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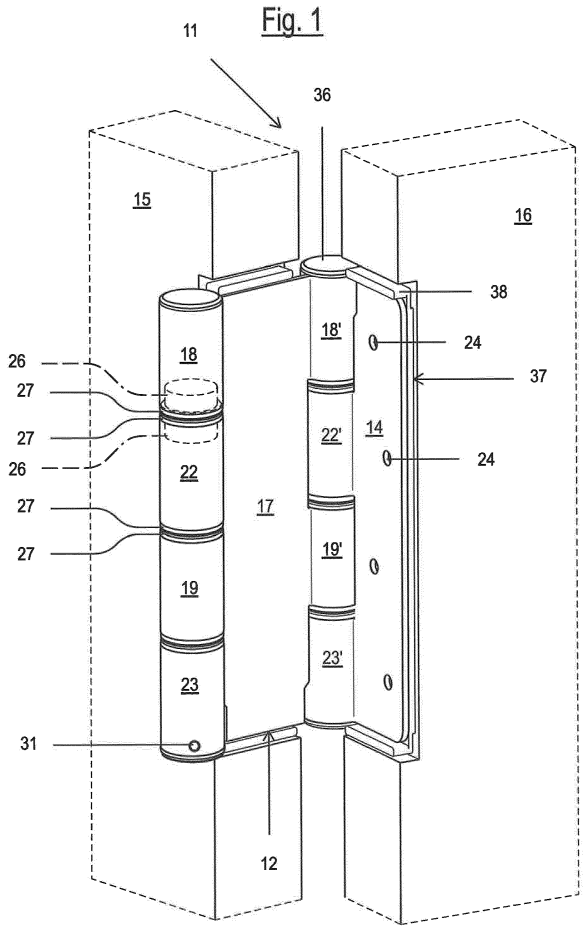
(54) DOUBLE-ACTION SPRING HINGE FOR DOOR PANELS AND THE LIKE

(57) A double-action spring hinge for door panels and the like (11) comprising a central body (12) to which two wings (13,14) are rotatably connected on opposite sides, wherein one wing (13) of said two wings (13, 14) is destined for being fixed to an upright (15) of a door and the other wing (14) to a panel (16) of a door; wherein the central body (12) comprises a substantially rectangular intermediate portion (17) from which two pairs of arms (18,19 and 18',19') extend on opposite sides, and wherein the two wings (13,14) have a substantially rectangular portion (21) from a side of which two arms (22,23 and 22',23' respectively) extend, wherein the two arms (22,23 and 22',23') of the two wings (13,14) are formed spaced from each other in such a position as to allow them to be arranged between the arms (18,19 and 18',19' respectively) of the central body (12); all of the arms (18,19 and 18' 19'; 22,23 and 22',23') being curved to form cylindrical slots; a pair of tubular elements (20) each suitable for containing a helical spring (25) and receiving end caps (36), which are positioned at opposite ends of each tubular element (20) and receive opposite ends (29) of each spring (25); sliding cylindrical bushes (26) provided with an end of a flange (27) which extends outwardly, positioned externally to each tubular element (20), wherein the bushes (26) are arranged in pairs with the flanges (27) head to head, and wherein the pairs of bushes (26) thus arranged are positioned between consecutive aligned cylindrical slots of arms (18,22,19 and 23) of one side of the hinge (11) and consecutive aligned cylindrical slots of arms (18',22',19' and 23') respectively of another side of the hinge (11); the sliding bushes (26) being formed in an antifriction engineering polymer and the central body (12) and the two wings (13,14) being produced in cold-pressed steel.

Fig. 1



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Description

[0001] The present invention relates to a double-action spring hinge for door panels and the like.

[0002] Hinges applied to an upright and a panel have long been used for creating a single hinge for a door. These hinges are usually provided with return springs in which a spring acts on the wing or wings of the hinge and opposes the movement of the wings in the opening direction of the panel. There are also hinges which, when they can effect a movement at 180°, have two wings arranged on opposite sides with respect to a central body to define a double hinge called "double-action".

[0003] The term double hinge refers to hinges provided with two rotation axes, parallel to each other, typically but not limitedly used for swing doors and the like.

[0004] In short, double hinges are composed of two single hinges parallel and spaced, with respective rotation axes. The two hinges are connected by a central body (usually called "eye" in jargon) and the central body is in turn connected at its two sides with respective wings.

[0005] When in use, for example, one of the two wings is connected to a panel of the door, for example a swing door, whereas the other wing is connected to an upright of the door, which in turn is fixed to the wall.

[0006] The springs of the double hinge must be able to be loaded according to requirements, in order to avoid an excessive return speed with obvious problems.

[0007] And this problem in the case of double hinges is greater due to their conformation.

