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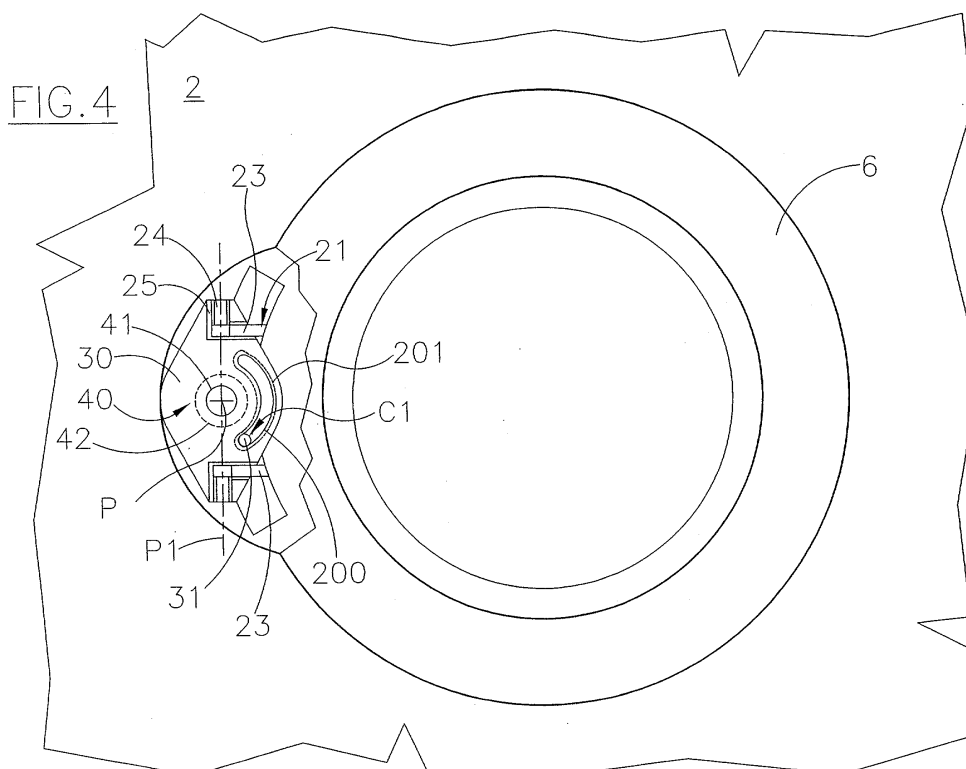
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(54) **Electrical household appliance with door for the closing of an internal chamber**

(57) An electrical household appliance is described comprising an internal chamber (3) and a structure with a front panel (2) provided with an opening (5) for the access to said internal chamber (3). The electrical household appliance (1) comprises a door (6) suitable to close said opening (6) and means for the hinging (7) of the door (6) to the rim (8) of the opening (5); the hinging means (7) are suitable to move the door (6) from a closing position (A) of said opening (5) to an opening

position (B) for the access to the internal chamber (3). The electrical household appliance (1) comprises means for the coupling (9) of the door (6) to the front panel (2) suitable to cooperate with said hinging means (7) in order to assure the closing position (A) of the door (6) and operable in order to allow the opening of the door (6). The hinging means (7), after the operation of said coupling means (9), are suitable to determine the opening position (B) by means of the movement of the door (6) upward.



Description

[0001] The present invention refers to electrical household appliance with door for the closing of an internal chamber.

[0002] Currently there are electrical household appliances comprising a structure with a front panel provided with an opening for the access to an internal chamber of the electrical household appliance and a door to close said opening. Electrical household appliances made in this way are, for instance, laundry washing-machines with front loading in which a drum suitable to contain the laundry to be washed is situated in a central position of the laundry washing machine and has an opening on the front of the machine. Such revolving drum is mounted in a container, called washing tub, destined to contain the washing water and equipped for the anchorage of suspension organs which allow it to remain suspended inside a cabinet containing the laundry washing machine.

[0003] The front opening of the washing drum is closed by transparent door hinged to the front panel of the cabinet and openable toward the outside of the machine by means of rotation on an axis parallel to the front panel of the machine. This determines an operating dimension of the same laundry washing-machine greater than the volume relative to the physical dimensions of the machine. In fact, with washing machine with open door, most part of the door projects frontally as regards the shape of the cabinet and it is therefore necessary to consider, in conditions of installation of the washing machine, the space relative to the opening of the door. In particular the front opening space of the door is the most penalising since it adds the dimension of the door to the dimension of depth of the electrical household appliance.

[0004] In view of the state of the art herein described, it is an object of the present invention to provide an electrical household appliance with door for the closing of an internal chamber which, in operating conditions, has dimensions smaller than the known electrical household appliance.

