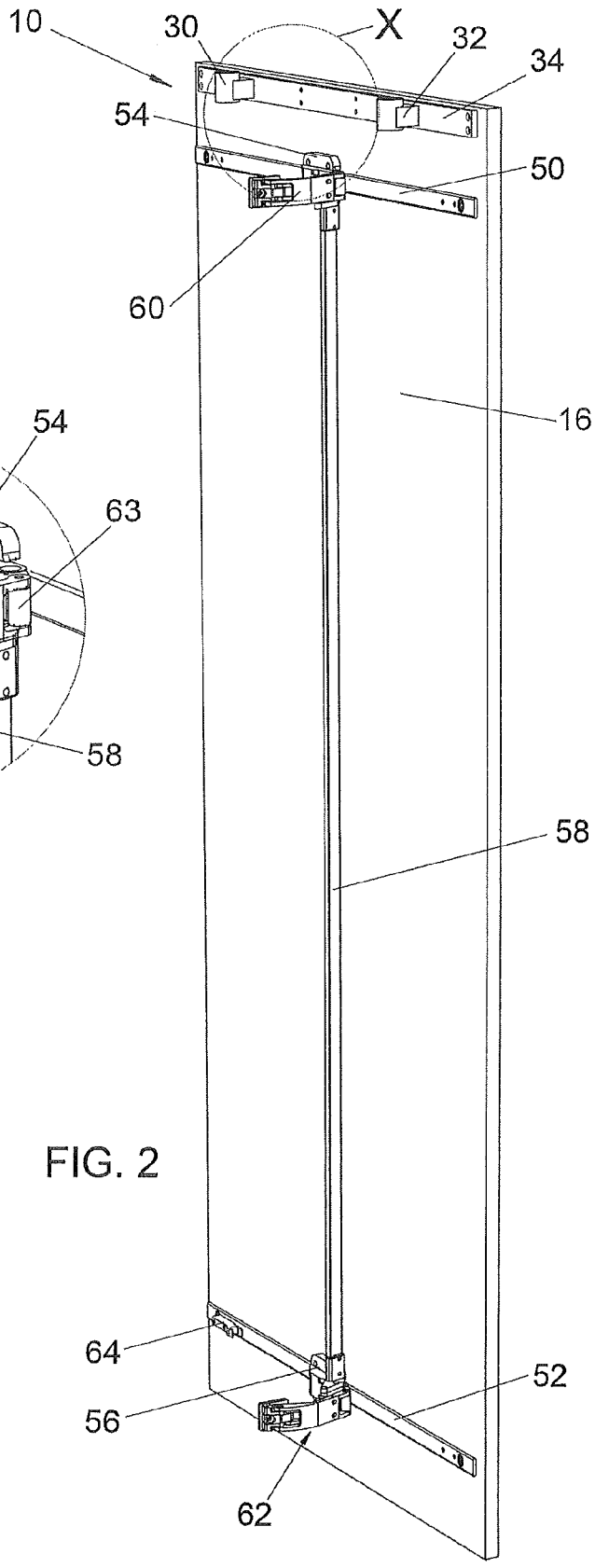



FIG. 2

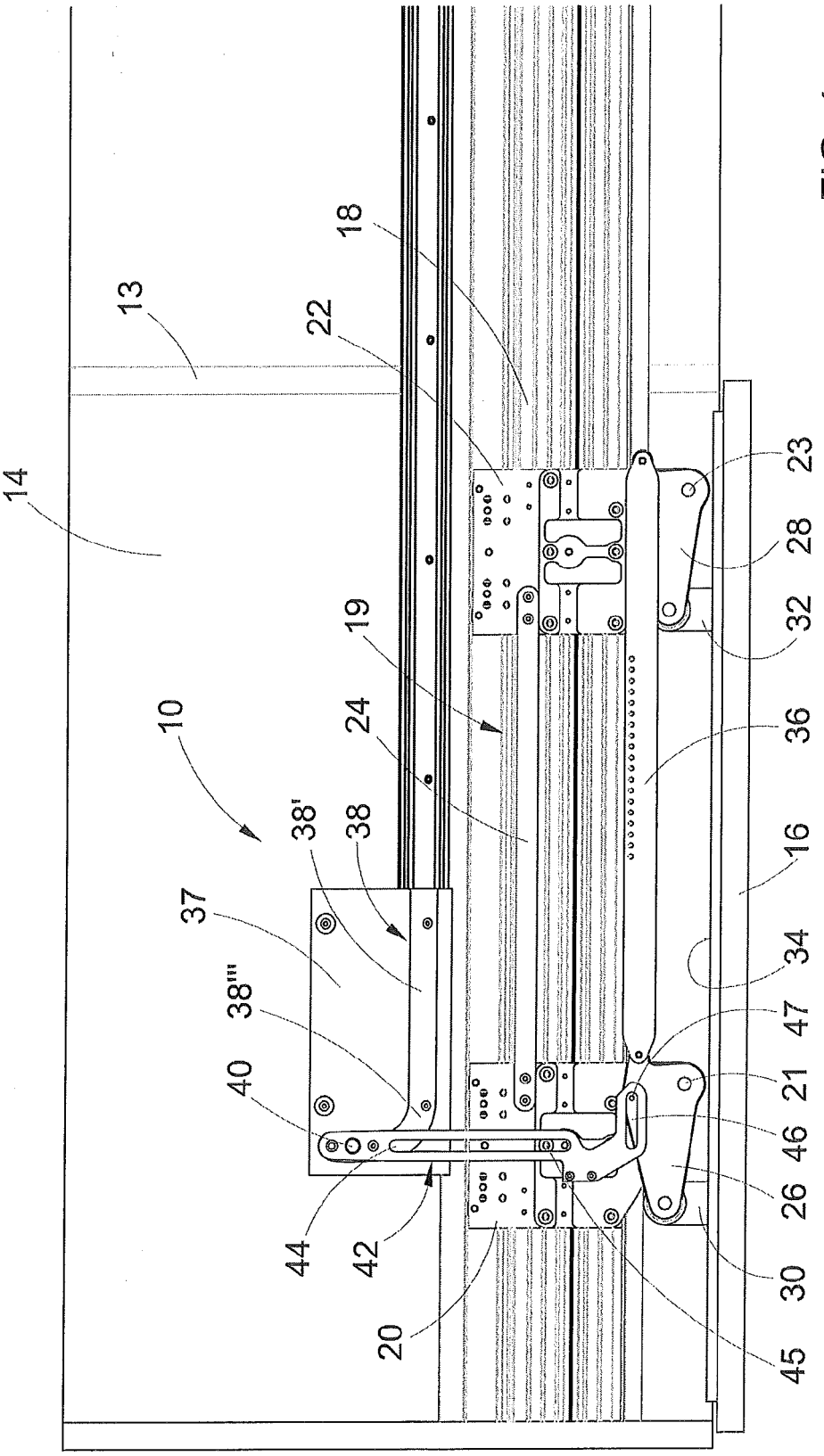

14
13
18
22
23
28
32
19
10
24
36
38'
38
16
37
34
38'''
47
40
21
46
