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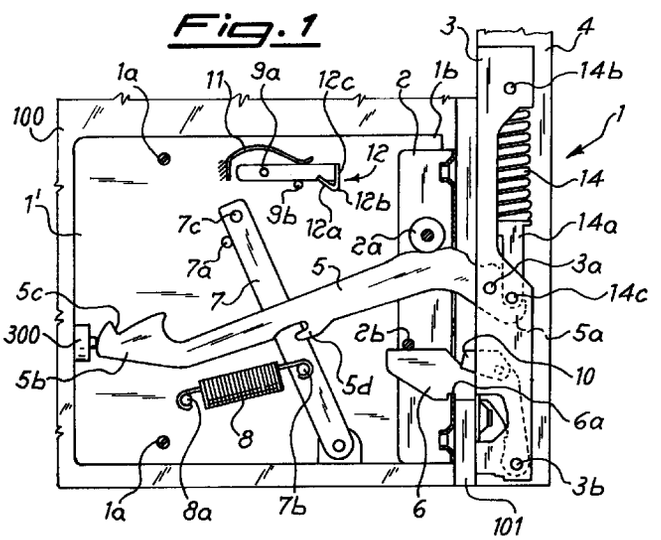
(54) Doors hinge for electric household appliances, furniture or the like, with multiple counterbalancing means

(57) Hinge for the doors (4) of electric household appliances, furniture and the like, comprising a plate (1) which is fixed to the wall (100) of the electric appliance and which has connected to it a first box-shaped guiding and support element (2), a second box-shaped element (3) connected to the door (4) and carrying a fixed arm (6) and a movable arm (5) which can be connected to each other via associated engaging means (5d, 10) and resilient means (14) for balancing the door (4), in which said fixed plate (1) has hinged on it an additional rod (7) which is subject to the recall action of resilient means (8) and the free end of which has means (7c) designed to engage/disengage with/from the free end of said movable arm (5) during the opening/closing rotational movement of the door, there also being provided a device (9) for stopping the return movement of the rod (7) into the rest position, which can be deactivated by means of the free end of the arm (5) upon each rotation of the door (4) in either direction and activated when the two arms (5, 6) are engaged with one another for extraction of the door itself.

Fig. 1



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Description

The present invention relates to a hinge for the doors of electric household appliances, furniture and the like, having separate resilient elements which are attached to the door and to the electric appliance and which exert a combined action for balancing of the door during the opening/closing rotational movement thereof, and also comprising a device for stopping rotation of a lever connected to said balancing means attached to the electric appliance, which can be deactivated upon each rotation of the door in either direction and activated when the door itself is extracted from its seat.

In the technology for the construction of electric household appliances, such as ovens and the like, it is known of the need to provide the latter with doors which can perform a rotational opening movement so as to allow access to the cooking compartment or the like.

It is also known of hinges for said electric appliances such as ovens and the like, consisting of a part attached to the door, with which they are articulated in a mutually connectable manner in a predetermined position so as to allow rapid and precise extraction/reinsertion of the oven door by means of releasing of the said arms from the fixed hinge part attached to the electric appliance.

It is also known that the movable part of said hinges, attached to the door, contains a balancing spring designed to keep the door as balanced as possible during the rotational opening and closing movement, by exerting, in the first case, a braking action and, in the second case, a recall action, which reduce the amount of force required by a user in order to perform these two manoeuvres.

In the most recent embodiments of ovens and the like, the increasingly higher internal temperature which is required and obtainable requires that the closing doors be fitted with cavity glass of greater thickness, resulting in a significant increase in the overall weight of the door itself.

This increase in weight obviously requires over-dimensioning of all the parts which make up the hinge, such as pins, arms and, in particular, the balancing spring which must be increased in terms of both its overall dimensions and calibration of the force which can be exerted, this resulting in the need to redesign the entire hinging assembly, including the seats of the fixed elements and the door, as well as the need by the user to apply considerable forces in order to be able to open and close the door; since the majority of users consist of housewives, there is an obvious need to provide hinges which, on the contrary, can be operated with a small amount of force on the part of the user.