[0005] According to the present invention, such object is attained by means of an electrical household appliance comprising an internal chamber and a structure with a front panel provided with an opening for the access to said internal chamber, said electrical household appliance comprising a door suitable to close said opening and means for hinging of the door to the rim of the opening, said hinging means being suitable to move said door from a closing position of said opening to an opening position for the access to the internal chamber, said electrical household appliance comprising coupling means of the door to the front panel suitable to cooperate with said hinging means in order to assure the closing position of said door and operable in order to allow the opening of the door, characterised in that said hinging means, after the operation of said coupling means,

are suitable to determine said opening position by means of the movement of said door upward.

[0006] Owing to the present invention it is possible to provide an electrical household appliance with a door for the closing of an internal chamber that is easier to install as compared with the known electrical household appliance.

[0007] The characteristics and the advantages of the present invention will become evident from the following detailed description of an embodiment thereof, which is illustrated as a non-limiting example in the enclosed drawings, in which:

Figure 1 is a perspective view of a laundry washing machine according an embodiment of the present invention;

Figure 2 is a transversal view in section of the front part of the machine in Figure 1 with door closed;

Figure 3 is a transversal section view similar to the one in Figure 2 but with door uncoupled from the front panel of the machine;

Figure 4 is a schematic front view of the machine in Figure 1 with door closed;

Figure 5 is a schematic front view of the machine in Figure 1 with door open;

Figure 6 is a schematic front view of a laundry washing machine according to a variation of the embodiment of the present invention.

[0008] With reference to Figures 1-5 a front loading laundry washing machine 1 is shown provided with a front panel 2 and with an internal chamber made up of drum 3 revolvingly mounted in a washing tub. The drum 3 is provided with of an opening lined up with an opening 5 of front panel 2 for the access to drum 3.

[0009] The machine 1 is provided with a door 6 suitable to close the opening 5 and means 7 for the hinging of the door 6 to the rim 8 of the opening 5. The hinging means 7 are suitable to move said door 6 from a closing position A of said opening 5 to an opening position B for the access to the drum, as better visible in Figures 2-5.

[0010] The machine 1 comprises means 9 for the coupling of the door 6 to the front panel 2 which are suitable to cooperate with said hinging means 7 in order to assure the closing of said door. The coupling means 9 are operable in order to allow the opening of the door 6.

[0011] The hinging means 7, after the operation of said coupling means 9, are suitable to determine said opening position B by means of movement of the door 6 upward, preferably by means of a rotation around an axis P transversal to same door 6.

[0012] The hinging means 7 comprise a first part 20 and a second part 30 facing each other and hinged to each other by means of additional means 40, preferably made up of a ball joint comprising a spherical cavity 42 of the first part 20 and a sphere 41 integral with the second part 30 and arranged inside the cavity 42. Said additional means 40 allow the rotation of said second part

30, that it is integral with the door 6, as regards said first part 20 around an axis P that passes through the ball joint 40 and is transversal to the door 6, as better visible in Figures 2 and 3.

[0013] Instead of the ball joint 40 it is possible to use a joint made up of a pin that is capable to rotate inside a cylindrical cavity; the pin and the cavity have longitudinal axis transversal to the door 6 and corresponding to the axis P.

[0014] The first part 20 is provided with a pair of arms 21 having each one an end 22 integral with the rim 8 of the opening 5 of the front panel 2 and the other end 23 provided with a vertical pin 24 arranged inside vertical cavities 25 obtained in the first part 20. Said arms 21 allow a movement of rotation, by a small angle D, around a vertical axis P1 parallel to the front panel 2 and passing through the pins 24, of the first part 20 and of the elements connected with it, that is the second part 30 and the door 6 in such a way so that the same door 6 gets in an intermediate position A1. The part 20 is provided also with a doorstop 26 suitable to go in abutment with the front panel 2 in order to limit the movement of rotation of the part 20 around the axis P 1 passing through the pins 24, that is in order to limit the angle D. Said angle D is such as to determine movement of the door 6 away from the front profile of the panel 2 necessary to allow the movement upward of said door 6, as visible in Figure 3.

[0015] The first part 20 comprises also an arched cavity 200 facing the part 30 and in which a pin 31 of the same part 30 can slide. The ends of the arched cavity 200 make up end of stroke elements of the pin 31 on the cavity 200, as visible in Figure 4.

[0016] The coupling means 7 also comprise doorstop elements 27 of the door 6 in the positions that this can assume during the rotation between the position A1 and the opening position B. Said doorstop elements 27 are preferably associated with the pin 31 and, in the case in which the cavity 200 is pierced and in the case in which the cavity 200 belongs to the first part 20 and the pin belongs to the second part 30, they consist in a spring device made up of a spring 28 compressed between a contrast element 29 integral with the pin 31 and the rim 201 of the cavity 200, as visible in Figures 2 and 3.

[0017] The coupling means 9 comprise a bolt 91 suitable to connect the door 6 with the rim 8 of the opening 5 of the front panel 2 and a push-button 92 suitable to operate on said bolt 91 in order to release it and assure the uncoupling of the door 6. The coupling means 9 and the hinging means 7 are such as to assure the watertightness of the door 6 during all the various washing stages of the machine 1. The closing of the door 6 is obtained by means of action of pressure on the same door 6 toward the panel 2 in order to determine the action of bolt 91.

