(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 343 100 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.03.2024 Bulletin 2024/13

(21) Application number: **23179818.2**

(22) Date of filing: **16.06.2023**

(51) International Patent Classification (IPC):
E06B 5/16 *(2006.01)* ***E06B 3/46*** *(2006.01)*
E05D 15/06 *(2006.01)* ***E05F 1/02*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E06B 5/16; E05D 15/063; E05D 15/0656; E05D 15/066; E05D 15/0665; E05F 1/02; E06B 3/4636

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **22.09.2022 IT 202200019401**

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(54) SLIDING FIRE DOOR AND RESPECTIVE SIMPLIFIED SLIDING GUIDE SYSTEM

(57) A sliding fire door is described, comprising: at least one sliding panel for closing a passageway; one upper linear guide which is fixed to a wall at the passageway and oriented along a first horizontal and parallel direction with respect to a walking surface; sliding means which are integral with the sliding panel and slidingly engaged with the upper linear guide to allow the sliding panel to translate between opening and closing positions of the passageway; one inverted U-shaped box-shaped channel which is fixed below the sliding panel, which encloses a sliding cavity; one or more plates which are fixed on the walking surface at the passageway. Each plate protrudes moderately from the walking surface, so that the plates do not fit into the sliding cavity during the opening/closing movement of the sliding panel. Below the box-shaped channel, on both sides of each plate, guide elements are provided which translate vertically and are in contact with the walking surface during the opening/closing movement of the sliding panel. The guide elements are arranged around each plate to prevent any transverse movement of each sliding panel when the door is closed.

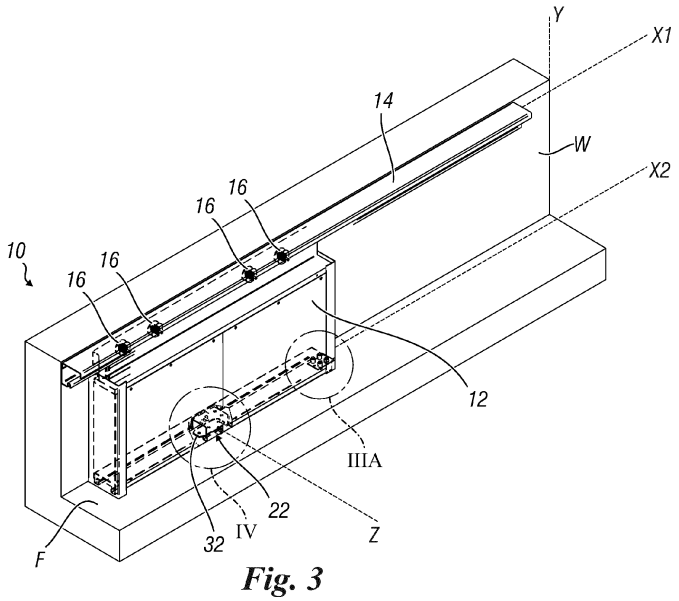

Fig. 3

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Description

[0001] The present invention generally relates to the field of sliding doors and, more particularly, to a sliding fire door and a respective sliding guide system.

[0002] As is known, sliding fire doors, which are also called firebreak doors or gates, are safety devices that separate two contiguous rooms from the fire in order to avoid that the flames spread to the adjacent room, if a fire occurs in a room. Hence, sliding fire doors have considerable mass and weight, very often over 1000 Kg, to be able to perform their technical functions consisting primarily in ensuring a quick and unhesitating closing and in resisting to the very high temperatures that typically occur during a fire.

[0003] A typical sliding fire door is provided with one or more panels designed to close a passageway at which the sliding door is installed. Each panel is slidingly constrained to a support and sliding linear guide, which is fixed to a wall at the passageway and is normally arranged above the panel or panels. Appropriate sliding means connect each panel to the upper support and sliding linear guide.

[0004] In order to allow the normal and continuous passage of people and goods, each panel of the sliding fire door is usually left in the open position. However, closing the panel or panels is, in the event of fire, an absolute priority and therefore it must be guaranteed in the shortest possible time. In order to guarantee the complete and total closing of the sliding door in the event of fire, a widely used closing system involves the application of an energy accumulated in the form of a counterweight to the panel or panels of the sliding door. The counterweight is typically constrained to each panel of the sliding door by means of a rope and pulley drive system and is provided with a retaining device, generally an electromagnetic device, which allows the respective panel to be retained when opening without the counterweight coming into operation. In the event of fire, the counterweight is released from its retaining system to automatically pull the respective panel towards its closing position.

[0005] A single panel of a sliding fire door can achieve large dimensions, with an overall length (which is, of course, compatible with the dimensions of the passageway) that can far exceed three meters. For sliding fire doors of not particularly large dimensions, with panels having an overall length which does not exceed three to five meters, additional lower sliding linear guides, i.e., positioned on the walking surface at the passageway, are not normally provided for in addition to the respective upper support and sliding linear guides. On the contrary, for sliding fire doors of large dimensions, with panels having an overall length exceeding five meters, the presence of lower sliding linear guides is required for each panel in addition to the respective upper support and sliding linear guides. These lower sliding linear guides are in fact needed to prevent each panel of the sliding door from deforming due to the wind, or to phenomena that occur in the event of fire, such as bursts or deformations due to the heat, as will be better specified hereinafter.

[0006] The lower sliding linear guides of the known type for sliding fire doors can consist of a rail protruding from the walking surface, such as the one shown in the cross-sectional views in Figures 1A and 1B, where the walking surface is indicated with F. This protruding rail is indicated with R, preferably has a rectangular cross-sectional shape (but it could have any shape whatsoever) and is designed to engage with a corresponding linear cavity obtained under each panel of the sliding fire door. Preferably, this cavity has a linear shape, but it could have any shape whatsoever, compatibly with the shape of the protruding rail.

[0007] However, the possibility is not excluded that the lower sliding linear guides of the known type for sliding fire doors are made in different shapes with respect to the rail, although still protruding with respect to the walking surface F. Merely by way of example, as shown in Figures 2A and 2B, the lower sliding linear guides of the known type for sliding fire doors could also consist of a plurality of rollers R which protrude with respect to the walking surface F to engage with the linear cavity obtained under each panel of the sliding fire door.

[0008] Whatever their embodiment, the lower sliding linear guides of the known type for sliding fire doors can cause a few drawbacks which are listed below. First of all, as the lower sliding linear guides of the known type for sliding fire doors protrude from the walking surface to fit into the lower linear cavity of each panel of the sliding fire doors, they can constitute an obstacle to the passage of pedestrians, who could trip over them, or of vehicles, that should jump. These drawbacks are particularly annoying in case of sliding fire doors which are installed in usually crowded spaces, such as airports or shopping centers.

[0009] Another drawback of the lower sliding linear guides of the known type for sliding fire doors is due to the fact that, in the event of fire, the panel or panels of the sliding door inevitably undergo an expansion due to the increase in temperature. This expansion, which is also called "bulging", causes a deformation which affects above all the lower part of each panel, mainly occurs in the lower part of each panel, i.e., the part which is closest to contact with any lower sliding linear guides. Thus, in the event of fire, a decoupling between each panel and the respective lower sliding linear guide might occur with consequent "derailment" of the lower part of the panel during its movement towards the closing position.

[0010] Lower linear sliding guides have therefore been produced for sliding fire doors which comprise one or more box-shaped channels which can be buried below the walking surface. Each box-shaped channel is provided with an elongated slot which is oriented along the sliding direction of the panels of the sliding door. Each panel is therefore provided in the lower part with at least one guide means which slidingly fits into the elongated slot. A linear sliding guide system of this type has been illus-

trated in document EP-A-4006293 in the name of the same applicant. Although this linear guides system has proved to be very effective in its operation, as it eliminates any protrusion from the walking surface, it can however be expensive and complicated to install, as it requires excavation operations on the walking surface at the doorway.

[0011] The object of the present invention is, therefore, to provide a sliding fire door and a respective sliding guide system which are capable of solving the aforementioned drawbacks of the prior art in an extremely simple, economical and particularly functional way.

[0012] Specifically, an object of the present invention is to provide a sliding guide system for a sliding fire door, in particular a sliding guide system located below with respect to the sliding fire door, which does not constitute a significant obstacle to the circulation of people, vehicles and/or goods through the sliding fire door.

[0013] Another object of the present invention is to provide a sliding guide system for a sliding fire door, in particular a sliding guide system placed below with respect to the sliding fire door, which always ensures a quick closing of the sliding fire door under any weather condition and at any high temperature that could occur in the event of fire, keeping the door anchored to the guide.

[0014] A further object of the present invention is to provide a sliding guide system for a sliding fire door, in particular a sliding guide system placed below with respect to the sliding fire door, which can be made in a simplified manner with respect to the prior art, in particular not requiring any complicated and costly machining to be carried out on the walking surface at the doorway.

[0015] These objects according to the present invention are achieved by providing a sliding fire door and a respective sliding guide system as set forth in claim 1.

[0016] Further features of the invention are highlighted by the dependent claims, which are an integral part of the present description.

[0017] The features and advantages of a sliding fire door and a respective sliding guide system according to the present invention will be clearer from the following exemplifying and non-limiting description, referring to the attached schematic drawings, in which:

Figure 1A is a cross-sectional view, obtained along a vertical plane, of a sliding fire door which is provided with a lower sliding linear guide according to the prior art;

Figure 1B is a detailed view of the particular indicated with I in Figure 1A;

Figure 2A is a cross-sectional view, obtained along a vertical plane, of a sliding fire door which is provided with another lower sliding linear guide according to the prior art;

Figure 2B is a detailed view of the particular indicated with II in Figure 2A;

Figure 3 is a perspective view of a first embodiment of a sliding fire door and a respective sliding guide system according to the present invention;

Figure 3A is a detailed view of the particular indicated with III-A in Figure 3;

Figure 4 is a detailed view of the particular indicated with IV in Figure 3;

Figure 5 is a cross-sectional view, obtained along a vertical plane, of the sliding fire door in Figure 3;

Figure 6 is a detailed view of the particular indicated with VI in Figure 5;

Figure 7 is a detailed view similar to that in Figure 6, but with the sliding fire door shown in a different working condition;

Figure 8 is a detailed view similar to that in Figure 6, but with the sliding fire door shown in a further different working condition;

Figure 9 is a variant of the first embodiment of the sliding fire door shown in figure 3;

Figure 9A is a detailed view of the particular indicated with IX-A in Figure 9;

Figure 10 is a perspective view of a second embodiment of a sliding fire door and a respective sliding guide system according to the present invention;

Figure 11 is a detailed view of the particular indicated with XI in Figure 10;

Figure 12 is an enlarged cross-sectional view of a particular of the sliding fire door in Figure 10;

Figure 13 is a perspective view of a third embodiment of a sliding fire door and a respective sliding guide system according to the present invention;

Figure 14 is a detailed view of the particular indicated with XIV in Figure 13;

Figure 15 is an enlarged cross-sectional view of a particular of the sliding fire door in Figure 13;

Figure 16 is a perspective view of a fourth embodiment of a sliding fire door and a respective sliding guide system according to the present invention;

Figure 17 is a detailed view of the particular indicated with XVII in Figure 16;

Figure 18 is an enlarged cross-sectional view of a particular of the sliding fire door in Figure 16;

Figure 19 is a perspective view of a sliding fire door according to the present invention, shown in a full opening position;

Figure 19A is a detailed view of the particular indicated with XIX-A in Figure 19;

Figure 19B is a detailed view of the particular indicated with XIX-B in Figure 19;

Figure 20 is another perspective view of a sliding fire door according to the present invention, shown in a full opening position;

Figure 20A is a detailed view of the particular indicated with XX-A in Figure 20; and

Figure 20B is a detailed view of the particular indicated with XX-B in Figure 20.

[0018] With reference in particular to Figures 3 to 20B, some preferred embodiments of a sliding fire door according to the present invention, which is indicated as a

whole with reference number 10, are shown. The sliding fire door 10, in the various figures, is not represented in scale but it is in any case designed to be installed at a passageway P (partially visible in Figure 9 and completely visible in Figures 19 and 20) obtained through a wall W of a building.

[0019] The sliding fire door 10 comprises, in a per se known manner, at least one sliding panel 12 which is arranged for closing the passageway P, as well as at least one upper support and sliding linear guide 14 of each sliding panel 12. The upper linear guide 14 is fixed to the wall W of the building at the passageway P, it is positioned above each sliding panel 12 and is oriented along a first direction X1 (visible, for example, in Figure 3) which is substantially horizontal and parallel with respect to a walking surface F.

[0020] Each sliding panel 12 can be conveniently manufactured by joining, along the first horizontal direction X1, a plurality of modules or panels manufactured with a metal material (typically a steel sheet). As shown, for example, in Figure 5, each module or panel of the sliding panel 12 can be internally hollow and can be internally filled with insulating materials for insulation purpose.

