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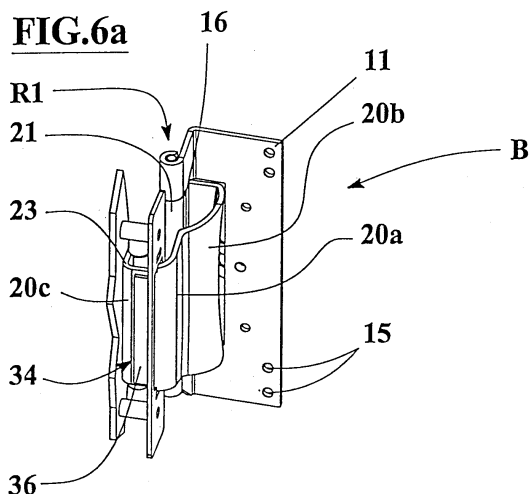
(54) **Two stage hinge device for the door of electric household appliances, particularly for washing machine**

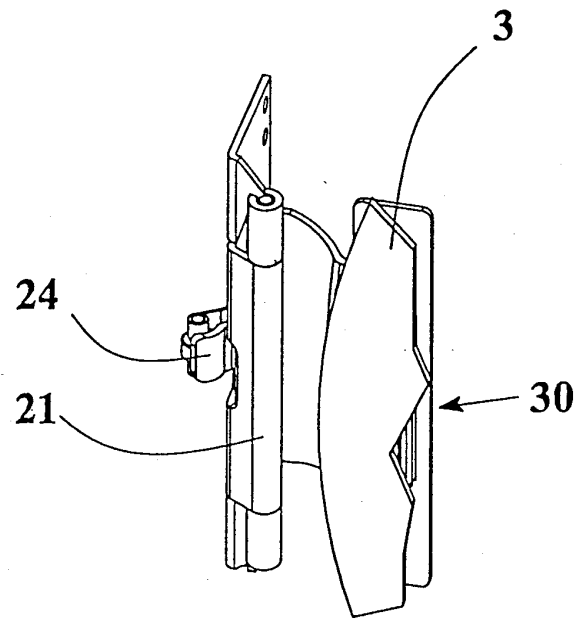
(57) A hinge device (1), particularly for the door (3) of an electric household appliance (2), of the type washing machine, oven and the like, includes a connection element (10) connected to the frame (6) of the appliance (2), a support element (30) to which is connected the door (3) and a shaped element (20), whose first end (21) is hinged to the connection element (10), and whose second end (23) is hinged to the support element (30).

The device further includes stop means, first (14) and second (34) fit to limit the amplitude of the rotations, respectively first (R1), between the shaped element (20) and the connection element (10), and second (R2), between the support element (30) and the shaped element

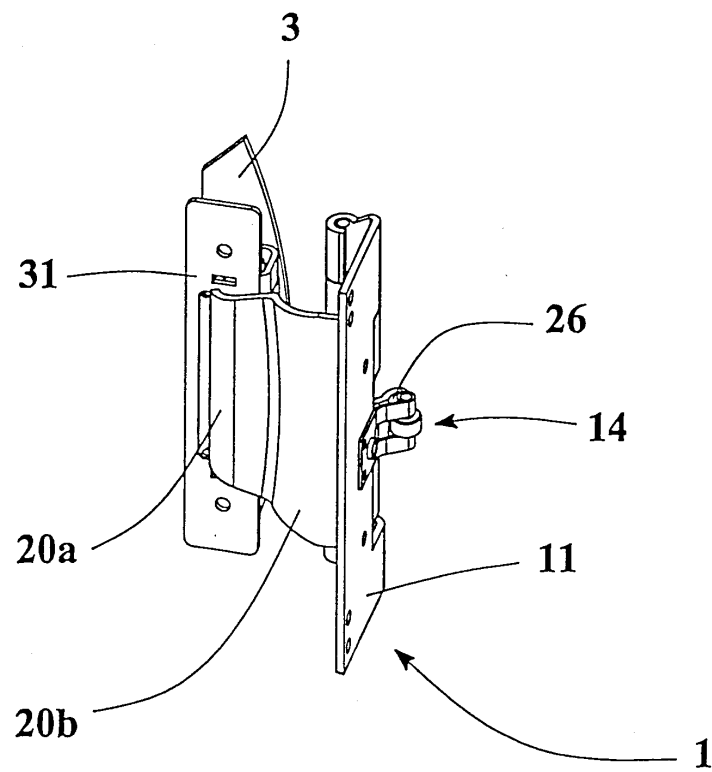
(20), and friction means (32), positioned between the shaped element (20) and the support element (30).

The friction means (32) are fit to differentiate the values of the counter actions exerting against the rotations, first (R1) and second (R2), determining a two-stage opening-closing for the door (3), so that this latter changes from a closing condition (C), in which the door (3) closes the load opening (5) of the appliance (2), to an extreme opening condition (A), in which the same door (3) is at the maximum distance from the opening (5), through an intermediate opening condition (B) in correspondence of which there is the passage between the conditions of rotations, first (R1) and second (R2).





**FIG. 6b**



**FIG. 6c**

## Description

**[0001]** The present invention relates to the production of components for electrical household appliances and the like.

**[0002]** Particularly the invention concerns a two-stage hinge device for the door of electrical household appliances, particularly for washing machine, fit to allow a double joint between the door and the body of the related appliance so that to realize an opening-closing system in two phases.

**[0003]** It is known that the doors of appliances such as washing machines, ovens and the like are fixed to the frame of the apparatus by means of hinge device allowing the rotation of the same doors between a closing position and an opening condition or vice-versa.

**[0004]** Generally said hinge is positioned sideways with respect to the opening carried out in the electrical household appliance body and fit to be closed by the relative door, in such a way to allow a side rotation of the same door during the opening/closing operation.

**[0005]** The known hinge devices include a connection element constituted by a shaped plate extending longitudinally along a main axis, fixed to the appliance frame and having a support element fixed to the door hinged to a pivot parallel to the main axis.

**[0006]** The known hinges devices connected to the related door allow an opening condition with an angle of around 90-100 degrees in comparison with the closing position.

**[0007]** The main drawback of the known hinge devices is that with said opening angle the opened door is protruding from the washing machine body and generally is in the way, particularly when this electrical household appliance is put in narrow spaces. Thus the opened door limits the load operations of the laundry to be washed, hampering particularly the user movements.