[0018] The door 6 has an internal surface 61 having a concave central part 62 which couples with a convex peripheral part 63. The shape of said door 6 allows to

reduce the angle D of rotation around the axis P1.

[0019] With the door 6 in closing position A it is necessary to operate on the push-button 92 in order to obtain the release of the bolt 91 and the consequent uncoupling of the door 6.

[0020] With the door 6 uncoupled, the same door 6 gets arranged in the intermediate position A1 after rotation around the axis P1 of the angle D; said angle D is such as to allow the movement of the door 6 away from the front profile of the panel 2. The rotation of the angle D takes place in automatic way because of the pressure of the door 6 on the tightness rim in the position A. A greater rotation of the door 6 around the axis P1 is prevented by the doorstop 26 of the part 20 which can go in abutment with the front panel 2.

[0021] With the door 6 in position A1 the same door can be moved upward from a user in order to determine the access to the drum 3 of the laundry washing machine. In fact, by applying a force upward to the door 6, the ball joint 40 determines its counter-clockwise rotation around the axis P transversal to the axis P1 and to the same door 6 and transversal to the front panel 2 by less than an angle equal to the angle D.

[0022] During the rotation of the door 6 around the axis P the sphere 42 rotates inside the cavity 41 and the pin 31 slides in the arched cavity 200 from a position C1 corresponding to one end of the cavity 200 up to a corresponding position C2 at the other end of the arched cavity 200.

[0023] When the pin 31 reaches the position C2 the opening position B of the door 6 is determined; the ends of the arched cavity 200 function also as end of stroke element for the rotation of the door 6 since they limit its rotation.

[0024] The doorstop element 27 associated with the pin 31 allows the door 6 to remain in the opening position B thus preventing the same from falling. In fact the spring 28 is arranged around the same pin 31 between the contrast element 29 integral with the pin 31 and the rim 201 of the cavity 200 that is opposite to the element 29; the spring 28 functions as doorstop element of the door 6 in the position B and in any position along the cavity 200 in which the pin 31 can be. The action of the spring 28 is to expand itself thus forcing the element 29 to move away from the rim 201; this action can be such as to overcome the weight of the door 6 and to make it remain in the opening position B or in any other position that said door can assume between the position A1 and the position B. The spring 28 must be made, that is opportunely dimensioned and calibrated, so as to allow the aforesaid operation of stop of the door 6.

[0025] In order to close the door 6 for example after having loaded the drum 3 with the laundry to be washed or to have unloaded the drum from the washed laundry, it is necessary to operate on the door by applying a force downward in such a way so as to determine a clockwise rotation around the same axis P. When the pin 31 will reach the position C1 the position A1 of the door 6 will

be determined again. The thrust action of the door 6 toward the front panel 2 determines the action of closing of the bolt 91 and therefore the closing position A of the door 6.

[0026] As an alternative it is possible that the arched cavity 200 belongs to the part 30 and the pin 31 belongs to the part 20 so that it is the arched cavity 200 to slide on the pin 31.

[0027] With the laundry washing machine 1 the spaces due to the opening of the door are remarkably reduced as compared with the known washing-machines. In fact the front opening of the door determines a space due to the depth of the laundry washing machine and to the dimension of the door. Said space can be very disadvantageous in case of small rooms or structures next to the laundry washing machine.

[0028] The hinging means 7 can be arranged in various zones along the rim 8 of the front panel 9. In some of them, as visible in Figure 6, said hinging means 7 allow the door 6 in opening position B to be contained in the lateral profile 300 of the laundry washing machine or also said door not to project as regards the lateral profile 300 of the laundry washing machine 1. In that way it is also possible to reduce lateral spaces taken up by the laundry washing machine 1 to the prejudice of a greater space above.

[0029] The inventive solution of the door movable upward in order to determine the access to the drum 3 can be used also for washing-machines with inclined tub.

