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

(11) **EP 3 842 609 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.06.2021 Bulletin 2021/26

(51) Int Cl.:
E05D 3/02 *(2006.01)* ***E05D 7/00*** *(2006.01)*
E05D 7/04 *(2006.01)*

(21) Application number: **19425095.7**

(22) Date of filing: **23.12.2019**

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
KH MA MD TN

(71) Applicant: **BAUXT S.R.L.**
33053 Latisana (UD) (IT)

(72) Inventors:
- **Snaidero, Lorenzo**
  33053 Latisana (IT)
- **Castro, Gaetano**
  33100 Udine (IT)

(74) Representative: **Petraz, Gilberto Luigi et al**
GLP S.r.l.
Viale Europa Unita, 171
33100 Udine (IT)

(54) CONCEALED HINGING DEVICE FOR CLOSING ELEMENTS, IN PARTICULAR ARMORED DOORS

(57) An adjustable and concealed hinging device (12) for hinging a closing element, in particular a reinforced door, with respect to a fixed element. The hinging device comprises a hinging element (21) configured to be disposed coaxially with a hinging axis (X) and mounted on a support member (22) configured to be disposed in a compartment made in the closing element. The hinging device (12) also comprises adjustment members for selectively adjusting the position of the hinging element (21) along its hinging axis (X), along a sliding direction (Y), perpendicular to the hinging axis (X), and/or along a translation direction (Z), perpendicular to both the hinging axis (X), and also to the sliding direction (Y).

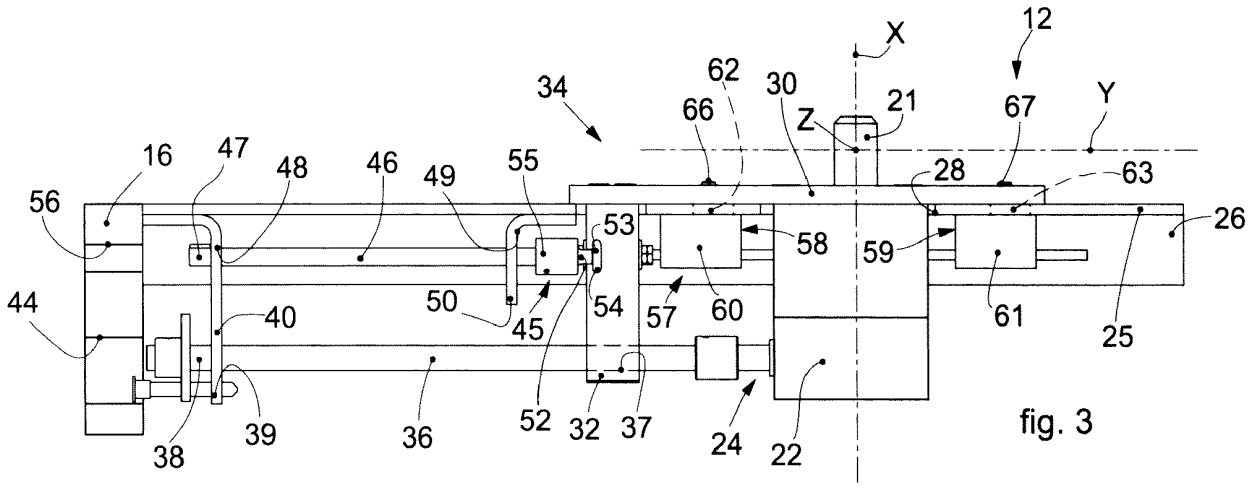


fig. 3

EP 3 842 609 A1

Description

FIELD OF THE INVENTION

[0001] The present invention concerns an adjustable hinging device of the so-called concealed type, configured to hinge closing elements, in particular reinforced doors, with respect to a fixed element, such as a support frame, or a support structure.

[0002] By "concealed hinging device" we mean a device that is not visible, when it is associated with the closing element to be hinged.

[0003] According to a particular use of the hinging devices, in accordance with the present invention, each closing element is hinged on two of such hinging devices, which are configured to be disposed preferably aligned along the same vertical hinging axis and positioned one on an upper zone of the closing element and the other on a lower zone of the closing element, in order to cooperate respectively one with an upper part of the fixed element, and the other with a lower part of the fixed element, or directly with the floor.

BACKGROUND OF THE INVENTION

[0004] Concealed hinging devices, or concealed hinges, for hinging closing elements, such as reinforced doors, with respect to corresponding fixed elements, are known. These fixed elements comprise, for example, a very robust frame, for example made of metal, which defines an aperture, or gap, having a normally rectangular section. These hinging devices comprise at least two pins, or pintles, located along the same axis of rotation, or hinging axis, usually vertical.

[0005] A reinforced door, for example, usually has a much greater weight than traditional doors, that is it can have a weight even much greater than 80 kg.

[0006] In particular, many concealed hinges are known, each comprising two hinging elements and a central pin on which the latter are hinged. In these types of hinges one of the hinging elements is configured to be attached on a vertical element, or a jamb, of the support frame, while another one of the two hinging elements of each hinge is configured to be attached on the closing element to be hinged, usually in correspondence with a lateral edge of the latter.

[0007] These known concealed hinges have the disadvantage of usually being rather complex and expensive and often not suitable for supporting very heavy closing elements, such as reinforced doors, or other.

[0008] In the sector of reinforced doors, in order to hinge them with respect to a support frame, it is also known to install two hinging devices disposed one on an upper horizontal part of the support frame, and the other on a lower part of the support frame, or directly on the floor, and each comprising a hinging pin disposed coaxial with the axis of rotation.

[0009] Alternatively, each hinging device can be installed in a compartment made in the same reinforced door to be hinged, at a determinate distance from a lateral edge thereof, opposite the one in which the lock is located. In this known solution, a hinging device has the hinging pin facing upward, in order to cooperate with a corresponding hinging hole made on the upper horizontal part of the support frame, and another hinging device has the hinging pin facing downward, in order to cooperate with a corresponding hinging hole made on the lower part of the support frame, or directly on the floor.