The technical problem which is posed is therefore that of providing a hinge for the doors of electric household appliances such as ovens and the like, which enables doors of considerable weight to be operated without the need for over-dimensioning of the parts which make up the hinge itself and without requiring a considerable amount of force on the part of the user.

Within the scope of this technical problem it is also required that the hinge should be of the type with arms which can be connected to each other for rapid extraction of the door; moreover, it is required that the hinge according to the invention should be easy and economical to produce with a small number of parts which are not subject to particular wear and that it should be able to be dimensioned such that it can be applied to the conventional doors of electric household appliances and the like, without the need for variations in the dimensions and existing connections.

These results are obtained by the present invention, which provides a hinge for the doors of electric household appliances, furniture and the like, comprising a plate which is fixed to the wall of the electric appliance and which has connected to it a first box-shaped element forming the fixed guiding part of the hinge, a second box-shaped element connected to the door and carrying a fixed arm and a movable arm which can be connected to each other via associated engaging means, and resilient means for balancing the door, in which said fixed plate has hinged to it a rod which is subject to the recall action of resilient means and the free end of which has means designed to engage/disengage with/from the free end of said movable arm during the rotational opening/closing movement of the door, there also being provided a device for stopping the return movement of the rod into the rest position, which can be deactivated via the free end of the arm upon each rotation of the door in either direction and activated when the two said hinge arms are engaged with one another for extraction of the door itself.

Further details may be obtained from the following description, with reference to the accompanying drawings, in which:

- Figure 1 shows a side view of the hinge according to the invention in the closed position;
- Figure 2 shows a side view of the hinge according to the invention in the partially open position engaged with the second balancing spring;
- Figure 3 shows a side view of the hinge according to the invention in the partially open position during contact with the pawl;
- Figure 4 shows a side view of the hinge according to the invention when the door is in the totally open position;
- Figure 5 shows a side view of the hinge according to the invention with the door in the extracted position.

As can be seen in Figure 1, the hinge 1 according to the invention is composed of a plate 1 connected, via screws 1a or the like, to the fixed wall 100 of an electric

household appliance or the like.

In addition to forming the fixed support of the hinge, the plate 1 also forms a protective barrier for the insulation material present in some electric appliances such as ovens for example, which is worn by the abrasive action of the movable parts of the hinge during the opening/closing rotational movements.

The edge 1b of the plate 1 corresponding to the front opening of the furniture and/or electric appliance has fixed to it a box-shaped element 2 carrying a roller 2a and a pin 2b which are transverse with respect to the direction of opening of the hinge, as will become clear below.

The part of the hinge 1 movable in rotation is formed by a second box-shaped element 3 which is located inside the thickness of a door 4 for closing the compartment of the electric appliance.

Said box-shaped element 3 located inside the door 4 has a first transverse pin 3a and a second transverse pin 3b; the pin 3a has hinged on it a first arm 5 movable with the door 4 and guided by the said roller 2a attached to the fixed box-shaped element 2; the pin 3b has hinged on it a second right-angled arm 6 which is engaged with the fixed box-shaped part 2 by means of a seat 6a and is kept immobile on the fixed part 3 itself by means of said pin 2b.

The pin 3b of the said fixed arm 6 therefore forms the fixed axis of rotation of the hinge 1. The box-shaped element 3 also has housed inside it a rod 14a, the opposite ends of which are retained by pins 14b and 14c which are attached respectively to the box-shaped element itself and the end 5a of the arm 5; said rod 14a has mounted on it a helical spring 14 which, being compressed or extended during opening/closing of the door 4, performs the required action of balancing/recalling of the door itself.

The plate 1 attached to the electric appliance also has hinged on it a rod 7 kept in abutment against a stop 7a by the recall action of a spring 8 arranged between a fixed projection 8a of the plate 1 and a pin 7b attached to the rod 7.