26
44
42
30
20
45

FIG. 4

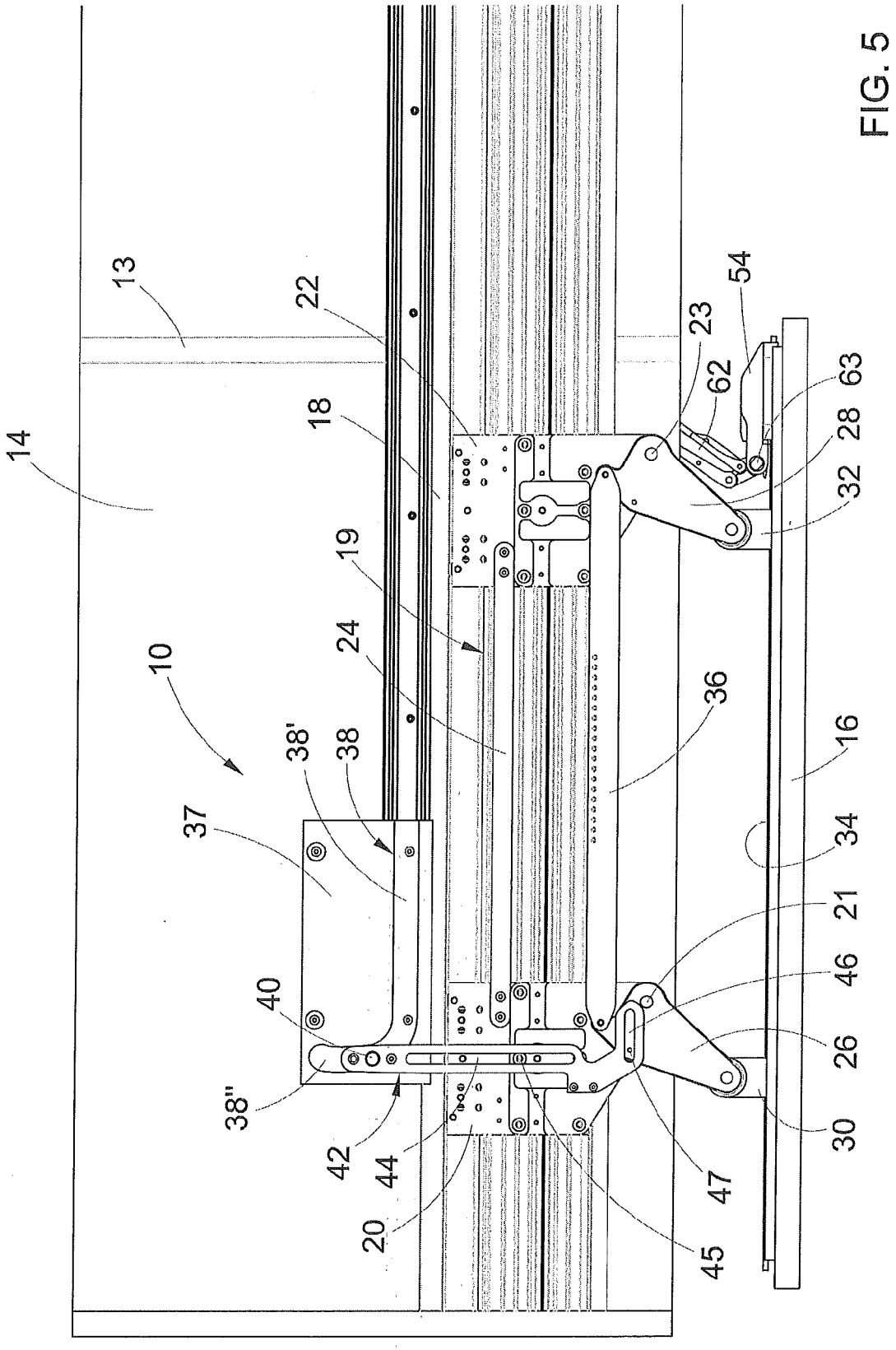

13
22
54
23
62
63
18
28
14
32
19
24
10
36
38'
38
16
37
34
21
40
46
26
38"
42
44
30
47
20
45