[0008] The previous term "swing doors" (also called "come and go") refers to doors where double spring hinges must be applied. These doors are generally used for dividing environments where there is considerably frequent passage or where there is the need for having the widest possible opening of the door.

[0009] Swing doors open up to arcs of 180° (90° in one direction and 90° in the opposite direction from a central "equilibrium" position of the panel at which the door is closed).

[0010] Although different solutions have been found for these hinges, they are nevertheless subject to the weights of the panel (variation of the spring load) and to small movements or undulations around the equilibrium position of the panel when the door is closed.

[0011] This is particularly felt when the door, when it is open, is released. In this transient condition, the amplitude and number of undulations varies depending on the load applied to the spring. In addition, the return speed of the hinge, often high, can cause excessive stress and mechanical loads. This consequently leads to a potential danger for those using the door or panel.

[0012] A further problem is the configuration of current hinges of this type which have parts protruding from the overall dimensions of the hinge with potential accidental hooking points.

[0013] US 2003/051313 A1 relates to a double hinge according to the preamble of claim 1.

[0014] The general objective of the present invention is therefore to provide a double hinge which is able to solve the problems mentioned above and other limits present in the prior art.

[0015] A further objective of the invention is to provide a double hinge which can be used on swing doors and the like with minimum overall encumbrance and the elimination of parts projecting from their overall dimensions.

[0016] The above-mentioned objectives are achieved, according to the invention, by a double hinge as defined in the enclosed main claim and optionally and advantageously having the characteristics of the enclosed subclaims, which form an integral part of the present description.

[0017] In general, according to the invention, the double-action spring hinge for door panels and the like comprises

- a central body to which two wings are rotatably connected on opposite sides, wherein one wing of said two wings is destined for being fixed to an upright of a door and the other wing to a panel of a door;
- wherein said central body comprises a substantially rectangular intermediate portion from which two pairs of arms extend on opposite sides, and
- wherein said two wings have a substantially rectangular portion from a side of which two arms extend, wherein said two arms of the two wings are spaced from each other in such a position as to allow them to be arranged between the arms of the central body;
- all of said arms being curved to define cylindrical slots;
- a pair of tubular elements each suitable for containing a helical spring and receiving end caps, which are positioned at opposite ends of each tubular element and receive opposite ends of each spring;
- sliding cylindrical bushes provided at an end of a flange which extends outwardly, positioned externally to each tubular element, wherein said sliding bushes are arranged in pairs with said flanges head to head, and wherein said pairs of bushes thus arranged are positioned between consecutive aligned cylindrical slots of arms of one side of the hinge and consecutive aligned cylindrical slots of arms of another side of the hinge;
- said sliding bushings being formed in an anti-friction engineering polymer and said central body and said two wings being produced in cold-pressed steel.

[0018] A fixing element is preferably provided between said end caps and said central body and two wings.

[0019] Spacers are also provided, in the form of flattened U-shaped brackets, produced in an engineering polymer and arranged associated with each of the wings.

[0020] The spacers with a flattened U-shaped section have side legs of their U-shaped section having a dimension at least greater than the thickness of each wing.

[0021] The structural and functional characteristics of

the invention, and its advantages with respect to the prior art, will be clearly understood from the following description, referring to the attached drawings, which show non-limiting examples of a double hinge produced according to the innovative principles of the present invention.

[0022] In the drawings:

figure 1 is a perspective view showing a hinge according to the invention applied to a door, for example a swing door, and to an upright of the door, in turn fixed to the wall;
figures 2 to 5 show plan diagrams from above of the hinge of figure 1 in a closed position, partially open and completely open in successive positions;
figure 6 shows the hinge of the previous figures when exploded in its various components aligned on a plane;
figure 6a shows some enlarged details of what is shown in figure 6;
figure 7 shows the hinge of the previous figures when arranged assembled with various components aligned on a plane;
figure 7a shows an enlarged portion of the hinge assembled shown in figure 7.

[0023] With reference to the figures, these show a non-limiting example of a double-action spring hinge for panels of doors and the like according to the invention.

[0024] In its general features, a double-action spring hinge 11 comprises a central body 12 to which two wings 13 and 14 are connected on opposite sides.

[0025] The two wings 13 and 14 are rotatably coupled with the central body 12 and one wing 13 of said two wings is destined for being fixed to an upright 15 and the other wing 14 to a panel 16 of a door.

[0026] The central body 12 has a substantially rectangular intermediate portion 17 from which two pairs of arms 18, 18' and 19, 19' extend. The central body 12 is for example made of pressed sheet metal and its arms 18, 18' and 19, 19' are then curved to define cylindrical slots. The cylindrical slots 18, 19 arranged on one side of the central body 12 receive a tubular element 20, for example a piece of drawn-steel tube, which defines a pin of the hinge 11. The same occurs for the cylindrical slots 18', 19 arranged on the other side of the central body 12 which receive a similar tubular element 20.

