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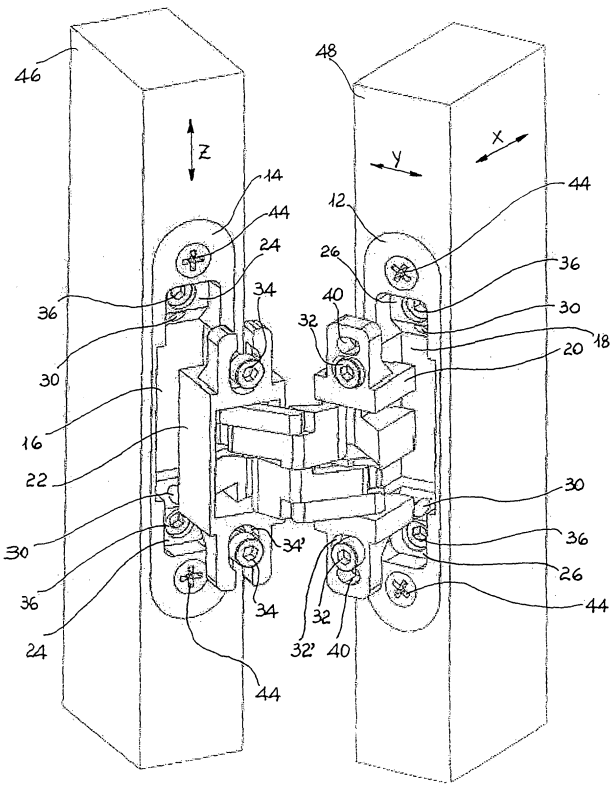
(54) Improved concealed hinge

(57) An improved concealed hinge (10) especially for furniture panels or doors, made of metal or other suitable materials, comprises a pair of half shells (12-14), suitable for being inserted into respective seats of a door or panel (48) and of a jamb (46), connected to one another in an articulated fashion and provided with a cavity (16) or (18) wherein a cage (20) or (22) is arranged and constrained; each cage (20) or (22) is provided at two points with means for the adjustment thereof as regards the exposure relative to said cavity (16) or (18).

FIG. 6



EP 2 110 502 A2

Description

[0001] This invention relates to an improved concealed hinge.

[0002] More in particular, this invention relates to a concealed hinge for furniture doors and panels, which allows a plurality of adjustments, keeping very limited overall dimensions.

[0003] As is known, the so-called concealed hinges are composed of two paired support bodies, connected to one another by articulated arms, respectively recessed in a shaped seat obtained in the door or panel on one side and in the relevant jamb on the other. A solution of this kind allows making the hinge invisible, which for this reason is particularly appreciated as it does not create any interruptions in the aesthetic linearity of the furniture door or panels as a whole; at the same time, the concealed hinges allow the required opening movement of doors and panels in the same way as the traditional exposed hinges.

[0004] During the assembly of known concealed hinges, that is, during the installation of doors or panels, adjustment operations become necessary, for example in the height direction; with reference mainly to doors, this is to compensate for the differences in level that may concern parts of the floor.

[0005] The adjustments are sometimes required in the horizontal direction too, for the alignment relative to the jamb profile, as well as in depth for obtaining perfect planarity of the door relative to the jamb itself. To this end, known concealed hinges are provided with means, typically composed of screws or dowels cooperating with an optional eccentric, which allow changing the arrangement or the orientation of the part of hinge contained in one and/or in the other of the support bodies. However, these solutions are constructively very complex.

[0006] To make an adjustment in the depth direction too, that is, along an orthogonal axis relative to the fixing plane of the hinge to the jamb and to the door, a solution is known of angularly moving, lifting or lowering it, a plate arranged between each of the support bodies and the respective part of hinge inserted therein; this embodiment, however, causes the prior loosening of the screws that fix the support bodies to the door or to the jamb and in any case allows the adjustment only with reference with only one of said support bodies.

[0007] As a consequence, the adjustment may be unsatisfactory, if not even useless under certain conditions.

[0008] In fact, intervening on the upper hinge and adjusting the support body recessed into the door in negative direction, the result is that with closed door, the outer edge facing the floor raises; such distance of the floor is maintained also opening the door. If the same adjustment on the other hand takes place on the support body recessed in the jamb, with closed door the outer edge facing the floor remains always raised, but opening the door the distance from the floor decreases, becomes zero at 90° and becomes even negative at 180°.

[0009] Besides these drawbacks regarding the adjustment in the depth direction, known concealed hinges have large overall dimensions, in particular as regards the thickness or depth of the bodies themselves wherein the articulated arms that connect the bodies themselves fold; this considerably limits the possibilities of using such concealed hinges, in particular on structures made of materials other than wood and of limited thickness.

[0010] A further disadvantage that is found in known concealed hinges relates to the fact that the support bodies and the parts provided with the adjustment means contained therein make a single unit that is coupled to the door and to the jamb during the installation of the door itself; therefore, it often happens that while fixing the support bodies into the cavities set up on the door and on the jamb, the finished surfaces, sometimes lacquered, may get chipped or scratched, with the need of making touch ups that in any case may be visible. The drawback also occurs if the door needs to be removed, for example for decorating the rooms or for more complex maintenance or renovation works; in these situations, it may also occur that the fixing screws into the door or jamb are arranged inaccurately into the existing holes, thus causing a poor and inadequate seal over time.

[0011] The object of this invention is to obviate the drawbacks mentioned hereinabove.

[0012] More in particular, the object of this invention is to provide an improved concealed hinge suitable for allowing precise adjustments along multiple axes, and in particular in the depth direction.

[0013] A further object of the invention is to provide a hinge as defined above wherein such adjustments keep the distances from the floor and from the door jamb constant, either if it is in closed condition, partially or totally open.

[0014] A further object of the invention is to provide an improved concealed hinge with limited overall dimensions, especially in relation to the thickness or depth of the parts suitable for being recessed into the door and into the jamb, and therefore capable of being applied to doors or panels made of materials other than wood.

[0015] Last but not least, another object of the invention is to provide the users with an improved concealed hinge suitable for preventing the risk of chipping or scratching or aesthetic alterations of any kind during the fixing to the door and to the jamb on the finished surfaces concerned by such fixing.

[0016] A further object of the invention is to provide an improved concealed hinge suitable for preventing the risk of an inadequate fixing thereof subsequent to the removal of the door it is applied to.

[0017] A further object of the invention is to provide the users with an improved concealed hinge suitable for ensuring a high level of resistance and reliability over time, also such as to be easily and inexpensively constructed.

[0018] These and yet other objects are achieved by the improved concealed hinge of this invention, especially for furniture panels or doors, which comprises a pair

of half shells, suitable for being inserted into respective seats of a door or panel and of a jamb, connected to one another in an articulated fashion and provided with a cavity wherein a cage is arranged and constrained and which is essentially **characterised in that** each cage is provided at two points with means for the adjustment thereof as regards the exposure relative to said cavity.

[0019] The construction and functional features of the improved concealed hinge of this invention shall be better understood from the following detailed description, wherein reference is made to the annexed drawing tables showing a preferred and non-limiting embodiment thereof, wherein:

figure 1 shows a schematic front view of the improved concealed hinge of this invention in the open condition;
figure 2 shows a schematic view of a longitudinal section along line B-B in figure 1 of a half part of the same hinge;
figure 3 shows a schematic cross section view along line A-A of figure 1 of the same hinge;
figure 4 shows a schematic perspective top view of the same hinge in open condition;
figure 5 shows a schematic perspective top view of the same hinge in open condition and rotated by 180° relative to the previous figure;
figure 6 shows a schematic perspective view of the concealed hinge of this invention in the condition of partial coupling to the door and to the relative jamb;
figure 7 shows a schematic perspective view of one of the support bodies of the same hinge;
figure 8 shows a schematic exploded view of the same hinge;
figure 9 shows a further schematic perspective exploded view of the same hinge, wherein some components are arranged aligned for the assembly;
figure 10 shows a schematic exploded view of the improved concealed hinge of this invention according to an alternative embodiment;
figure 11 shows a schematic perspective top view of the concealed hinge according to figure 10;
figure 12 shows a schematic perspective top view of the same hinge, rotated by 180° relative to figure 11;
figure 13 shows a schematic front view of the same hinge in open condition;
figure 14 shows a schematic view of a longitudinal section along line A-A in figure 13 of a half part of the same hinge;
figure 15 shows a schematic cross section view along line B-B of figure 13 of the same hinge;
figure 16 shows a partial enlargement of section A-A of the hinge of figure 14;
figure 17 shows a schematic cross section view along line E-E of figure 13 of the same hinge;
figure 18 shows a schematic perspective view of the same hinge in the condition of partial coupling to the door and to the relative jamb.