Claims

1. Electrical household appliance comprising an internal chamber (3) and a structure with a front panel (2) provided with an opening (5) for the access to said internal chamber (3), said electrical household appliance (1) comprising a door (6) suitable to close said opening (6) and means (7) for hinging the door (6) to the rim (8) of the opening (5), said hinging means (7) being suitable to move said door (6) from a closing position (A) of said opening (5) to an opening position (B) for the access to the internal chamber (3), said electrical household appliance (1) comprising means for the coupling (9) of the door (6) to the front panel (2) suitable to cooperate with said hinging means (7) in order to assure the closing position (A) of said door (6) and operable in order to allow the opening of the door (6), **characterised in that** said hinging means (7), after the operation of said coupling means (9), are suitable to determine said opening position (B) by means of the movement of said door (6) upward.
2. Electrical household appliance according to claim 1, **characterised in that** said hinging means (7) are suitable to rotate the door (6) upward around an axis (P) transversal to the same door (6) in order to determine said opening position (B) of the door (6).
3. Electrical household appliance according to claim 1 or 2, **characterised in that** said hinging means (7), after the operation of said coupling means (9), determine a rotation of the door (6) around an axis (P1) parallel to the front panel (2) in order to determine an intermediate position (A1) of said door (6) in which this is moved away from the profile of the front panel (2) in such way so as to allow the subsequent movement upward in order to reach said opening position (B).
4. Electrical household appliance according to claim 3, **characterised in that** said rotation of the door (6) around said axis (P1) parallel to the front panel (2) is limited by the abutment of a doorstep (26) of said hinging means (7) with said front panel (2).
5. Electrical household appliance according to claim 3, **characterised in that** said hinging means (7) comprise additional means (40) suitable to determine a rotation of the door (6) upward around an additional axis (P) transversal to said axis (P1) parallel to the front panel (2) or transversal to said door (6) in order to determine said opening position (B) of the same door (6).
6. Electrical household appliance according to claim 5, **characterised in that** said hinging means (7) comprise a first part (20) and a second part (30), said second part (30) being rotatable as regards said first part (20).
7. Electrical household appliance according to claim 6, **characterised in that** said hinging means (7) comprise end of stroke elements (200, 31) of said door (6) in the opening position (B) and the closing position (A).
8. Electrical household appliance according to claim 7, **characterised in that** said hinging means (7) comprise an arched cavity (200) belonging to one of said first (20) and second (30) part and a pin (31) belonging to the other one of said first (20) and second (30) part, said pin (31) being sliding in said arched cavity (200) and said end of stroke elements (200, 31) being made up of the ends of said arched cavity (200).
9. Electrical household appliance according to claim 8, **characterised in that** said hinging means (7) comprise doorstep elements (27) of said pin (31) in the positions that it can assume along the arched cavity (200).
10. Electrical household appliance according to claim 8, **characterised in that** said doorstep elements

(27) are associated with said pin (31), said doorstep elements (27) comprising a spring device (27) suitable to allow the locking of said pin (31) in the positions that it can assume along the arched cavity (200) by means of compression of a spring (28) between the rim (201) of said cavity (200) and an element of contrast (29) integral with said pin (31). 5

11. Electrical household appliance according to claim 5, **characterised in that** said additional means (40) 10
comprise a ball joint.
12. Electrical household appliance according to claim 6, **characterised in that** said additional means (40) 15
comprise a pin revolvable in a cylindrical cavity having the longitudinal axis parallel to said additional axis (P).
13. Electrical household appliance according to claim 1, **characterised in that** said hinging means (7) are 20
connected in a zone of the rim (8) of the opening (5) of said front panel (2) in such a way that said door (6), in position of opening (B), is contained in the lateral profile (300) of said structure. 25
14. Electrical household appliance according to claim 1, **characterised in that** said hinging means (7) are 30
connected in a zone of the rim (8) of the opening (5) of said front panel (2) in such a way so as to prevent that said door (6), in position of opening (B), to project as regards the lateral profile (300) of said structure. 35
15. Electrical household appliance according to claim 1, **characterised in that** said electrical household 40
appliance is a laundry washing machine.
16. Electrical household appliance according to claim 1, **characterised in that** said electrical household 45
appliance is a laundry dryer machine. 50
- 55