[0027] The two wings 13 and 14, also made for example of pressed sheet metal, have a substantially rectangular portion 21 on one side of which two arms 22, 23 and 22', 23' respectively extend. The two arms 22, 23 and 22', 23' of the two wings 13, 14 are formed at a distance from each other in such a position that they can be positioned between the arms 18 and 19 and 18' and 19' respectively of the central body 12. The pairs of arms 22, 23 and 22', 23' of the two wings 13, 14 are also curved to define cylindrical slots which are aligned with the slots of the central body 12.

[0028] The two wings 13 and 14 are provided with a series of holes 24 for housing screws or dowels for applying the hinge 11 to the upright 15 and to the door 16.

[0029] A spring 25, in helical form, is positioned inside each tubular element 20, which, as already mentioned, is produced, for example, by means of a piece of drawn-steel tube. This spring 25 ensures a fine adjustment and a smooth movement and is arranged between end caps 36, which are positioned at opposite ends of the tubular element 20 and act as a support for the spring 25 and allow, as can be seen, the preloading of the spring 25. Said spring 25 is made, for example, of Aisi 302 stainless steel so as to obtain a product with a movement that is not too fast. With this material, moreover, it can be regulated with extreme precision.

[0030] Sliding bushes or cylindrical bearings 26, shaped in section as short tubular portions, with a flange 27 at one end extending outwardly, are positioned outside the tubular element 20. Pairs of these bushes 26, arranged head-to-head with their flanges 27, are positioned between consecutive aligned cylindrical slots of arms 18, 22, 19 and 23 of one side of the hinge 11 and aligned consecutive cylindrical slots of arms 18', 22', 19' and 23' respectively of another side of the hinge 11. The bushes are made for example of a technical anti-friction polymer. This material has been tested and produces a constant and perfect functioning, even under extreme conditions, for over 200,000 cycles, as shown by tests carried out.

[0031] With reference to the end caps 36, it should be pointed out that, together with other elements of the hinge, they provide a preloading device. More specifically, in the drawings it can be noted that each end cap 36 has a blind hole 28 suitable for receiving an end stem 29 of the spring 25.

[0032] Furthermore, a series of radial holes 30 are provided for receiving, for example, a fixing grub screw 31 or another element. This fixing grub screw 31 is inserted from the outside into one of the radial holes 30 of the cap 36, once the required preloading of the spring 25 has been effected. The grub screw 31 is also arranged in a hole 32 provided on one side in an arm 23 or 23' of the wing 13 or 14 and on another side in a hole 33 provided in an arm 18, 18' of the central body 12. In this way, the grub screws 31 form a fixing element between the end caps 36 and the central body 12 and the two wings 13, 14.

[0033] Depending on the radial hole 30 in which the grub screw 31 is engaged, there is a certain preloading of the spring 25.

[0034] The end cap 36 provides a cylindrical body so as to be freely rotatable with respect to the final end of the tubular element 20, so that it can be rotated in order to adjust the preloading.

[0035] It should also be noted that at one end of the intermediate portion 17 of the central body 12 and at the opposite end of the wings 13, 14 there are indentations or recesses 35. These indentations or recesses 35 have a dimension along the facing sides of the central body 12 and the wings 13, 14 equal to that of the end caps 36

so as to allow easy handling during the assembly and adjustment of the hinge 11. Furthermore, this arrangement advantageously causes the hinge to have a substantially linear surface line, without parts protruding from the whole. In this way, a hinge is created which is also provided with a clean and linear appearance, having a minimal impact with respect to the material of the door and uprights.

[0036] According to the present invention, spacers 37 are also provided, in the form of flattened U-shaped brackets, made of a special engineering polymer. These spacers 37 are arranged associated with each of the wings 13, 14 and side legs 38 of their U-section and have a dimension at least greater than the thickness of each wing 13, 14. These spacers 37 in this material are at the same time extremely resistant and elastic so as to allow a damping function in the movement preceding the door stop, shown in Figure 2. When the door is closed, the contact and the perfect adherence between the spacers 37 ensures a constantly correct position of the door, eliminating the noise of the contact between metal parts. In addition, a functioning slowdown is obtained, which is useful for the duration of the hinge.

[0037] Figures 2 to 5 show plan diagrams from above of the hinge of figure 1 in a closed position, partially open on one side and on the opposite side and when fully open.

[0038] These diagrams show how the hinge of the present invention has an extremely reduced thickness when the door is closed, allowing adaptation to any type of door, of any material and also of large dimensions.

[0039] The cylindrical sliding bushes 26, shaped in section as short tubular portions, with a flange 27 extending outwardly formed at one end thereof, are made, for example, of plastic material, such as that known on the market under the registered trade-name of LATI, consisting of modified acetal plastic material.