The free end of the rod 7 has a transversely projecting pin 7c designed to engage with a corresponding hook 5c formed in the free end 5b of the movable lever 5 which also has a second hook 5d in an approximately intermediate position of its bottom profile.

Said second hook 5d is designed to retain a bridge-piece 10 hinged on the upper surface of the fixed arm 6 so as to form a connection between the two arms 5 and 6 which, as will be described more fully below, allows extraction/insertion of the hinge and hence the door from/into the fixed seat 2.

Finally, the plate 1 has mounted on it a pawl 9 rotating about a pin 9a and pushed into abutment against a stop 9b by the action of resilient means 11 attached to the plate 1.

The free end of the pawl 9 has, thicknesswise, a portion 12 folded so as to form an inclined surface 12a, a bottom rounded vertex 12b and a front abutment surface 12c designed to cooperate with the rear surface of the free end of the rod 7.

The hinge operates in the following manner:

When the door 4 is closed (Figure 1) in the vertical position in abutment against the seal 101, the fixed arm 6 is engaged with the fixed box-shaped element 2, the movable arm 5 is completely inserted inside the cavity of the wall 100 of the electric appliance itself, the lever 7 is in abutment against the stop 7a, being recalled by the action of the spring 8 and the pawl 9 is lowered, pushed into abutment against the stop 9b of the resilient element 11.

When the door 4 is rotated so as to open (Figure 2), the movable arm 5 is extracted until the hook 5c on its free end 5b engages with the pin 7c projecting transversely from the free end of the rod 7; continuing the rotational opening movement of the door 4, the lever 7 is entrained in rotation by the movable arm 4 against the recall action of the spring 8 which, from this moment onwards, starts to cooperate with the spring 14 so as to keep the door 4 itself balanced, i.e. braked during opening.

During rotation towards the totally open horizontal position (Figure 4), the rounded free end of the movable arm 5 intercepts (Figure 3) the inclined end surface 12a of the pawl 9, causing raising of the latter against the thrusting action of the resilient means 11 which causes the pawl 9 to recover its lowered position as soon as the hook of the arm 5 has passed beyond the rounded vertex 11b.

The raising of the pawl 9 thus allows the free passage of the lever 7 and regular opening of the door 4.

Similar operation occurs during the return rotational closing movement of the door, the rounded end of the arm 5, passing again beneath the rounded vertex 12b of the pawl, raises it allowing return rotation as far as the point where the lever 7 rests against the pin 7a, neutralizing the action of the spring 8 with respect to the door 4 which from this moment on is balanced, or recalled during closing, by the spring 14 alone.

It is therefore obvious how, during the normal opening/closing movement of the door, the pawl 9 is inactive and the door 4 itself is balanced by the combined action of the two springs 14 and 8, which intervene in a varying manner during rotation in accordance with the positions where there is the greatest moment determined by the weight of the door itself.

If, however, the door 4 needs to be pulled out (Figure 5), the hinge operates as follows: after reaching the angular position which allows engagement of the bridge-piece 10 with the intermediate hook 5d of the arm 5, the door 4 can be rotated upwards, freeing at the same time the fixed arm 6 from its seat and the hook 5c of the movable arm from the pin 7c of the rod 7 which, recalled by the action of the spring 8, returns back until its free end comes into abutment against the end surface 11c of the pawl 9 which, no longer interacting with the lever 5, has lowered, creating the desired obstacle which keeps the rod 7 in a predetermined position.

In this position it is possible to pull out the door 4 freely and, when operation has been completed, reinsert it by means of an identical reverse manoeuvre.

When the door 4 is inserted, the hook 5c of the movable arm 5 engages again with the pin 7c of the rod 7 and, after lowering the bridge-piece 10 again, freeing it from the hook 5d, the door is brought back into the horizontal position shown in Figure 4, restoring the already described operating condition of the hinge.