[0010] In the sector of concealed hinging device, or concealed hinges, in particular for hinging very heavy closing elements, such as reinforced doors, one of the technical problems to be addressed and solved, known to all those skilled in the art, is the correct positioning of the closing element with respect to the fixed structure, especially during the assembly step, but also during use.

[0011] Another technical problem that operators are faced with in the sector of windows and doors in general and above all, in particular, in the specific sector of reinforced doors, is being able to make one or more adjustments of the hinging element, or pintle, with respect to the fixed structure.

[0012] In order to try to solve these technical problems, the Applicant has designed and embodied a concealed hinging device for hinging a closing element, in particular a reinforced door, with respect to a fixed element, which has been the object of the European patent application EP18425081, filed on 26.10.2018. This known hinging device comprises a hinging element configured to be disposed coaxially with a hinging axis and mounted on a support mean configured to be disposed in a compartment made in the closing element as above. First adjustment means are provided for selectively adjusting the axial position of the hinging element as above, along the hinging axis as above, and second adjustment means are provided for selectively adjusting the position of the hinging element as above along a sliding direction, substantially perpendicular to the hinging axis as above.

[0013] This known hinging device, although functional and effective, however, only allowed two adjustments in directions perpendicular to each other, one of which along the hinging axis.

[0014] Therefore, one purpose of the present invention is to provide a concealed hinging device for hinging a closing element, such as a reinforced door, with respect to a fixed element, which in addition to being robust, simple to make and reliable, and which, at the same time, allows an easy and convenient installation of the closing element to be hinged, also allows an easy adjustment of the position of each of its hinging elements with respect to the corresponding support member, in at least two directions, advantageously in at least three directions, for example each perpendicular with respect to the other two, even when the closing element is already installed in the corresponding fixed element.

[0015] The Applicant has studied, tested and embodied the present invention to overcome the shortcomings

of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0016] The present invention is set forth and characterized in the independent claim.

[0017] The dependent claims describe other characteristics of the present invention, or variants to the main solution idea.

[0018] In accordance with the above purpose, an adjustable and concealed hinging device, according to the present invention, for hinging a closing element, in particular a reinforced door, with respect to a fixed element, comprises a hinging element configured to be disposed coaxially with a hinging axis and mounted on support means configured to be disposed in a compartment made in the same closing element, and primary adjustment means configured to selectively adjust the position of the hinging element along a sliding direction, substantially perpendicular to the hinging axis as above and/or the axial position of the hinging element along the hinging axis with respect to the closing element as above.

[0019] In accordance with a characteristic aspect of the present invention, the adjustable and concealed hinging device, also, comprises additional adjustment means configured to selectively adjust the position of the hinging element as above along a translation direction, substantially perpendicular to both the hinging axis, and also to the sliding direction as above.

[0020] In accordance with another characteristic aspect of the present invention, the primary adjustment means as above comprise first adjustment means configured to selectively adjust the axial position of the hinging element as above along the hinging axis as above and second adjustment means configured to selectively adjust the axial position of the hinging element as above along the sliding direction as above, and the additional adjustment means as above comprise third adjustment means.

[0021] In accordance with another characteristic aspect of the present invention, the support means as above comprise a containing box in which the hinging element as above is inserted so that the latter can slide axially along the hinging axis as above, due to the effect of a rotation thereof with respect to the containing box as above.

[0022] In accordance with another characteristic aspect of the present invention, the containing box as above is attached to a plate, which is slidably mounted, both along the sliding direction as above, and also along the translation direction as above, with respect to a support element configured to be attached to the closing element as above.

[0023] In accordance with another characteristic aspect of the present invention, the hinging device, also, comprises a guide member attached to the plate as above, and which together with the latter and with the containing box as above makes up a hinging assembly mobile with respect to the support element as above.

[0024] In accordance with another characteristic aspect of the present invention, the adjustment means as above comprise a first adjustment bar having the axis parallel to the sliding direction as above, a central part guided in the guide member as above, and an external end guided by a first support plate, which is attached to the support element as above.

[0025] In accordance with another characteristic aspect of the present invention, the first adjustment bar as above has an internal end which terminates inside the containing box as above and on which there is attached a driving bevel gear wheel, permanently in mesh with a corresponding driven bevel gear wheel, both also disposed inside the containing box as above, and the driven bevel gear wheel as above is rotatable about the hinging axis as above and is coupled with the hinging element as above so as to make it rotate together with it, but leaving it free to move axially with respect to it.

[0026] In accordance with another characteristic aspect of the present invention, the second adjustment means as above comprise a second adjustment bar having the axis parallel to the sliding direction as above and an external end threaded and screwed on a threaded hole made on the first support plate as above, and the second adjustment bar as above is also guided into a through hole, not threaded, of a second support plate, which is attached to the support element as above.

[0027] In accordance with another characteristic aspect of the present invention, the second adjustment bar as above has an internal end provided with a terminal element inserted in a guide groove made in the guide block as above and parallel to the translation direction as above.

[0028] In accordance with another characteristic aspect of the present invention, the third adjustment means as above comprise two adjustment mechanisms, identical to each other and disposed one on one side, and one on the other side of the containing box as above, wherein each of the two adjustment mechanisms as above comprises an adjustment element, which is shaped so as to have a cylindrical part outside the support element as above and a disk disposed in an eccentric position with respect to the cylindrical part as above and inserted in a corresponding slot, made in the support element as above, and in which a respective guide peg is eccentrically mounted on the corresponding disk, exits from the support element as above from the opposite side with respect to the cylindrical part as above, and is attached with precision in a corresponding threaded hole of the plate as above.

[0029] In accordance with another characteristic aspect of the present invention, each of the two adjustment elements as above is provided both with a first longitudinal and peripheral groove, parallel to the hinging axis as above and disposed angularly at 90° with respect to the corresponding guide peg, and also with a second

groove transverse and perpendicular to the first groove as above.