**[0008]** For remedying such drawback, that is to guarantee a bigger opening angle for the door, for instance an angle of 180 degrees, the known hinge devices need a support element having dimensions particularly elongated and curved in such a way to guarantee the free opening of the door without interfering with the structure of the washing machine, particularly close to the hinge.

**[0009]** However, a support element so shaped, in correspondence of the door closing, would interfere internally with the washing machine drums stopping its free rotation. This is one of the main reasons for which the hinges of the washing machine doors must have small dimensions.

**[0010]** An adopted compromise is then to move forward the door in comparison with the washing machine wall, that is to install hinge devices such that the frontal wall of the door, in correspondence of the closing position, protrudes from the frontal wall of the washing machine body, in which the water tightness is guaranteed by a gasket having often large sizes.

**[0011]** Said solution has some drawbacks such as the

increasing of the washing machine dimensions, sometimes with protrusions that can be easily hit, and the necessity of particularly large and expensive gaskets and of doors/portholes having a complex shape because of the concavities.

**[0012]** The main object of the present invention is to propose a hinge device, fit to carry out the articulated joint of the door with the body of a related electric household appliance, particularly a washing machine. The hinge device has a two-stage opening system, which defines the smallest encumbrance for the door in correspondence of the opening and closing conditions.

**[0013]** Further object is to propose a hinge that guarantees the door opening of around 180 degrees, allowing therefore the maximum accessibility to the load opening of the washing machine.

**[0014]** Other object is to propose a hinge device of small dimensions, which guarantees that the door wall is, in the closing condition, on the same plane with the frontal wall of the electric household appliance.

**[0015]** Further object is to propose a device having a constructive and functional simplicity, an easy installation and a safe, precise and reliable use.

**[0016]** The aforesaid objects are achieved according to the content of the claims.

**[0017]** The features of the present invention will be underlined in the following description, with reference to the enclosed drawings, in which:

- Figure 1 shows a perspective schematic view of the appliance provided with the hinge device object of the present invention in which the related door is at closing position;
- Figure 2 shows a perspective schematic view of the hinge device at the door closing position;
- Figures 3a, 3b, 3c show perspective enlarged views, respectively front, side and back, of the device of figure 1 at the closing position;
- Figure 4 shows a perspective schematic view of the appliance of figure 1, with the related door in an intermediate opening condition;
- Figure 5 shows a perspective schematic view of the hinge device in the intermediate opening condition of the figure 4 appliance;
- Figures 6a, 6b, 6c show perspective enlarged views, respectively front, side and back, of the figure 4 device in the intermediate opening condition;
- Figure 7 shows a perspective schematic view of the appliance of figure 1, with the related door at an opening condition;
- Figure 8 shows a perspective schematic view of the

hinge device in the corresponding opening condition of the appliance of figure 7;

- Figures 9a, 9b, 9c show perspective enlarged views, respectively front, side and back, of the device of figure 1 at the opening condition.

**[0018]** With reference to the figures 1 and 2, numeral 1 indicates a hinge device, particularly for the door 3 of an electric household appliance 2, for instance a washing machine. The device 1 is in a closing position C, in which the wall of the door 3 is practically lined up with the frontal wall 4 of the appliance 2 and closes the load opening 5 of this latter.

**[0019]** With reference to the figures from 3a to 3c, the device 1 includes a connection element 10, a shaped element 20, a support element 30, stopping means, first 14 and second 34, and friction means 32.

**[0020]** The connection element 10 is essentially constituted by a flat shaped frontal wall 11, having a series of holes 15. An end 17 of said frontal wall 11 is refolded and supports a first pivot 12. Besides between the refolded end 17 and the frontal wall 11 there is a hollow part 13, slot-type, almost square shaped and having a stop 16 fit to define the maximum opening angle of the hinge 1.

**[0021]** The shaped element 20 is constituted by a suitable shaped surface whose ends are refolded toward the inside.

**[0022]** Particularly, the shaped element 20, better shown in figure 9a, is constituted by two ends, first 21 and second 23, between which a curvilinear part 20b, a plane part 20a and an end part 20c, almost perpendicular to the plane part 20a, are included.

**[0023]** Furthermore, the curvilinear part 20b has almost centrally a tongue 24 carried out in the same wall and protruding therefrom. Said tongue 24 is positioned in correspondence of the first stop means 14 and has a concave housing at his end 26.

**[0024]** The first end 21 of the shaped element 20 is hinged to the connection element 10, by means of the first pivot 12, in such a way that the curvilinear part 20b of the shaped element is housed and free to rotate in the slot 13.

**[0025]** The support element 30 is rotatably hinged, by means of a second pivot 22, to the second end 23 of the shaped element 20.

**[0026]** Said support element 30 is essentially constituted by a fixing plate 31, to which the door 3 is fixed, said fixing plate having a slot 33 fit to be crossed by the second end 23 of the shaped element 20.

**[0027]** The second pivot 22 is integral with a refolded end 35 of the support element 30, while the friction means 32 are associated in correspondence of the central part of said second pivot 22, said means 32 essentially constituted by an insert 32a, locked in correspondence of the second end 23 of the shaped element 20.

**[0028]** The first stop means 14 are constituted essen-

tially by an elastic plaque 14b, "U" shaped, at the back and almost centrally fixed to the frontal wall 11 of the connection element 10, which supports a sliding roller-type element 14a, rotatably connected to the free end of the elastic plaque 14b.

**[0029]** The second stop means 34 are constituted essentially by a stop 36 carried out in the external edge of the slot 33 of the fixing plate 31.

**[0030]** As it is better shown in figure 4, the frontal wall 11 of the connection element 10 is fixed, by means of screws passing through the holes 15, to a side part of the frame 6 of the appliance 2, in correspondence of its opening 5.

**[0031]** The operation of the hinge device 1 is very simple and includes the complete opening of the door 3 in two following stages.

**[0032]** When the user of the appliance 2 needs to open the door 3, he operates on a handle 7 of this latter and pulls toward the outside the door 3 realizing the first opening stage which involves the passage from the closed position C, shown in the figures 1 and 2, to an intermediate opening condition B, shown in the figures 4 and 5, in which the door 3 is opened with an angle of around 90 degrees in comparison with the frontal wall 4 of the appliance 2.