[0020] With reference to the above figures, the improved concealed hinge of this invention, globally indicated with 10 at figures 4 and 5, comprises a pair of half shells 12, 14, of metal or other suitable material that make up the support bodies suitable for being inserted and fixed into the cavities respectively obtained in the door and in the jamb. Each of the two half shells 12, 14 defines a rectangular plan body, with rounded ends corresponding to the smaller sides, centrally provided with a cavity 16, 18, open on one of the fronts and suitable for receiving respective anchoring bodies or cages 20, 22. Cages 20 and 22 comprise a part of the adjustment means of the hinge and, centrally, they receive the elements suitable for the articulated connection of the half shells 12, 14 which shall be described hereinafter. The central cavities 16 and 18 extend in opposite directions and form as many raised zones relative to the base of the cavities themselves and lowered relative to the upper front of the half shells 12, 14; said zones are indicated with 24 as regards half shell 14 and with 26 as regards half shell 12. Two threaded holes 28, 30, aligned along the longitudinal axis of the half shells 12 and 14, are made on each of zones 24 and 26; the holes 30, that is, for example, those closer to one another, are made on a preferably inclined part of the above zones 24, 26 and receive as many screws 32, 34 respectively suitable for fixing the cages 20 and 22 into the half shells themselves. The holes 28 of the same zones 24 and 26, visible at figure 8, are by way of an example those the distance between axes whereof is greater and they receive as many screws 36 through which it is possible to carry out one of the adjustments of hinge 10. Such adjustment corresponds to that referred to the depth, that is, along the axis indicated with "X" at figure 6, and it relates to the exposure or retraction of cages 20 and 22 relative to the respective half shells, starting from an initial condition of planarity between said components.

[0021] Screws 36, for example of the Allen type, may be screwed more or less in depth into the threaded holes 28 of the raised zones 24, 26, so as to align with the zones themselves or protrude relative to the same. In the first case, the depth adjustment of the cages 20, 22 is null, meaning that they are perfectly planar relative to the exposed front of the half shells 12, 14 or even negative, meaning that said cages are recessed by a limited extent into the half shells themselves; in the second case, the projection of the screws 36 relative to the raised zones 24, 26 leads the cages 20, 22 to expose more or less relative to said half shells; the exposure of the screws 36 is preferably possible by an extent comprised between 1.0 and 5.0 mm and of course it is preceded by the loosening of screws 32 and 34 that fix cages 20 and 22 to the respective half shells and by the subsequent locking thereof. To allow such adjustment, the ends of cages 20, 22 that surmount screws 36 are provided with slits 38 or slots 40 wherethrough a manoeuvring wrench or other suitable means can pass. The head of screws 36, if they are exposed relative to the plane defined by the raised

zones 24, 26, is sufficiently extended to create a suitable abutment surface for cages 20, 22. The opposite ends of half shells 12, 14 are traditionally provided with through holes 42 for conventional screws 44 for fixing the half shells 12, 14 into the jamb and door or panel; at figure 6 the jamb is indicated with 46 and the door or panel with 48.

[0022] The hinge 10 of this invention allows carrying out further adjustments in the height and width direction. In particular, the cage 20 of the half shell 12 may be moved laterally, into the half shell itself, according to the direction indicated by axis "Y" at figure 6, whereas the cage 22 of the half shell 14 may be moved in vertical direction into the half shell itself, in the direction indicated by axis "Z" of the same figure 6. To this end, the cages 20 and 22 have a smaller width and height dimension than that formed by the sum of the cavities 16, 18 and of the raised zones 24, 26 of the half shells 12, 14; moreover, the screws 32 and 34 that fix the cages 12, 14 to said half shells are inserted into slots 32' with horizontal development and 34' with vertical development obtained on the cages themselves, as schematised at figure 5.

[0023] The possibility of width or height movement of the cages 20 and 22 relative to the half shells 12 and 14 is preferably comprised between 1.5 and 4.5 mm. the spaces determined by the smaller dimension of the cages 12, 14 relative to the cavities 16, 18 and to the raised zones 24, 26 are indicated with S1 referring to the possibility of movement of the cage 20 along axis "Y" and with S2 referring to the possibility of movement of the cage 22 along axis "Z", as per figures 1, 4 and 5. To carry out such adjustments, once the half shells 12, 14 have been fixed into the seats of the jamb 46 and of the door 48 through the screws 44, it is sufficient to loosen the screws 32 or 34 that fix the cages 20, 22 to the half shells 12, 14, move one or the other of such cages laterally (axis Y) or vertically (axis Z) and once the desired position has been reached, tighten the screws themselves.

[0024] All the values indicated above, both for width and height adjustment and for the position as regards the greater or lesser exposure of the cages 20, 22 relative to the half shells 12, 14, are purely approximate and refer to a concealed hinge 10 usable on a door 48 with relative jamb 46; in the case of furniture panels, or doors of considerable dimensions and/or weight, wherein the same dimensions of the concealed hinge 10 are or may be smaller or larger, such values will correspondingly be varied, decreased or increased, according to the various requirements and based of the specific applications.

[0025] Thanks to the possibility of adjustment along the three axes "X", "Y" and "Z", the improved concealed hinge of this invention is capable of compensating for the differences in level that sometimes concern the floor and the height and width misalignments between door and jamb.

[0026] According to a further advantageous feature of this invention, the articulated connection of the half shells 12, 14 is obtained by a plurality of arms sliding open and closed on one another and such solution achieves the important advantage of significantly reducing the thickness or depth of the half shells 12, 14 compared to the traditional concealed hinges. In particular, the articulated connection of the half shells 12, 14 is obtained by two pairs of arms 50, 52 and 50', 52', identical to each other, rotated relative to one another by 180°, arranged at the cavities 16, 18 of the half shells themselves and connected by pins forming a compacted set. The arms 50 and 50' are composed of plates of substantially parallelepiped shape, with an end provided with a side appendix 54 with the hole 56 that crosses the arms themselves.

[0027] The arms 52, 52' are composed of two integral sectors that define an angular element; in the bottom side of the sector having larger width they are provided with a hole 58. A similar hole, indicated with 60, is made in the connection zone between said sectors. A plurality of pins are arranged in said holes which connect the arms 50, 50', 52, 52' to one another and to the cages 20, 22, in parallel provided with similar holes 62. In particular, a first pin 64 is inserted in the hole 62 of the cage 20 and in the hole 56 of the appendix 54 of the arm 50, whereas a second pin 66 crosses the hole 62 of the cage 20 and the hole 58 of the arm 52'.

[0028] A third pin 68 crosses the hole 62 of the cage 22 and the hole 58 of the arm 52, whereas a fourth pin 70 crosses the hole 62 of the cage 22 and the hole 56 of the arm 50'.

[0029] Finally, a fifth pin 72 is inserted in the opposite holes 60 (only one of which is visible at figure 9) of the arms 52 and 52', connecting the same. An articulated connection or articulation is obtained in this way, wherein a point is pivoted in the cage 20, another point is pivoted in the cage 22, a third point is pivoted in each pair of arms 50, 52 and 50', 52'.