[0030] In accordance with another characteristic aspect of the present invention, in each of the two first grooves as above there is inserted a threaded insert, which has a threaded through hole, substantially parallel to the sliding direction as above and in which a third threaded adjustment bar is screwed at least in correspondence with the two threaded inserts as above, and the third adjustment bar as above is partly housed in the two second grooves and is through in a hole of the guide member as above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] These and other characteristics of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a first front view of a closing element shown in a closed position with respect to a fixed support frame and using two concealed hinging devices according to the present invention, in accordance with a first embodiment;
- fig. 2 is a second front view of a closing element shown in a closed position with respect to a fixed support frame and using two concealed hinging devices according to the present invention, in accordance with a second embodiment;
- fig. 3 is a front view, on an enlarged scale, of the hinging device mounted in an upper zone of the closing element of fig. 1;
- fig. 4 is a left lateral view of the hinging device of fig. 3;
- fig. 5 is a axonometric view of the hinging device of fig. 3, in which some of its components are shown exploded to better represent other parts of the same hinging device;
- fig. 6 is a axonometric view from below of the hinging device of fig. 3;
- fig. 7 is a view from below of the hinging device of fig. 3.

[0032] We must clarify that in the present description and in the claims the terms vertical, horizontal, lower, upper, right, left, high and low, with their declinations, have the sole function of better illustrating the present invention with reference to the figures of the drawings and must not be in any way used to limit the scope of the invention itself, or the field of protection defined by the attached claims. For example, by the term vertical we mean an axis, or a plane, that can be both perpendicular to the line of the horizon, and also inclined, even by a few degrees, for example up to 30°, with respect to that perpendicular position.

[0033] Furthermore, in the different embodiments described hereafter, the same reference numbers refer to similar or identical elements or components of the hinging device according to the present invention.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0034] Before describing the embodiments, we must, also, clarify that the present description is not limited in its application to details of the construction and disposition of the components as described in the following description using the attached figures.

[0035] The present invention can provide other embodiments and can be obtained or executed in various other ways. We must, also, clarify that the phraseology and terminology used here is for the purposes of description only, and cannot be considered as limitative.

[0036] In accordance with a first embodiment, shown in fig. 1, the closing element 10 is hinged along the vertical hinging axis, or axis of rotation, X, on the fixed element, in this specific case a support frame, 11 by means of two hinging devices 12 and 13 according to the present invention, the first mounted inside an upper zone of the closing element 10 and the second inside a lower zone of the closing element 10.

[0037] In the example, shown in fig. 1, the closing element 10 is a reinforced door with a weight comprised between about 100 and 500 kg. The closing element 10 is provided with a lock 14 mounted adjacent to a right lateral edge 15 thereof, opposite to a left lateral edge 16, which is instead close to the hinging axis X.

[0038] It can be noted that the hinging axis X is positioned at a determinate distance D, for example from about 100 mm to 500 mm, from the left lateral edge 16 of the closing element 10.

[0039] In the example provided here, the support frame 11 is metallic. According to an example of a construction solution, the support frame 11 comprises two vertical uprights 17 and 18, or jambs, or vertical elements, an upper horizontal element 19 and a lower element 20, also horizontal, which according to a variant, not shown in the drawings, can coincide with the floor, or be incorporated therein.

[0040] In accordance with a second embodiment, shown in fig. 2, the closing element 10 is mounted on the support frame 11 in a specular manner, so it has the lock 14 adjacent to the left lateral edge 16 in order to cooperate with the vertical upright 17 of the support frame 11. The hinging axis X is positioned at the determinate distance D from the right lateral edge 15 and the two hinging devices 12 and 13 are mounted in inverted positions, that is with the hinging device 13 on the upper zone of the closing element 10 and the hinging device 12 on the lower zone of the closing element 10.

[0041] The hinging device 12 (fig. 3) comprises a hinging element, in this specific case a substantially cylindrical pin or pintle 21, mounted sliding axially in a support mean, in this specific case a containing box 22 (figs. 3 and 5) and configured to be disposed coaxially with the hinging axis X.

[0042] In particular, the pin 21 has an internal part 23 (fig. 5) threaded and screwed into a corresponding female thread (not shown in the drawings) present in the containing box 22, whereby, by rotating the pin 21 with respect to the latter, as will be described in detail later, the pin 21 itself can move axially, that is along the hinging axis X, with respect to the containing box 22 itself, by means of first adjustment means 24 (fig. 5), which will be described in detail later.

[0043] The containing box 22, together with the pin 21, is mounted on an upper plate 30 which is resting on a lug 25 of a fixed support element, which in this specific case is an L-shaped metal foil 26, and is sliding with respect thereto along a sliding direction Y (fig. 3), which in this specific case is perpendicular to the hinging axis X and, during use, is horizontal.

[0044] The foil 26 is configured to be attached horizontally in an upper compartment 27 (fig. 1) made in the upper zone of the closing element 10, and is disposed perpendicular to the hinging axis X.

[0045] In particular, the containing box 22 (figs. 3 and 5) is disposed with wide clearance in a first housing 28, in this specific case of a rectangular shape, made in the same lug 25 of the foil 26, and is attached, by means of four screws 29 (fig. 5), to the upper plate 30, which is disposed outside the same lug 25 and is provided with a through hole 31 in which the pin 21 passes with a small clearance.

[0046] A guide block 32 (figs. 3, 5, 6 and 7), substantially having the shape of a parallelepiped, is also attached laterally, by means of four screws 33, to the upper plate 30 on the same side of the containing box 22, so that a hinging assembly, generally indicated with the reference number 34 (figs. 3, 6 and 7) and consisting of the upper plate 30, the containing box 22, and the guide block 32, forms a whole which can move joined together both in the sliding direction Y, and also in a translation direction Z (figs. 3 and 7) substantially perpendicular to both the hinging axis X, and also to the sliding direction Y, as will be described in detail below.

[0047] In particular, the upper part of the guide block 32 is disposed with wide clearance in a second housing 35 (fig. 5), in this specific case of a rectangular shape, made in the same lug 25 of the foil 26.