**[0033]** More precisely, in consequence of force applied by the user, starting from the closing position C of the hinge device 1, shown in the figures from 3a to 3c, in which the plane part 20a of the shaped element 20 faces the frontal wall 11 and the fixing plate 31 of the support element 30, to which the door 3 is fixed, is almost parallel to the plane part 20a. The hinge device effects a first rotation condition R1 between the shaped element 20 and the connection element 10, moving into the intermediate opening condition B, shown in the figures from 6a to 6c, in which the plane part 20a is almost perpendicular to the frontal wall 11.

**[0034]** During this rotation, the roller 14a slides with friction firstly on the external profile of the portion curvilinear 20b and then on the external profile of the tongue 24, which is the prolongation surface for the roller sliding. In this way, there is a friction force of almost constant intensity between the roller 14a and the shaped element 20.

**[0035]** Said sliding finishes when the roller 14a stops in the housing 26 being an elastic block for the roller 14a, in correspondence of the intermediate opening condition B.

**[0036]** The rotation R1 amplitude of the shaped element 20 is therefore delimited from one side by the frontal wall 11 and from the other side by the first stopping means 14.

**[0037]** At this point the user, acting on the door 3, realizes the second stage of the door opening, so involving the passage from the aforesaid intermediate opening condition B to an extreme opening condition A, shown in the figures 7 and 8, in which the door 3 is opened with an angle of around 180 degrees in comparison with the

frontal wall 4 of the appliance 2, so that the door 3 is at the maximum distance from the opening 5.

**[0038]** More precisely, in consequence of the force applied by the user, a second rotation condition R2, between the support element 30 and the shaped element 20, is achieved. The fixing plate 31 rotates around the end part 20c by means of the second pivot 22 up to bring the hinge device 1 from the intermediate opening condition B to the extreme opening condition A, shown in the figures from 9a to 9c in which the fixing plate 31 of the support element 30, to which the door 3 is fixed, is almost perpendicular to the plane part 20a.

**[0039]** During said rotation, the insert 32a exerts a friction force, of almost constant intensity, on the second pivot 22.

**[0040]** It is important to underline that the presence of the insert 34 differentiates the values of the counter actions acting against the rotations, first R1 and second R2. More precisely, during the door opening, the friction force between the connection element 10 and the shaped element 20 is smaller than the friction force between the shaped element 20 and the support element 30.

**[0041]** In this way, at the first stage only the shaped element 20 rotates around the connection element 10, while the support element 30 remains integral thereto. Once reached the intermediate opening condition B and, that is, once the roller 14a is stopped at the housing 26, said rotation is further disallowed and therefore the second stage starts, in which the support element 30 pivots around the shaped element 20, while this latter remains motionless with respect to the connection element 10.

**[0042]** It is advantageous to notice that in the passage from the intermediate opening condition B to the extreme opening condition A, this latter condition is carried out by the contact of the inside edge of the slot 33 with the inside part of the second end 23.

**[0043]** Vice-versa, in the passage from the extreme opening condition A to the closing condition C, the support element 30 firstly rotates around the shaped element 20, realizing the second rotation condition R2, while this latter remains motionless in comparison with the connection element 10, in consequence of the counter action exerted by the housing 26 on the roller 14a, which has bigger intensity than the friction force carried out by the insert 32a.

**[0044]** Then the door 3 reaches the intermediate opening condition B defined by the contact of the stop 36 of the slot 33 with the external profile of the end part 20c. At this point the support element 30 cannot rotate anymore and therefore the force, applied to the door 3 by the user, can release now the roller 14a from the housing 26, causing the first rotation condition R1 of the shaped element 20 around the connection element 10 up to the achievement of the closing condition C of the door 3.

**[0045]** In a variant of the hinge device 1 in object, the

slide element 14a is constituted by a sliding block fit for sliding on the external profile of the shaped element 20. In this way, a friction force of preferred intensity can be achieved, in comparison with the force given by the friction element 32.

**[0046]** A further variant provides that the friction means 32 are interposed also or only between the connection element 10 and the shaped element 20. Positioning an insert 32a also or only in correspondence of the first pivot 12, it is carried out a two-stage hinge device for closing/opening the door 3, in which the realization order of the rotations, first R1 and second R2, can be reversed in comparison with the realization order described in the preferred embodiment.

**[0047]** The friction means 32 act therefore as sequencers for the opening and closing phases of the door 3.

**[0048]** It is useful to notice that the inserts 32a, constituting said friction means 32, are carried out with plastic material or generally with material having such hardness features to achieve successfully the function for which they are designed.

**[0049]** With said device, of small dimensions, it is also possible to open the door with a very wide angle, nearly of 180 degrees, and at the same time to line up the door to the frontal wall of the appliance at the closing condition, improving the functionality and the aesthetics of this latter.

**[0050]** The aforesaid objects are completely achieved according to the technical solution object of the present invention.

**[0051]** The main advantage of the present invention is therefore to provide a hinge device, fit to carry out the articulated joint of the door with the body of a related electric household appliance, particularly a washing machine. The hinge device has an opening system using two phases, which determines the smallest encumbrance for the door in correspondence of the extreme opening and closing condition.

**[0052]** Further advantage is to provide a hinge that guarantees the door opening of around 180 degrees, allowing therefore maximum accessibility to the load opening of the washing machine.

**[0053]** Other advantage is to provide a hinge device of reduced dimensions, which guarantees that the door wall is, in the closing condition, in the same plane with the frontal wall of the electric household appliance.

**[0054]** Further advantage is to propose a device having a constructive and functional simplicity, an easy installation and a safe, precise and reliable use.