It is therefore obvious how, with the hinge according to the invention, it is possible to balance any weight of the door by means of suitable calibration of the two springs 14 and 8, and how the distribution of the balancing force makes it possible to maintain limited dimensions, volume and wear of all the parts which make up the hinge; furthermore, with the hinge according to the invention it is also possible to ensure that the door can be extracted easily and safely.

The support plate 1 may also be provided with safety microswitches 300 designed to cooperate with the movable arm 5 in order to activate/deactivate for example the oven resistances and/or other auxiliary devices for closing/opening of the door 4 itself.

Many variants may be introduced as regards the realization of the parts which make up the invention, without thereby departing from the protective scope of the invention as defined by the claims which follow.

Claims

1. Hinge for the doors (4) of electric household appliances, furniture or the like, comprising a plate (1) which is fixed to the wall (100) of the electric appliance and which has connected to it a first box-shaped guiding element (2), a second box-shaped element (3) connected to the door (4) and carrying a fixed arm (6) and a movable arm (5) which can be connected to each other via associated engaging means (5d, 10) and resilient means (14) for balancing the door (4), characterized in that said fixed plate (1) has hinged on it an additional rod (7) which is subject to the recall action of resilient means (8) and the free end of which has means (7c) designed to engage/disengage with/from the free end of said movable arm (5) during the opening/closing rotational movement of the door, there also being provided a device (9) for stopping the return movement of the rod (7) into the rest position, which can be deactivated by means of the free end of the arm (5) upon each rotation of the door (4) in either direction and activated when the two arms (5, 6) are engaged with one another for extraction of the door itself.

2. Hinge according to Claim 1, characterized in that the free end (5b) of said movable arm (5) has a hook-shaped profile (5c) designed to engage with said means (7c) present on the free end of the lever (7) attached to the fixed plate (1).

3. Hinge according to Claim 1, characterized in that said means provided on the free end of said rod (7) consist of a pin (7c) projecting transversely outwards for engagement with said hook (5c) of the movable arm (5).

4. Hinge according to Claim 1, characterized in that said resilient means for recalling the rod (7) consist of a spring (8), the opposite ends of which are attached respectively to the plate (1) and the said rod (7).

5. Hinge according to Claim 1, characterized in that said device for stopping the return movement of the rod (7) substantially consists of a pawl (9) pivotably hinged on the fixed plate (1) and retained in abutment against a stop (9b) attached to the plate (1) by the thrusting force of resilient means (11).