[0048] The first adjustment means 24 as above, which are able to displace the pin 21 axially and selectively along its hinging axis X, comprise a first adjustment bar 36 (figs. 3, 5, 6 and 7) having its axis parallel to the sliding direction Y, a central part guided on a hole 37 made in the guide block 32, and an external end 38 guided on a slot 39 (figs. 3, 5 and 6) of a first support plate 40 (figs. 3, 5, 6 and 7), which is attached in the lower part of the lug 25 of the foil 26, perpendicular to it. In particular, the slot 39 is parallel to the translation direction Z (figs. 3 and 7).

[0049] The first adjustment bar 36 has an internal end 41 (fig. 5) which terminates inside the containing box 22 and on which a driving bevel gear wheel 42 is keyed, permanently in mesh with a corresponding driven bevel gear wheel 43, also both disposed inside the containing box 22. The driven bevel gear wheel 43 is rotatable about the hinging axis X and is coupled to the pin 21 in a known manner, so that it can make it rotate with it, but leaving it free to move axially with respect to it.

[0050] The external end 38 of the first adjustment bar 36 is disposed in the proximity of the left lateral edge 16 (figs. 1 and 3), or the right lateral edge 15 (figure 2), of the closing element 10 and is configured to be driven by a tool of the known type, for example a screwdriver, or an Allen key, through a first aperture 44 (fig. 3) made in the same left lateral edge 16 (figs. 1 and 3), or respectively right lateral edge 15 (fig. 2), of the closing element 10.

[0051] The selective rotation of the first adjustment bar 36 in one direction, or the other, causes, by means of the bevel gear wheels 42 and 43, the screwing or unscrewing of the threaded internal part 23 of the pin 21 with respect to the containing box 22, and the consequent axial displacement of the same pin 21 along its hinging axis X, while the same bevel gear wheels 42 and 43 remain constantly in mesh with each other.

[0052] The hinging device 12 also comprises second adjustment means, generally indicated with the reference number 45 (figs. 3 and 5), which are able to displace the entire hinging assembly 34, and therefore also the pin 21, along the sliding direction Y (figs. 3 and 7).

[0053] The second adjustment means 45 comprise a second adjustment bar 46 (figs. 3, 5 and 6) having its axis parallel to the sliding direction Y and an external end 47 threaded and screwed onto a threaded hole 48 (figs. 3 and 5) made on the first support plate 40. The second adjustment bar 46 is also guided in a through hole 49, not threaded, of a second support plate 50, which is attached by means of two screws 51 (fig. 5) in the lower part of the lug 25 of the foil 26.

[0054] An internal end 52 of the second adjustment bar 46 is provided with a small disc 53 (figs. 3 and 5) inserted in a lateral groove 54 made in the guide block 32 and parallel to the translation direction Z (figs. 3 and 7). A collar 55 is mounted on the second adjustment bar 46 between the internal end 52 of the latter and the second support plate 50.

[0055] The external end 47 of the second adjustment bar 46 is disposed in the proximity of the left lateral edge 16 (figs. 1 and 3), or the right lateral edge 15 (fig. 2), of the closing element 10, and is configured to be driven by a tool of the known type, for example a screwdriver, or an Allen key, through a second aperture 56 (fig. 3) made in the same left lateral edge 16 (figs. 1 and 3), or respectively right lateral edge 15 (fig. 2), of the closing element 10.

[0056] Therefore, by screwing, or unscrewing, the second adjustment bar 46 with respect to the threaded hole 48 (figs. 3 and 5), which is in a fixed position with respect to the foil 26, a displacement of the pin 21 is obtained along the sliding direction Y, because the whole hinging

assembly 34 is displaced along that sliding direction Y with respect to the fixed part of the hinging device 12, that is of the foil 26, and therefore to the closing element 10 to which that foil is attached.

[0057] The hinging device 12, also, comprises third adjustment means, generally indicated with the reference number 57 (figs. 3 and 5), which are able to displace the hinging assembly 34, and therefore also the pin 21, along the translation direction Z (figs. 3 and 7).

[0058] The third adjustment means 57 comprise two adjustment mechanisms 58, 59 (figs. 3, 5, 6 and 7), identical to each other and disposed one on one side and the other on the other side of the containing box 22 of the pin 21.

[0059] Each adjustment mechanism 58, 59 comprises an adjustment element 60 (figs. 3 and 7), respectively 61, which is shaped so as to have a cylindrical part disposed close to the internal part of the lug 25 (fig. 3) of the foil 26, and a disk 62, respectively 63, disposed in an eccentric position with respect to the cylindrical part as above, and inserted in a corresponding slot 64, respectively 65, made in the same lug 25. The two slots 64 and 65 are disposed on opposite sides with respect to the first housing 28 and are aligned along the sliding direction Y.

[0060] Each adjustment mechanism 58, 59, also, comprises a respective guide peg 66, respectively 67, which is eccentrically mounted on the corresponding disk 62, respectively 63, exits from the lug 25 of the foil 26, is parallel to the pin 21 and is attached with precision in a corresponding threaded hole 68, respectively 69 (fig. 5), of the upper plate 30.

[0061] The coupling of the guide pegs 66 and 67 with the upper plate 30 is such as not to generate friction, or a clamping, between the disks 62 and 63 of the adjustment mechanisms 58 and 59, the lug 25 of the foil 26 and the upper plate 30, by means of two bushings coaxial with the guide pegs 66, 67 with a length greater than the thickness of the adjustment elements 60, 61 and of the lug 25.

[0062] Furthermore, each of the two adjustment elements 60 and 61 is provided both with a longitudinal and peripheral first groove 70 (figs. 6 and 7), parallel to the hinging axis X and disposed angularly at 90° with respect to the corresponding guide peg 66, respectively 67, and also with a second groove 71 transverse and perpendicular to the first groove 70.

[0063] In each of the two first grooves 70 there is inserted a threaded insert 72, cylindrical in shape, which has a threaded through hole, substantially parallel to the sliding direction Y and in which a third adjustment bar 73 is screwed, threaded at least in correspondence with the two threaded inserts 72. The third adjustment bar 73 is partly housed in the two second grooves 71 and is through in a hole 74 (fig. 7) of the guide block 32. Furthermore, the third adjustment bar 73 is held in an axial position, while being allowed to rotate about its own axis, by two pairs of nuts 75, disposed on one side and on the other of the guide block 32, and configured to prevent sliding or inflection of the third adjustment bar 73 with respect to the same guide block 32.