## Claims

1. Two-stage hinge device for the door (3) of electric household appliances (2), particularly for washing machines, having a frame (6) and a load opening (5) closable by means of said door (3), with said de-

vice (1) including:

- a connection element (10) joined to said frame (6);
- a support element (30) to which said door (3) is connected;
- a shaped element (20), whose one first end (21), hinged to said connection element (10), allows a first rotation condition (R1) between said shaped element (20) and said connection element (10), and whose second end (23), hinged to the support element (30), allows a second rotation condition (R2) between said shaped element (20) and support element (30);

said hinge device (1) being characterized in that includes:

- first stop means (14), positioned between said connection element (10) and said shaped element (20) and fit to limit the amplitude of said first rotation (R1), in cooperation with said connection element (10);
  - second stop means (34), positioned between said shaped element (20) and said support element (30) and fit to limit the amplitude of said second rotation (R2);
  - friction means (32), positioned between said shaped element (20) and said support element (30), and/or between said connection element (10) and said shaped element (20), and fit to differentiate the values of the counter actions exerting against said rotations, first (R1) and second (R2), causing said two-stage opening-closing for said door (3), so that this latter changes from a closing condition (C), in which said door (3) closes said opening (5), to an end opening condition (A), in which said door (3) is at a maximum distance from said opening (5), through an intermediate opening condition (B) in correspondence of which there is the passage between said conditions of rotations, first (R1) and second (R2).
2. Device according to claim 1 characterized in that the passage from said closing condition (C) to said intermediate opening condition (B) is carried out through said first rotation (R1) and that said first stop means (14) fix elastically said first rotation (R1) in correspondence of said intermediate opening condition (B) and in the passage from this latter to said extreme opening condition (A) and vice-versa.
3. Device according to the claim 1 characterized in that said first stop means (14) include a sliding element (14a), connected to a plaque (14b) fixed to a frontal wall (11) of said connection element (10), fit to slide on the external profile of a curvilinear part

(20b) of said shaped element (20), adjacent to said first end (21), in correspondence of said first rotation (R1).

4. Device according to the claim 3 characterized in that said first stop means (14) further include a tongue (24), almost centrally protruding from said curvilinear part (20b) and acting as prolongation surface for the movement of said sliding element (14a), the end of said tongue (24) being provided with a concave housing (26) fit to act as elastic block for said sliding element (14a) in correspondence of said intermediate opening condition (B).
5. Device according to the claim 3 characterized in that said sliding element (14a) is constituted by an idle roller, fit for rolling on said external profile.
6. Device according to the claim 3 characterized in that said sliding element (14a) is constituted by a sliding block, fit to slide on said external profile.
7. Device according to the claim 3 characterized in that said plaque (14b) is elastic.
8. Device according to the claim 1 characterized in that said connection element (10) includes a hollow part (13) inside which rotates at least a curvilinear part (20b) of said shaped element (20) adjacent to said first end (21).
9. Device according to the claim 1 characterized in that said friction means (32) are constituted essentially by an insert (32a) associated at least to a second pivot (22) integral with said support element (30) and to which it is hinged said shaped element (20), fit to exert a friction force in correspondence of said second rotation (R2).
10. Device according to the claim 1 characterized in that said support element (30) is constituted essentially by a fixing plate (31) for said door (3), provided with a slot (33) crossed by said second end (23) of said shaped element (20), said fixing plate (31) being fit to rotate around at least an end part (20c) of said shaped element (20), adjacent to said second end (23).
11. Device according to the claim 10 characterized in that that said second stop means (34) include a stop (36), positioned in correspondence of the external edge of said slot (33), and fit to contact said end part (20c) in order to limit said second rotation (R2).
12. Device according to the claim 2 characterized in that the intensity of the friction force exerting between said shaped element (20) and said connection element (10) is smaller than the intensity of the

friction force exerting between said support element  
(30) and said shaped element (20).

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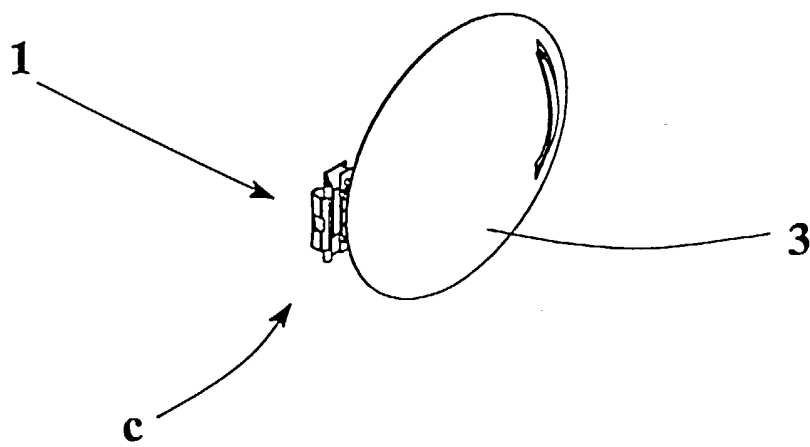
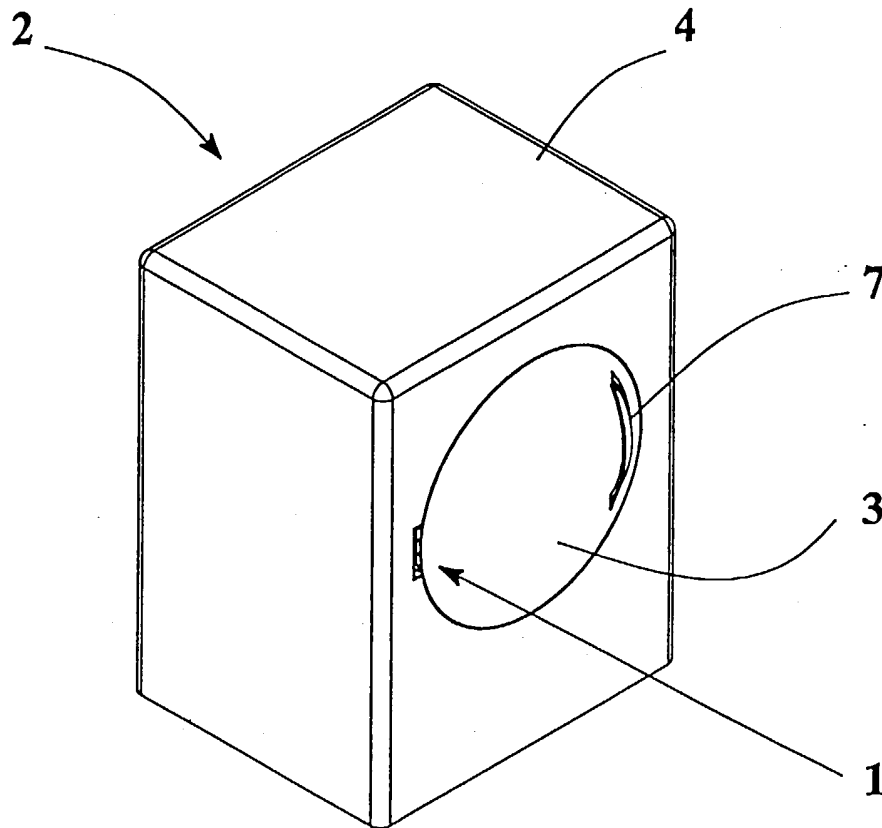
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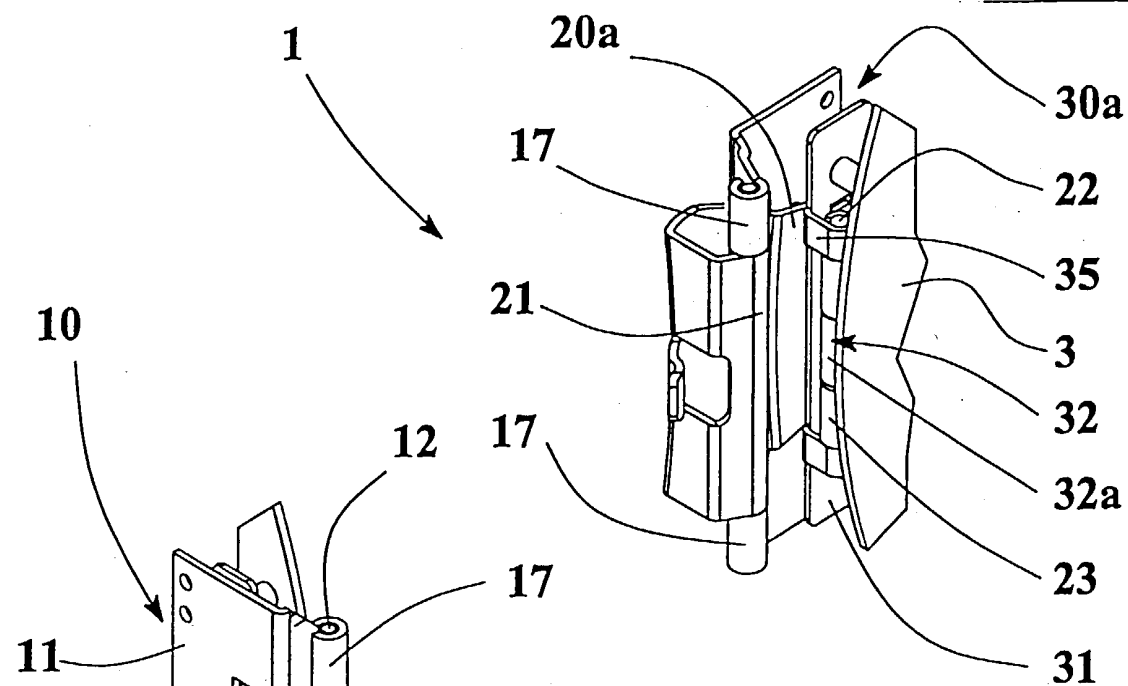
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**FIG.1**

