



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 0 859 197 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.08.1998 Bulletin 1998/34

(51) Int. Cl.⁶: **F24C 15/02**

(21) Application number: **98102687.5**

(22) Date of filing: **17.02.1998**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **17.02.1997 IT BO970069**

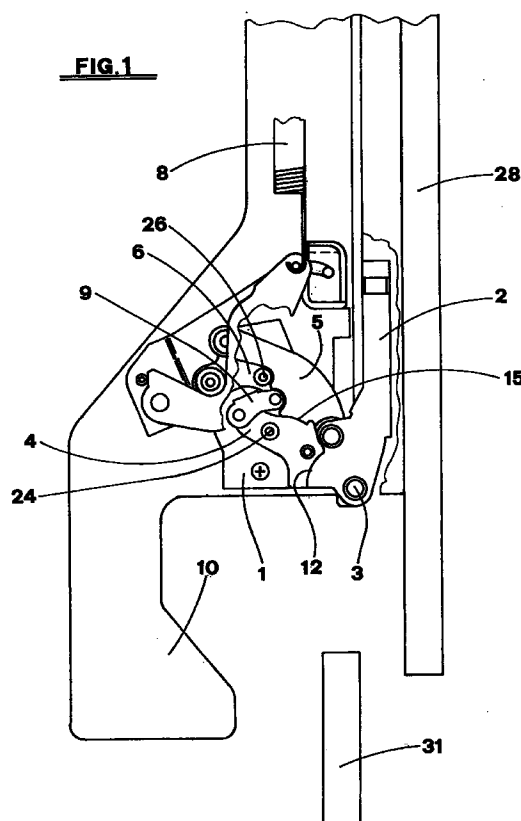
(71) Applicant: **C.M.I. S.r.l.**
Crespellano, (Bologna) (IT)

(72) Inventors:
• **Gherardi, Eros**
Bologna (IT)
• **Ghidini, Teresa**
Bologna (IT)
• **Degli Esposti, Ermes**
Bologna (IT)

(74) Representative: **Negrini, Elena**
Studio Ing. Giampaolo Agazzani
Via Varthema 21
40137 Bologna (IT)

(54) **Hinge device, particularly for the door of household electric appliances and the like, having upward and outward movement of the door during opening**

(57) The hinge device, particularly fit to be used with a door (28) of household electric appliances and the like, includes a coupling element (1), fastened to the appliance structure (10), with a rocker arm element (4) joined thereto and having a pivot (3) for the door support by means of a support element (2). The coupling element also binds a pivoting plate (6) to which is connected a shaped segment (5) hinged with an end to the support element (2). A connection element (9) joins the pivoting plate (6) to the rocker arm element (4) in opposite position with respect to the pivot (3) connected to the support element (2). The door opening defines, by means of the shaped segment (5), the oscillation of the plate (6) that, by means of connection element (9), rotate the rocker arm element (4) moving the pivot (3) upward and outward, while a counterbalancing spring (8) acts on the plate (6) by means of a L-lever (11). In this way the bottom of the door (28) can pass above a baseboard (31) placed for covering the free space under the appliance (10).



EP 0 859 197 A2

Description

The present invention concerns the production of components for household electric appliances and the like.

It is known that the appliance doors such as ovens, dishwashers and the like, are fixed to the frame structure of the household electric appliance by means of hinge devices allowing the door rotation between a closed and opened position.

Under said doors there is often a baseboard which covering the unaesthetic empty space between the bottom of the appliance and the floor.

In some cases, the rotation center doesn't coincide with the bottom of the door frontal panel, which therefore must be kept raised from the baseboard top, allowing the free rotation of the door. This mutual spaced misplacement of the door frontal panel from the baseboard top doesn't allow to cover in optimal way the empty space between the appliance bottom and the floor, therefore the baseboard function is partially reduced.

On the contrary, in view of getting an acceptable effect the door panel bottom should be to a lower level in comparison with the baseboard top, but this would not allow the door opening because the panel bottom should contact the baseboard top edge.

The object of the present invention is to realize a hinge device allowing a door misplacement with respect to the baseboard without hindering the door opening and closing.

A further object of the invention is to realize said hinge device maintaining a structure having great constructive and functional simplicity, as well as economic structure under the productive profile.

Said object is achieved according to the claim content.