[0064] The third adjustment bar 73 has an external end 76 (figs. 4 and 6) guided in a groove 77 made laterally on the first support plate 40.

[0065] The external end 76 of the third adjustment bar 73 is also disposed in the proximity of the left lateral edge 16 (figs. 1 and 7), or right lateral edge 15 (fig. 2), of the closing element 10, and is configured to be driven by a tool of the known type, for example a screwdriver, or an Allen key, through a third aperture 78 (fig. 7) made in the same left lateral edge 16 (figs. 1 and 3), or respectively right lateral edge 15 (fig. 2), of the closing element 10.

[0066] By screwing, or unscrewing, the third adjustment bar 73, the third adjustment of the hinging device 12 along the transverse direction Z is carried out, by rotating the two disks 62 and 63 of the adjustment elements 60 and 61 inside the slots 64 and 65, so that the guide pegs 66 and 67 are displaced along the transverse direction Z, while maintaining the hinging assembly 34 in the position reached along the sliding direction Y. In fact, with this action of screwing, or unscrewing, the third adjustment bar 73 the entire hinging assembly 34 is moved, together with the first adjustment bar 36 and the third adjustment bar 73 itself, while the second adjustment bar 46 remains in a fixed position with respect to the two support plates 40 and 50; in fact, it is the guide block 32 which moves with respect to it.

[0067] The hinging device 12, in the examples described here, is positioned in the upper compartment 27 (fig. 1) of the closing element 10 so that the pin 21 is facing upward, in order to cooperate with a corresponding hinging hole, not shown in the drawings, made on the upper element 19 of the support frame 11, coaxially with the hinging axis X.

[0068] The hinging device 12 allows to easily adjust the position of the pin 21 independently in each of three directions perpendicular to each other, that is both a first adjustment along the hinging axis X and also a second adjustment along the sliding direction Y, and/or also a third adjustment along the translation direction Z, as described above.

[0069] Each of the three adjustments as above can be made both during the assembly of the closing element 10 on the support frame 11, and also during the use of the same closing element 10, intervening from the outside of the latter on the first adjustment bar 36, on the second adjustment bar 46 and/or on the third adjustment bar 73.

[0070] The hinging device 13, shown in figs. 1-2, is substantially the same as the hinging device 12 described heretofore, with the difference that the position of the second adjustment bar 46, of the guide block 32 and of the first adjustment bar 36 is specular with respect to the pin 21 and to the containing box 22.

[0071] In particular, in the example provided here, the hinging device 13 is positioned in a lower compartment

79 (fig. 1) of the closing element 10, so that the pin 21 is facing downward, in order to cooperate with a corresponding hinging hole, not shown in the drawings, made on the lower element 20 of the support frame 11, coaxially with the hinging axis X.

[0072] In the same way as the hinging device 12, the hinging device 13 also allows to easily adjust the position of the pin 21 independently in each of three directions perpendicular to each other, that is both a first adjustment along the hinging axis X and also a second adjustment along the sliding direction Y, and/or also a third adjustment along the translation direction Z, as described above.

[0073] In the embodiment shown in fig. 2, the hinging device 13 is disposed in the upper compartment 27, with the pin 21 facing upward, while the hinging device 12 is disposed in the lower compartment 79, with the pin 21 facing downward.

[0074] It is understood that modifications and/or additions of parts may be made to the hinging devices 12 and 13 as described heretofore, without departing from the scope of the present invention.

[0075] For example, the connection between the internal end 41 of the first adjustment bar 36 and the pin 21, instead of between the pair of bevel gear wheels 42 and 43 could be made by means of a worm screw, connected or keyed coaxially with the same first adjustment bar 36, and permanently coupled with a gear wheel coaxial with the pin 21.

[0076] It is also clear that, although the present invention has been described with reference to a specific example, a person of skill in the art shall certainly be able to achieve many other equivalent forms of hinging devices, having the characteristics as set forth in the attached claims and hence all coming within the field of protection defined thereby.

Claims

1. Adjustable and concealed hinging device for hinging a closing element (10), in particular a reinforced door, with respect to a fixed element (11), comprising a hinging element (21) configured to be disposed coaxially with a hinging axis (X) and mounted on support means (22) configured to be disposed in a compartment (25, 79) made in said closing element (10), and primary adjustment means (24, 45) configured to selectively adjust the axial position of said hinging element (21) along said hinging axis (X) and/or the position of said hinging element (21) along a sliding direction (Y), substantially perpendicular to said hinging axis (X) with respect to said closing element (10), **characterized in that** it, also, comprises additional adjustment means (57) configured to selectively adjust the position of said hinging element (21) along a translation direction (Z), substantially perpendicular to both said hinging axis (X), and also to said sliding direction (Y).

2. Hinging device as in claim 1, **characterized in that** said primary adjustment means comprise first adjustment means (24) configured to selectively adjust the axial position of said hinging element (21) along said hinging axis (X) and second adjustment means (45) configured to selectively adjust the axial position of said hinging element (21) along said sliding direction (Y), **and in that** said additional adjustment means comprise third adjustment means (57).

3. Hinging device as in claim 1 or 2, **characterized in that** said support means comprise a containing box (22) in which said hinging element (21) is inserted so that the latter can slide axially along said hinging axis (X) due to the effect of a rotation thereof with respect to said containing box (22).

4. Hinging device as in claim 3, **characterized in that** said containing box (22) is attached to a plate (30), which is slidably mounted, both along said sliding direction (Y), and also along said translation direction (Z), with respect to a support element (26) configured to be attached to said closing element (10).

5. Hinging device as in claim 4, **characterized in that** it, also, comprises a guide member (32) attached to said plate (30) and which together with the latter and with said containing box (22) makes up a hinging assembly (34) mobile with respect to said support element (26).

6. Hinging device as in claim 5, **characterized in that** said first adjustment means (24) comprise a first adjustment bar (36) having its axis parallel to said sliding direction (Y), a central part guided in said guide member (32), and an external end (38) guided by a first support plate (40), which is attached to said support element (26).