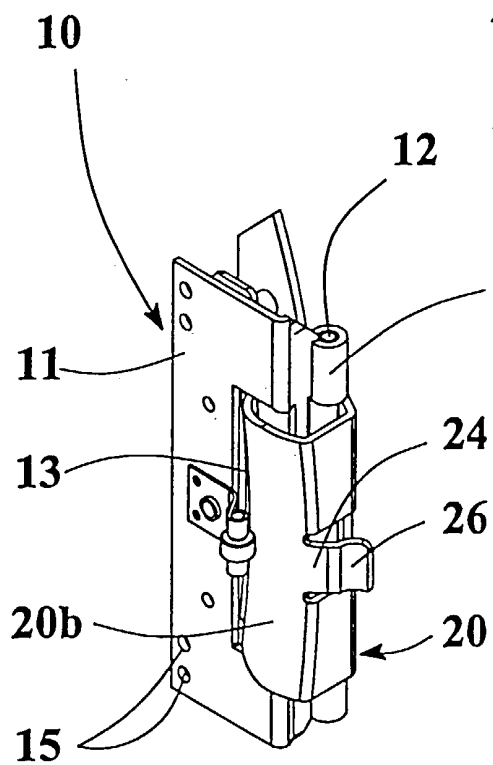


**FIG.2**

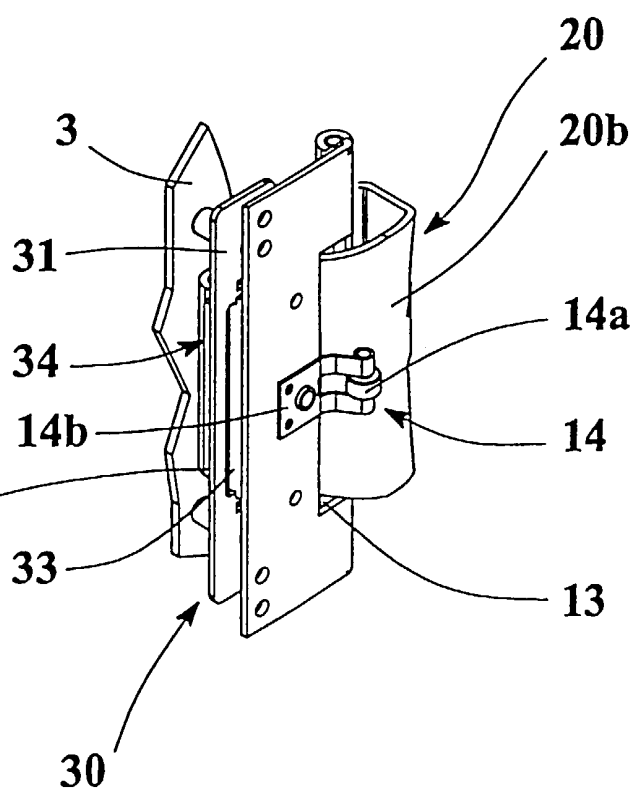
**FIG.3a**



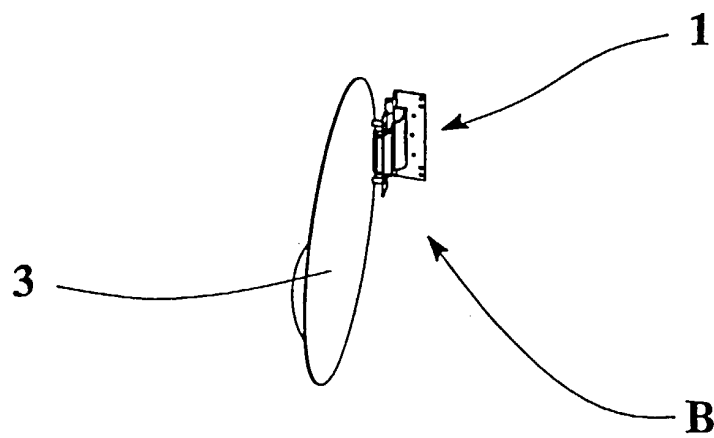