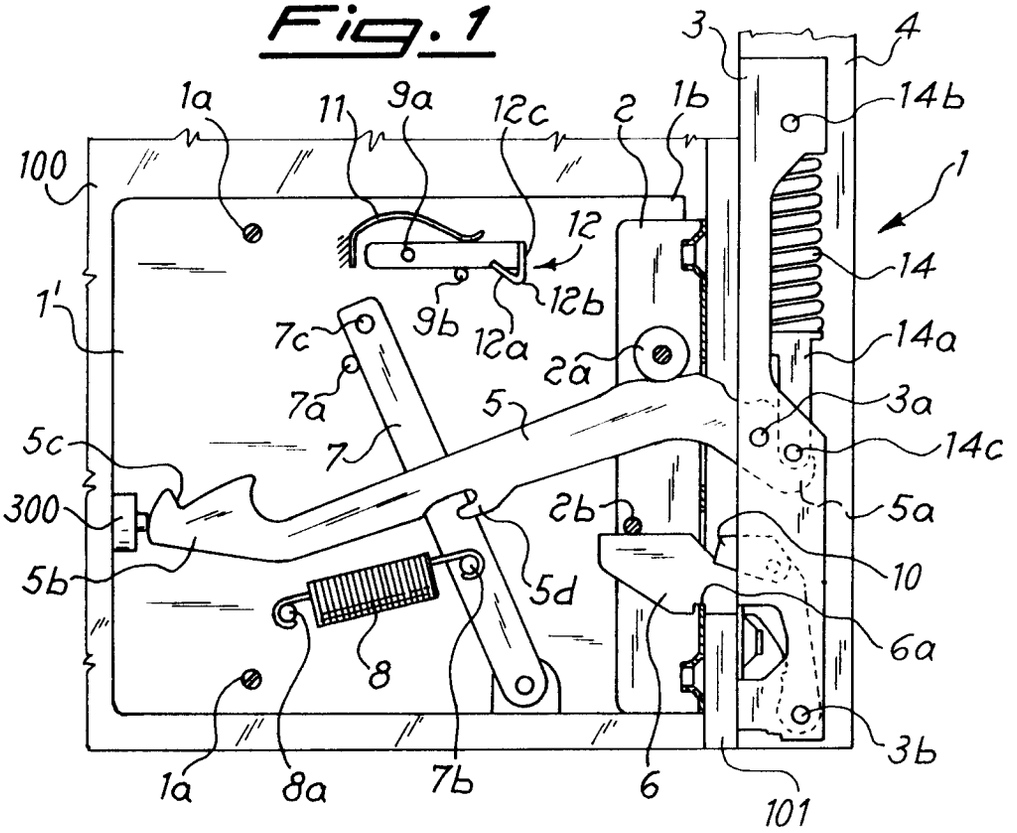
6. Hinge according to Claims 1 and 5, characterized in that said pawl has a free end shaped as a portion (12) folded so as to form an inclined surface (12a), a bottom rounded vertex (12b), and a front abutment surface (12c).

7. Hinge according to Claims 1 and 6, characterized in that said front abutment surface (12c) is designed to come into contact with the free end of the rod (7) as a result of release of the latter by the arm (5) when there is mutual relative engagement of the arm (6) and the arm (5) for extraction of the door (4).

8. Hinge according to Claim 1, characterized in that said resilient means (11) consist of a strip of folded harmonic steel with an end attached to the fixed plate (1).

9. Hinge according to Claim 1, characterized in that said support plate (1) is provided with at least safety microswitch (300) designed to cooperate with the movable arm (5) in order to activate/deactivate the functions and/or auxiliary devices of the electric household appliance in accordance with closing/opening of the door (4) thereof.

Fig.1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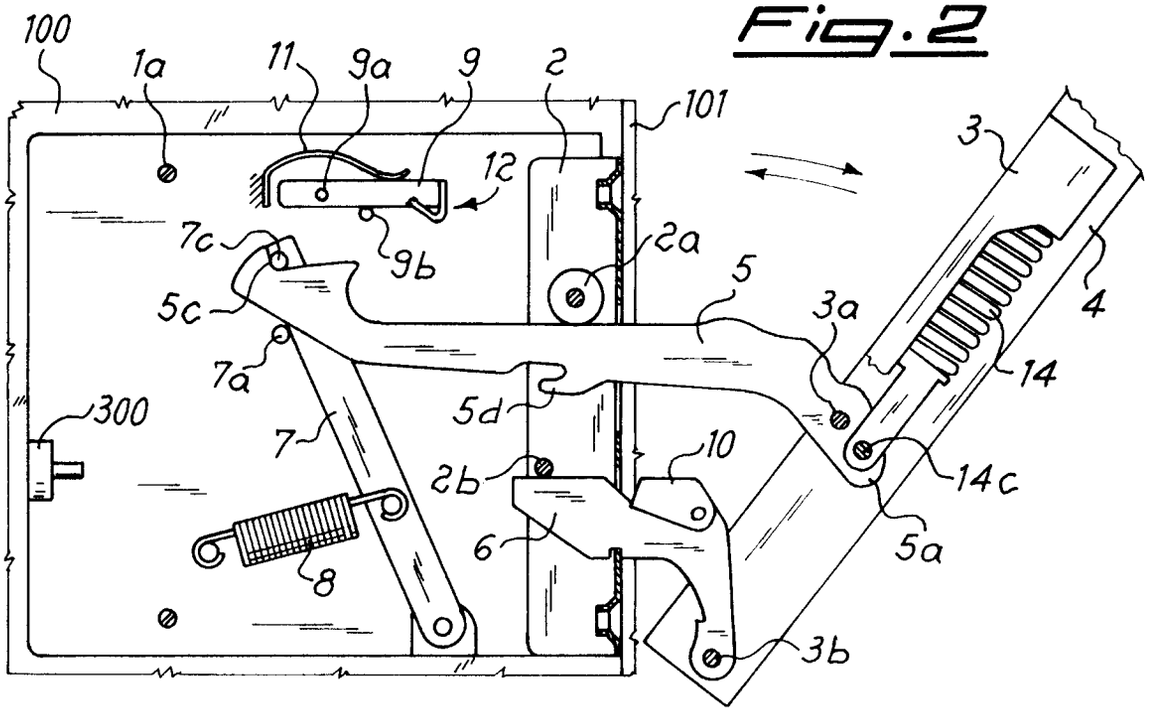
101