[0030] The arms 50, 52, 50', 52' thus compacted are connected by twos by means of rolls 74, inserted in respective cavities with semi circular profile 76 obtained along contiguous fronts of each pair of arms 50, 52, and 50',52'. Therefore, it is not necessary to make sliding slots for such arms inside the cages 20 and 22, with the advantageous consequence that the cages themselves have a limited height or thickness and also the hinge 10 as a whole can be applied to doors and jambs of reduced thickness.

[0031] Figures 10 to 18 relate to an alternative embodiment of the improved concealed hinge of this invention. The same reference numerals of the previous figures are used in said figures for common parts or components. The alternative construction of said concealed hinge refers to two elements, that is, to the means that allow the adjustment along axis "X" and to the arms that make up the articulated connection of half shells 12 and 14. The adjustment means along axis "X", in the embodiment described above, consist of screws (36), which may be tightened more or less in depth into the threaded holes (28), of further screws (32) and (34), which are first loosened and then locked for allowing said adjustment, as well as slits (38) or slots (40) wherethrough a suitable manoeu-

vring tool is inserted. In the embodiment of figures 10 to 18, on the contrary, the means that allow making a depth adjustment, that is, along axis "X" of the improved concealed hinge according to this invention, consist of a single element, globally indicated with (80) in figure 10. Element (80), which is present in two units on each of cages (20) and (22) is a screw consisting of a stem divided into two overlapped threaded portions, bottom (82) and top (84), separate from each other by an integral conical washer (86). Said conical washer 86 allows a larger support section than cages 20, 22. Each element (80) is suitable for being screwed, with the respective bottom threaded portion (82), in holes (28) of the half shells (12) and (14), crossing slots (32'), (34') made on cages (20), (22), similarly to the solution described before. The top threaded portion (84) of each element (80) is suitable for receiving a nut (88) by screwing, associated to an optional washer (90), suitable for abutting the respective cages 20, 22. Moreover, the top threaded portion (84) of each element (80) is provided with a shaped head hole (92), axially developed by a limited extent and by way of an example comprised between 1.5 and 4.0 mm. Said shaped hole, typically with hexagonal shape, is suitable for receiving a manoeuvring wrench for screwing and releasing the bottom portion (82) of each element (80) from the respective hole (28) of the half shells (12), (14), after removing or simply partially releasing the nut (88) screwed on the top portion (84) of the same element (80). The adjustment along axis "X" is thus obtained, eliminating the need for holes (30) created along the inclined parts (24), (26) of half shells (12) and (14) and eliminating also screws (32), (34). Moreover, also slits (38) and slots (40) are eliminated with consequent considerable strengthening of cages (20) and (22).

[0032] The alternative embodiment of said figures 10 to 18 also concerns the arms that make up the articulated connection of the two half shells (12) and (14), as two further end arms indicated with (94) and (96) are advantageously provided in association to the pairs of arms (50 - 52) and (50' - 52'). Said further arms are associated, in particular, to the side arms (50) and (50') with the purpose of compacting the entire articulation that connects the half shells (12) and (14). To this end, arms (94) and (96), with a small thickness, comprise an appendix (98) for engaging and connecting to the adjacent arm, besides a through hole (100) wherein pin (64) or (68) fits, and a little additional pin 75. The end arms (94), (96) are suitably chamfered along the heads so as to avoid that in the hinge closing step they may abut the edge of the cavities formed on cages (20) and (22) with the respective ends.

[0033] As can be noticed from the above, the advantages achieved by the invention are clear.

[0034] The improved concealed hinge of this invention allows easy and complete adjustments along three axes, that is, in the direction of width (axis Y), of height (axis Z) and of depth (axis X); in this latter case, the adjustment may advantageously be dual, that is, be made at both half shells 12, 14 for keeping the distance between floor and door constant, irrespective of the opening angle of the door itself.

[0035] Further advantageous is the provision of connecting the arms 50, 50', 52, 52' that form the articulation to each other and to the cages 20, 22 without the need of making sliding slots for the arms themselves in said cages.

[0036] Moreover, with this embodiment the hinge of this invention can be pre-mounted at the factory into the door and/or jamb, at least as regards the half shells 12, 14 thus preventing the danger of scratching the coat or the wood during the assembly on site. This is also useful if the door must be removed since extracting the woodscrews, which could cause problems for screwing them back into the original seats, is prevented.

[0037] Even if the invention has been described hereinbefore with particular reference to an embodiment thereof made by way of a non-limiting example, several changes and variations will appear clearly to a man skilled in the art in the light of the above description. This invention therefore is intended to include any changes and variations thereof falling within the spirit and the scope of protection of the following claims.

Claims

1. An improved concealed hinge (10) especially for furniture panels or doors, made of metal or other suitable materials, comprising a pair of half shells (12-14), suitable for being inserted into respective seats of a door or panel (48) and of a jamb (46), connected to one another in an articulated fashion and provided with a cavity (16) or (18) wherein a cage (20) or (22) is arranged and constrained, **characterised in that** each cage (20) or (22) is provided at two points with means for the adjustment thereof as regards the exposure relative to said cavity (16) or (18).

2. The hinge according to claim 1, **characterised in that** the cavities (16), (18) are made centrally into the half shells (12-14) and extend in opposite directions forming as many raised zones (24-26) provided with threaded holes (28) and (30), in the holes (30) there being arranged screws (32-34) for fixing the half shells themselves into the cages (20-22).

3. The hinge according to the previous claims, **characterised in that** respective screws (36) are arranged into the holes (28) of the raised zones (24-26) abutted by the base of the cages (20) and (22), the ends of the latter being provided, at the parts that surmount the screws (36), with slits (38) or slots (40).

4. The hinge according to claims 1 and 2, **characterised in that** the cages (20) and (22) have a smaller

width and height dimension than that of the cavities (16-18) and of the zones (24, 26) of the half shells (12-14) and the screws (32-34) that fix the cages themselves to said half shells are inserted into slots (32') with horizontal development and (24', 34') with vertical development.

5. The hinge according to claim 1, **characterised in that** the cavities (16), (18) that receive the cages (20) or (22) are made centrally into the half shells (12) and (14) and extend in opposite directions forming respective raised zones (26), each provided with a threaded hole (28) wherein an element (80) is screwed, consisting of a stem divided into two overlapped bottom (82) and top (84) threaded portions, separate from each other by an integral conical washer (86), said bottom portion (82) being screwed in holes (28).

6. The hinge according to claim 5, **characterised in that** on the top threaded portion (84) of each element (80) there is a nut (88) screwed, associated to a washer (90) that abuts the conical washer (86) from the top.

7. The hinge according to claims 5 and 6, **characterised in that** said top threaded portion (84) of each element (80) is provided with a shaped head axial hole (92), suitable for receiving a manoeuvring wrench for screwing and releasing the bottom portion (82) of the elements (80) from the respective threaded holes (28).

8. The hinge according to claim 1, **characterised in that** the articulated connection of the half shells (12-14) is obtained through pairs of arms (50-52), (50'-52') connected to one another and to the cages (20) and/or (22).

9. The hinge according to claim 8, **characterised in that** said arms (50-50') are composed of plates of substantially parallelepiped shape with an end provided with a side appendix (54) having a hole (56) that crosses the arms themselves.

10. The hinge according to claim 8, **characterised in that** the arms (52-52') are composed of two integral sectors that define an angular element provided at the bottom with a hole (58) and at the top with a hole (60).

11. The hinge according to claims 8, 9 and 10, **characterised in that** said arms (50-52) and (50'-52') are connected to one another and to the cages (20-22) by pins (64-66-68-70-72) and/or (75).