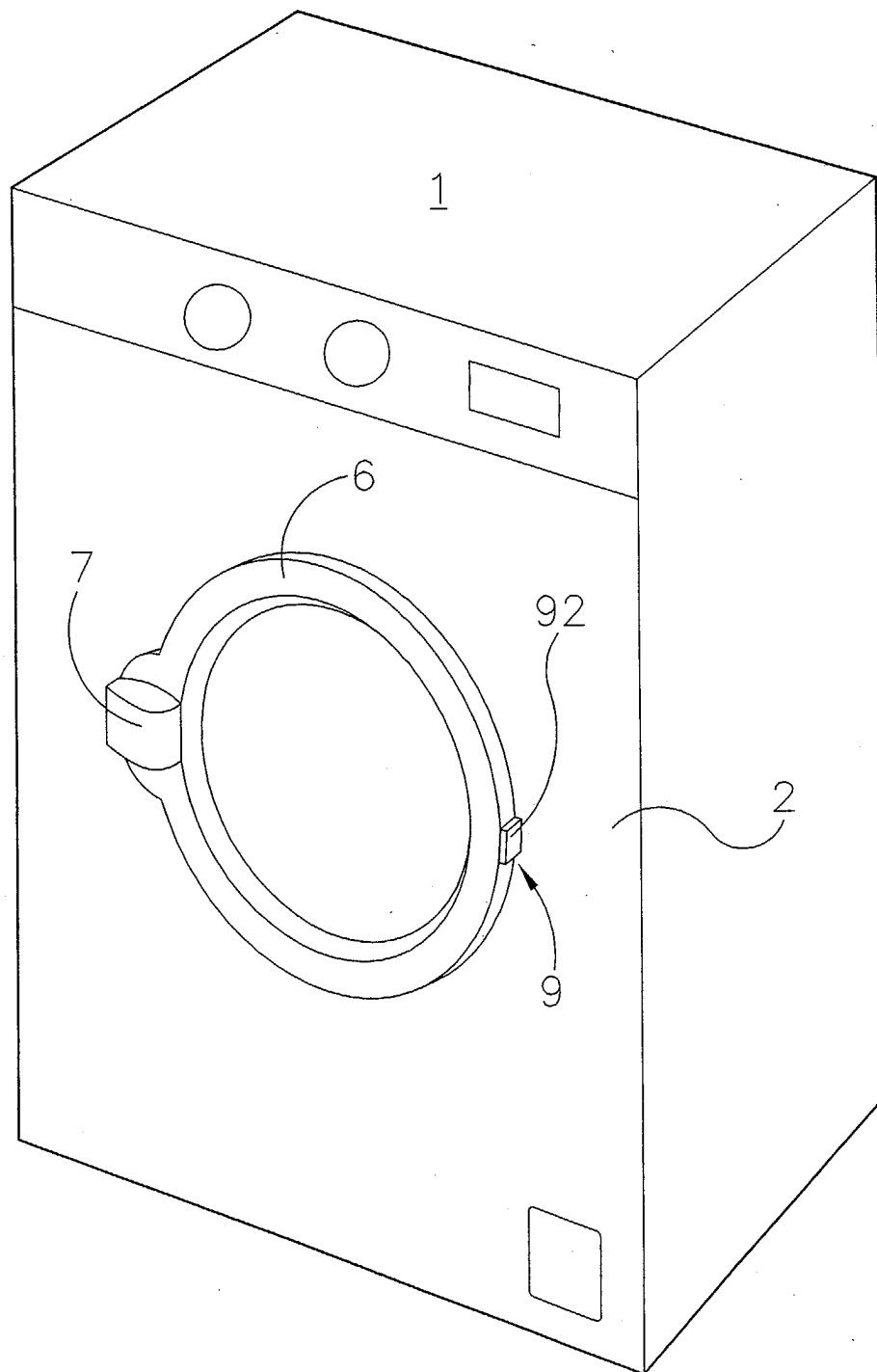


FIG. 1

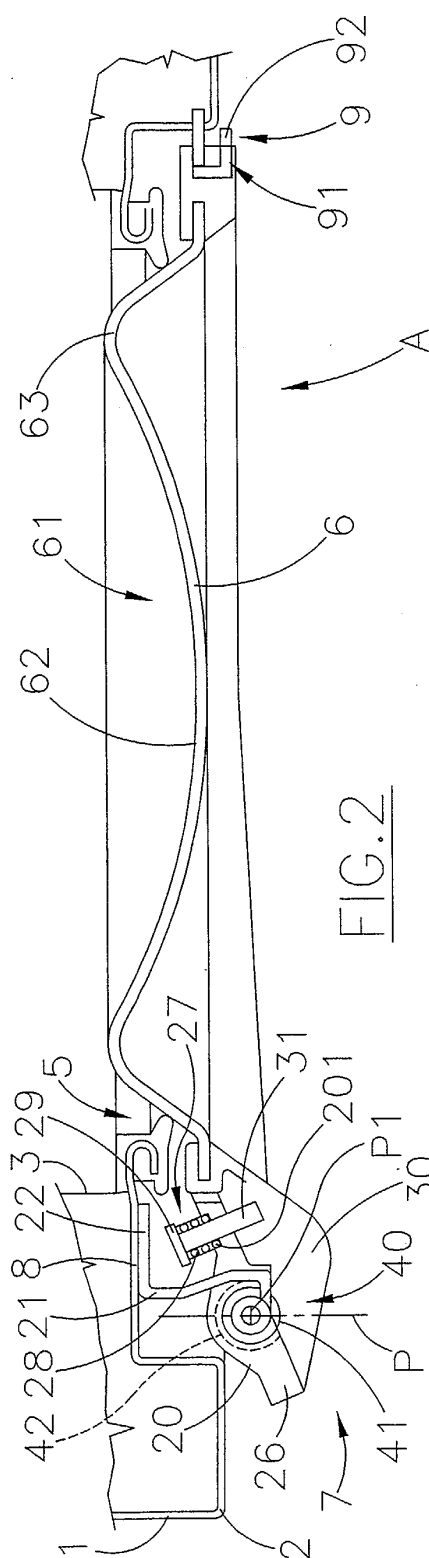