[0040] Said bushes 26 act as bearings in an engineering polymer, enveloping the pin, which, in practice, is a drawn-steel tube, and during the rotation of the hinge, they act as sliding bearings, avoiding contact and friction between the steel. There is no contact between the steel parts of the hinge, guaranteeing durability, high flow, no lubrication and maintenance.

[0041] These bushes eliminate any need for lubrication while achieving a constant easy movement between the extremely silent parts.

[0042] The central body 12 and the wings 13, 14 are, as already mentioned, made of cold-pressed steel, which allows excellent performance in terms of flow-rate and duration over time compared to other materials, and producing various surface finishes on the hinge, necessary for the different markets and application requirements.

[0043] This type of double-action hinge according to the invention achieves the objectives indicated above of withstanding stress, easily rotating without friction, being silent and having a smooth line with a clean and linear appearance.

[0044] The objectives indicated above have thus been achieved.

[0045] The protection scope of the invention is defined by the following claims.

Claims

1. A double-action spring hinge for door panels and the like (11) comprising

- a central body (12) to which two wings (13,14) are rotatably connected on opposite sides, wherein one wing (13) of said two wings (13, 14) is destined for being fixed to an upright (15) of a door and the other wing (14) to a panel (16) of a door;
- wherein it comprises a substantially rectangular intermediate portion (17) from which two arms (18,19 and 18',19') extend on opposite sides, and
- wherein said two wings (13,14) have a substantially rectangular portion (21) from which two arms (22,23 and 22',23' respectively) extend;
- all of said arms (18,19 and 18' 19'; 22,23 and 22',23') being curved to form cylindrical slots;
- a pair of tubular elements (20) each of which contains a helical spring (25) and receives end caps (36), which are positioned at opposite ends of each tubular element (20) and receive opposite ends (29) of each spring (25);
- sliding cylindrical bushes (26) provided with an end of a flange (27) which extends outwardly, positioned externally to each tubular element (20), wherein said sliding bushes (26) are arranged in pairs with said flanges (27) head to head,;
- said sliding bushes (26) being formed in an anti-friction engineering polymer, **characterized in that**
- two pairs of arms (18, 19 and 18', 19') extend on opposite sides from said substantially rectangular intermediate portion (17) of said central body (12),
- two arms (22, 23 and 22', 23' respectively) extend from each substantially rectangular portion (21) of said two wings (13, 14), wherein said two arms (22, 23 and 22', 23') of the two wings (13, 14) are spaced apart from each other in such a position that they can be arranged between said pairs of arms (18, 19 and 18', 19' respectively) of the central body (12);
- said pairs of bushes (26) are positioned between consecutive aligned cylindrical slots of said two arms (18, 22, 19 and 23) of one side of the hinge (11) and consecutive aligned cylindrical slots of said two arms (18', 22', 19' and 23') respectively, of another side of the hinge (11);

- said central body (12) and said two wings (13, 14) being made of cold-pressed steel.

2. The hinge (11) according to claim 1, **characterized in that** a fixing element (31) is provided between said end caps (36) and said central bodies (12) and two wings (13,14).

3. The hinge (11) according to claim 1 or 2, **characterized in that** spacers (37) are provided, in the form of flattened U-shaped brackets, produced in an engineering polymer and arranged associated with each of the wings (13,14).