[0021] The sliding fire door 10 also comprises one or more sliding means 16, which are fixed above each sliding panel 12 and are slidingly engaged with the upper linear guide 14 to allow each sliding panel 12 to translate, along the first horizontal direction X1, between an opening position and a closing position of the passageway P and vice versa. For example, and again in a per se known manner, the sliding means 16 can comprise a plurality of wheels 18 (see, for example, Figure 5), which are rotatably connected to each sliding panel 12, and at least one guide rail 20, which is constrained to the upper support and sliding linear guide 14 and on which the wheels 18 roll during the horizontal translation of each sliding panel 12.

[0022] The sliding fire door 10 also comprises at least one inverted U-shaped box-shaped channel 22, which is fixed below each sliding panel 12. Each box-shaped channel 22 is provided with a pair of parallel and opposite side walls 24, 26, oriented along a second horizontal direction X2 (visible, for example, in Figure 3) which is parallel and coplanar, with reference to a plane passing through the wall W of the building, with respect to the first horizontal direction X1. As shown in the Figures, preferably each box-shaped channel 22 has the same length, measured along the second horizontal direction X2, as the respective sliding door 12.

[0023] The side walls 24, 26 of each box-shaped channel 22 protrude below the respective sliding panel 12 to laterally enclose a sliding cavity 42 for sliding the box-shaped channel 22. This sliding cavity 42 opens downwards on the walking surface F and is oriented along the second horizontal direction X2.

[0024] As shown in Figure 6, the respective lower ends 28, 30 of said side walls 24, 26 of each box-shaped channel 22 are spaced from the walking surface F, along a vertical direction Y (visible, for example, in Figure 3) which is perpendicular with respect to the first horizontal direction X1 and to the second horizontal direction X2, according to a first predefined distance D1. This first distance D1 from the walking surface F allows each sliding panel 12 to move freely between the opening position and the closing position of the passageway P, and vice versa, even in case of any deformations in the walking surface F (as shown, for example, in Figure 7) and/or the presence of debris or other material at the walking surface F (as shown, for example, in figure 8).

[0025] The sliding fire door 10 also comprises one or more plates 32, which are fixed on the walking surface F at the passageway P. Each plate 32 protrudes upwards from the walking surface F and is oriented along the second horizontal direction X2 to face towards the sliding cavity 42 of the box-shaped channel 22 of each sliding panel 12 during the movement of these sliding panels 12 between the opening position and the closing position of the passageway P and vice versa. In the embodiments in Figures 3, 10, 13, 16 and 19, a single plate 32 is provided which is fixed to the walking surface F, so as to cause the least possible disturbance in the event of the passage of pedestrians and/or vehicles through the passageway P when the sliding fire door 10 is open. In any case, two, three (as for example in the variant in Figures 9 and 20) or more plates 32 can also be provided according to the width of the passageway P and, consequently, of the sliding fire door 10, as well as to the specific technical installation requirements of this sliding fire door 10.

[0026] Advantageously, each plate 32 protrudes from the walking surface F, along the vertical direction, according to a second predefined distance D2 which is less than or equal to the first distance D1 between the side walls 24, 26 of each box-shaped channel 22 and the walking surface F (as shown, for example, in Figure 6). In other word, the extent of the protrusion from the walking surface F of each plate 32, which coincides with the second distance D2 and therefore with the thickness of the plate 32, is less than or at most equal to the space which coincides with the first distance D1, which must necessarily be left between the lower end of each box-shaped channel 22, and therefore of each panel 12, and the walking surface F. This dimensional feature ensures that each plate 32 does not fit into the sliding cavity 42 of the panel 12, as occurs instead in the sliding fire doors according to the prior art, during the movement of this sliding panel 12 between the opening position and the closing position of passageway P and vice versa.

[0027] According to the invention, at least one guide element 34, 36, 38, 40 is provided on each side wall 24, 26 of the box-shaped channel 22 of at least one of the sliding panels 12 which is designed to translate at least vertically, i.e. from top to bottom and vice versa, and to remain in contact with the walking surface F during the movement of each one sliding panel 12 between the opening position and the closing position of the passageway P and vice versa. The vertical translation of each

guide element 34, 36, 38, 40 can be obtained according to different embodiments of the guide elements 34, 36, 38, 40, as will be better specified hereinafter.

[0028] On each side wall 24, 26 of said at least one box-shaped channel 22 a respective guide element 34, 36, 38, 40 is provided, so as to form a pair of guide elements 34, 36, 38, 40 which are opposite to each other. The opposite guide elements 34, 36, 38, 40 of each pair of guide elements 34, 36, 38, 40 are coaxial with respect to a third horizontal direction Z, which is perpendicular with respect to the first horizontal direction X1 and the second horizontal direction X2. In addition, the opposite guide elements 34, 36, 38, 40 of each pair of guide elements 34, 36, 38, 40 are arranged near the side edges, i.e., parallel to the second horizontal direction X2, of at least one respective plate 32 when each sliding panel 12 is in the closing position of the passageway P, to prevent any movement of each sliding panel 12 along the third horizontal direction Z.

[0029] Basically, as shown for example in the enlarged views in Figures 6, 12, 15 and 18, when each sliding panel 12 is in the closing position of the passageway P or, in other words, when the sliding fire door 10 is closed because a fire has occurred, the guide elements 34, 36, 38, 40 surround laterally, i.e., perpendicularly to the opening/closing horizontal sliding directions X1 and X2, a respective plate 32. Anyway, between the guide elements 34, 36, 38, 40 and the plate 32 there is a relative clearance, which is necessary so that there is no interference between these guide elements 34, 36, 38, 40 and this plate 32 in the normal operating conditions of the fire sliding door 10. As shown for example in Figure 6, the width D3 of each plate 32, measured along the third horizontal direction Z, is in fact less than the distance D4, again measured along said third horizontal direction Z, between two opposite guide elements 34, 36, 38, 40. Thus, in the event of expansions of the fire sliding door 10 due to the increase in temperature, which as mentioned above mainly occur in the lower part of each sliding panel 12, the presence of the guide elements 34, 36, 38, 40 on both sides of the plate 32 prevents the expansions of the fire sliding door 10 from turning into deformations and/or movements of the fire sliding door 10 in its lower part. In fact, in the event of expansions of the fire sliding door 10 due to the increase in temperature, the guide elements 34, 36, 38, 40 abut against the plate 32, in order to prevent the lower part of each panel 12 from moving in the transversal direction, i.e., along the third horizontal direction Z, consequently avoiding the formation of gaps through which the fire could pass.

[0030] Preferably, according to the first embodiment in Figures 3 to 8, to the second embodiment in Figures 10 to 12 and to the third embodiment in Figures 13 to 15, each guide element 34, 36, 38 comprises at least one toroidal-shaped wheel 44, which is provided with an internal hole of a predefined diameter and is mounted idle around a respective pin 46. Each pin 46 is oriented along the third horizontal direction Z has an outer diameter which is significantly less than the diameter of the internal hole of each wheel 44. In this way, each wheel 44 can not only translate vertically, i.e., from top to bottom and vice versa, but it can also move radially in all directions with respect to the corresponding pin 46, so that the sliding fire door 10, in its opening and/or closing movement, can overcome effectively and without slowing down any possible obstacle placed at the walking surface F. These wheels 44, abutting against a respective plate 32, in any case maintain the capacity to prevent the lower part of each sliding panel 12 from moving in the transversal direction (horizontal direction Z).

[0031] Preferably, the outer diameter of each pin 46 is less than or equal to half the diameter of the internal hole of each wheel 44. In this case, a substantial radial movement in all directions of each wheel 44 with respect to the corresponding pin 46 can be ensured. Again, preferably, the value of the difference between the diameter of the internal hole of each wheel 44 and the outer diameter of each pin 46 is less than the value of the second distance D2. In other words, the value of the maximum excursion of each wheel 44 with respect to the corresponding pin 46 never exceeds the thickness of a respective plate 32, so that the movement in the transversal direction (horizontal direction Z) of the lower part of each sliding panel 12 is definitively prevented.

[0032] According to the first embodiment in Figures 3 to 8, each pin 46 is preferably fixed directly on one of the side walls 24, 26 of the box-shaped channel 22. On the other hand, according to the second embodiment in Figures 10 to 12 each pin 46 could be fixed on a casing 48, which at least partially encloses the corresponding wheel 44, obviously without preventing its rolling contact with the walking surface F, and which in turn can be removably fixed on one of the side walls 24, 26 of the box-shaped channel 22. The removability of each casing 48 and the respective assembly consisting of a single pin 46 and a single wheel 44 simplifies the maintenance operations of the sliding fire door 10, as any damaged and/or worn wheels 44 can be replaced by disassembling the corresponding casing 48 from the box-like channel 22 and reassembling a new one.

[0033] According to the third embodiment in Figures 13 to 15, each wheel 44 can also be provided with elastic elements 50 for damping the radial movement with respect to the corresponding pin 46. As shown in the Figures, these elastic elements 50 could also consist of helical springs which are connected in a known manner to each wheel 44 on one side and to the box-like channel on the other side. In any case, the possibility of using other elastic elements 50 of a different type is not excluded.

[0034] According to the fourth embodiment in Figures 16 to 18, each guide element 40 could comprise at least one sliding body 52 instead of a respective wheel. Each sliding body 52 can be hinged on one of the side walls 24, 26 of the box-shaped channel 22 and can be provided with a lower sliding surface 54 for sliding on said walking

surface F. The lower surface 54 of each sliding body 52 can also act as an abutment element abutting against a plate 32, in order to prevent the lower part of each sliding panel 12 from moving in the transversal direction (horizontal direction Z).

[0035] Whatever the embodiment, the sliding fire door 10 could also be provided, in a per se known manner, with a guide unit comprising a plurality of rollers 56 which protrude with respect to the walking surface F to engage with the sliding cavity 42 of the box-like channel 22. These rollers are illustrated for simplicity only with reference to the first embodiment of the sliding fire door 10, shown in the Figures 3 to 8, as well as to the variant in Figure 9. From the constructional point of view, these rollers are, per se, similar to the rollers R shown in the Figures 2A and 2B of the prior art. However, the main difference from the prior art lies in the position of these rollers. In the sliding fire door 10 according to the present invention the guide unit which comprises the rollers 56 is positioned completely outside the passageway P or, in other words, outside the entire path on the walking surface F to be covered by each sliding panel 12 to pass from the opening position to the closing position of this passageway P. Basically, the rollers 56, while contributing to improving the ground guide system of the sliding fire door 10, do not interfere at all with the practicability of the passageway P, as can be clearly seen by observing Figures 19 and 20. In fact, solely the interaction between the plates 32 and the guide elements 34, 36, 38, 40 performs the function of ground guide and retaining of each sliding panel 12 at the passageway P.

[0036] It has thus been seen that the sliding fire door according to the present invention achieves the previously highlighted objects.

[0037] The sliding fire door of the present invention thus conceived is however susceptible of numerous modifications and variations, all of which falling within the scope of the same inventive concept; furthermore, all the details can be replaced by technically equivalent elements. In practice, the materials used, as well as the shapes and dimensions, may be any according to the technical requirements.

[0038] The scope of protection of the invention is therefore defined by the attached claims.

Claims

1. A sliding fire door (10) to be installed at a passageway (P) obtained through a wall (W) of a building, the sliding fire door (10) comprising:

- at least one sliding panel (12), which is arranged for closing said passageway (P);
- at least one upper support and sliding linear guide (14) of said at least one sliding panel (12), said at least one upper linear guide (14) being fixed to said wall (W) of the building at said passageway (P), being positioned above said at least one sliding panel (12) and being oriented along a first direction (X) which is substantially horizontal and parallel with respect to a walking surface (F);
- one or more sliding means (16), which are fixed above said at least one sliding panel (12) and are slidingly engaged with said at least one upper linear guide (14) to allow said at least one sliding panel (12) to translate, along said first horizontal direction (X), between an opening position and a closing position of said passageway (P) and vice versa;
- at least one inverted U-shaped box-shaped channel (22), which is fixed below said at least one sliding panel (12), wherein each box-shaped channel (22) is provided with a pair of parallel and opposite side walls (24, 26), which are oriented along a second horizontal direction (X2) parallel and coplanar, with reference to a plane passing through said wall (W) of the building, with respect to said first horizontal direction (X1), wherein said side walls (24, 26) protrude below said at least one sliding panel (12) to laterally enclose a sliding cavity (42) of said box-shaped channel (22), wherein each sliding cavity (42) opens downwards on said walking surface (F) and is oriented along said second horizontal direction (X2), and wherein the respective lower ends (28, 30) of said side walls (24, 26) are spaced from said walking surface (F), along a vertical direction (Y) which is perpendicular with respect to said first horizontal direction (X1) and to said second horizontal direction (X2), according to a first predefined distance (D1); and
- one or more plates (32), which are fixed on said walking surface (F) at said passageway (P), protrude upwards from said walking surface (F) and are oriented along said second horizontal direction (X2) to face towards said sliding cavity (42) during the movement of said at least one sliding panel (12) between the opening position and the closing position of said passageway (P) and vice versa;

the sliding fire door (10) being **characterized in that** each plate (32) protrudes from said walking surface (F), along said vertical direction (Y), according to a second predefined distance (D2) which is less than or equal to said first distance (D1), so that said one or more plates (32) do not enter into said sliding cavity (42) during the movement of said at least one sliding panel (12) between the opening position and the closing position of said passageway (P) and vice versa, **and in that** at least one guide element (34; 36; 38; 40) is provided on each side wall (24, 26) of the box-shaped channel (22) of at least one of the

sliding panels (12) which is designed to translate at least vertically and to remain in contact with said walking surface (F) during the movement of said at least one sliding panel (12) between the opening position and the closing position of said passageway (P) and vice versa, wherein pairs of opposite guide elements (34; 36; 38; 40) are provided each on a respective side wall (24, 26) of said at least one box-shaped channel (22), wherein the opposite guide elements (34; 36; 38; 40) of each pair of guide elements (34; 36; 38; 40) are coaxial with respect to a third horizontal direction (Z), which is perpendicular with respect to said first (X1) and second (X2) horizontal direction, and wherein the opposite guide elements (34; 36; 38; 40) of each pair of guide elements (34; 36; 38; 40) are arranged near the side edges, parallel to said second horizontal direction (X2), of at least one respective plate (32) when said at least one panel (12) is in the closing position of said passageway (P), said guide elements (34; 36; 38; 40) abutting against said plate (32), in order to prevent any movement of each sliding panel (12) along said third horizontal direction (Z).