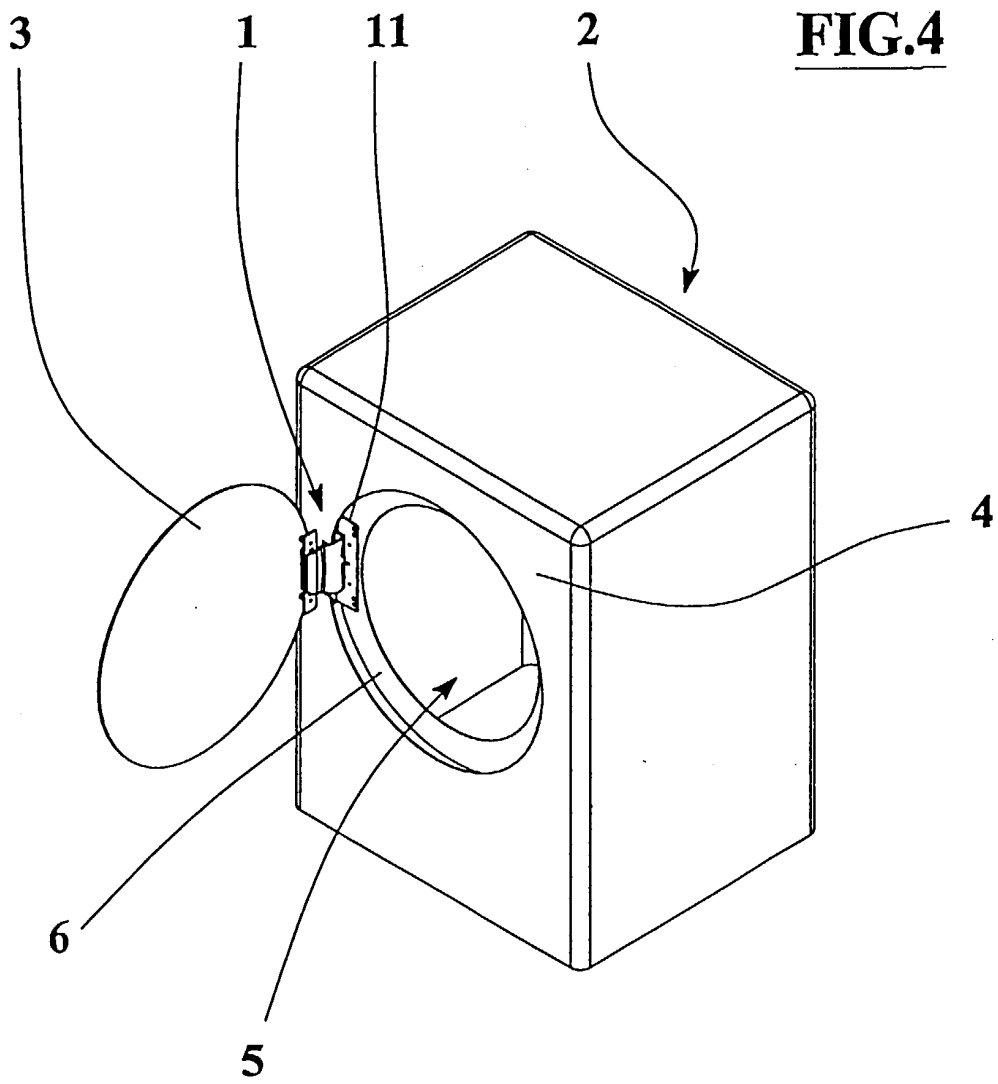
**FIG.3b**



C

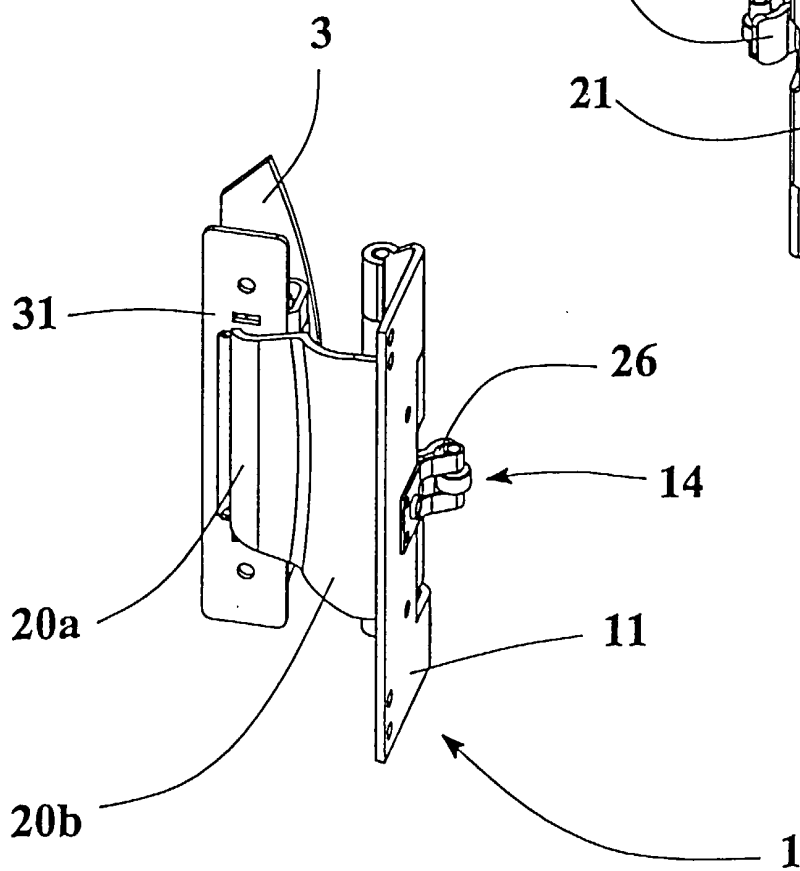
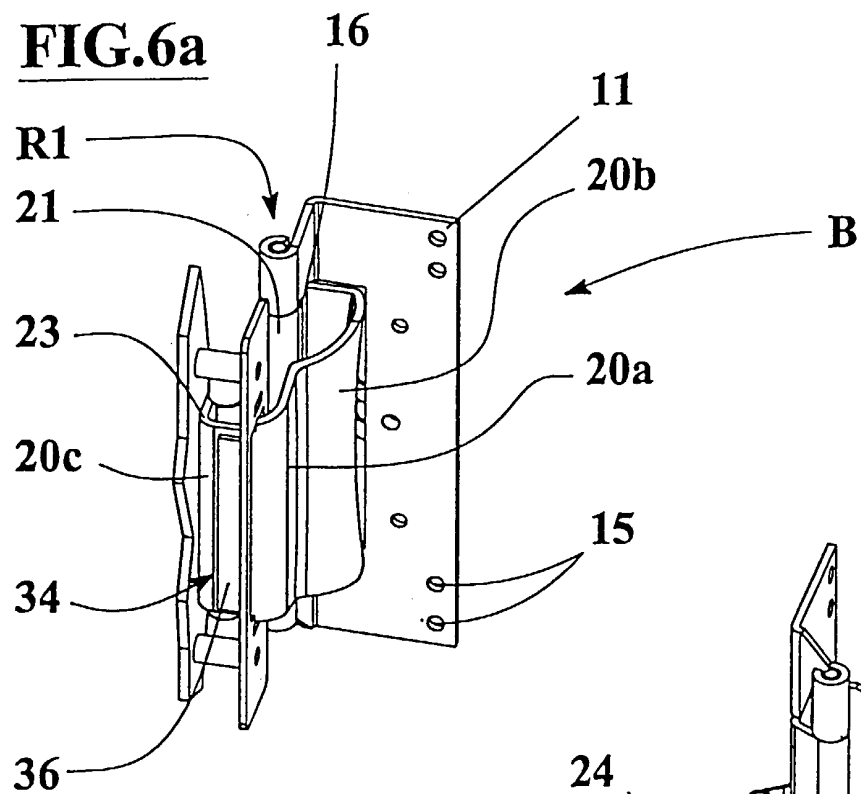