Fig.2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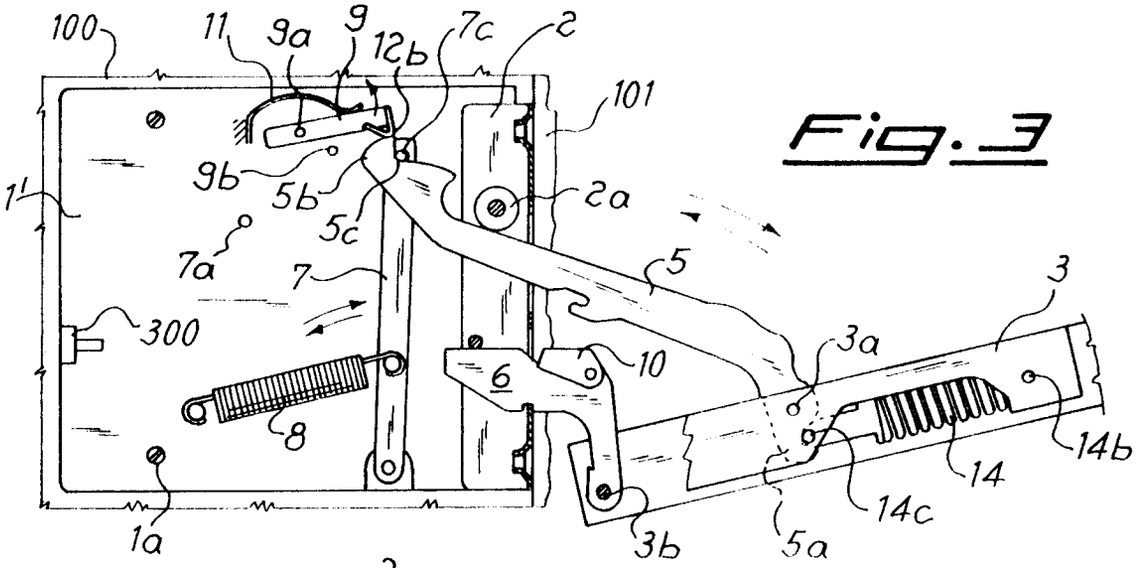