FIG. 5

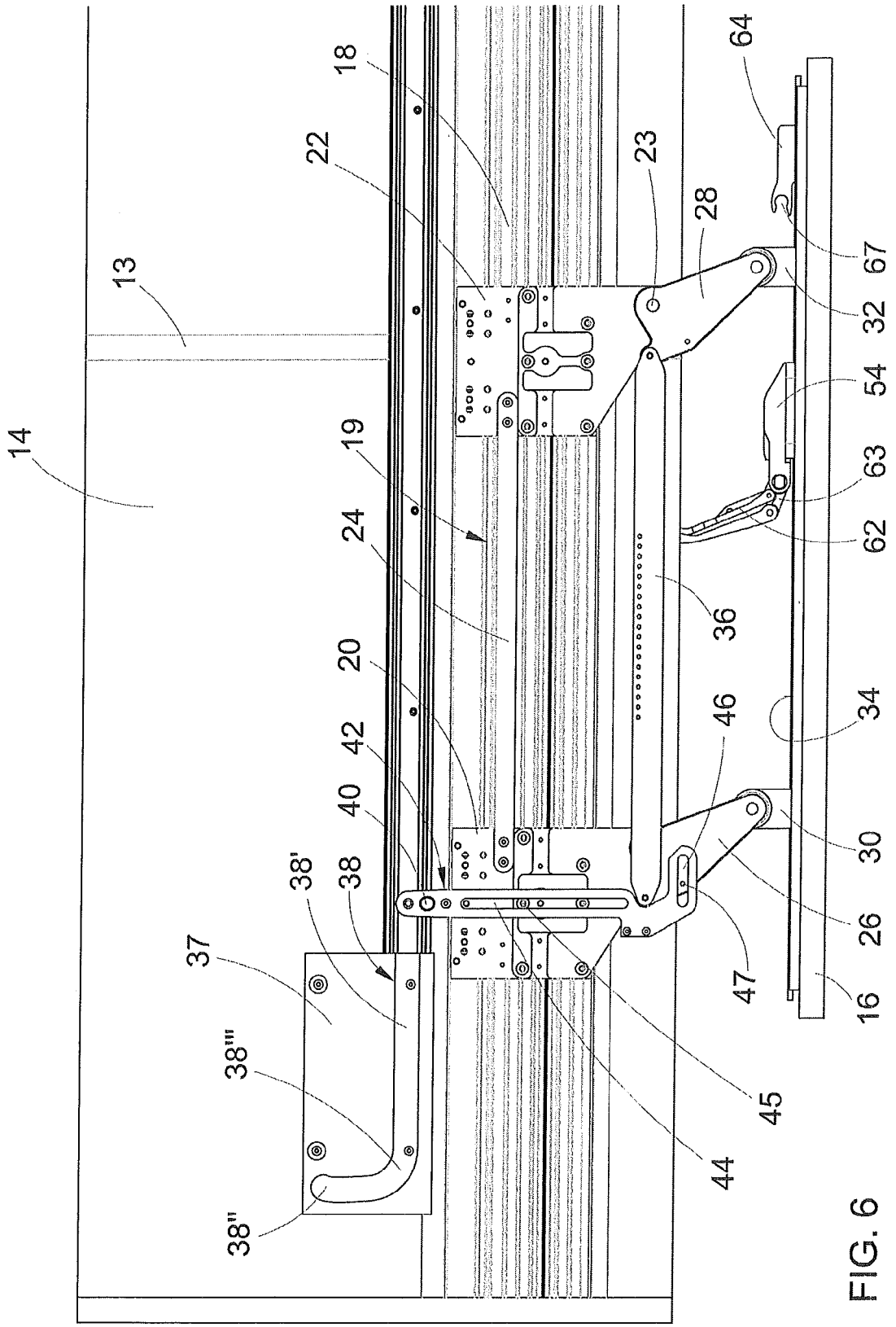
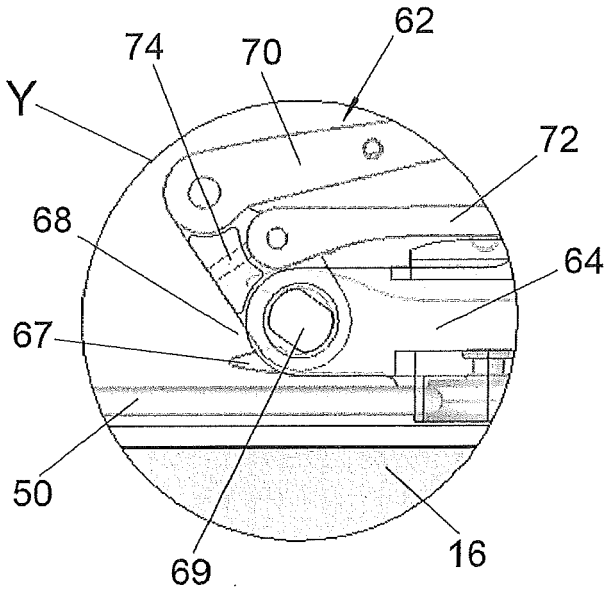