The features of the invention are underlined in the following, with particular reference to the enclosed drawings, in which:

- figure 1 shows a lateral view of the hinge device in object, at a closing position, with some elements partially removed for allowing the vision of others;
- figures 2 and 3 show corresponding view of the device in figure 1, but at different positions of partial opening;
- figure 4 shows corresponding view of the device in figure 1, when the hinge is completely opened.

The hinge device of the present invention is used particularly with a door 28 to be assembled on household appliances and the like.

Generally, two hinge devices of the here described type are used for assembling a door, which are applied, for instance, in correspondence of the two lower angles of the opening to be closed by the door.

For simplicity, it will make reference in the follow, to one hinge device only, keeping in mind that the con-

structive and functional considerations are the same for the other possible hinge device used.

With reference to the aforesaid figures, number 1 indicates a coupling element of the hinge device, constituted by a plate suitably shaped fixed to the appliance structure 10, for instance by means of screws 30, shown in figure 2.

The coupling element 1 supports, pivoted at a fulcrum 24, an elongated pivoted element 4 that is a rocker arm element pivotable on a vertical plane parallel to the coupling element 1.

The end of the rocker arm element 4 disposed toward the door 28 has a transversal pivot 3 with the horizontal axle perpendicular to the rocker arm element with a support element 2, fixed to the door 28, linked thereto. The support element 2 is made, in a known way, with a sheet metal element fixed longitudinally to the door 28.

For every door 28 two support elements 2 are generally used, for instance, in correspondence of the lower angles.

For simplicity, in the follow it will make reference to one support element 2 only, keeping in mind that another support element is used in correspondence of the other angle of the door 28.

It results that the rotation center of the door 28 is on the axle of the pivot 3 as to the appliance 10. Therefore, according with the invention, by pivoting the rocker arm element 4, the pivot 3 could be moved, and therefore the rotation center of the door 28, upward and outward, or respectively downward and inward, allowing the lower edge of the door to pass over the baseboard 31 during the first portion of the opening operation, as well visible in figure 3.

Moving means, acting on the rocker arm element 4, depending on the opening angle of said door 28, are provided to cause the rocker arm element pivoting.

Said moving means include a series of elements described as following in an illustrative and not limitative embodiment, and the inventive concept is based on having disposed the door rotation center on a pivoting element.

Firstly is provided an oscillating plate 6 hinged to the coupling element 1, in correspondence of a pivot 26, in such a way to pivot on a plan parallel to said coupling element 1.

The oscillating plate 6 is above the rocker arm element 4, and has some protrusions in correspondence thereto hinge connections 20, 21, 22, are carried out, well shown in figure 4. Obviously it is possible to carry out the plate without protrusions, providing that the mutual misplacing of the hinge connections is guaranteed.

A first hinge connection 20, placed between the others two, pivotally supports a roll 13, whose function, described in detail in the follow, consists in acting on the plate 6 with counterbalancing means 8, 11.

A second hinge connection 21 is connected to the

end of the rocker arm element 4, opposite to the door 28, by means of an elongated connection element 9. The connection element 9 is hinged to the rocker arm element 4 in correspondence of a fulcrum 29 (figure 3).

The connection point 22 of the pivoting plate 6, opposite to the connection point 21 joined to the rocker arm element 4 by means of the connection element 9, is connected to the door 28 by means of a shaped segment 5 that is hinged to a pivot 7 just above the pivot 3, on the support element 2 fixed to the door 28.

Said counterbalancing means 8, 11 oppose the door 28 weight, according to known techniques, particularly with a variable elastic reaction depending on the door opening. In fact, the door stress on the counterbalancing means varies depending on the door opening degree.

In this case, the counterbalancing means include a L-shaped lever 11 with an end hinged to the coupling element 1 and the other one fastened to an elastic element 8 that is a spring subjected to a tensile stress. The roll 13, pivotally supported by the pivoting plate 6 at the central connection point 20, rolls on the sides delimiting the smallest angle defined by the two angle section of the L-lever 11.

The spring 8 is vertically displaced above the plate 6 and exerts an upwardly traction at the end of L-lever 11 fastened thereto.

The effect is to give a rotation stress to the plate 6 determining a traction, transmitted by the shaped segment 5, to the door 28 in opposition to its opening, therefore getting a counterbalancing effect.