2. The sliding fire door (10) according to claim 1, **characterized in that** the width (D3) of each plate (32), measured along said third horizontal direction (Z), is less than the distance (D4), again measured along said third horizontal direction (Z), between the opposite guide elements (34; 36; 38; 40) of each pair of guide elements (34; 36; 38; 40).

3. The sliding fire door (10) according to claim 1 or 2, **characterized in that** each guide element (34; 36; 38) comprises at least one toroidal-shaped wheel (44), which is provided with an internal hole of a predefined diameter and is mounted idle around a respective pin (46), wherein each pin (46) is oriented along said third horizontal direction (Z) and wherein each pin (46) has an outer diameter which is less than the diameter of said internal hole of each wheel (44), so that said wheel (44) can move radially in all directions with respect to the corresponding pin (46).

4. The sliding fire door (10) according to claim 3, **characterized in that** the outer diameter of each pin (46) is less than or equal to half the diameter of said internal hole of each wheel (44).

5. The sliding fire door (10) according to claim 3 or 4, **characterized in that** the value of the difference between the diameter of said internal hole of each wheel (44) and the outer diameter of each pin (46) is less than the value of said second distance (D2).

6. The sliding fire door (10) according to any claims 3 to 5, **characterized in that** each pin (46) is fixed directly on one of said side walls (24, 26) of the box-shaped channel (22).

7. The sliding fire door (10) according to any claims 3 to 6, **characterized in that** each wheel (44) is provided with elastic elements (50) for damping the radial movement with respect to the corresponding pin (46).

8. The sliding fire door (10) according to any claims 3 to 5, **characterized in that** each pin (46) is fixed on a casing (48), which at least partially encloses the corresponding wheel (44) and can be in turn removably fixed on one of said side walls (24, 26) of the box-shaped channel (22).

9. The sliding fire door (10) according to claim 1 or 2, **characterized in that** each guide element (40) comprises at least one sliding body (52), which is hinged on one of said side walls (24, 26) of the box-shaped channel (22) and is provided with a lower sliding surface (54) for sliding on said walking surface (F).

10. The sliding fire door (10) according to any of the preceding claims, **characterized in that** each box-shaped channel (22) has the same length, measured along said second horizontal direction (X2), as the respective sliding panel (12).

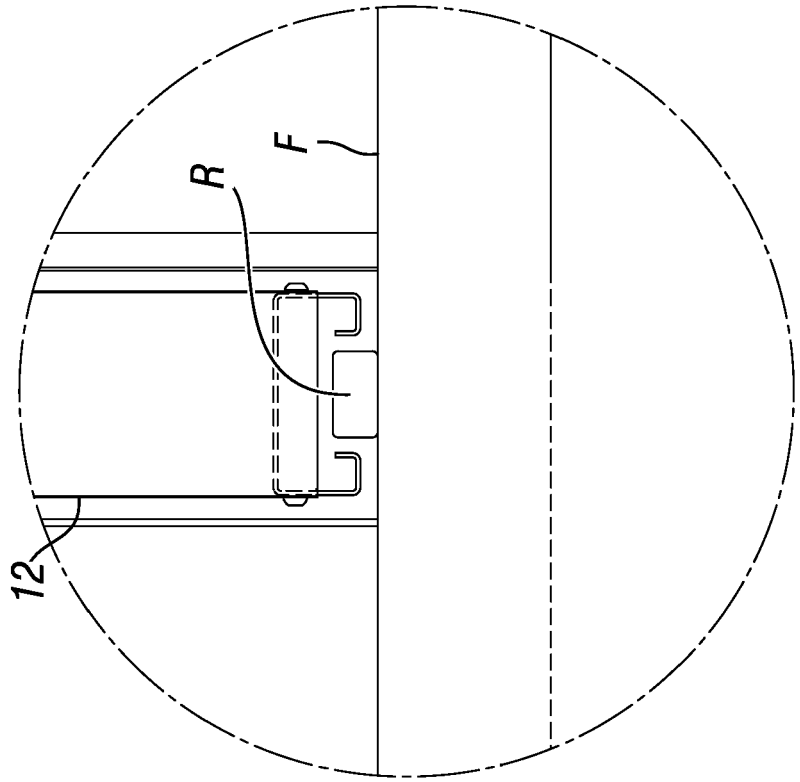


Fig. 1B (Prior Art)

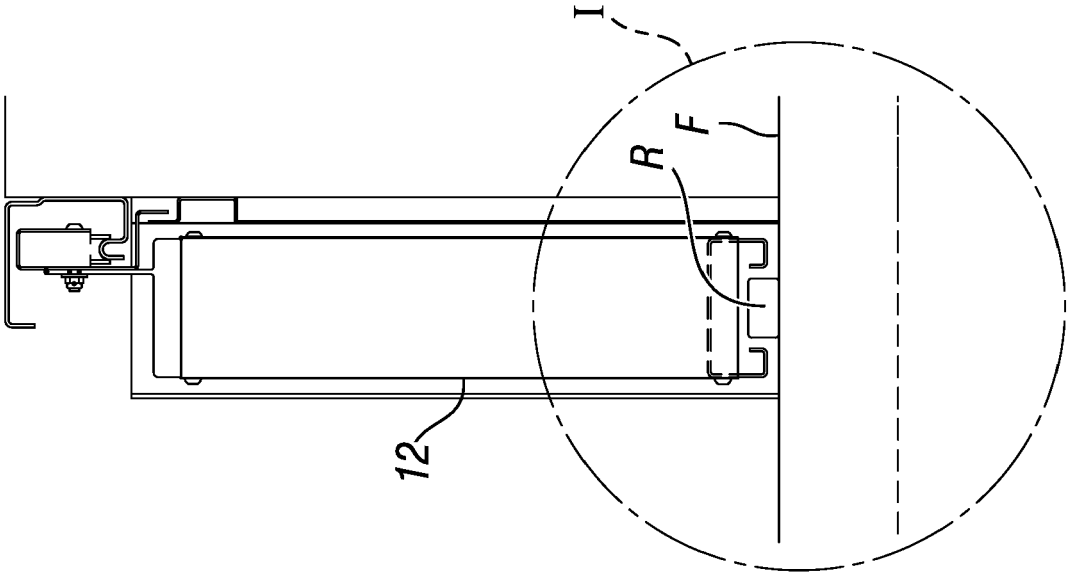


Fig. 1A (Prior Art)

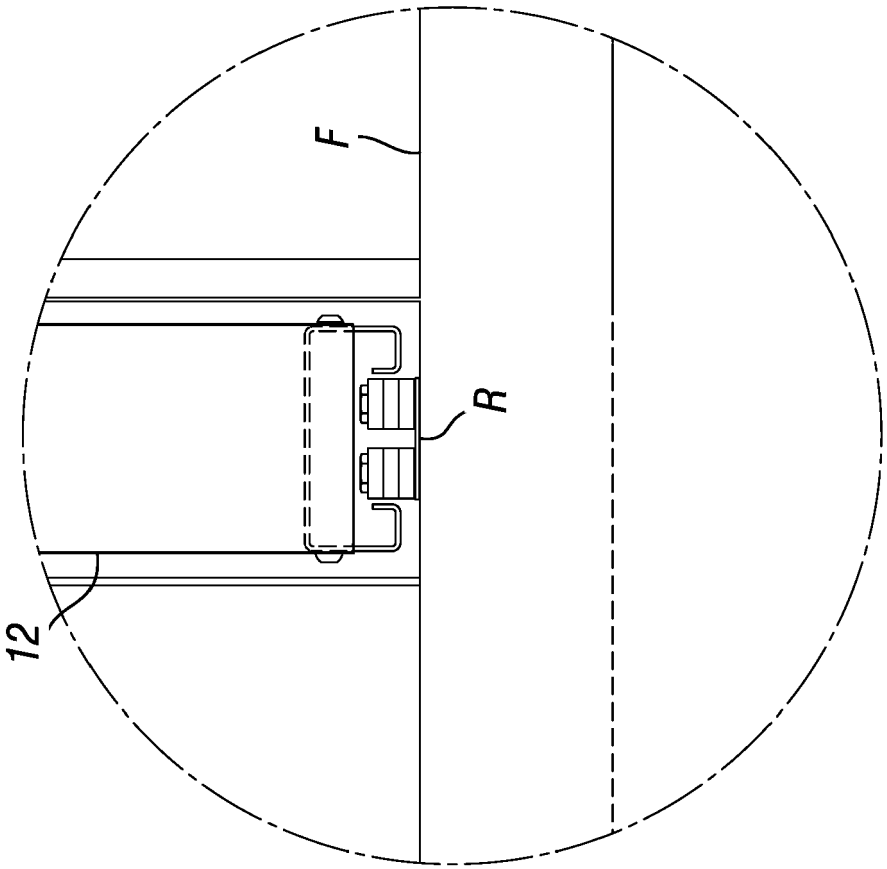


Fig. 2B (Prior Art)

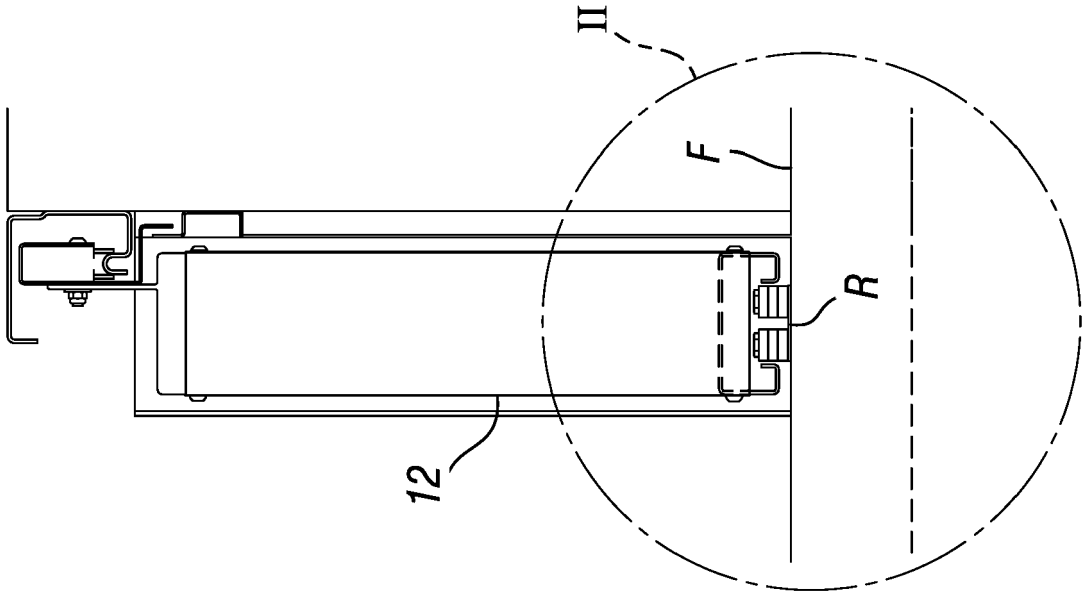


Fig. 2A (Prior Art)