7. Hinging device as in claim 6, **characterized in that** said first adjustment bar (36) has an internal end (41) which terminates inside said containing box (22) and on which there is attached a driving bevel gear wheel (42), permanently in mesh with a corresponding driven bevel gear wheel (43), both also disposed inside said containing box (22), **and in that** said driven bevel gear wheel (43) is rotatable about said hinging axis (X) and is coupled with said hinging element (21) so as to make it rotate together with it, but leaving it free to move axially with respect to it.

8. Hinging device as in claim 6 or 7, **characterized in that** said second adjustment means (45) comprise a second adjustment bar (46) having its axis parallel to said sliding direction (Y) and an external end (47) threaded and screwed on a threaded hole (48) made

on said first support plate (40), **and in that** said second adjustment bar (46) is also guided into a through hole (49), not threaded, of a second support plate (50), which is attached to said support element (26).

9. Hinging device as in claim 8, **characterized in that** said second adjustment bar (46) has an internal end (52) provided with a terminal element (53) inserted in a guide groove (54) made in said guide block (32) and parallel to said translation direction (Z).

10. Hinging device as in claim 6 or 7, **characterized in that** said third adjustment means (57) comprise two adjustment mechanisms (58, 59), identical to each other and disposed one on one side, and one on the other side of said containing box (22), wherein each of said two adjustment mechanisms (58, 59) comprises an adjustment element (60, 61), which is shaped so as to have a cylindrical part outside said support element (26) and a disk (62, 63) disposed in an eccentric position with respect to said cylindrical part and inserted in a corresponding slot (64, 65), made in said support element (26), and in which a respective guide peg (66, 67) is eccentrically mounted on the corresponding disk (62, 63), exits from said support element (26) from the opposite side with respect to said cylindrical part, and is inserted with precision into a corresponding threaded hole (68, 69) of said plate (30).

11. Hinging device as in claim 10, **characterized in that** each of said two adjustment elements (60, 61) is provided both with a first longitudinal and peripheral groove (70), parallel to said hinging axis (X) and disposed angularly at 90° with respect to the corresponding guide peg (66, 67), and also with a second groove (71) transverse and perpendicular to said first groove (70).

12. Hinging device as in claim 11, **characterized in that** into each of said two first grooves (70) there is inserted a threaded insert (72), which has a threaded through hole, substantially parallel to said sliding direction (Y) and in which a third threaded adjustment bar (73) is screwed at least in correspondence with said two threaded inserts (72), **and in that** said third adjustment bar (73) is partly housed in said two second grooves (71) and is through in a hole (74) of said guide member (32).