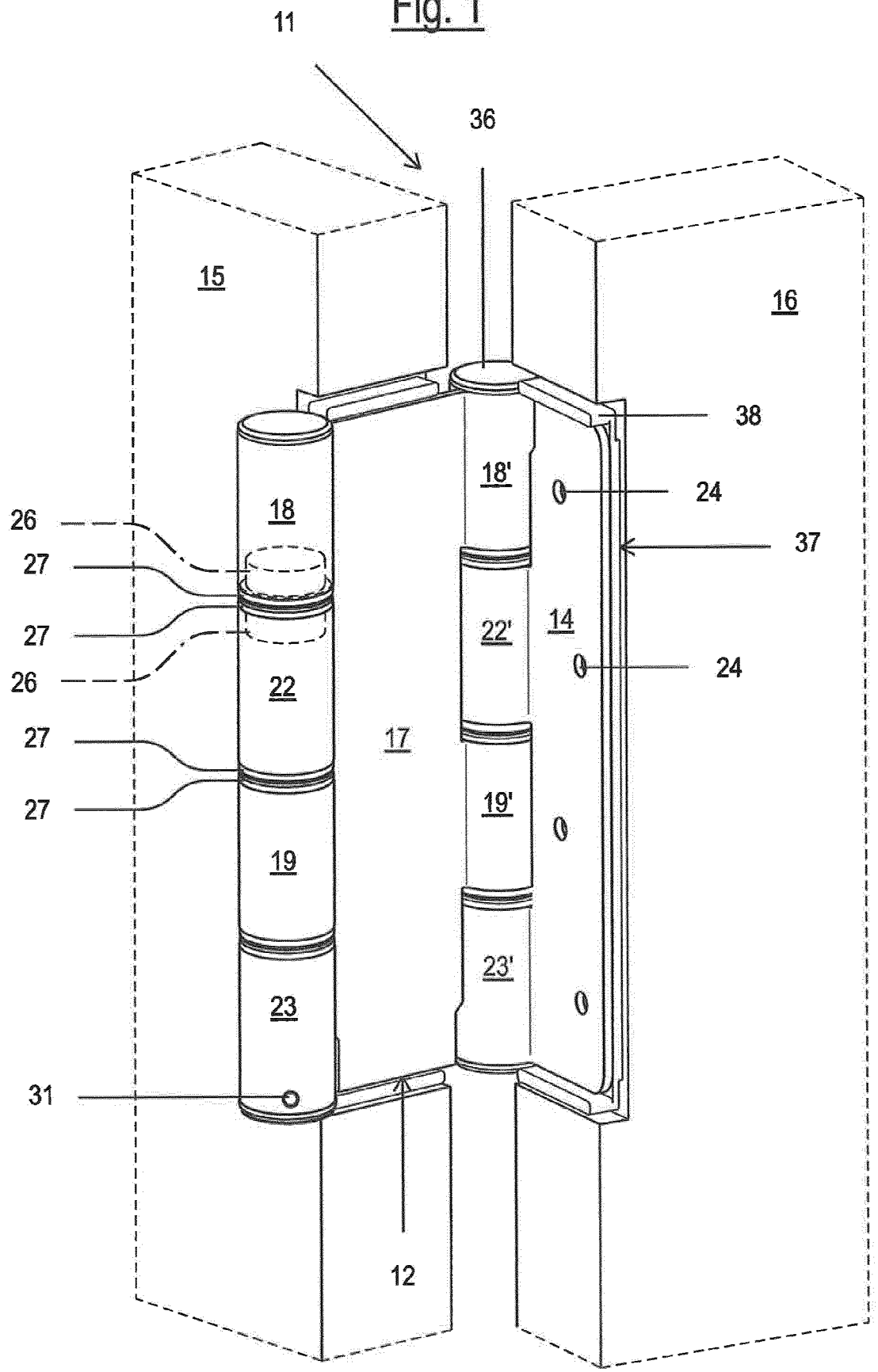
4. The hinge (11) according to claim 3, **characterized in that** said spacers (37) with a flattened U-shaped section have side legs (38) of their U-shaped section having a dimension at least greater than the thickness of each wing (13,14).

5. The hinge (11) according to claim 2, **characterized in that** said fixing element is a grub screw (31) and is inserted from the outside into one of the radial holes (30) of the cap (36), once the required preloading of the spring (25) has been effected, passing into a hole (32) provided on one side in an arm (23 or 23') of the wing (13 or 14) and on another side in a hole (33) provided in an arm (18,18') of the central body (12).

6. The hinge (11) according to one or more of the previous claims, **characterized in that** said spring (25) is made of Aisi 302 stainless steel.

7. The hinge (11) according to one or more of the previous claims, **characterized in that** indentations or recesses (35) are formed on opposite sides of an end of the intermediate portion (17) of the central body (12) and at an end of the wings (13,14), which have a dimension along the opposite sides of the central body (12) and the wings (13,14) equal to that of the end caps (36).

Fig. 1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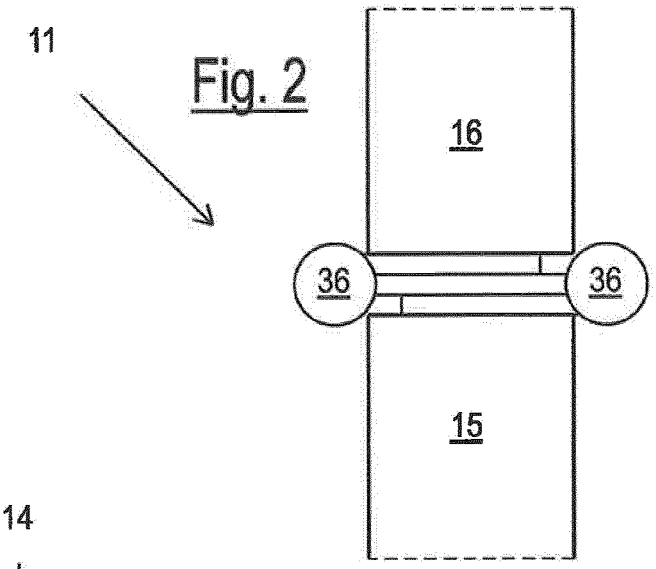