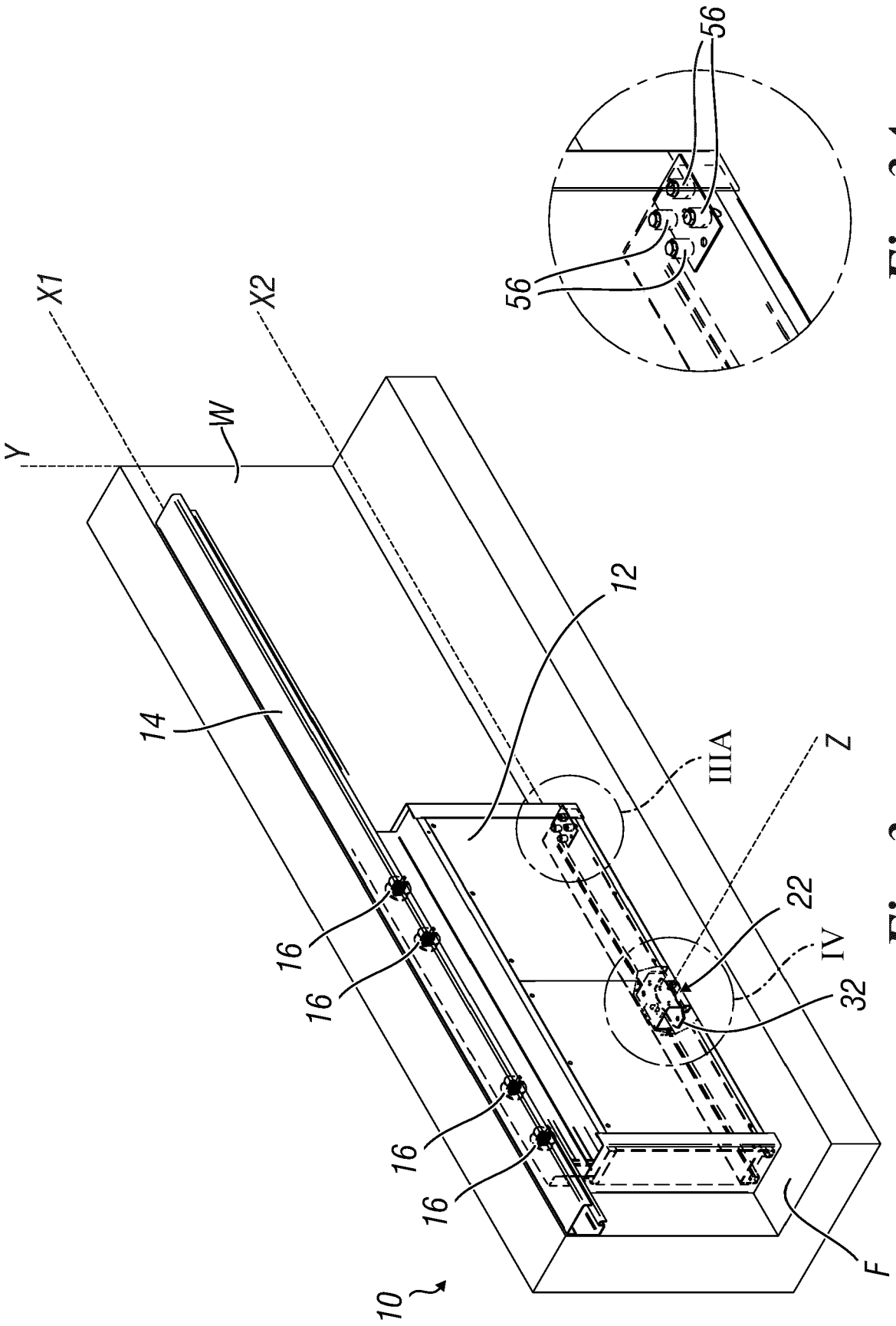
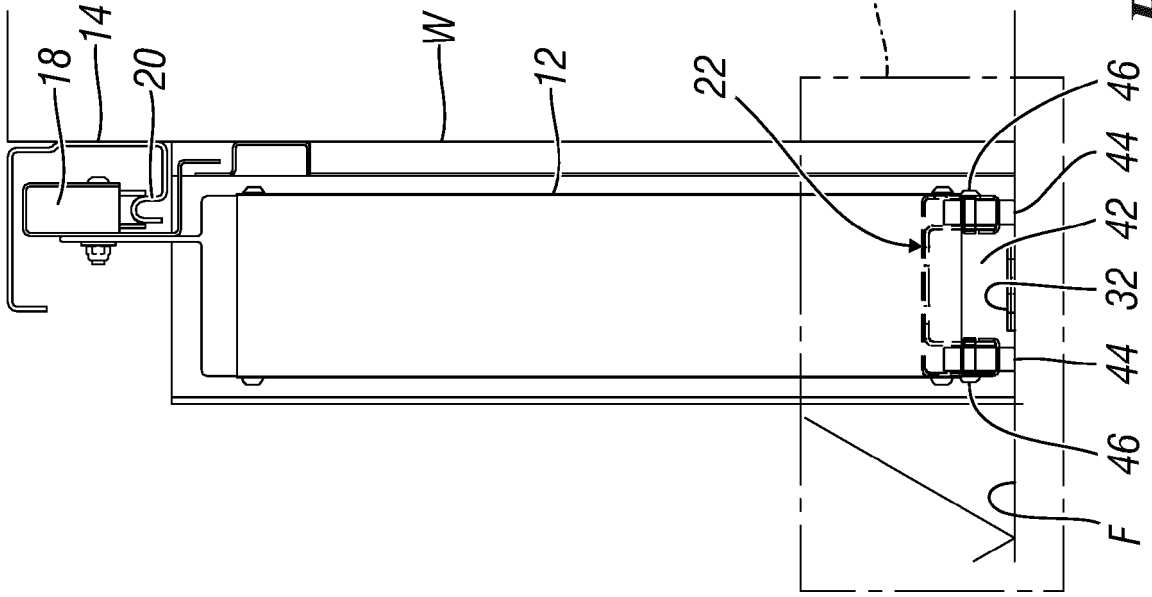


Fig. 3

Fig. 3A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32
44
46
F

Fig. 5

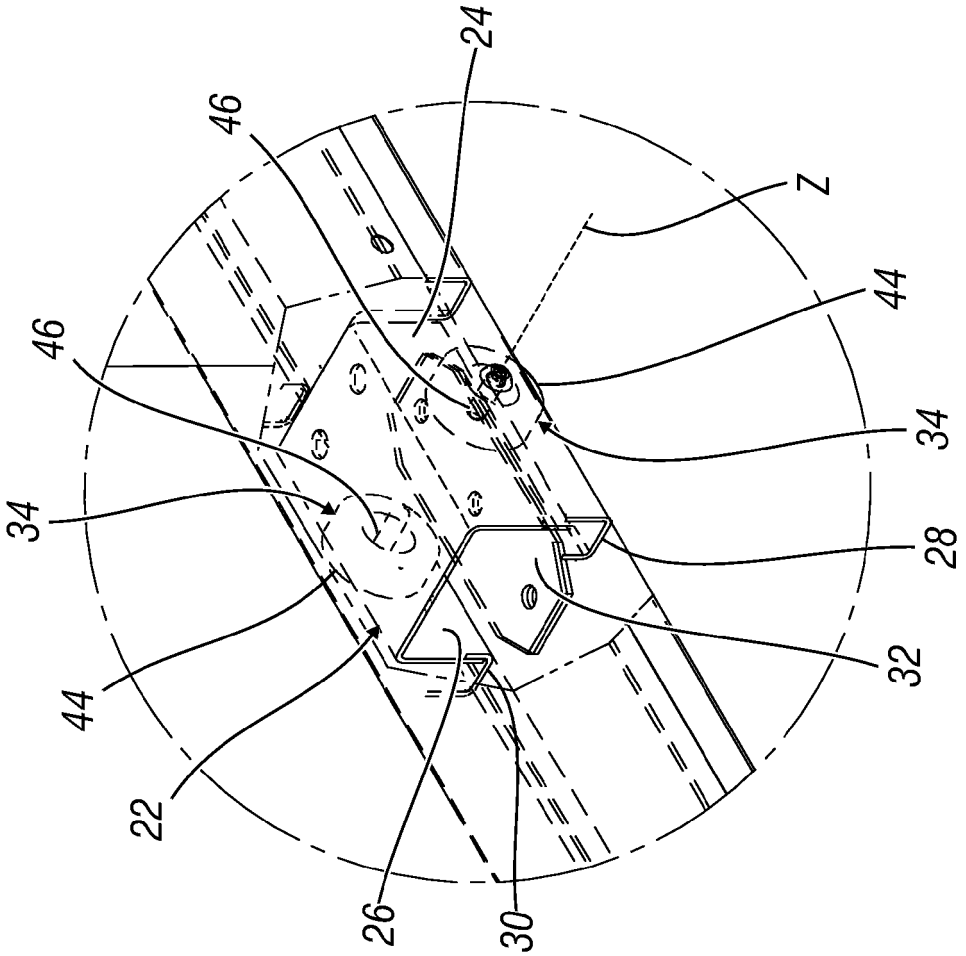
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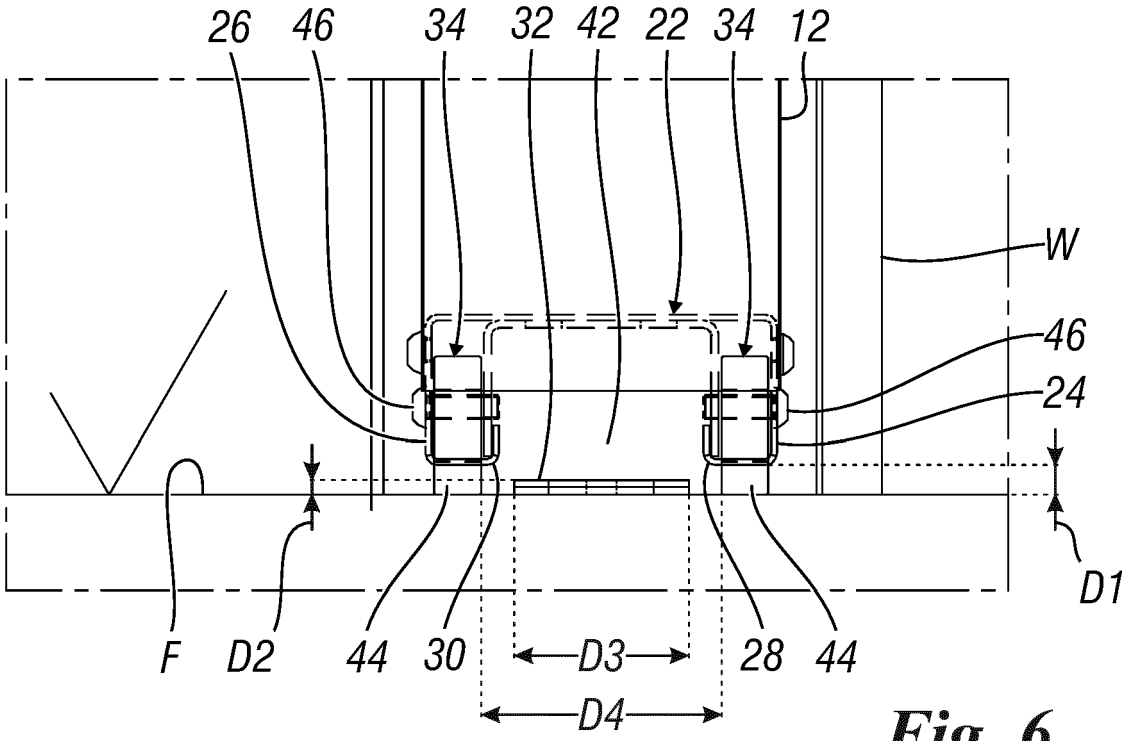
Fig. 4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D1
F
D2
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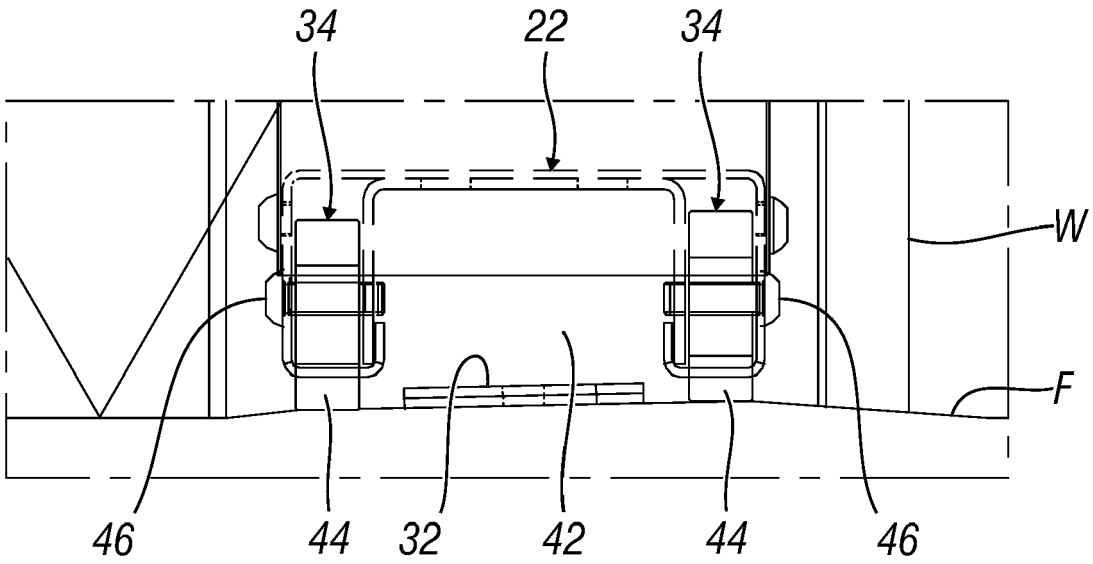
30
D3
28
44
D4