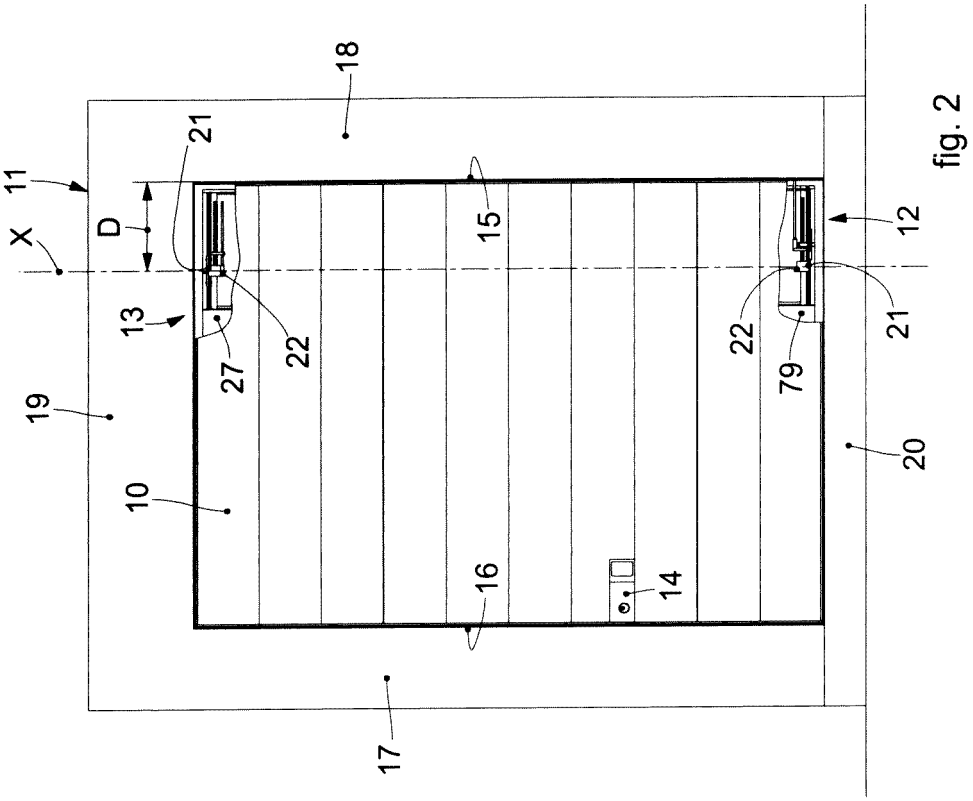

18
11
21
D
X
15
12
13
22
27
22
21
79
19
20
10
16
14
17

fig. 2

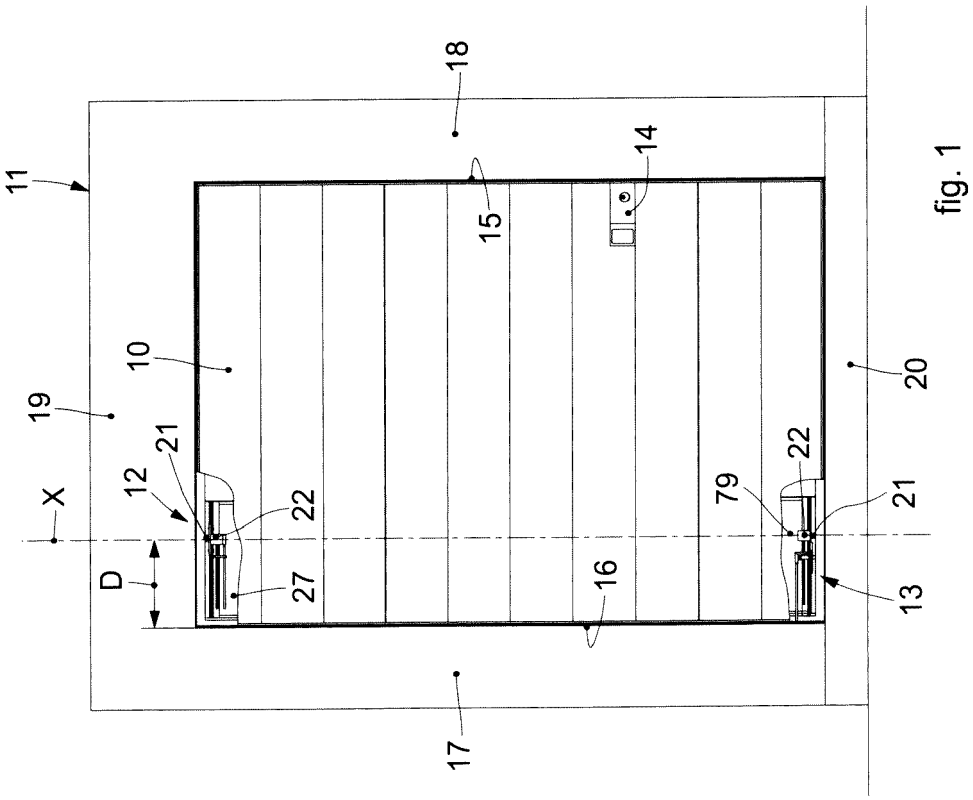

18
14
11
15
10
20
19
21
22
12
X
79
21
22
D
27
16
13
17

fig. 1

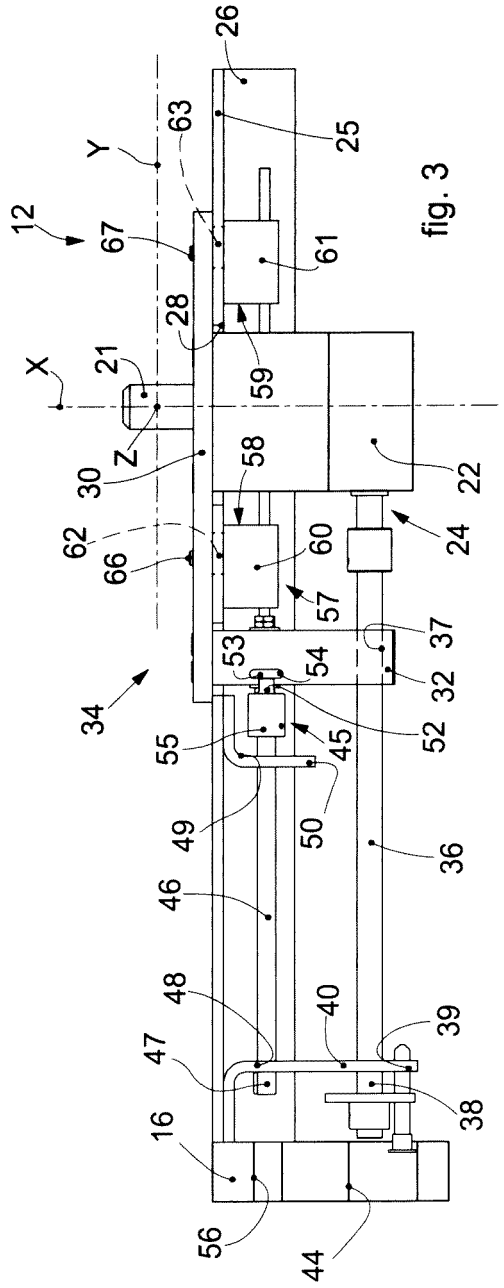


fig. 3

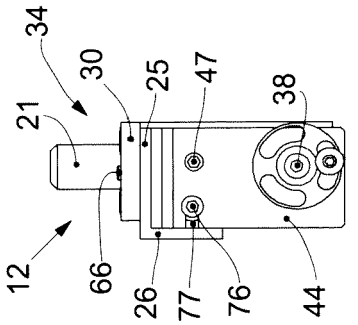
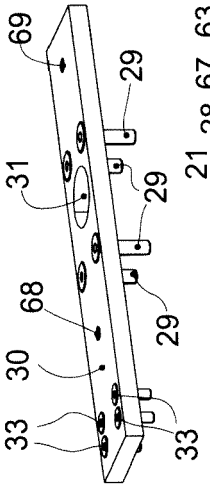