Fig. 2

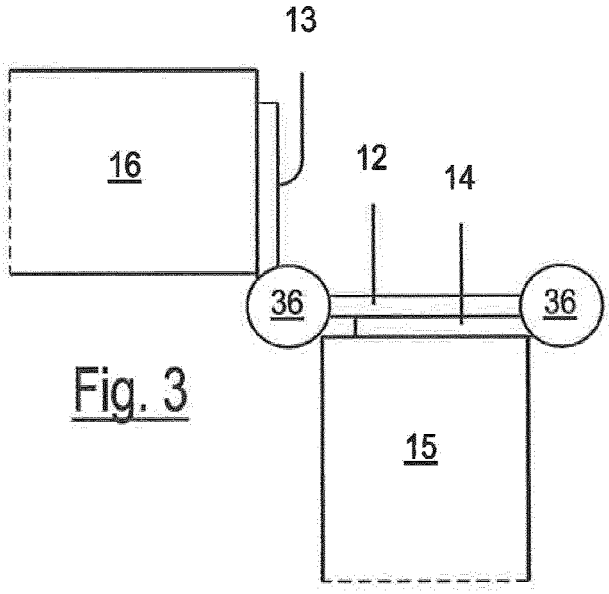

Fig. 3

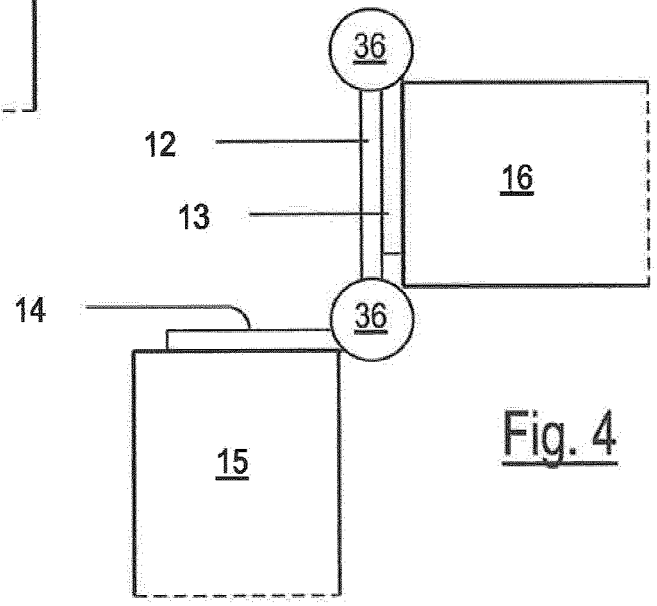

Fig. 4

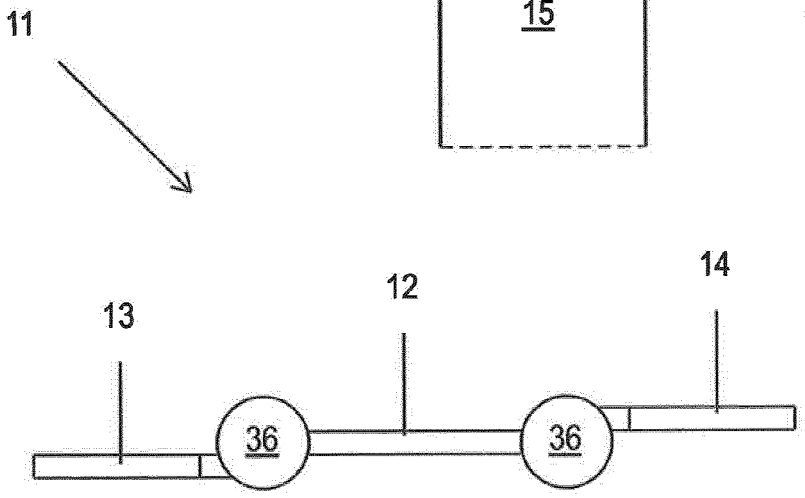

Fig. 5