12. The hinge according to claim 8, **characterised in that** said pins (64-66-68-70-72) are inserted in the holes (62) of the cages (20-22) and in the holes (56-58-60) of the arms (50-52) and/or (50'-52').

13. The hinge according to claims 9 and 10, **characterised in that** the arms (50-52) and (50'-52') are connected to one another by rolls (74) arranged in respective cavities with semi circular profile obtained along contiguous fronts of the arms themselves.

14. The hinge according to claims 8 to 12, **characterised in that** the pairs of arms (50 - 52), (50'-52') are coupled to respective end arms (94), (96) for compacting the entire articulation that connects the half shells (12) and (14), said end arms being provided with an appendix (98) for engaging and connecting to the adjacent arm and with a through hole (100) for the passage of the pin (64) or (68).

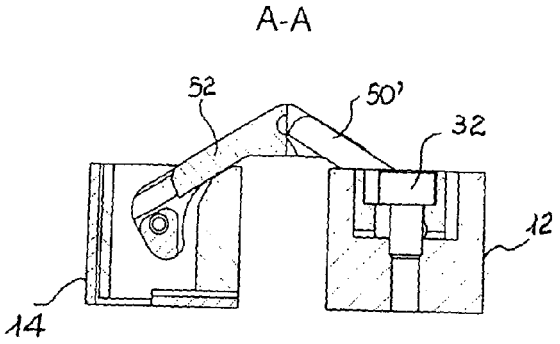


FIG. 3

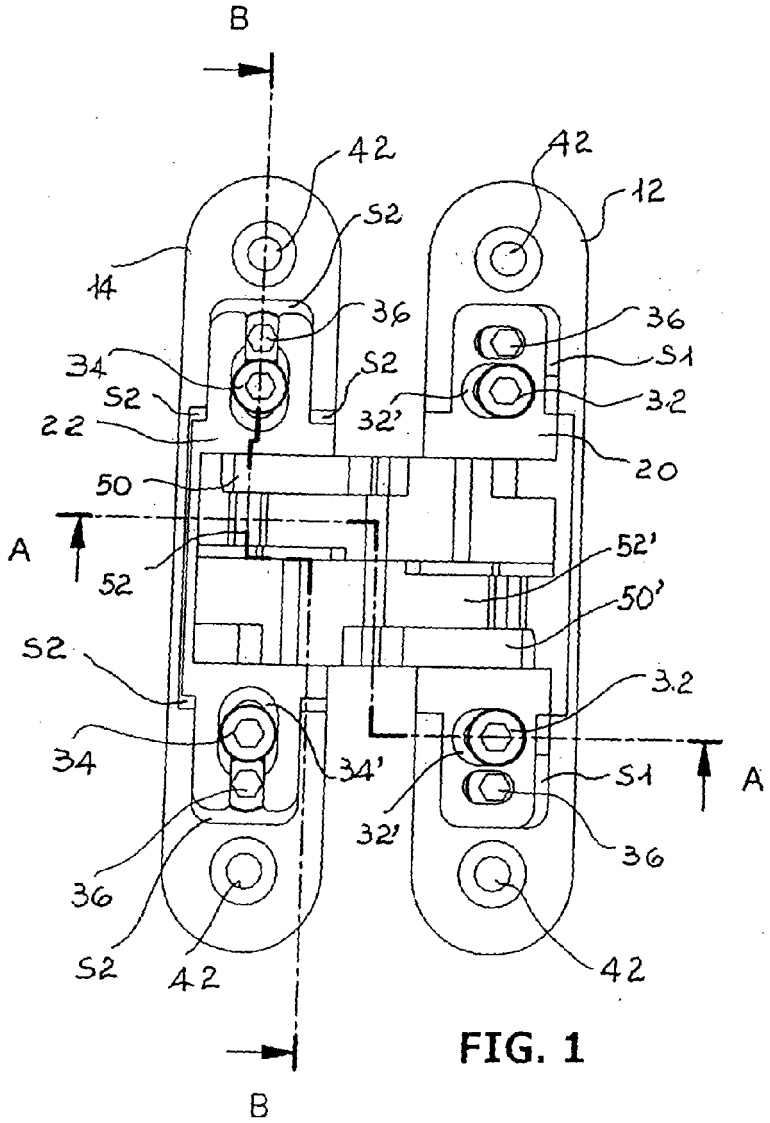


FIG. 1

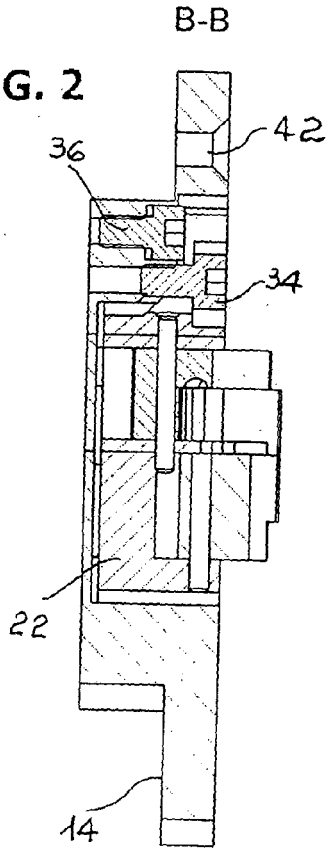


FIG. 2

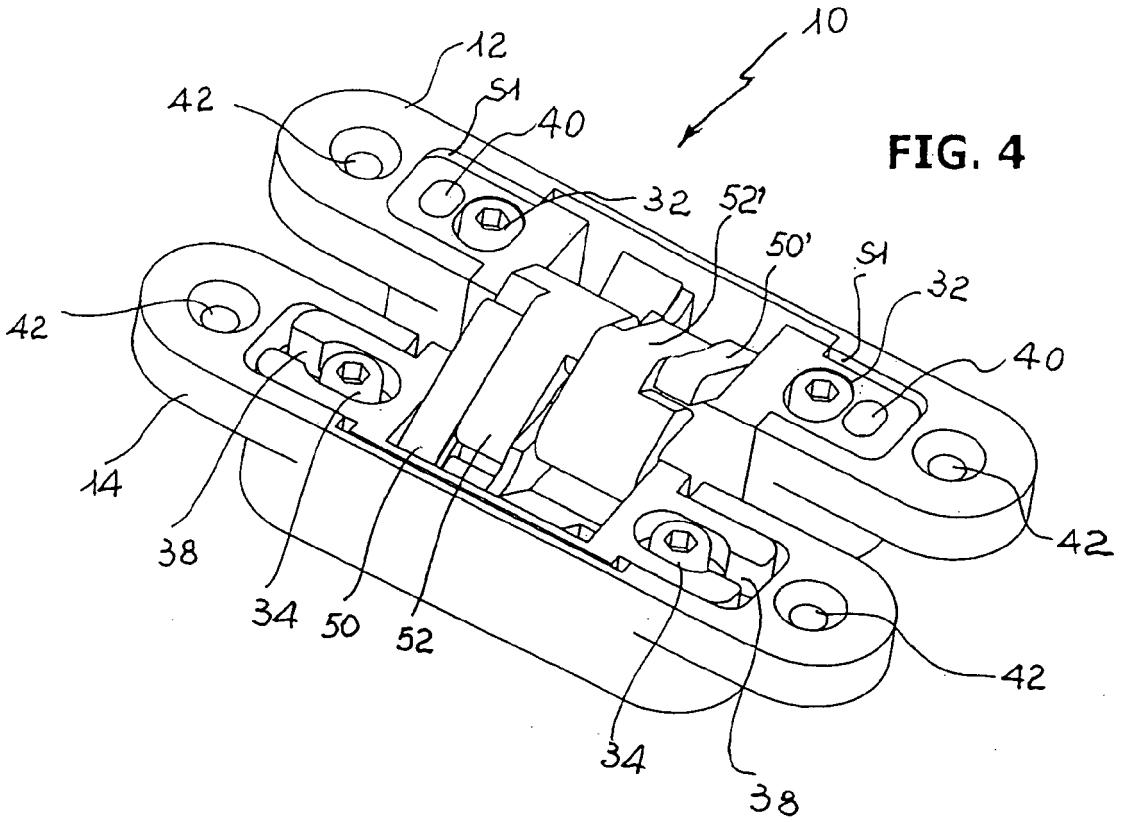

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FIG. 4

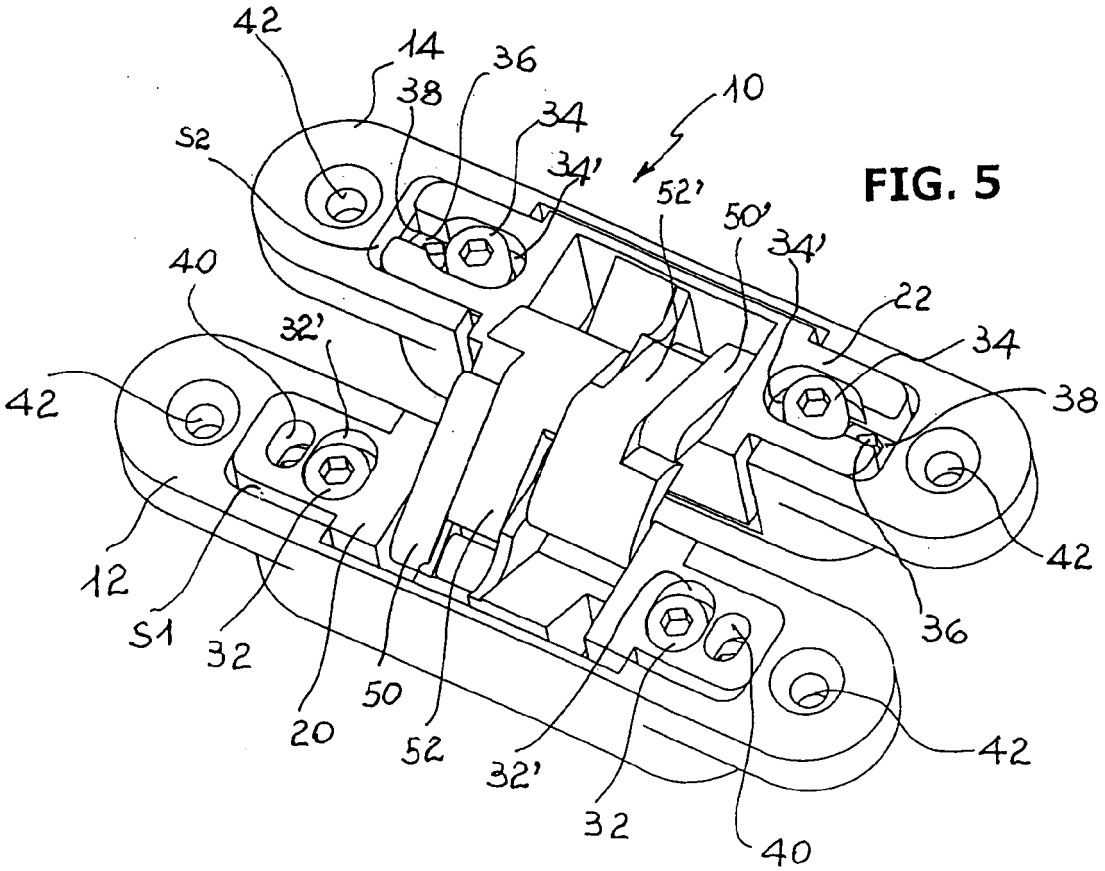
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FIG. 5

FIG. 6

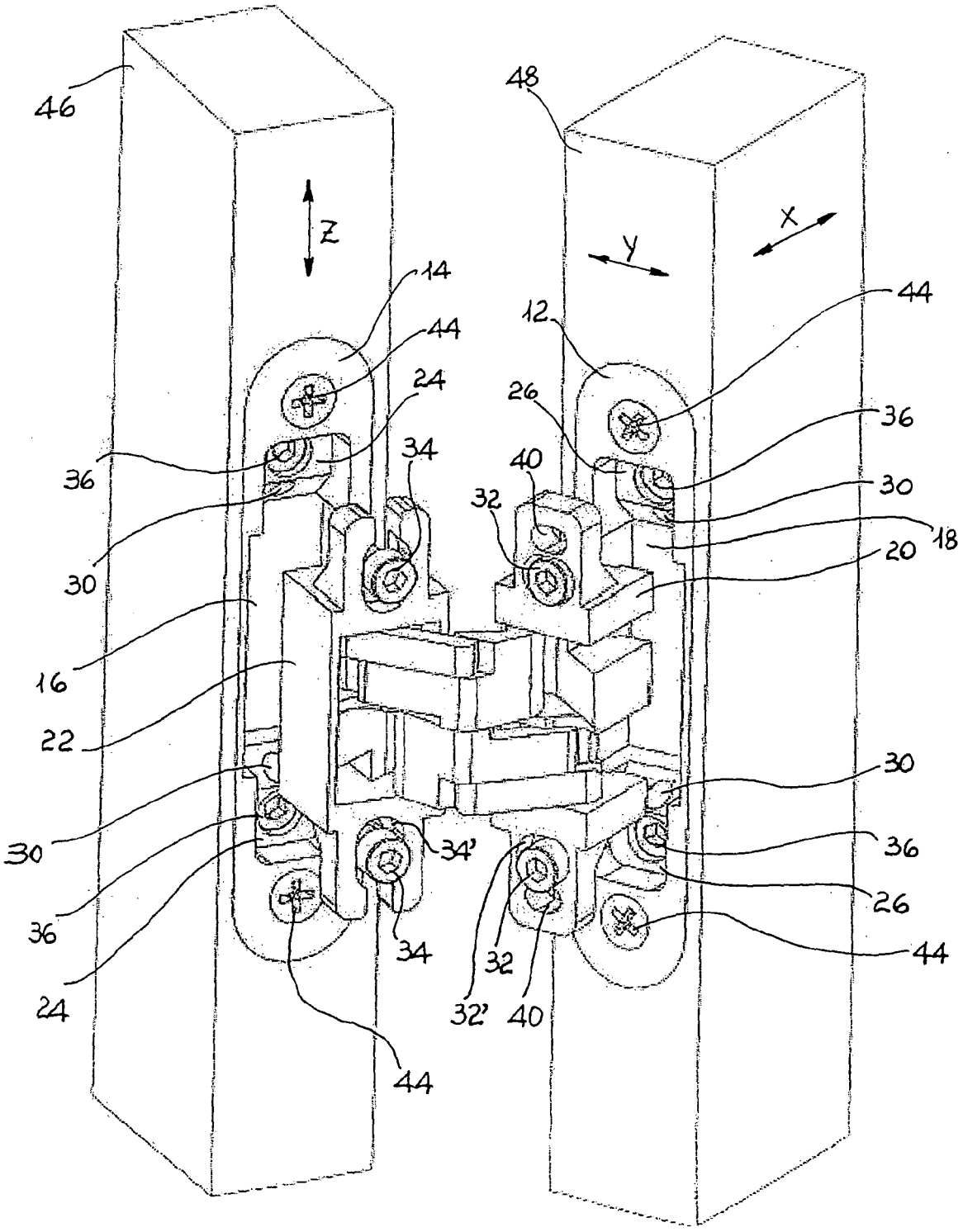
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FIG. 8