The variability of the counterbalancing effect is obtained by suitably shaping the inner part of the L-lever. In the present case, the surface run by the roll 13 has a wedge shape 25, so that in the first portion, between the angle of the L-lever and the top of the wedge 25, the traction on the door is greater than in the portion over the wedge top.

With the door 28 in closing position the roll 13 is in correspondence with a complementary seat 17 defined in the cross point between the two angle sections forming the L-lever 11.

Finally there are stop members 12, 15; 14, 16 designed to determine the stop position during the opening of the door 28.

Such stop members are made by providing complementary and opposite surfaces 12, 15 on the support element 2 and on the shaped segment 5, designed to mutually engage to define the maximum door opening position (figure 4), in cooperation with two complementary and opposite surfaces 14, 16 of the rocker arm element 4 and of the pivoting plate 6 mutually engaging.

In practice, when the door 28 is opened it determines, pivoting on the pivot 3, a traction onto the shaped segment 5 so causing the rotation of the pivoting plate 6. This latter exerts a traction on the rocker arm element, by means of the connection element 9, and determines the lifting and the outward moving of the

hinge point, coincident with the pivot 3 of the door during the first portion of the opening.

Then, the door bottom can pass above the baseboard 31, as well shown in figure 3.

In the second opening portion, namely from 45-50 degrees on, the pivot 3 returns to go down and to move inward, but this doesn't cause any problem, since the door bottom has already passed the baseboard top 31.

The roll 13 acts in traction on the spring 8 during this movement.

During the door closing, the component movements have inverse way.

The components, particularly the shaped segment 5, may have some notches and some seats 51, 52 (suitably indicated in figure 4) designed to house parts or ends of the other components, in their extreme positions (see figure 1).

This allows to get a more compact configuration and to place more component on the same vertical plane.

It is understood that all that has been described is not limitative, then possible constructive variations, for instance the moving means 5, 6, 9 may be of different type and shape on condition that they are fit to pivot the rocker arm 4 for moving upwardly the pivot 3 depending on the door opening, are intended to be within the present technical solution, as above described and in the follow claimed.

Claims

1. Hinge device, particularly for the door (28) of household electric appliances and the like, having a coupling element (1) fixed to the structure (10) of the appliance; a support element (2) fastened to said door (28) and hinged to said coupling element (1) in correspondence of a transversal pivot (3); counterbalancing means (8, 11) designed to oppose the effect of the door weight (28); stop members (12, 15; 14, 16) designed to define the opening stop position of the door (28); said device being characterized in that said pivot (3) is supported by a pivoting element (4) hinged to said coupling element (1), and that there are moving means (5, 6, 9) working on the pivoting element (4) to define an upward and an outward movement of said pivot (3) depending on the opening angle of said door (28).
2. Device according to claim 1, characterized in that said pivoting element (4) includes a rocker arm element (4) having the free end, opposite with respect to the pivot (3) joined to the door (28), bound to said moving means on with said counterbalancing means (8, 11) acting thereon.
3. Device according to claim 2, characterized in that said moving means include: a pivoting plate (6)

hinged to said coupling element (1) and subjected to said counterbalancing means (8, 11); a shaped segment (5) having its ends hinged to an hinge connection (22) of said pivoting plate (6) and to said support element (2), fixed to the door (28); a connection element (9) joining an hinge connection (21) of said pivoting plate (6), opposite with respect to the hinge connection (22) joined to the shaped segment (5), at the end of said rocker arm element (4) opposite to said support element (2).

4. Device according to claim 3, characterized in that said pivoting plate (6) is placed above said rocker arm element (4) and that said shaped segment (5) is joined to the door (28) in correspondence of a second pivot (7) placed above said pivot (3).
5. Device according to claim 3, characterized in that said counterbalancing means comprise a L-shaped lever (11), hinged with an end to said coupling element (1) and with the opposite end fastened to an elastic element (8), with a roll (13) pivotally supported by said pivoting plate (6) and rolling on the sides delimiting the smallest angle defined by said L-lever (11).
6. Device according to claim 5, characterized in that said elastic element (8) is constituted by a spring exerting a traction force.
7. Device according to claim 5, characterized in that in the closing position of said door (28), said roll (13) is in correspondence of a complementary seat (17) defined in the cross point between the two angle sections forming said L-lever (11).
8. Device according to claim 5, characterized in that the inner surface of said L-lever (11), run by said roll (13), has a wedge shape (25).
9. Device according to claim 3, characterized in that said support element (2) and shaped segment (5) are interested by complementary an opposite surfaces (12, 15) designed to mutually engage for defining the maximum opening position of the door (28), in cooperation with two complementary and opposite surfaces (14, 16) interesting said rocker arm element (4) and said pivoting plate (6) and mutually engaging.