Fig. 6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46

Fig. 7

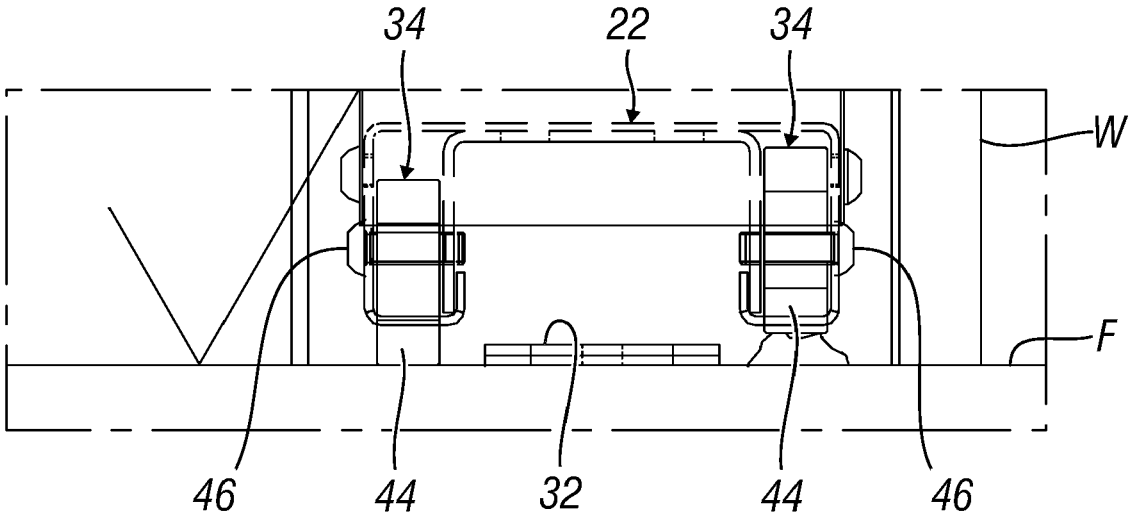


Fig. 8

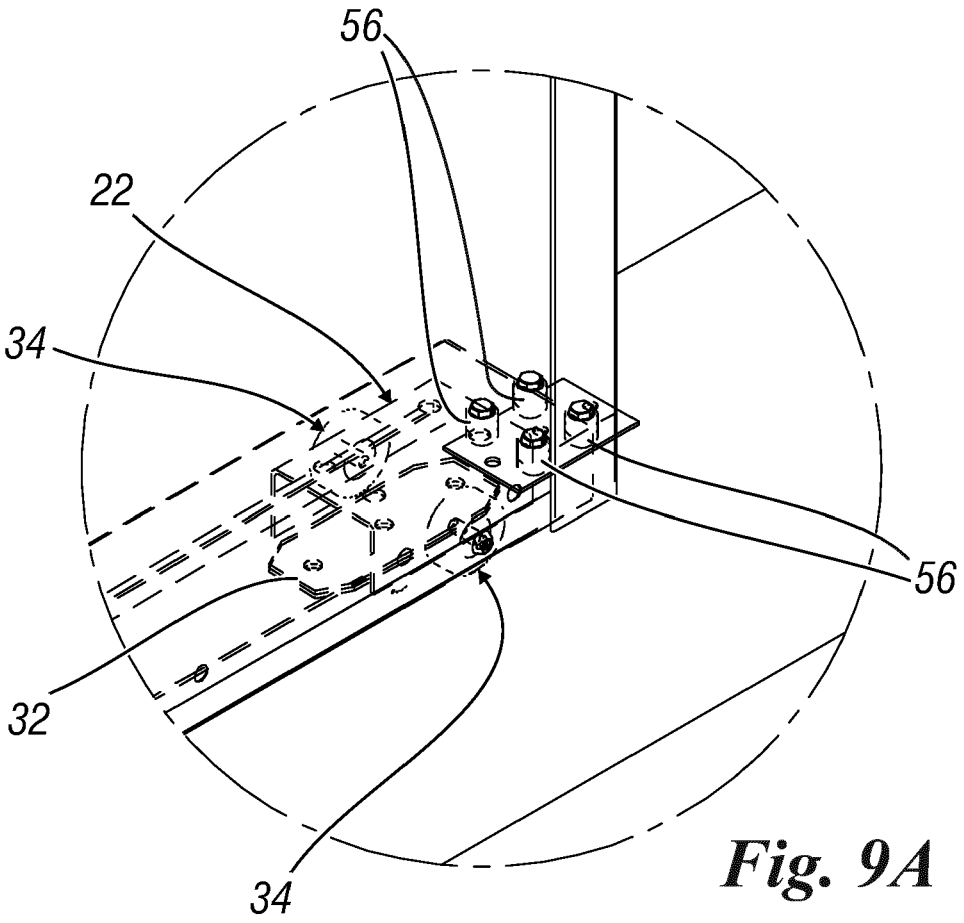


Fig. 9A

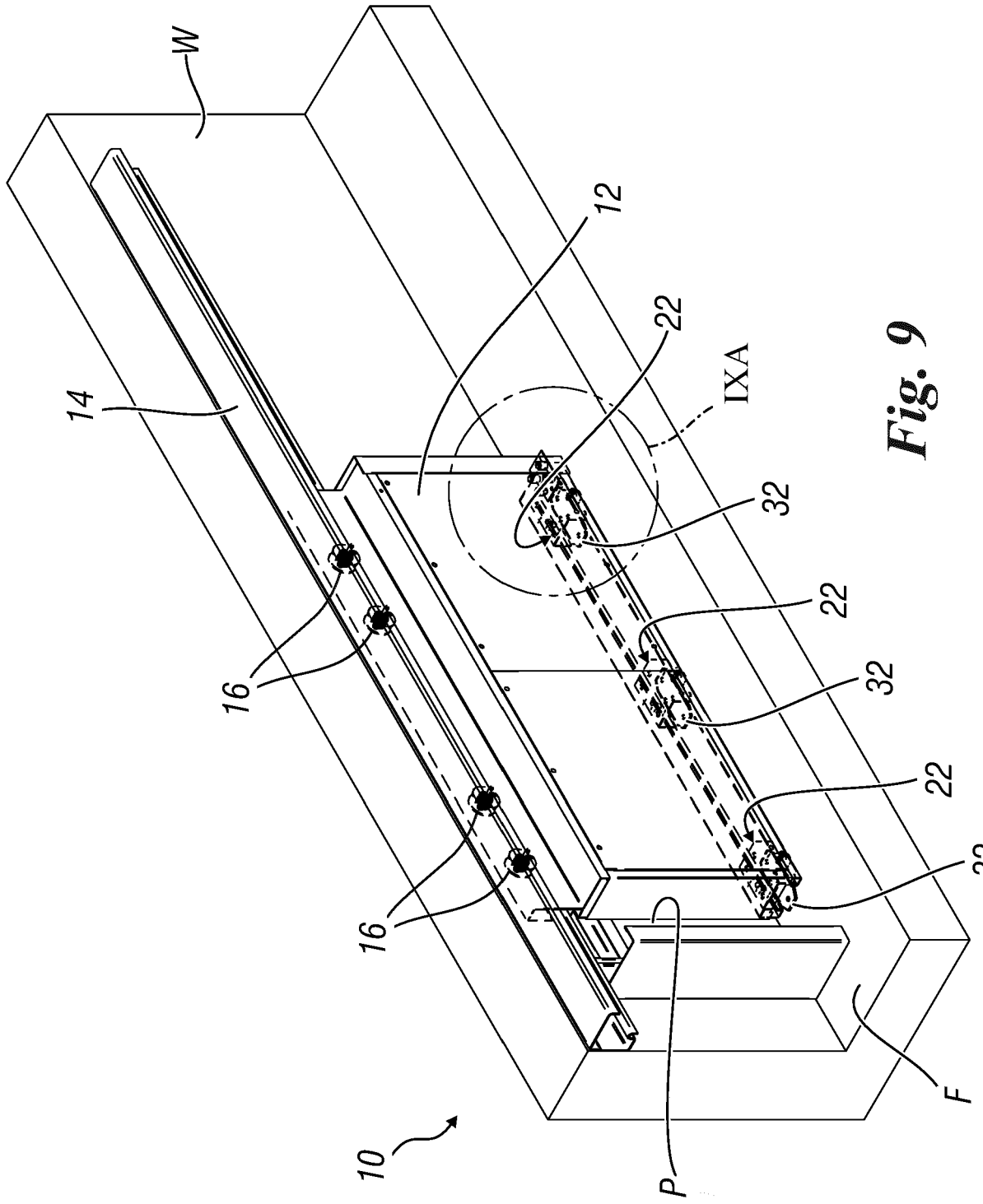


Fig. 9

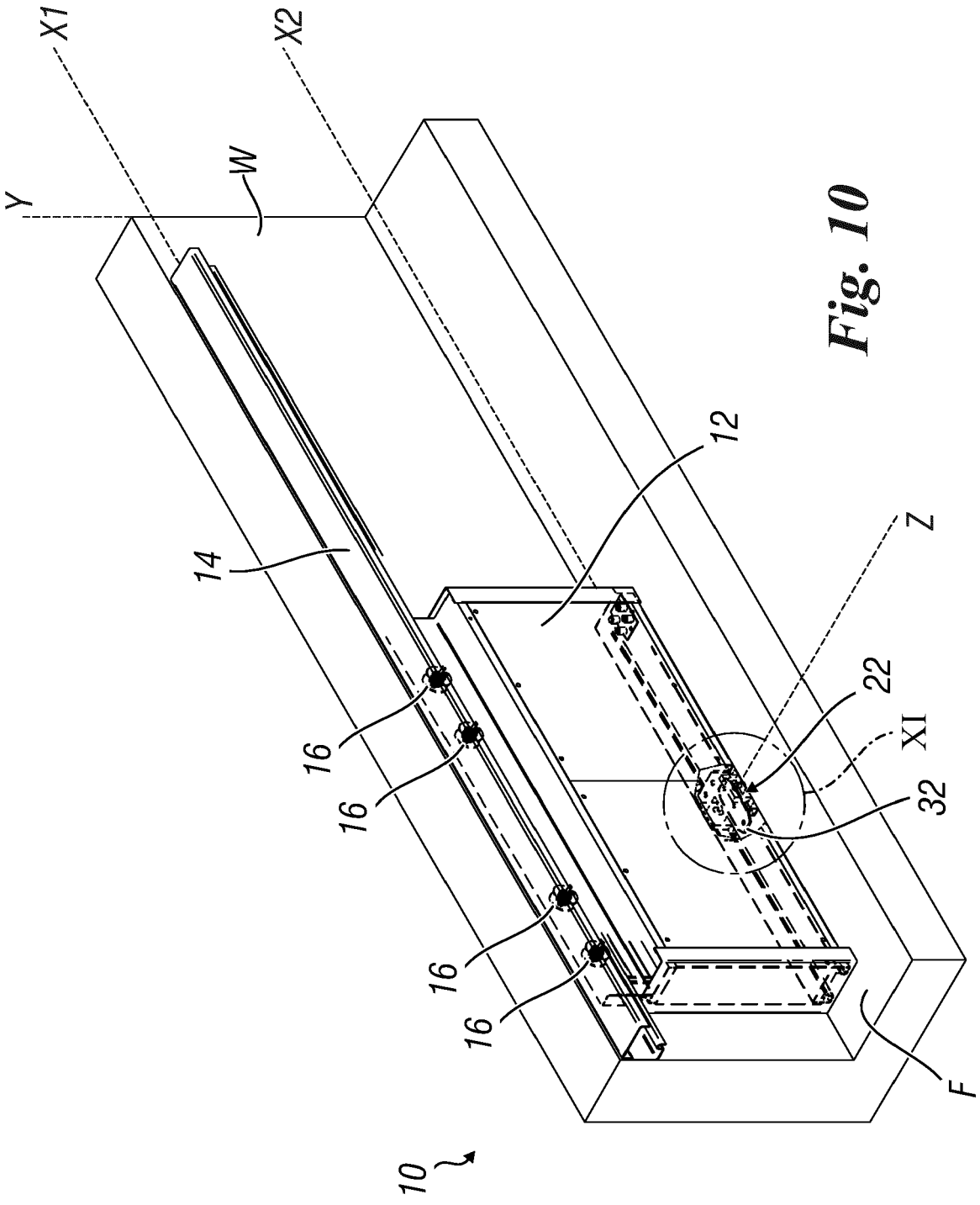
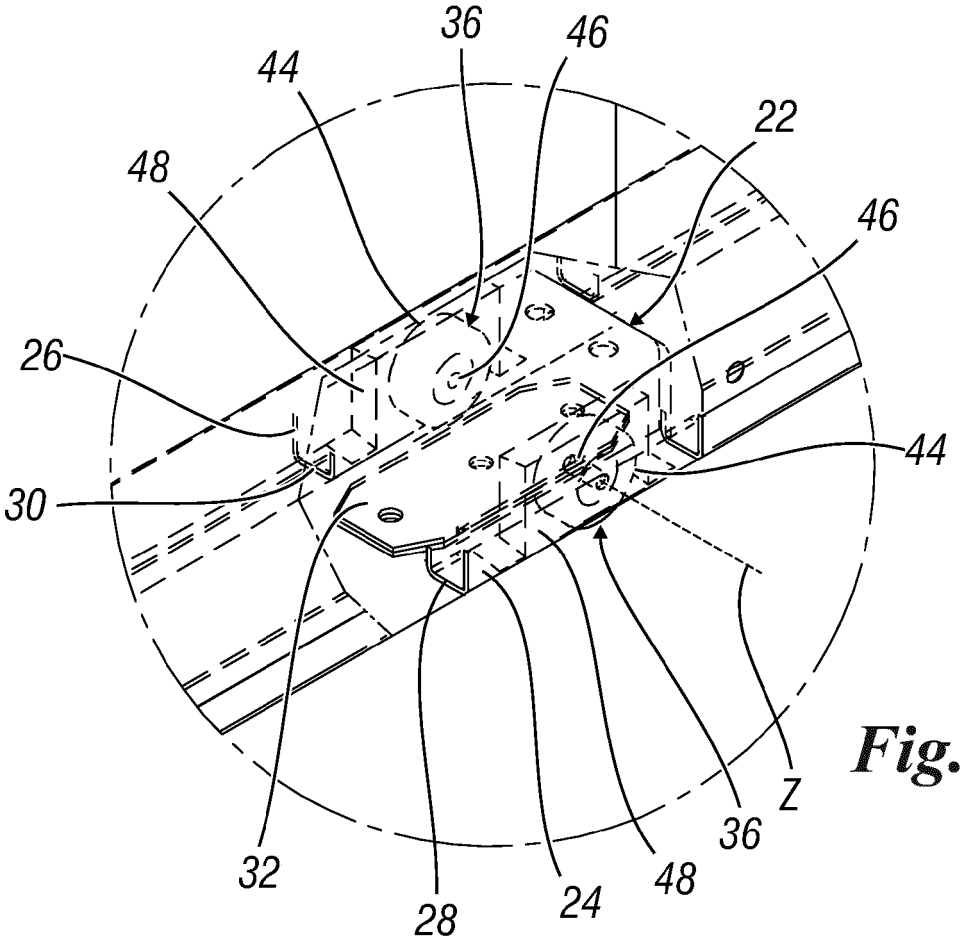