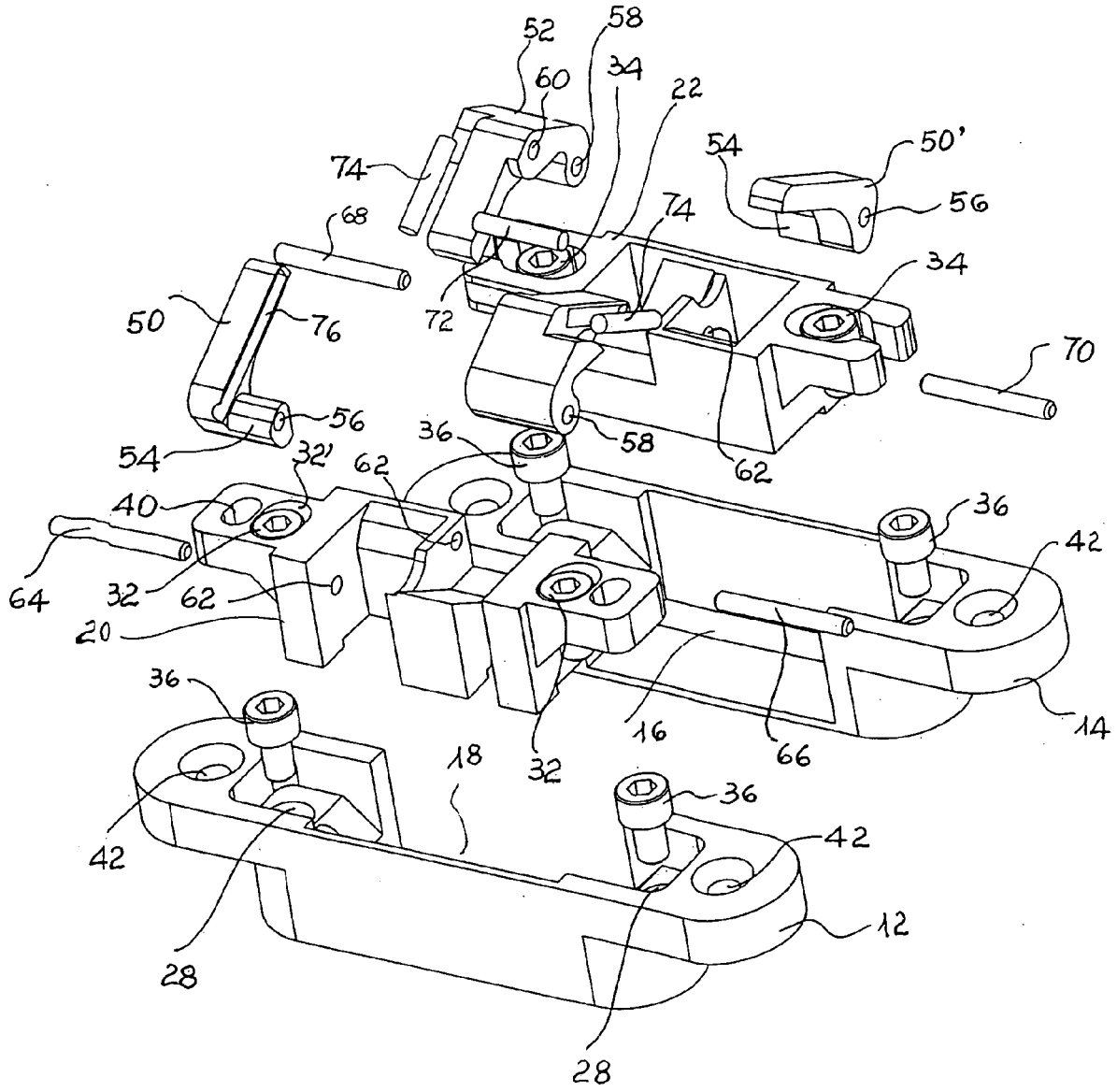
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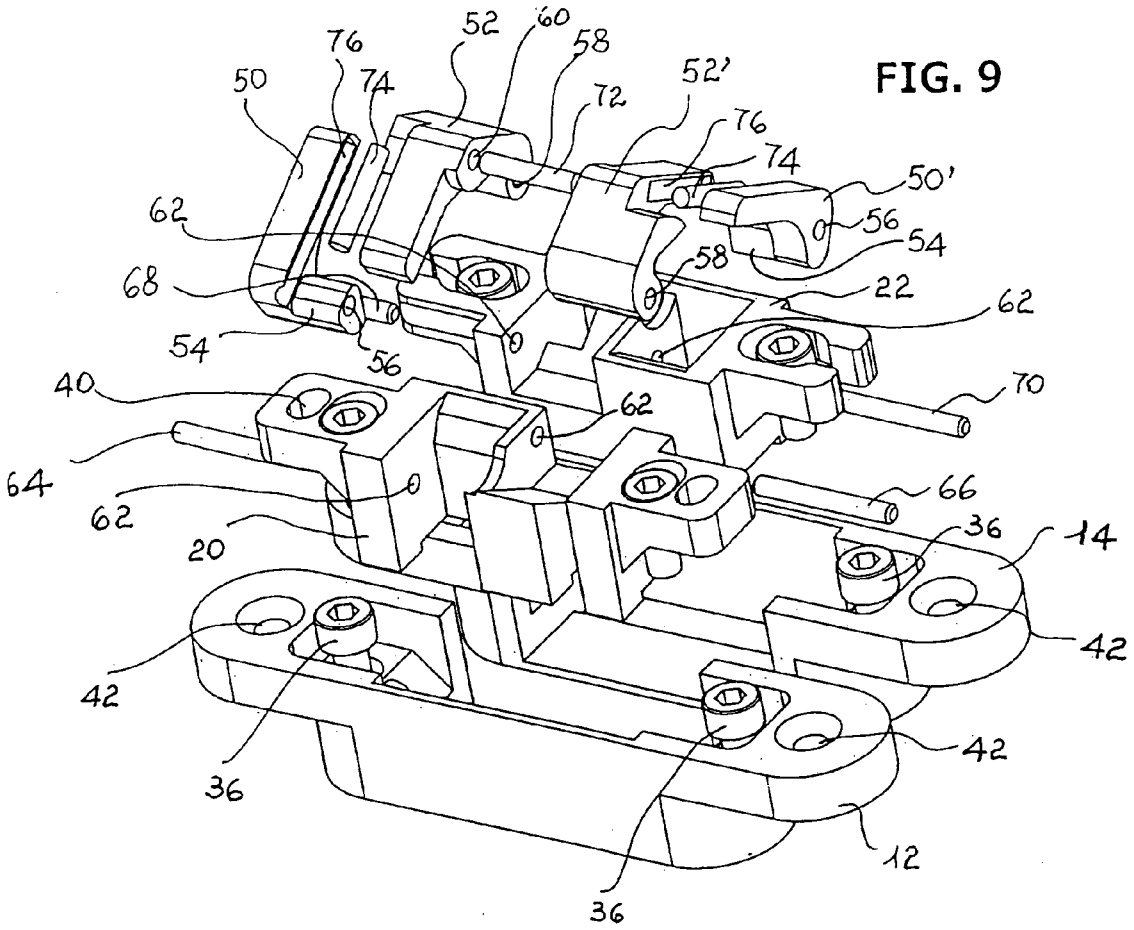
FIG. 9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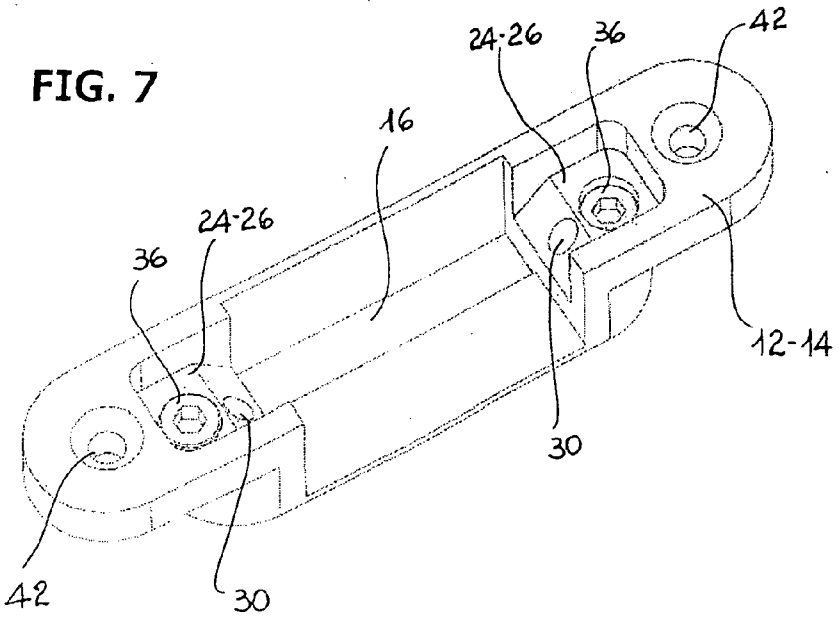
22
62
54
56
40
62
70
64
62
66
20
36
14
42
42
42
36
12
36