**FIG.3c**



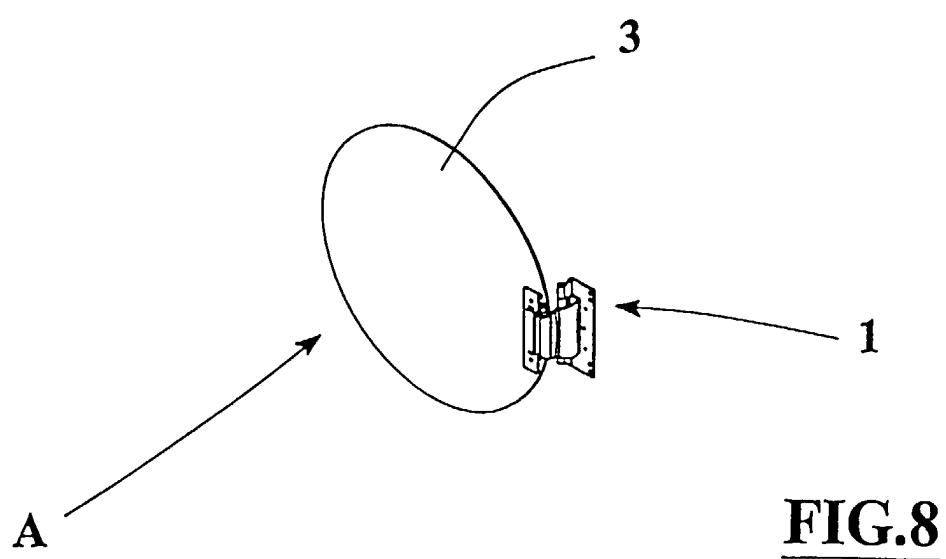
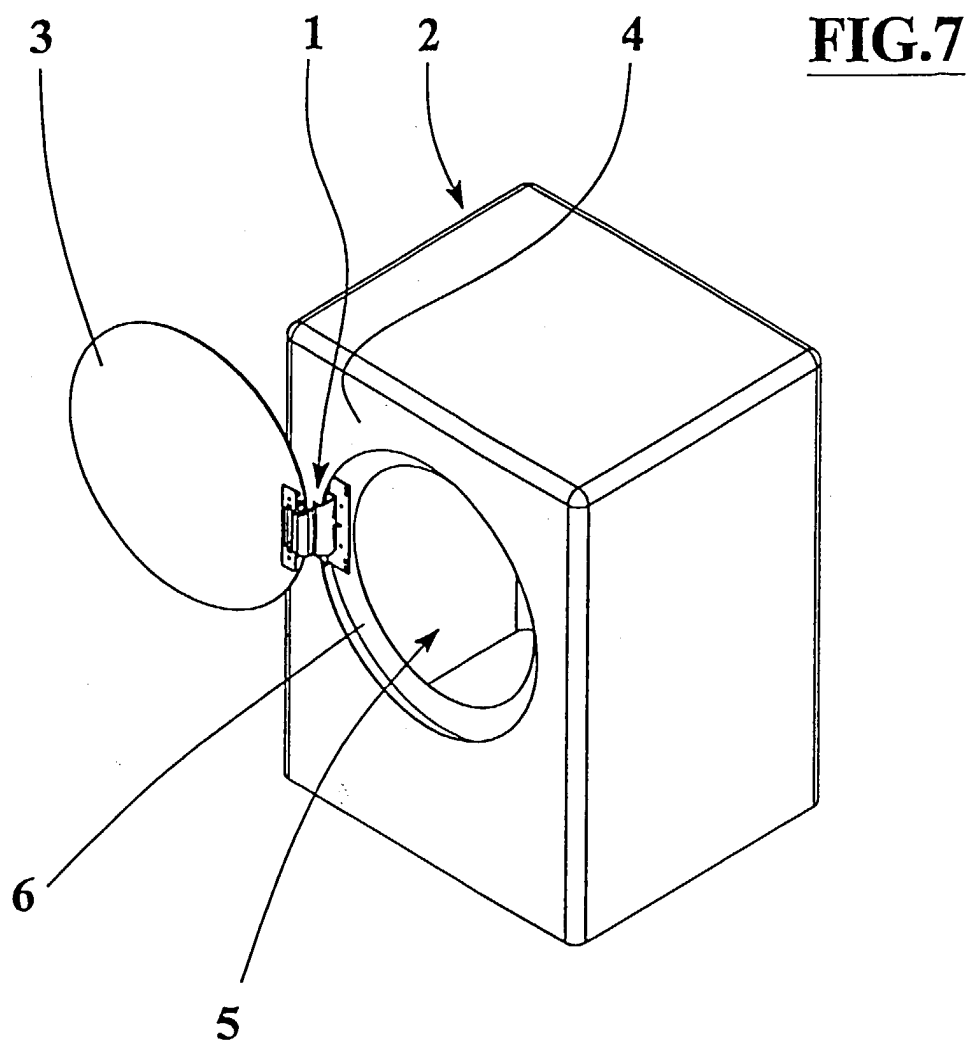
**FIG.5**