Fig. 10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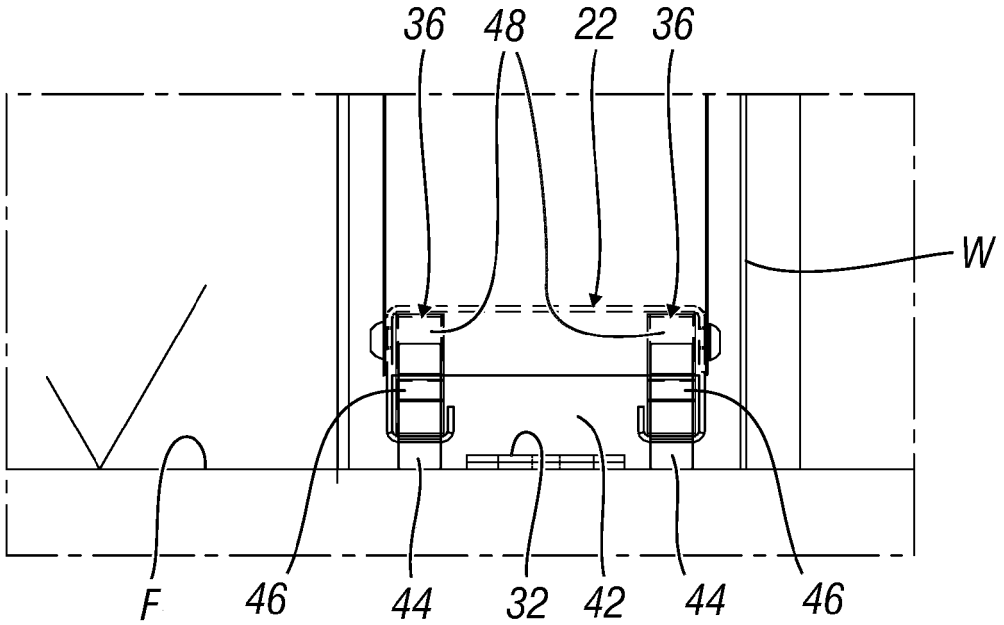
48
36
Z

Fig. 11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46

Fig. 12

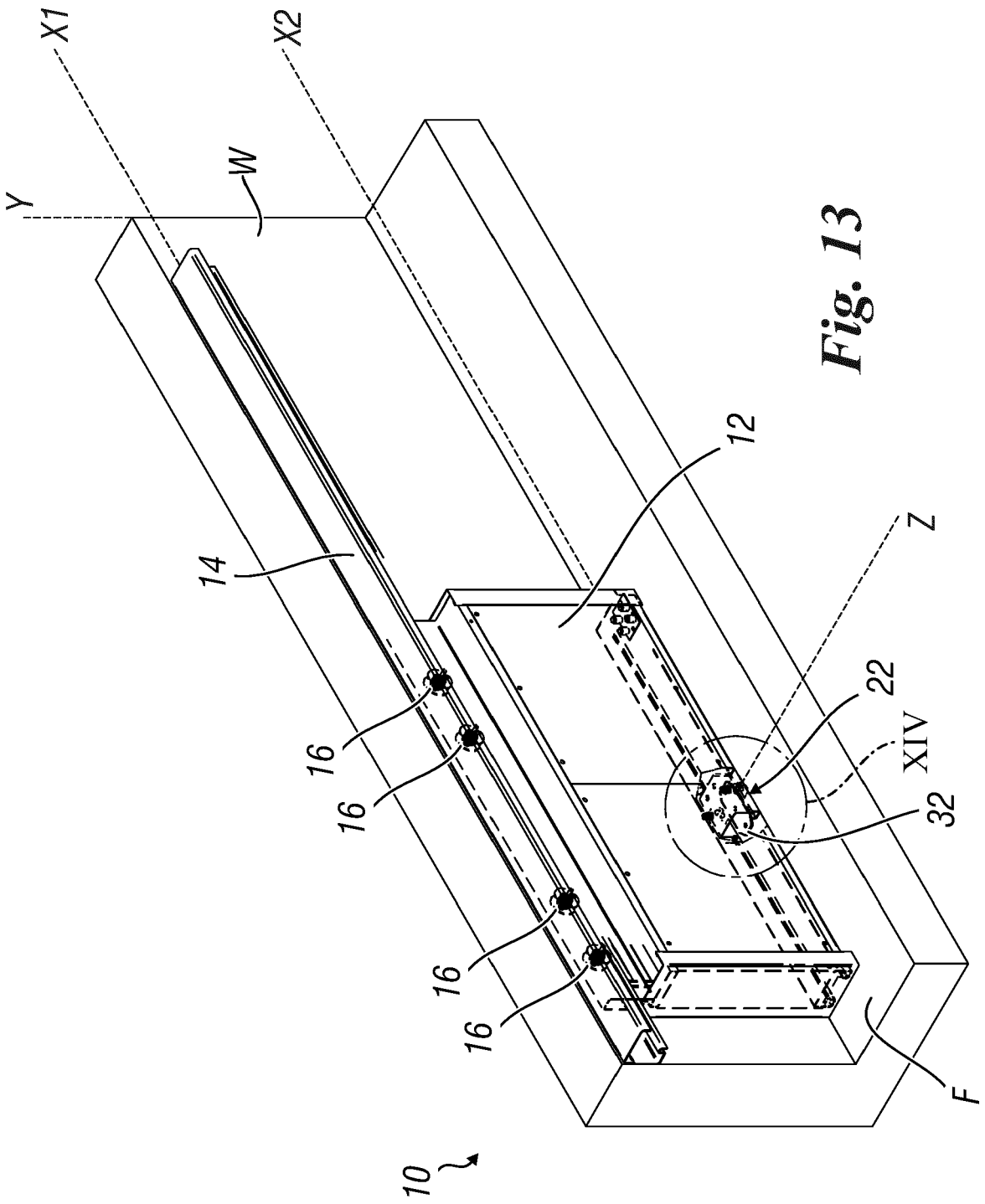
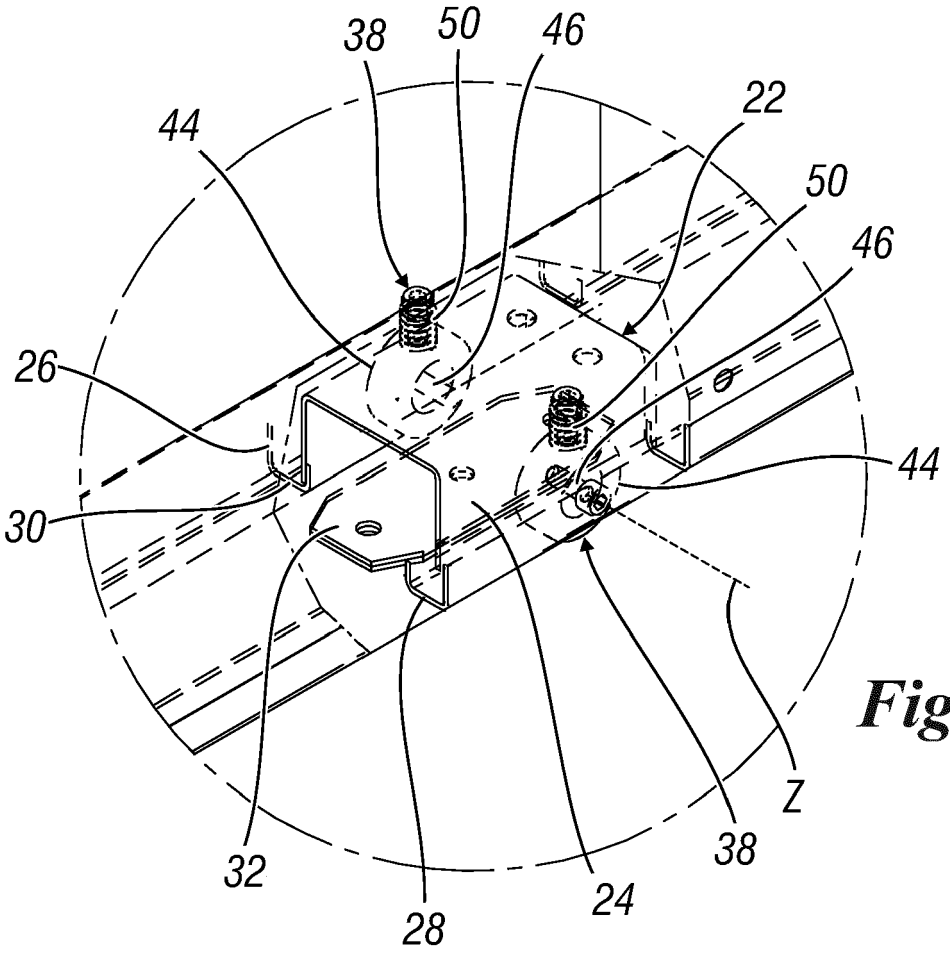


Fig. 13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44
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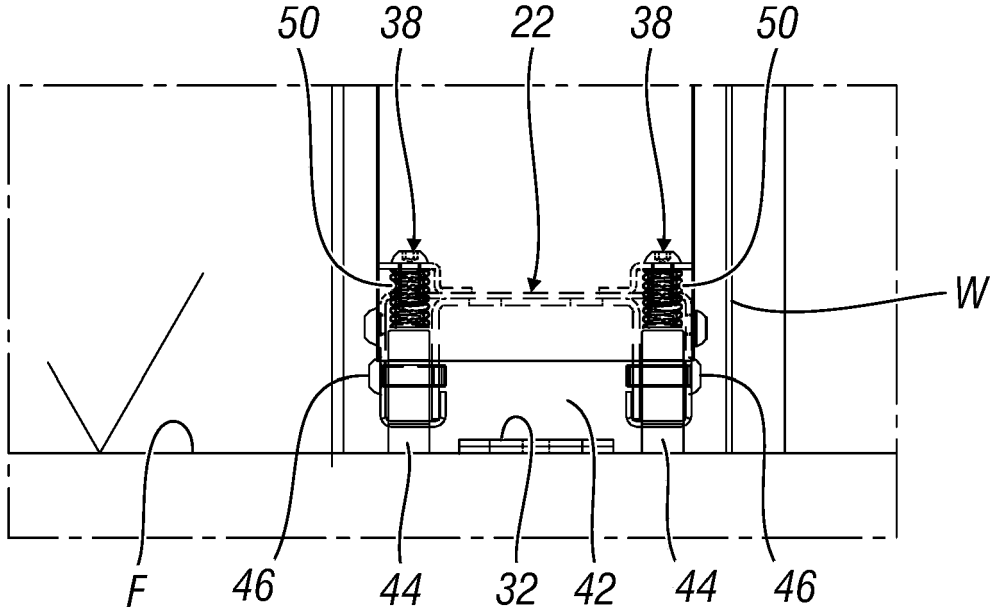
32
24
28