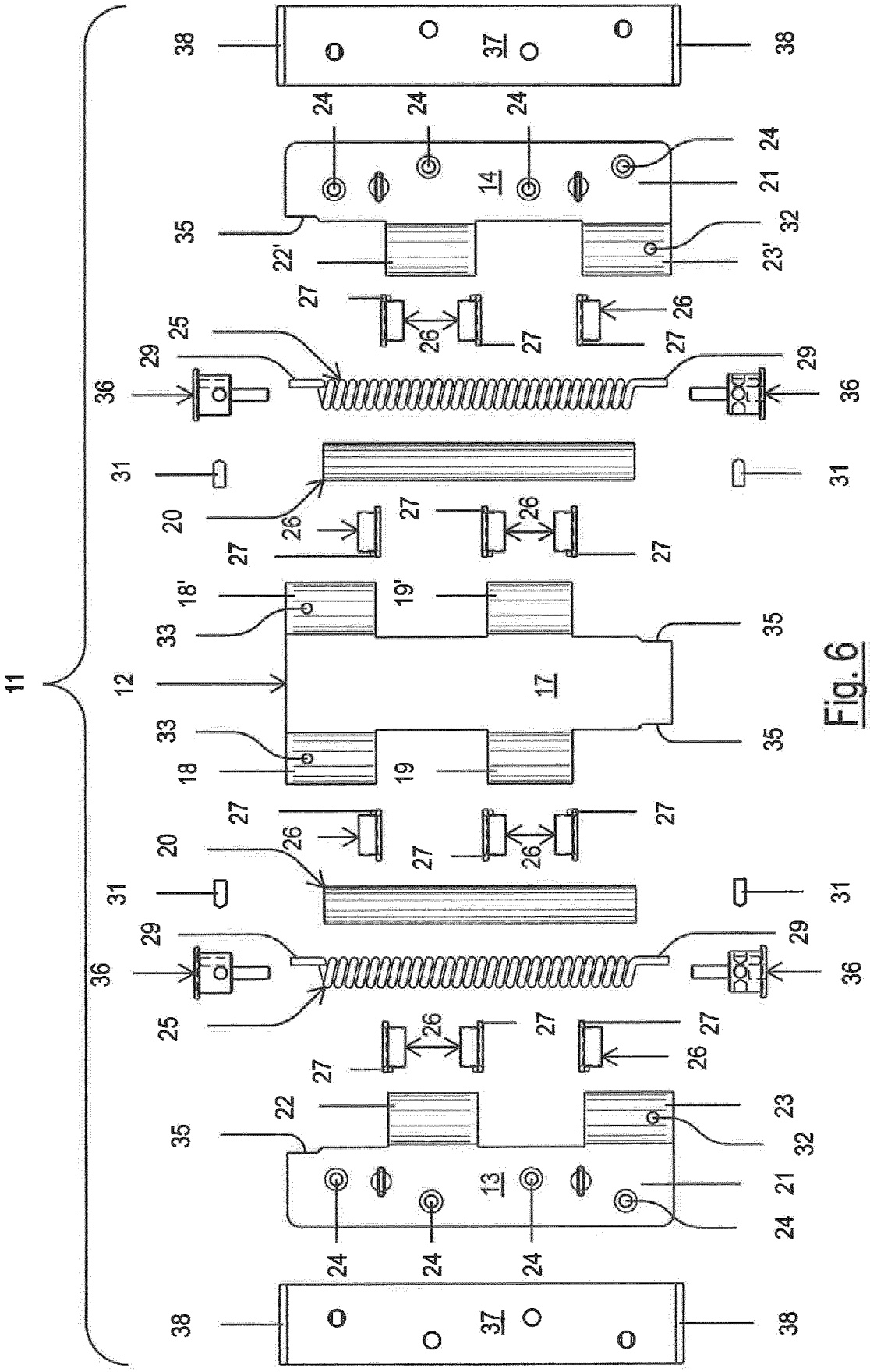
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Fig. 6

Fig. 6a

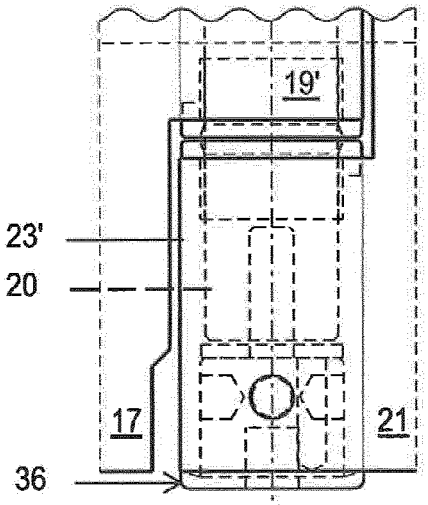
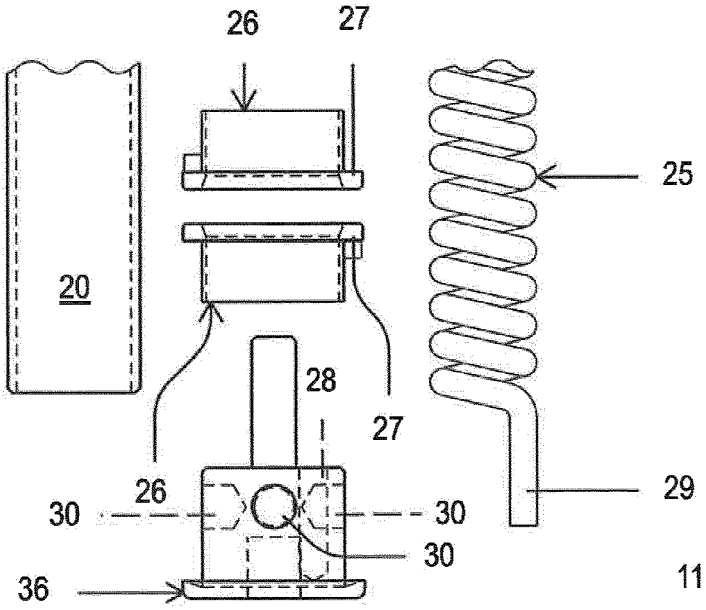