FIG. 7


24-26
36
42
16
24-26
36
12-14
30
42
30

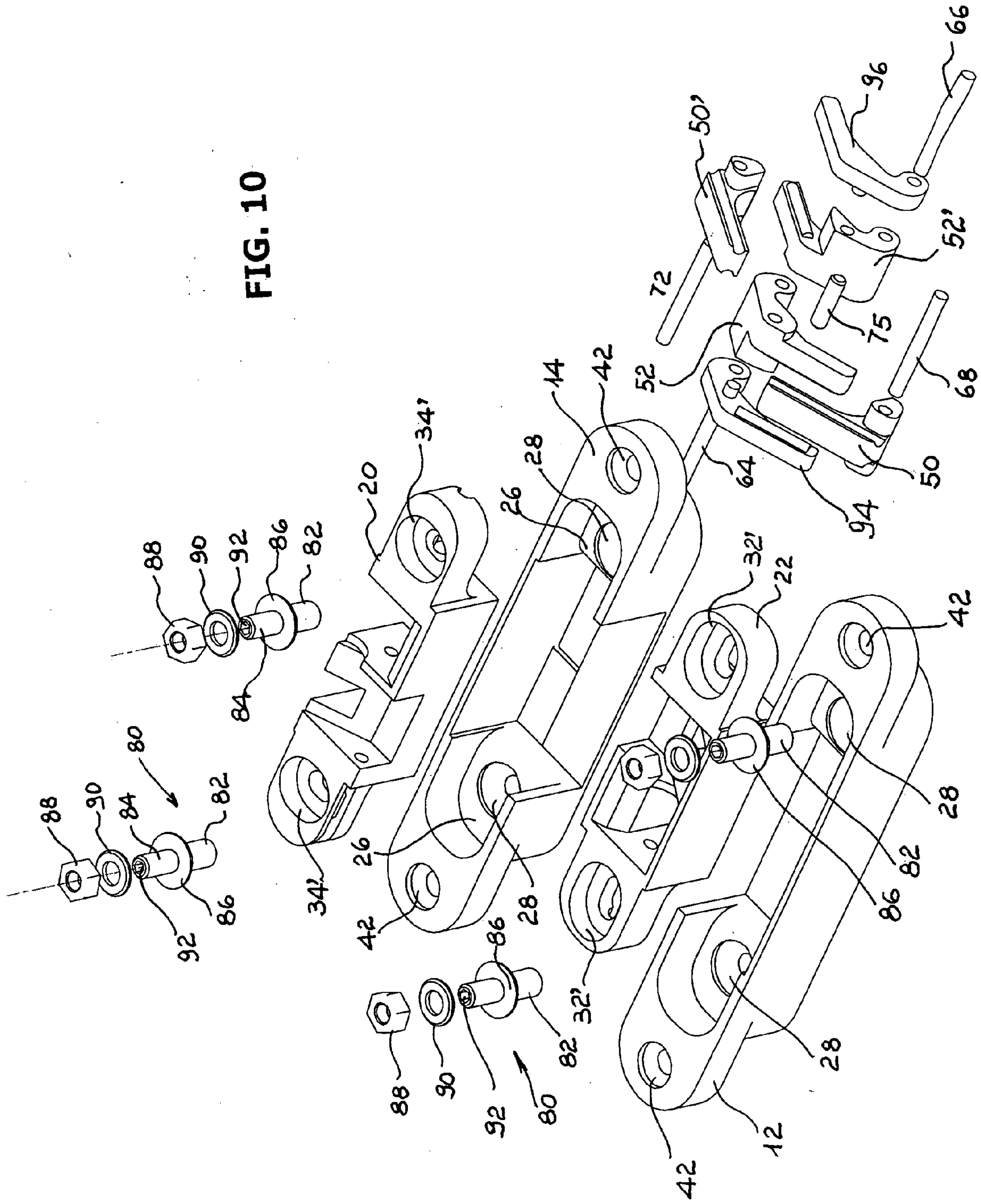

12
14
20
22
26
28
32'
34'
42
50
50'
52
52'
64
66
68
72
75
80
82
84
86
88
90
92
94
96