fig. 4



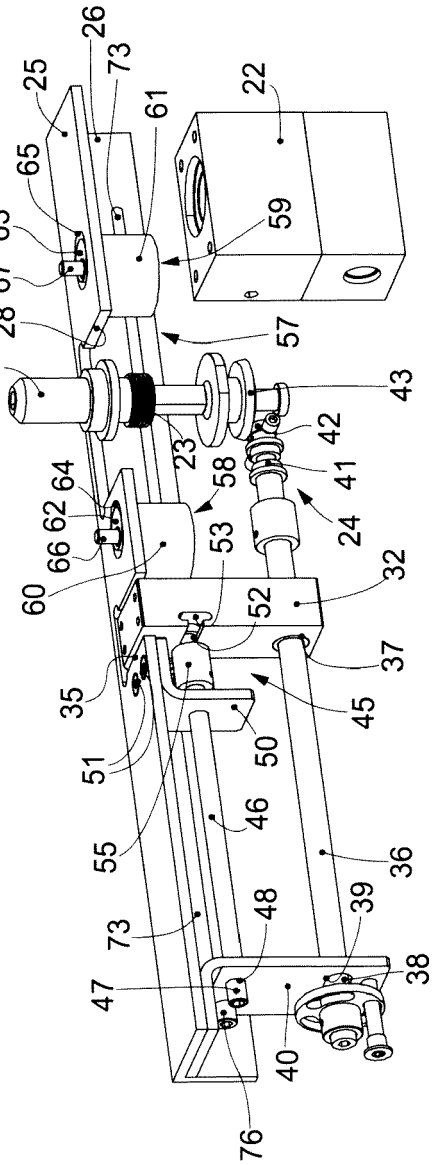


fig. 5

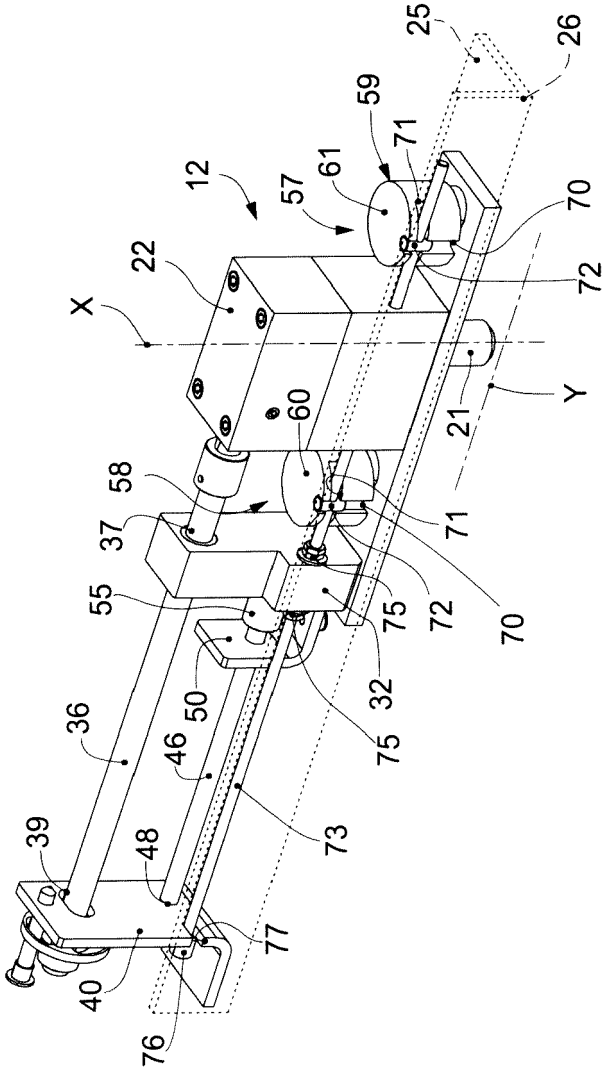

25
26
59
71
61
57
12
70
22
72
X
60
21
Y
58
71
37
72
70
55
75
32
50
75
36
46
73
39
48
77
40
76

fig. 6

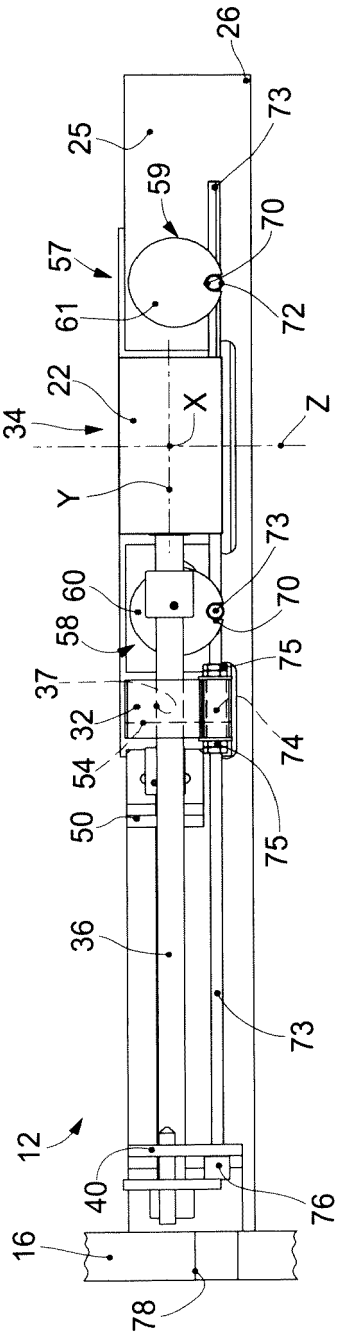

26
25
73
59
70
57
61
72
22
34
X
Z
Y
73
60
70
58
75
37
32
74
54
50
75
36
73
12
40
76
16
78

fig. 7

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 42 5095

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2008 028756 B3 (SFS INTEC HOLDING AG [CH]) 9 July 2009 (2009-07-09)	1,2	INV.
A	* paragraph [0024] - paragraph [0030] * * figures 1-6 *	4-12	E05D3/02 E05D7/00 E05D7/04
X	EP 2 369 109 A2 (SIMONSWERK GMBH [DE]) 28 September 2011 (2011-09-28) * paragraph [0019] - paragraph [0022] * * paragraph [0025] * * figures 1-5 *	1,2	
X	EP 2 208 843 A2 (SFS INTEC HOLDING AG [CH]) 21 July 2010 (2010-07-21) * paragraph [0027] - paragraph [0028] * * paragraph [0035] - paragraph [0039] * * figure 5 *	1-3	

TECHNICAL FIELDS SEARCHED (IPC)

E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 June 2020	Prieto, Daniel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 42 5095

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-06-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102008028756 B3	09-07-2009	AT 543973 T	15-02-2012
		DE 102008028756 B3	09-07-2009
		EP 2297418 A1	23-03-2011
		ES 2379047 T3	20-04-2012
		PL 2297418 T3	31-05-2012
		RU 2010136995 A	10-03-2012
		WO 2010003749 A1	14-01-2010
EP 2369109 A2	28-09-2011	DE 102010012144 B3	15-09-2011
		EP 2369109 A2	28-09-2011
		PL 2369109 T3	28-02-2017
EP 2208843 A2	21-07-2010	DE 102009004846 B3	10-12-2009
		EP 2208843 A2	21-07-2010
		ES 2605167 T3	13-03-2017

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 18425081 A **[0012]**