14
13
18
22
19
24
20
42
40
38'
38
37
38'''
38''
64
23
28
67
32
54
63
62
36
34
46
30
26
47
16
45
44

FIG. 6

FIG. 8



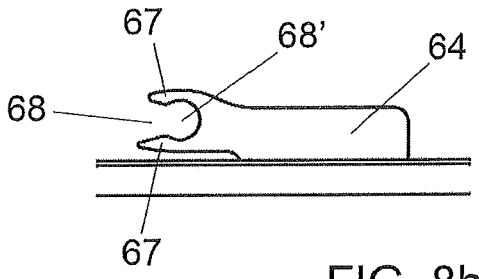
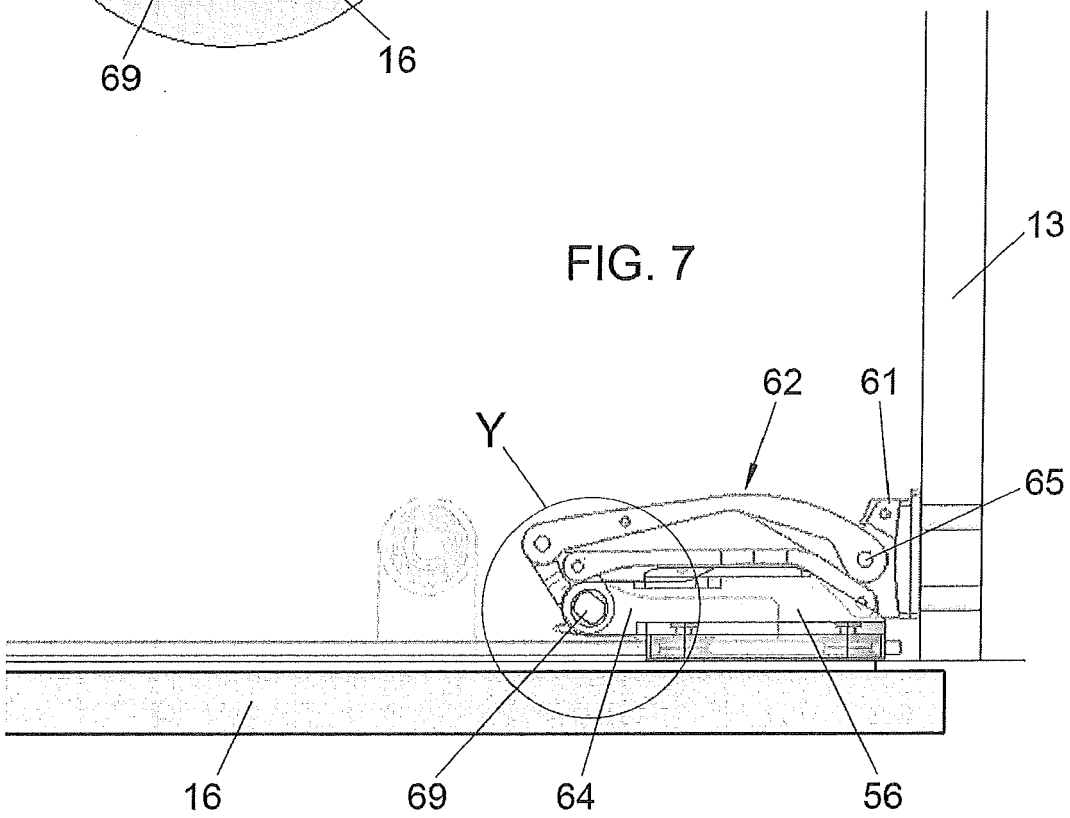