Fig. 7a



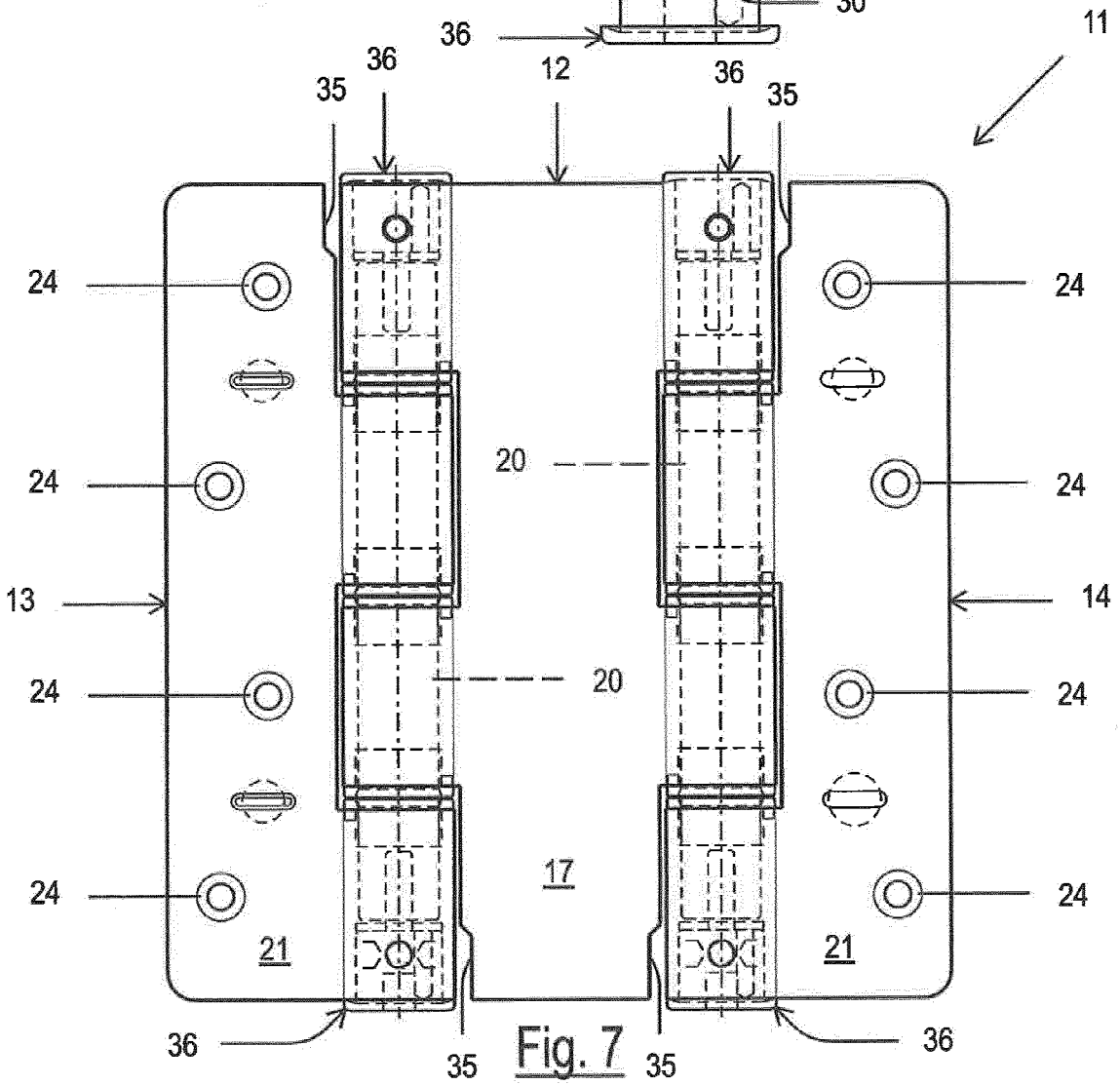


Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 2598

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TECHNICAL FIELDS SEARCHED (IPC)
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	4 July 2019	Klemke, Beate

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