FIG. 2

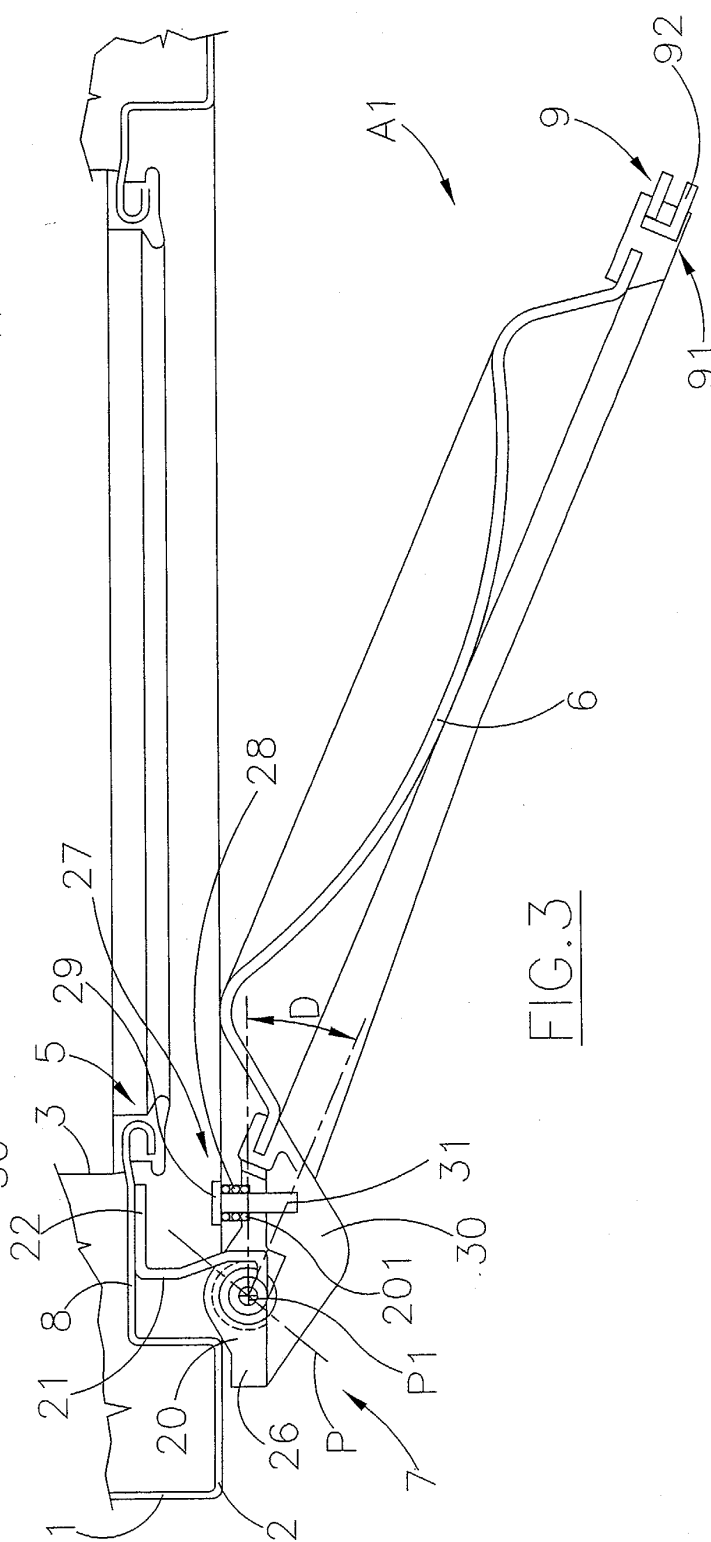