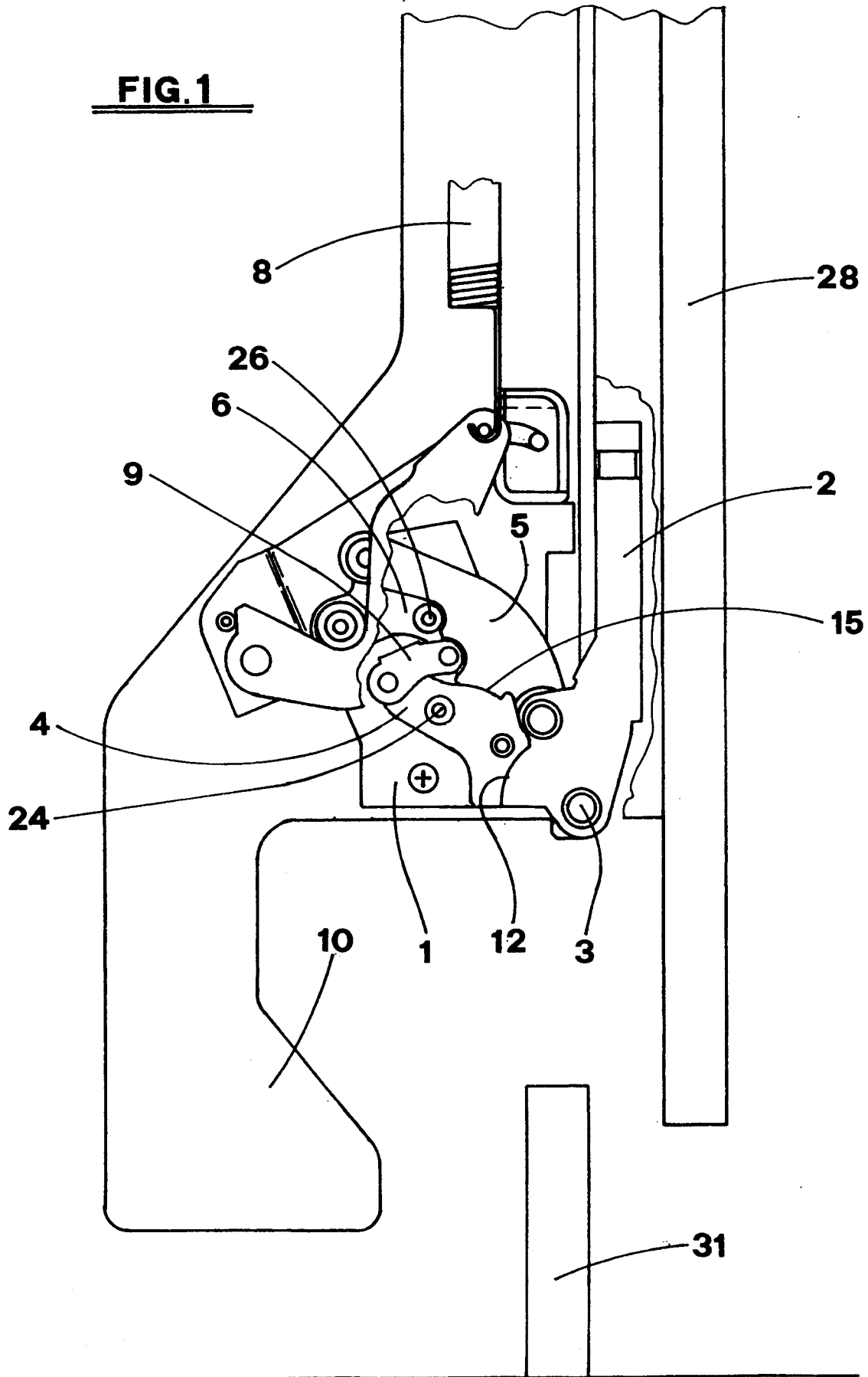


FIG. 2