Fig. 3

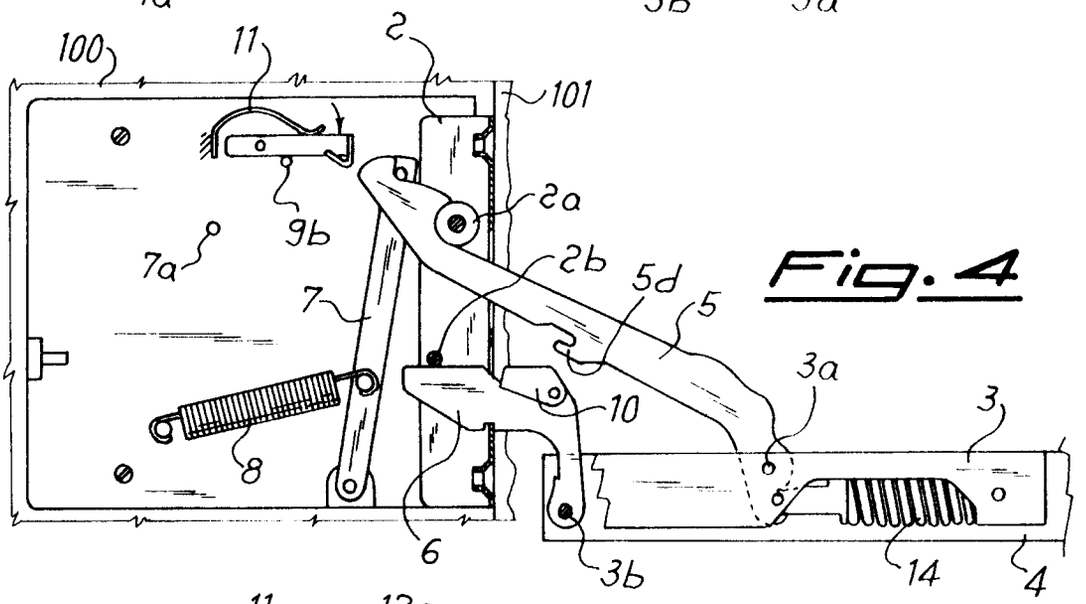

Fig. 4

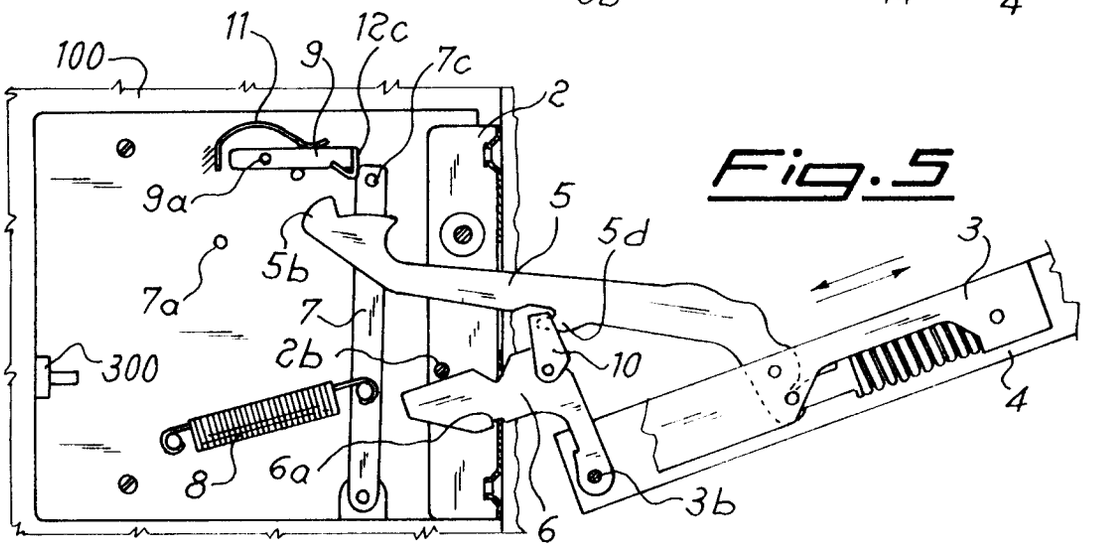

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 1553

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE-U-90 00 217 (NUOVA STAR) * the whole document * ---	1	F24C15/02
A	US-A-3 124 121 (BALTZ) * column 2, line 43 - column 3, line 14; figures * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F24C
E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 September 1996	Van Kessel, J

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
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P : intermediate document

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E : earlier patent document, but published on, or after the filing date
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