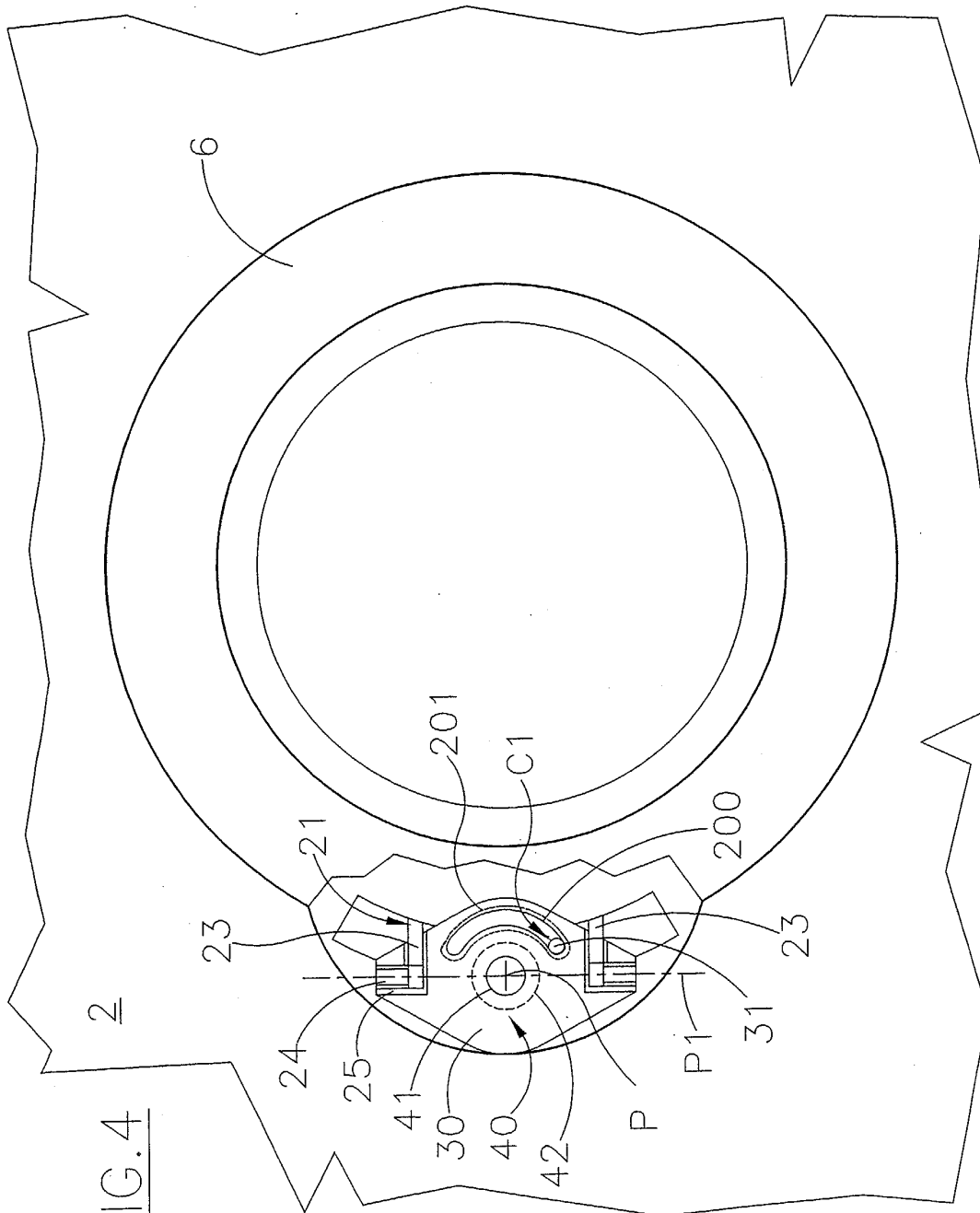
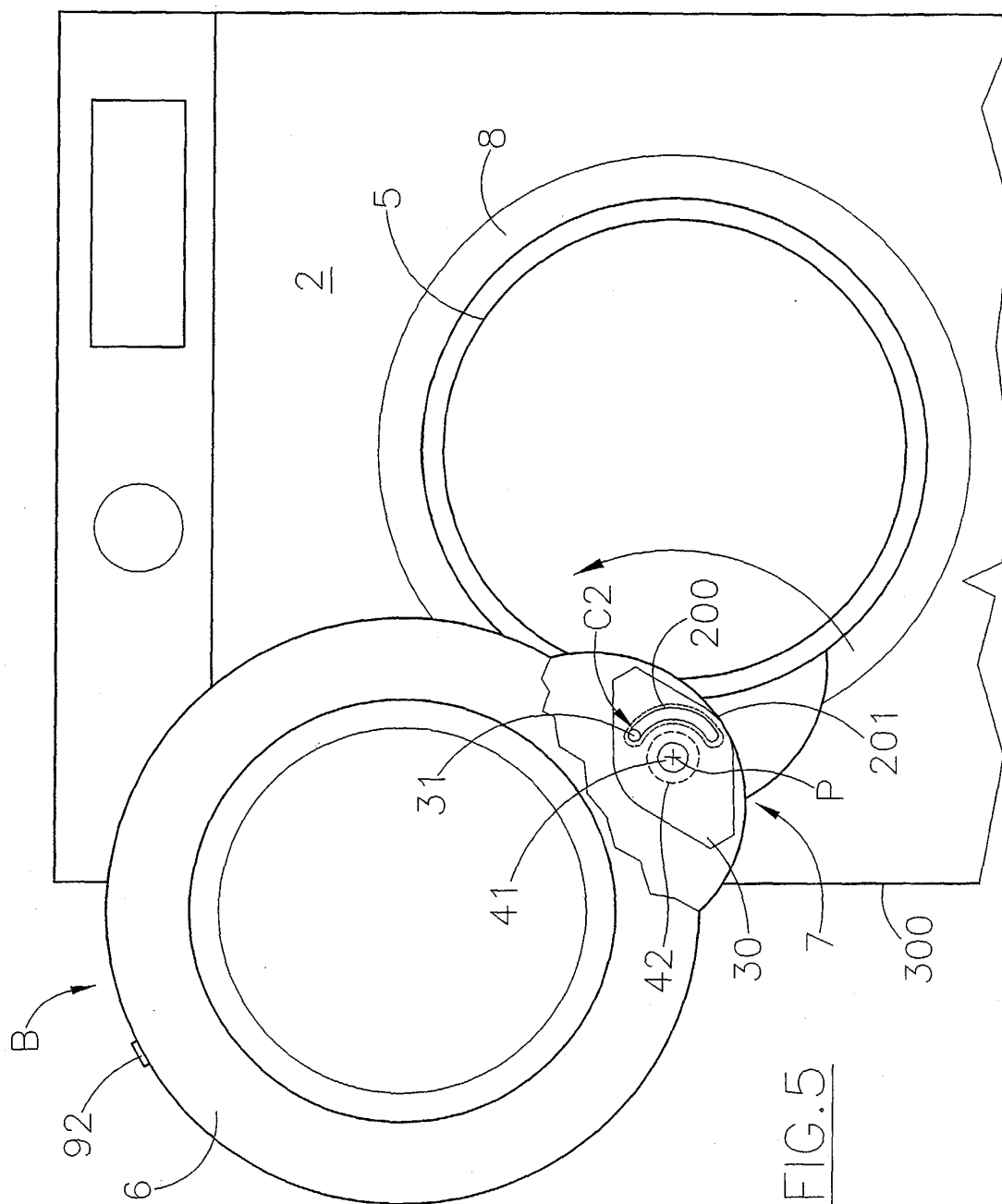