**FIG.6a**

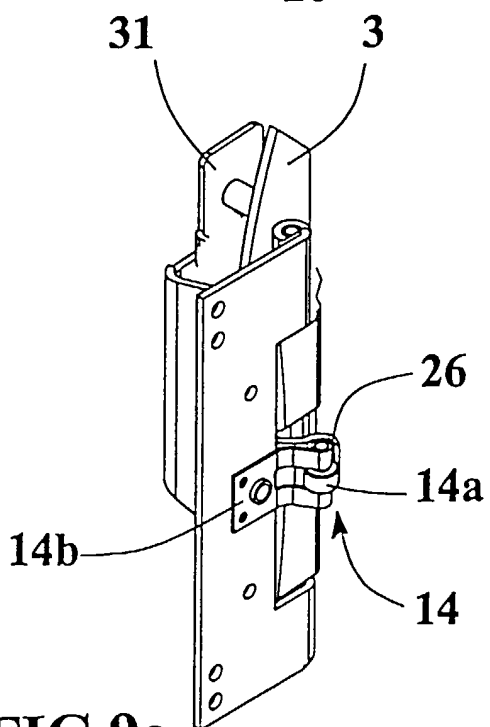
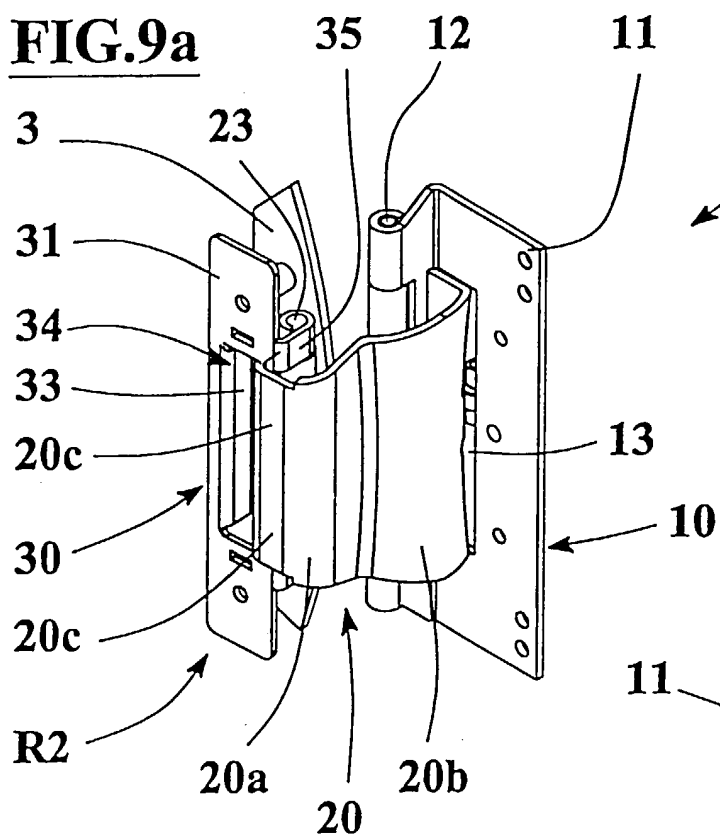


**FIG.6b**

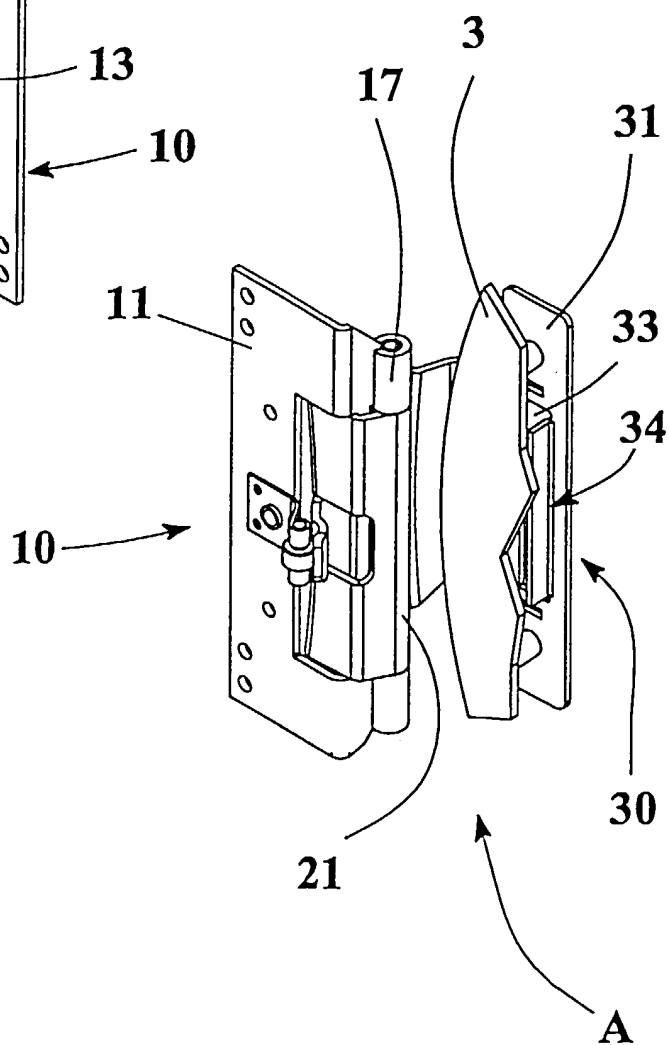
**FIG.6c**



**FIG.9a**



**FIG.9c**



**FIG.9b**