FIG. 10

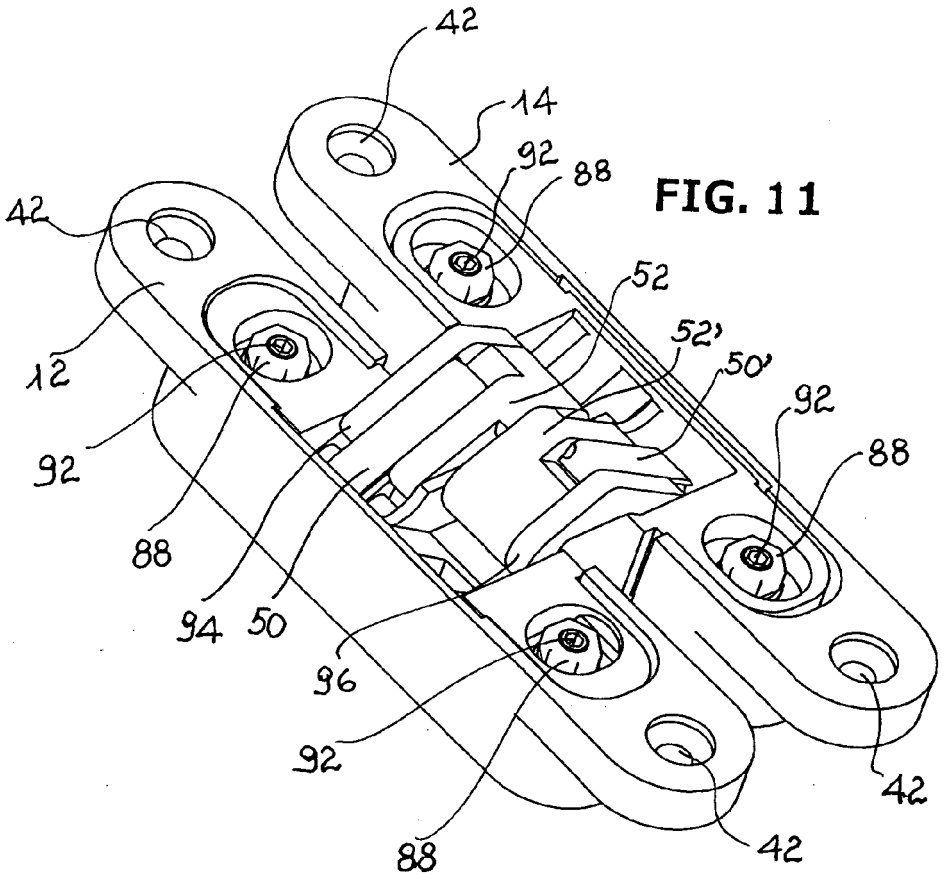

42
14
92
88
42
52
52'
50'
12
92
92
88
88
94
50
96
92
42
88
42

FIG. 11

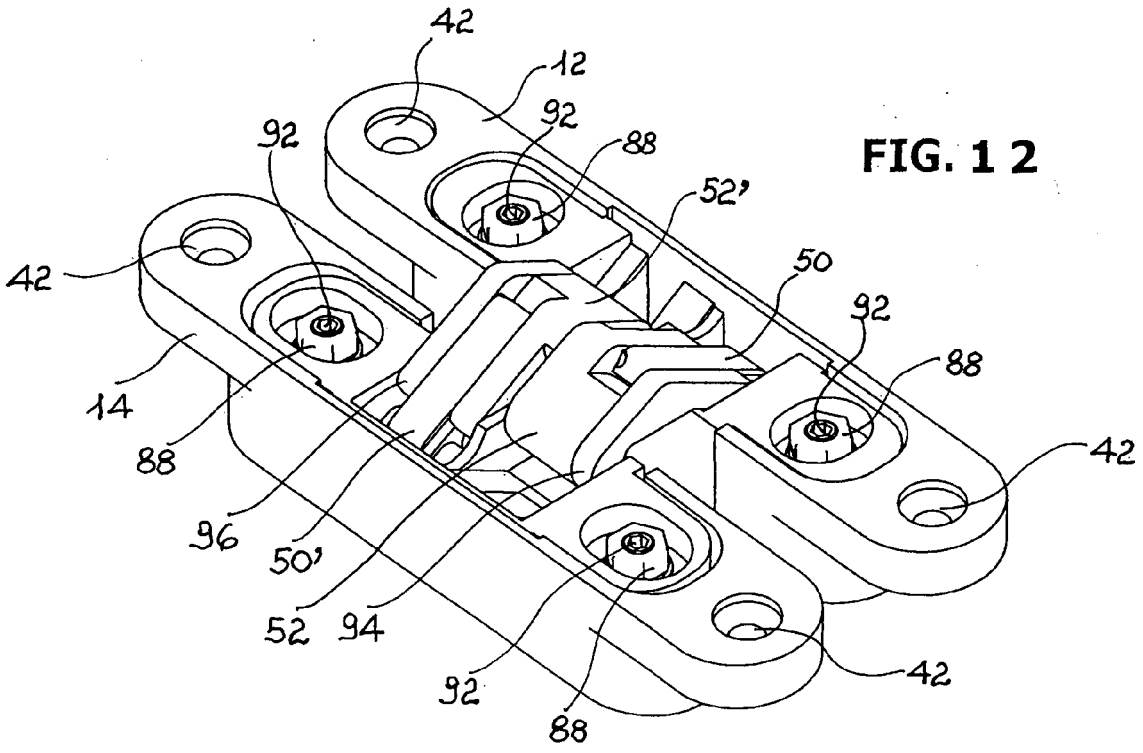

42
12
92
92
88
52'
42
50
92
14
88
88
96
50'
52
94
92
42
88

FIG. 12

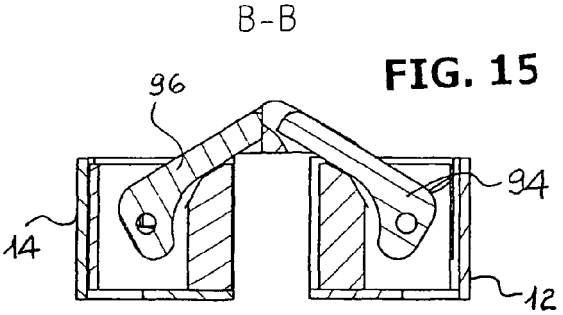


FIG. 15

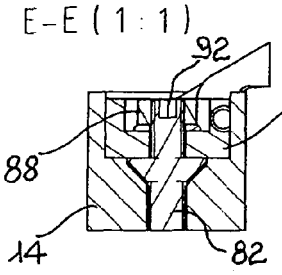


FIG. 17

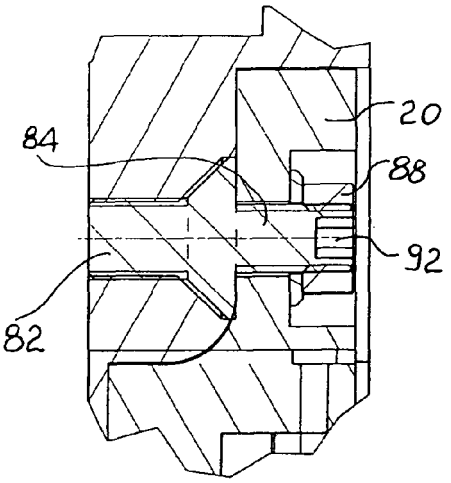
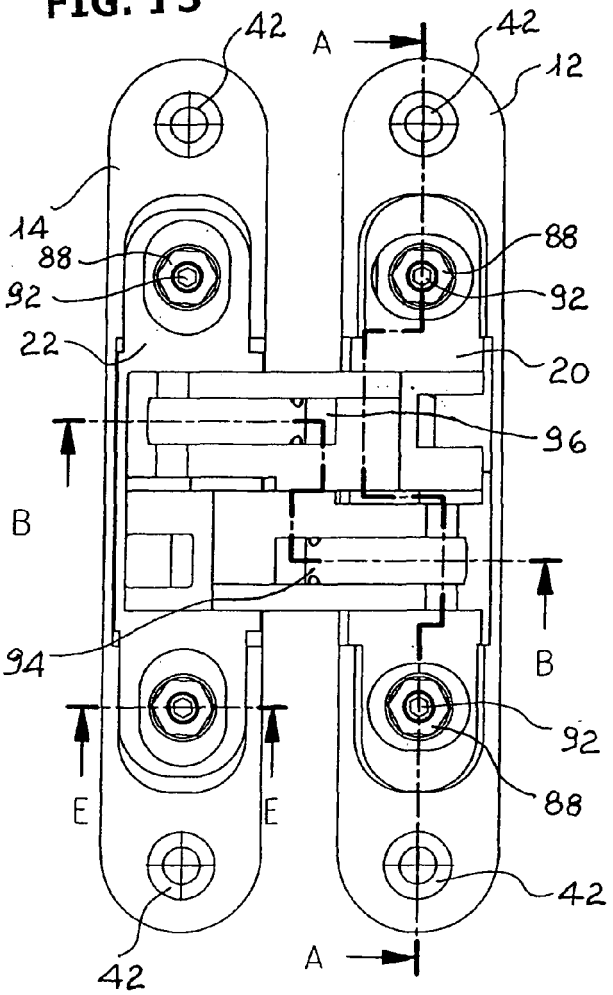


FIG. 16

FIG. 13



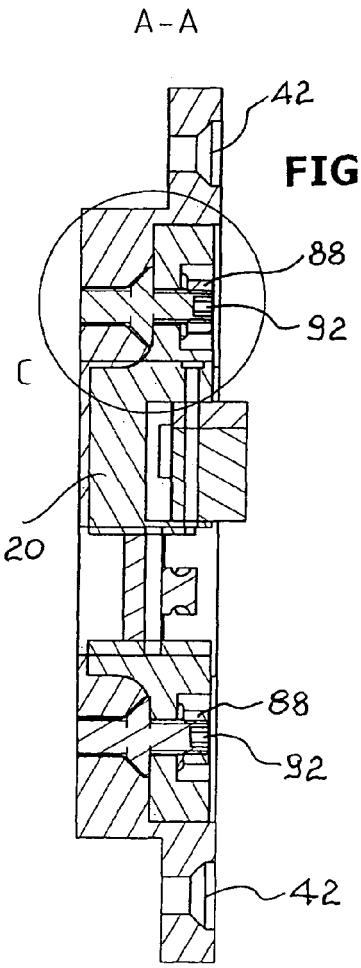


FIG. 14

FIG. 18