Fig. 14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46

Fig. 15

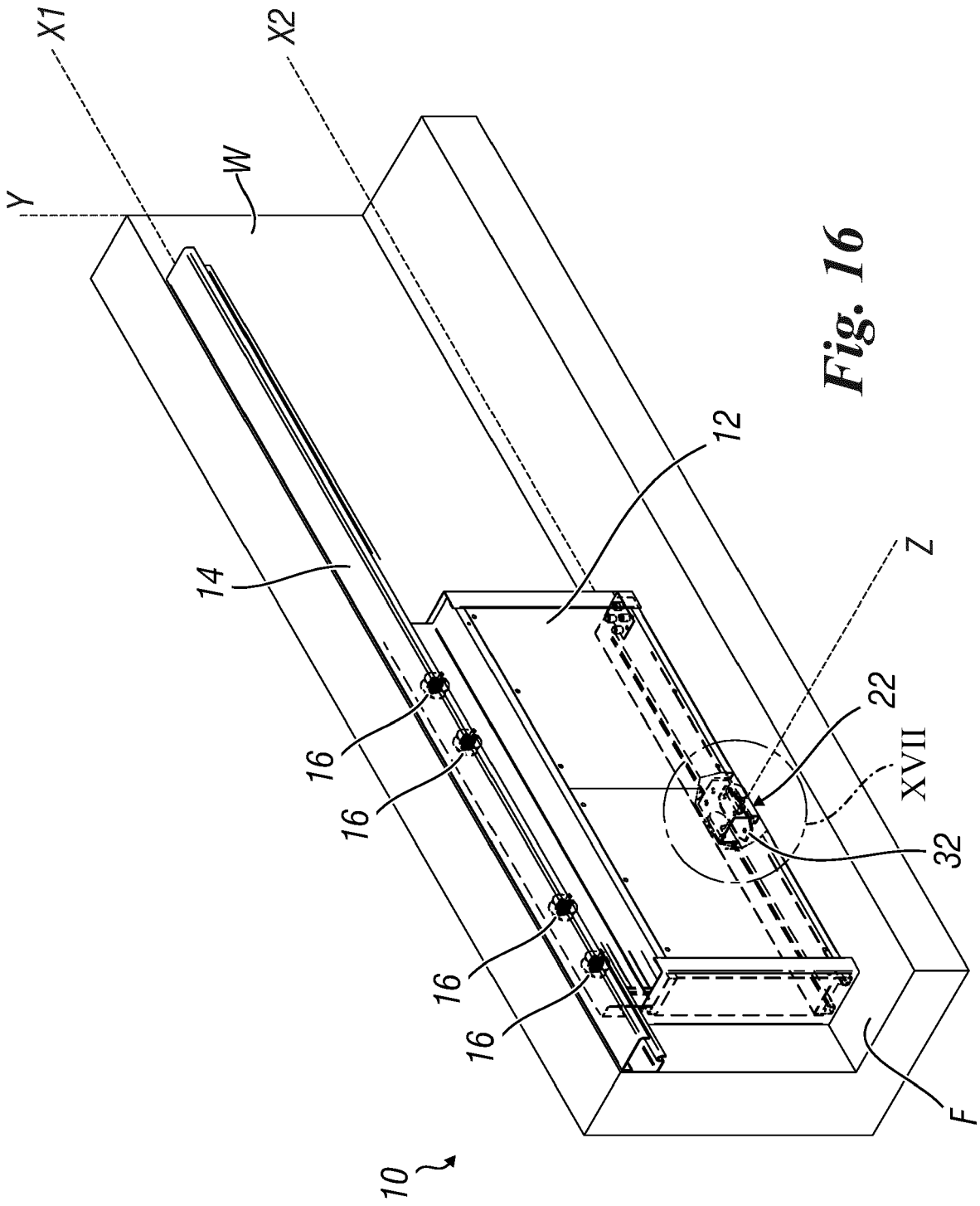

Fig. 16

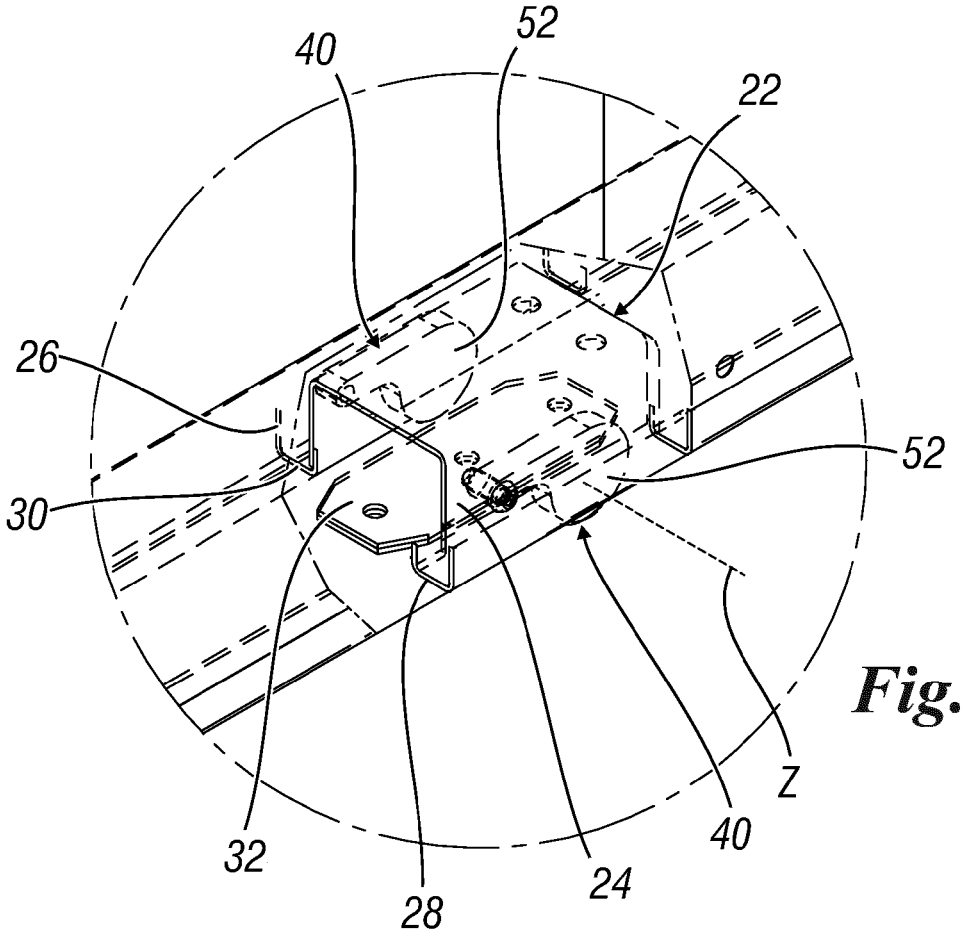

Fig. 17

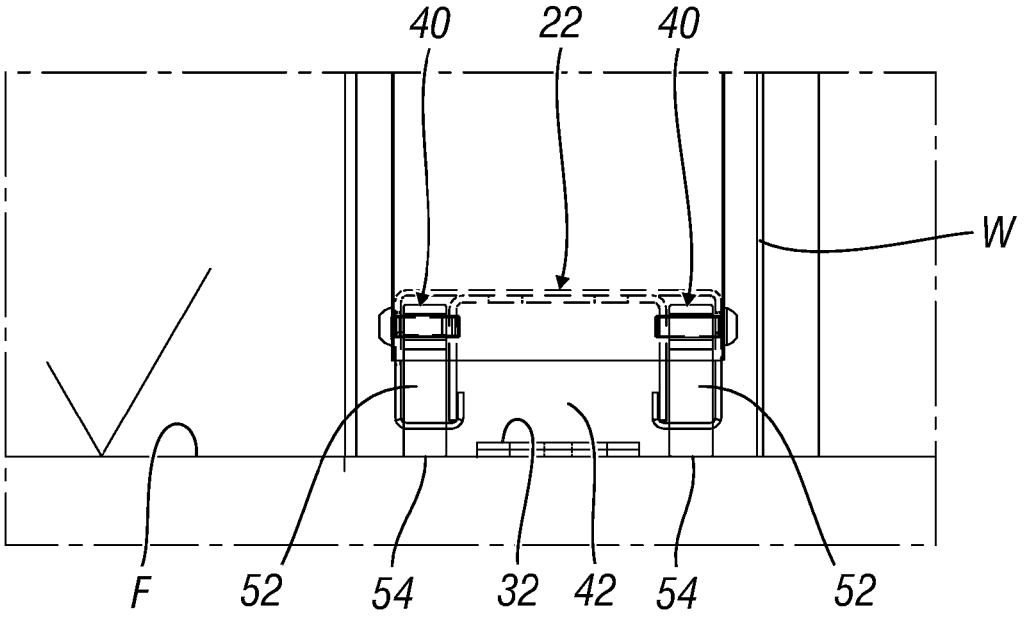

Fig. 18

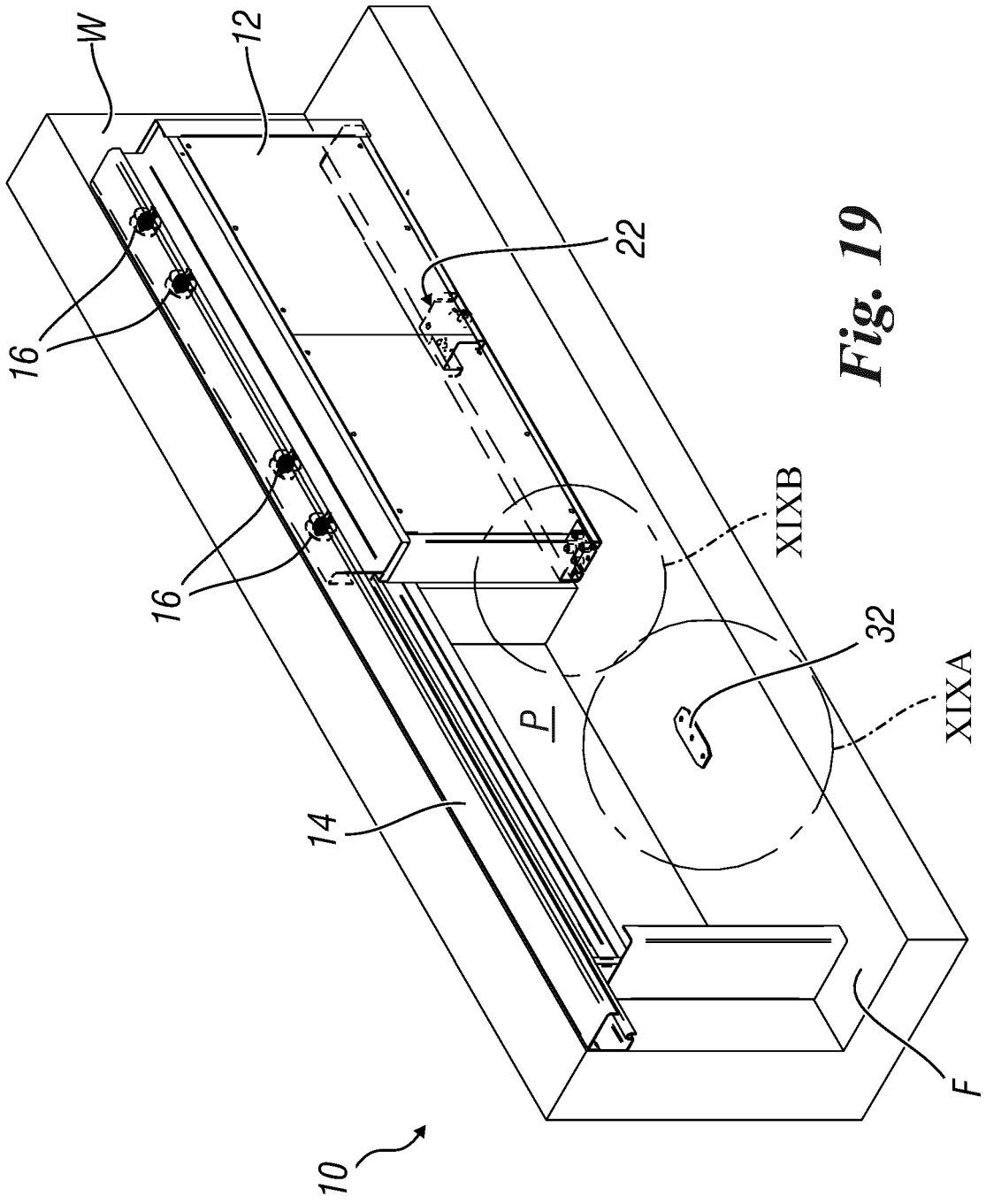

Fig. 19

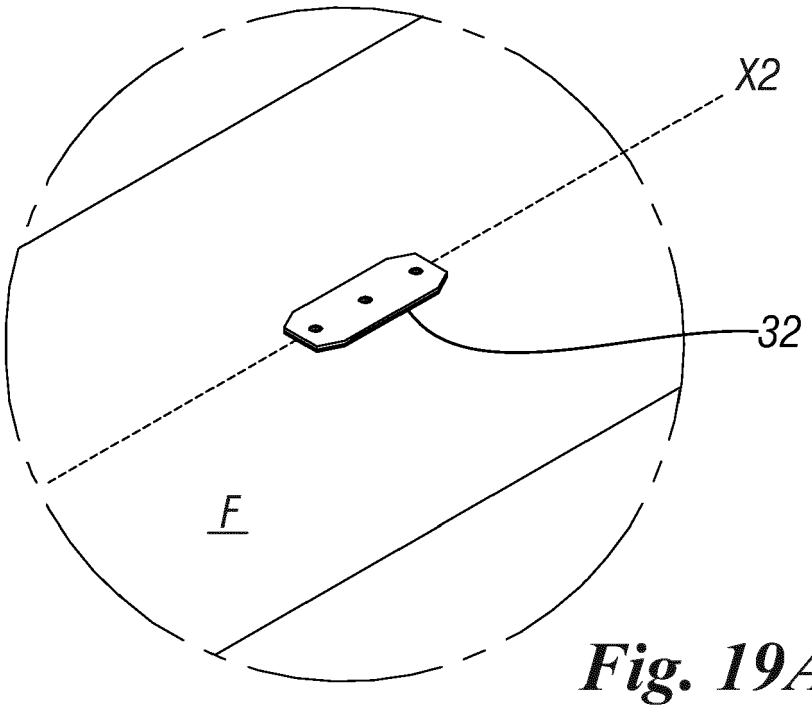

Fig. 19A

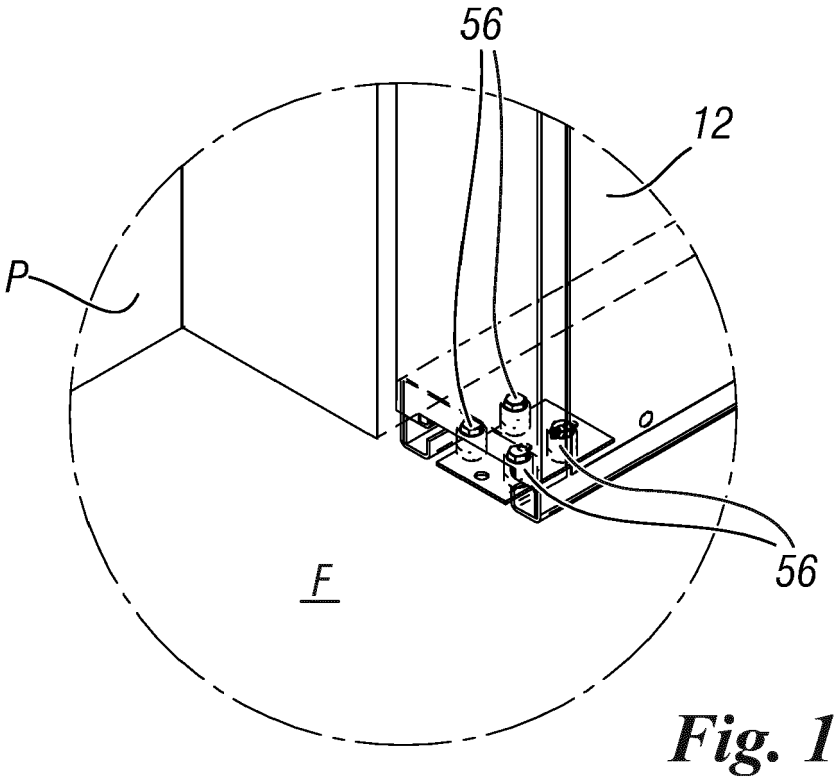

Fig. 19B

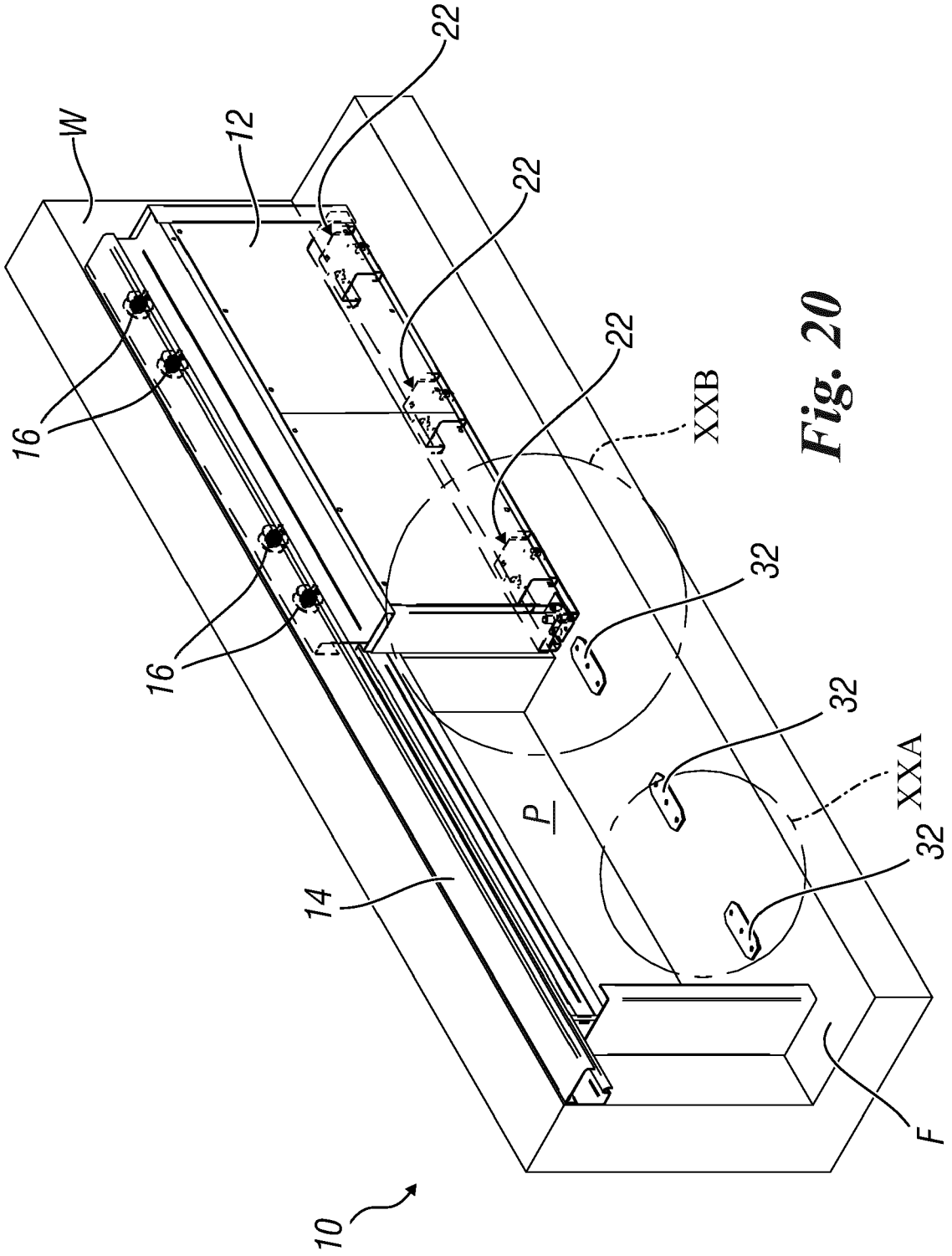

Fig. 20

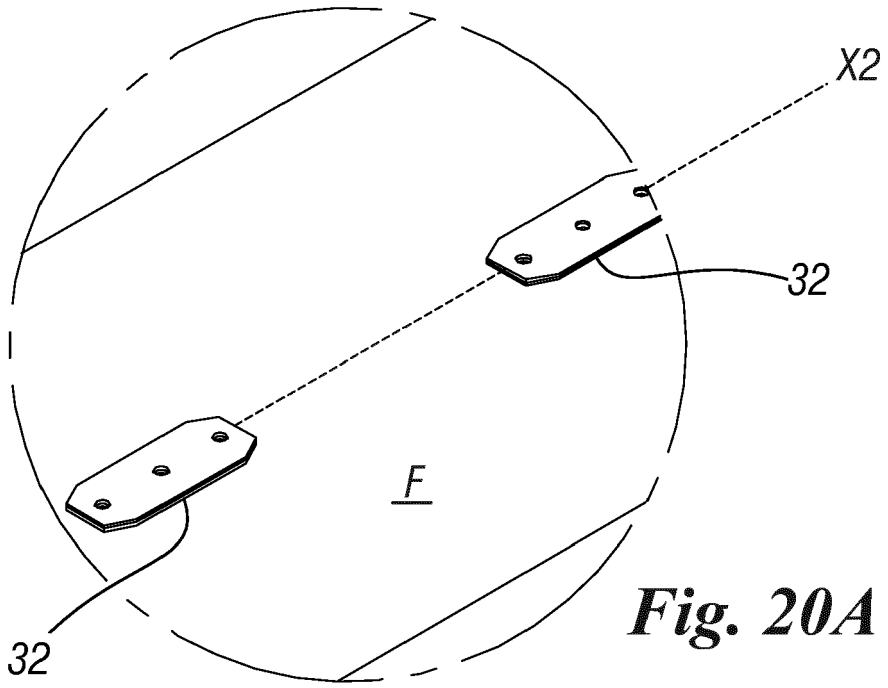

Fig. 20A

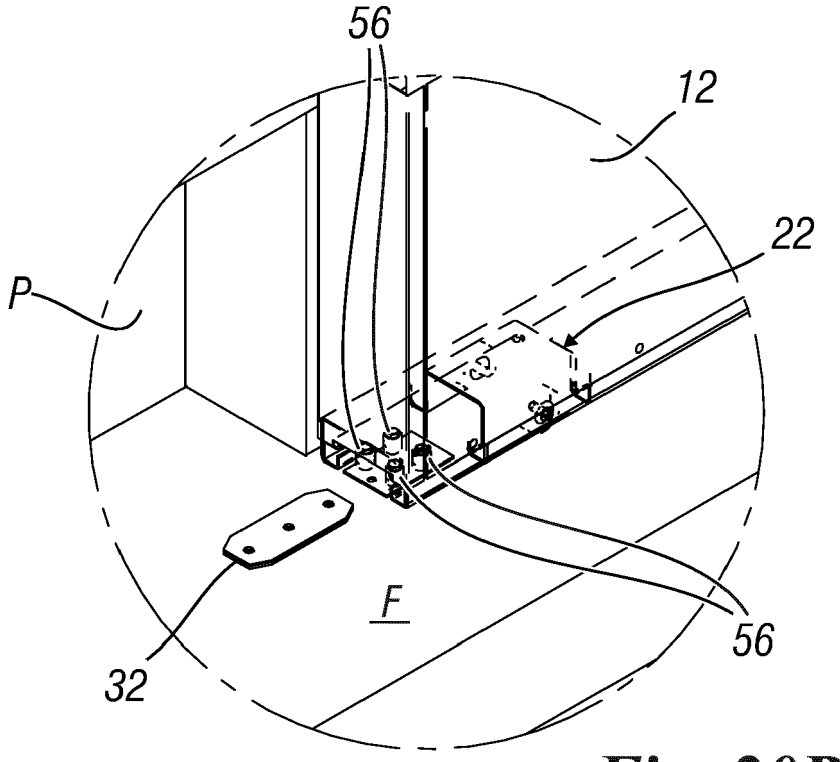

Fig. 20B

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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 9818

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	EP 4 006 293 A1 (MEVERIN SRL [IT]) 1 June 2022 (2022-06-01) * claim 1; figures 14-17 * -----	1	INV. E06B5/16 E06B3/46 E05D15/06 E05F1/02

TECHNICAL FIELDS SEARCHED (IPC)

E06B
E05G
E05D
E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 December 2023	Crespo Vallejo, D

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11-12-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 4006293 A1	01-06-2022	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- EP 4006293 A **[0010]**