FIG. 8b

FIG. 7



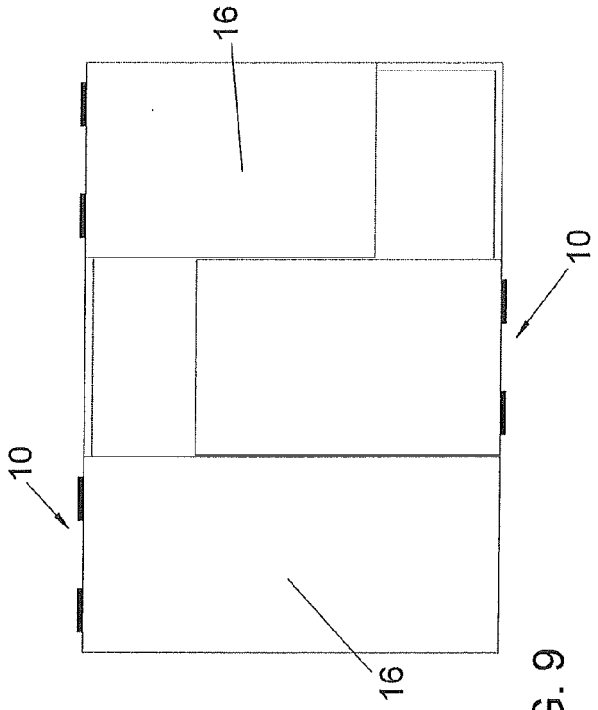



FIG. 9

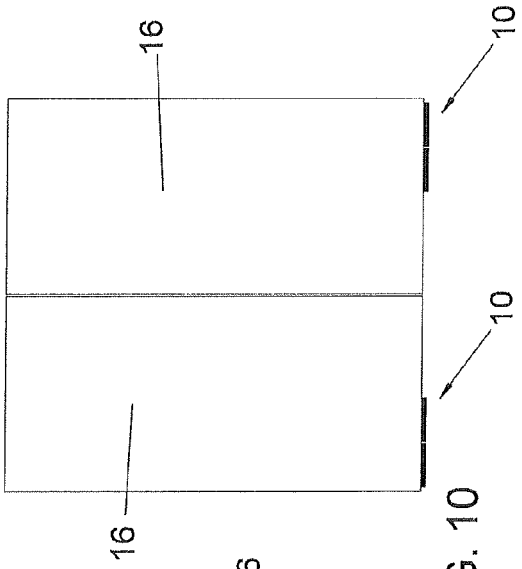
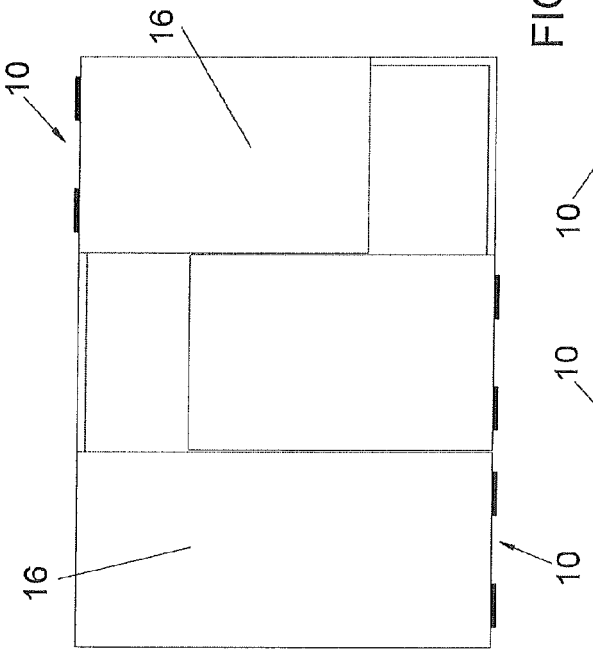
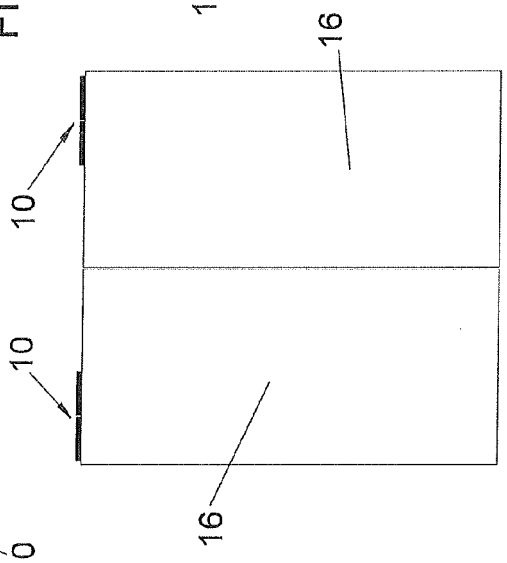



FIG. 10



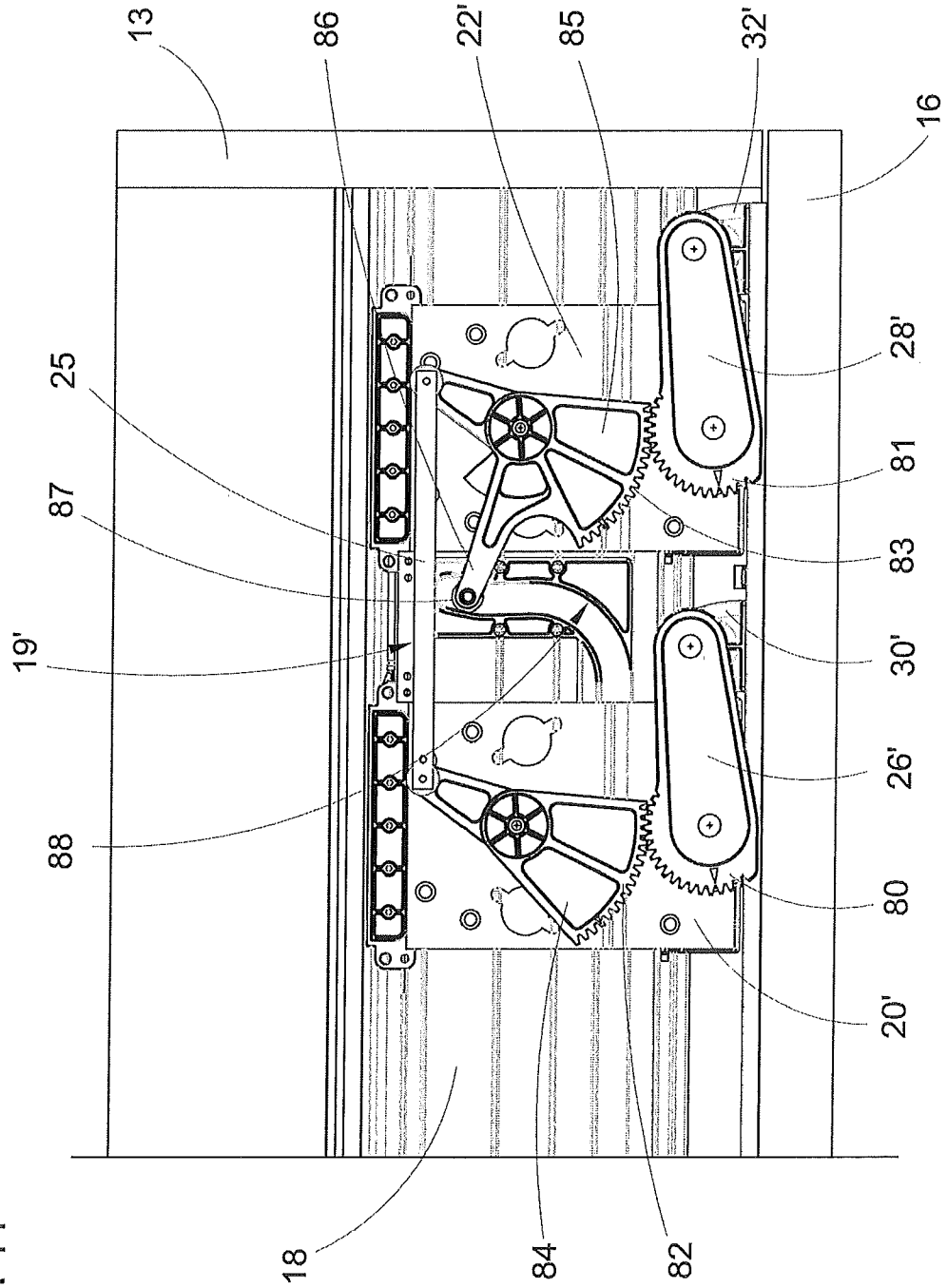



FIG. 11

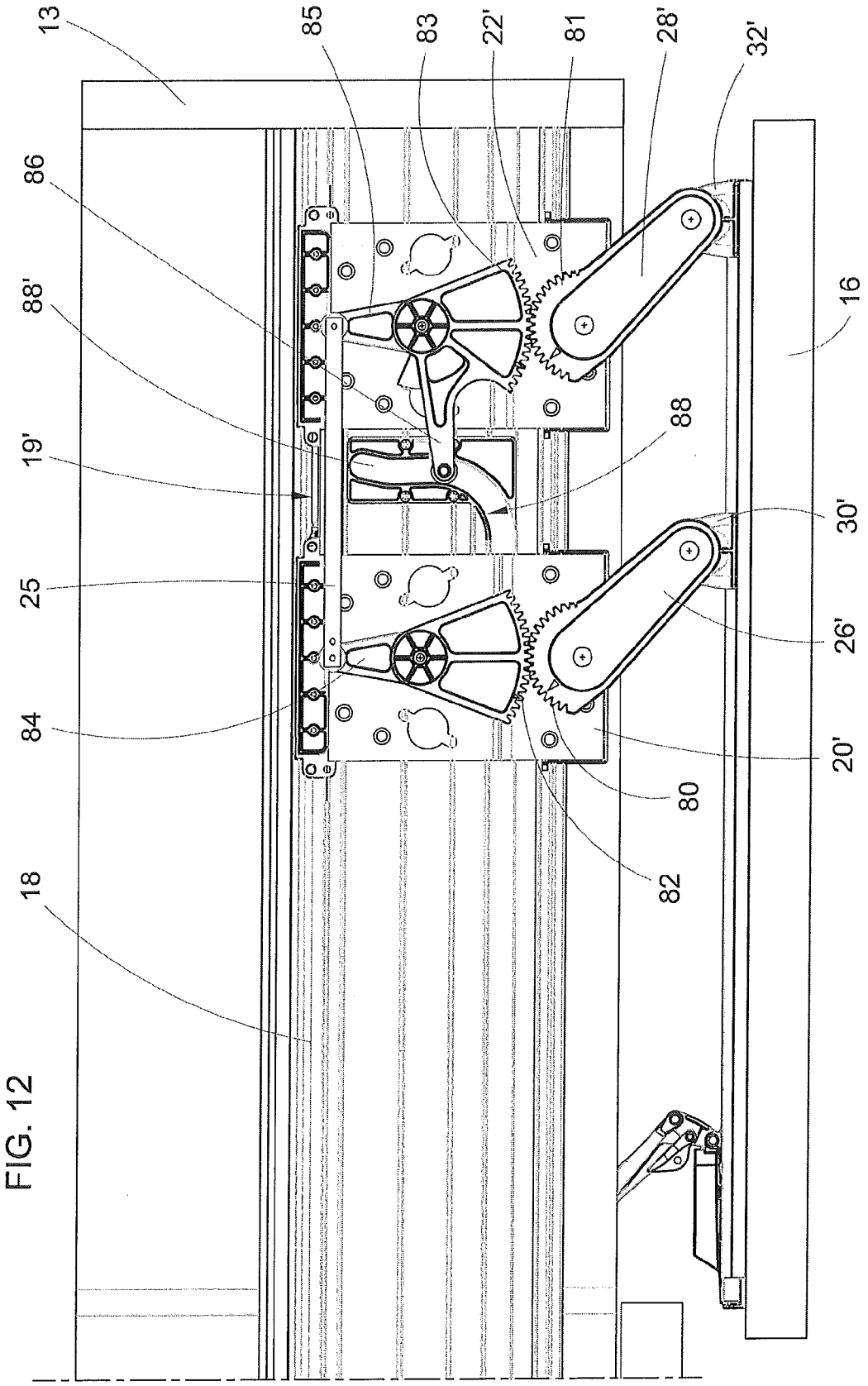



FIG. 12

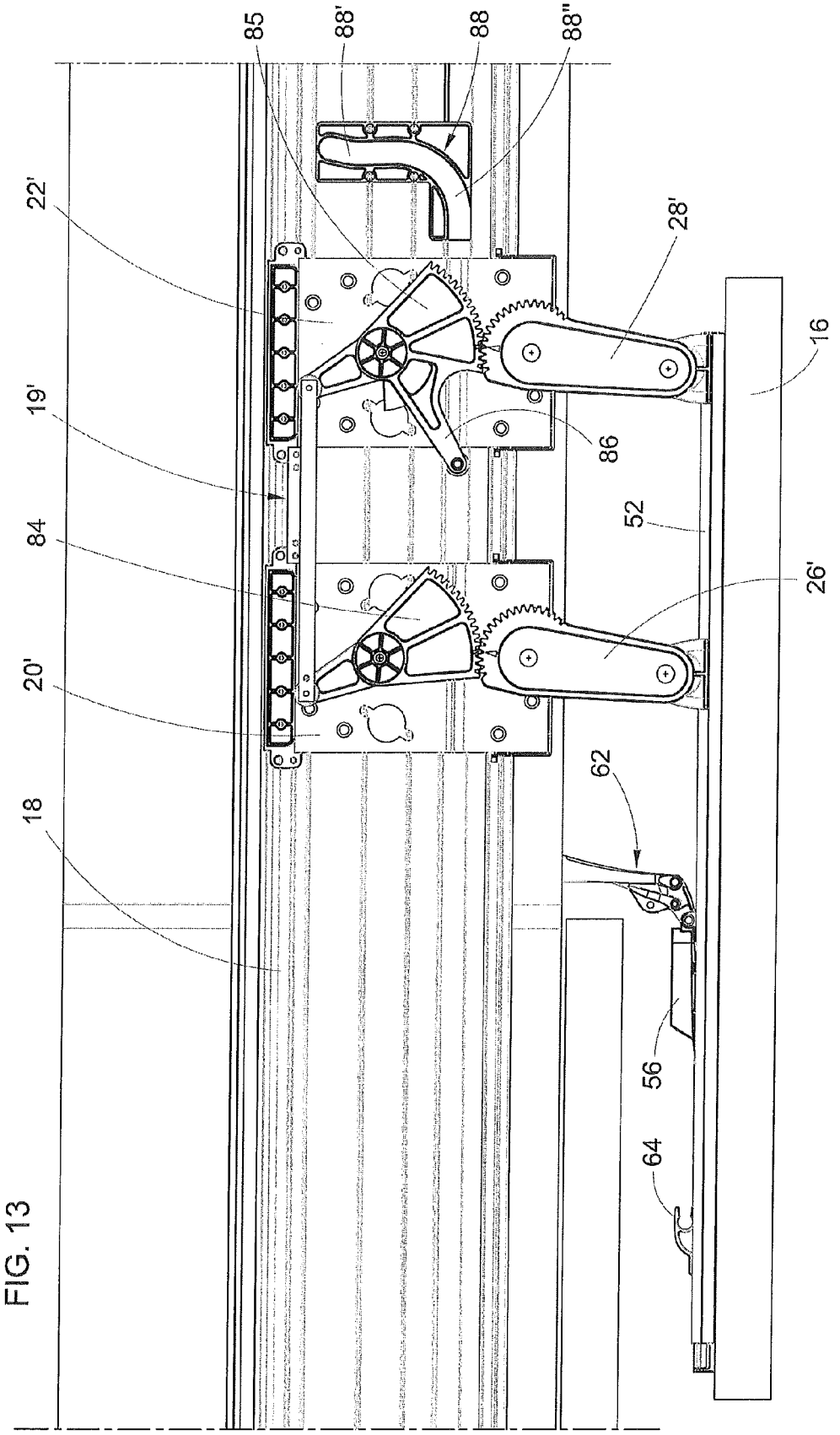



FIG. 13

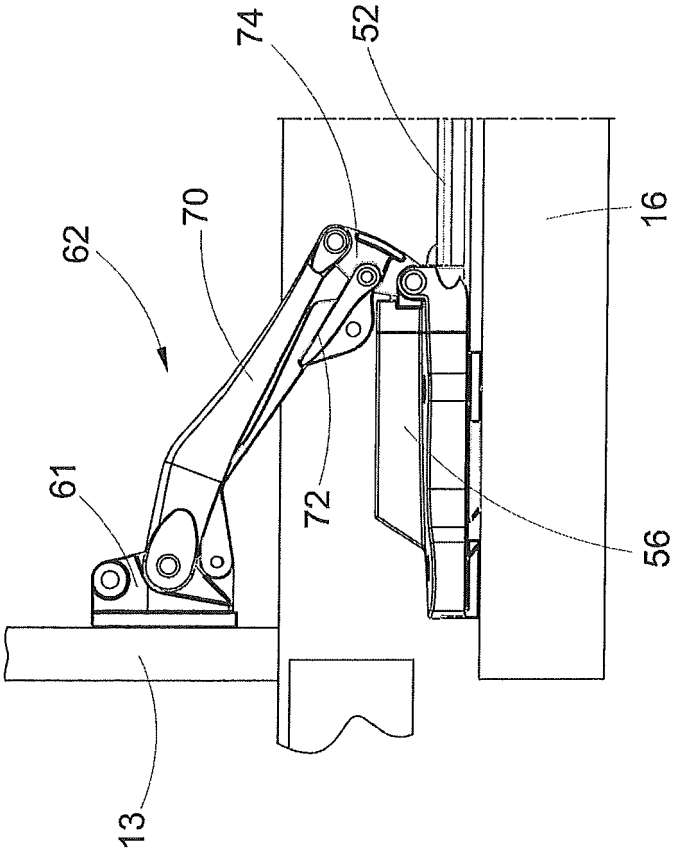



FIG. 14

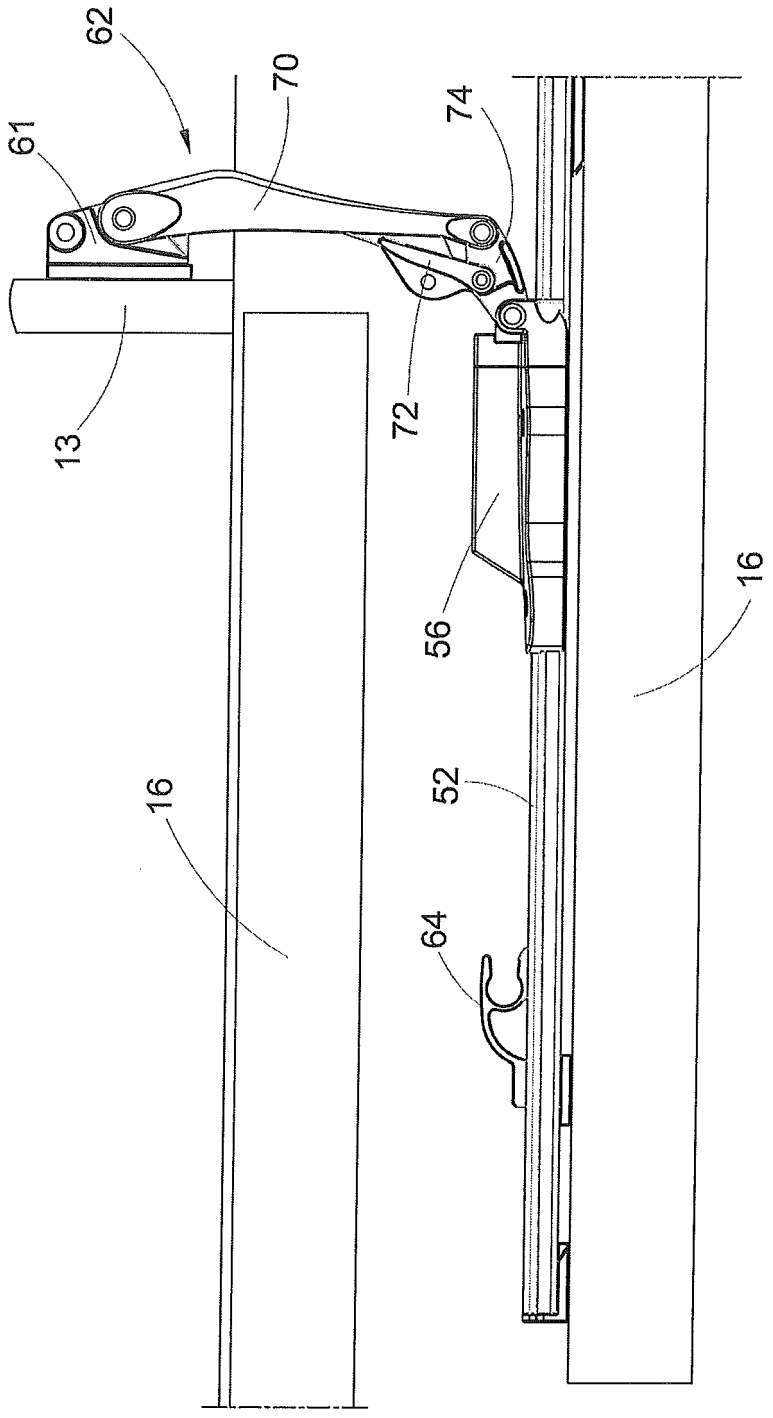



FIG. 15

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# EUROPEAN SEARCH REPORT

Application Number
EP 14 16 7578

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| Y<br>A | EP 1 039 088 A2 (GIOVANNETTI ANTONIO [IT])<br>27 September 2000 (2000-09-27)<br>* paragraphs [0014] - [0023] *<br>* figures 4-6 * | 1,3-10, 13<br>2,11,12 | INV.<br>E05D15/10 |
| Y,D | CH 702 441 A1 (EKU AG [CH])<br>30 June 2011 (2011-06-30)<br>* paragraphs [0010], [0017] - [0021] *<br>* figures 1-7 * | 1,3-10, 13 | |
| A,D | DE 20 2009 004802 U1 (HETTICH HEINZE GMBH & CO KG [DE])<br>23 September 2010 (2010-09-23)<br>* paragraphs [0026], [0027], [0032] - [0034], [0039] - [0042] *<br>* figures 1-5 * | 1,3-10, 13 | |
| A | EP 2 584 130 A1 (MIXAL S R L [IT])<br>24 April 2013 (2013-04-24)<br>* paragraphs [0026], [0027]; figures 5-8 * | 2,3,5 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC)<br>E05D |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 14 August 2014 | Klemke, Beate |

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14-08-2014

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EPO FORM P0459

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- CH 702441 **[0013]**