FIG. 3





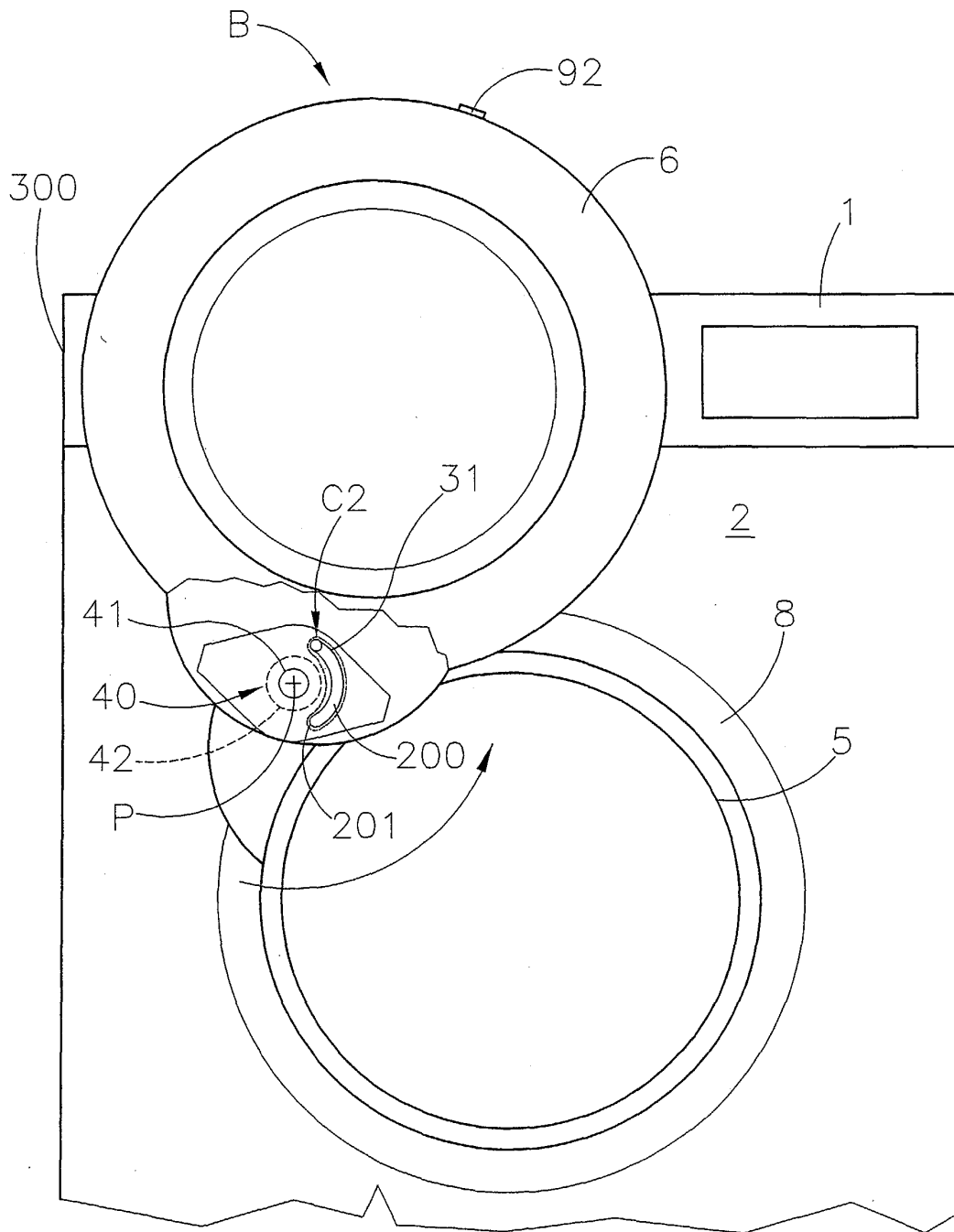


FIG. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5335

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.7)
X	EP 1 262 589 A (CANDY SPA) 4 December 2002 (2002-12-04) * column 5, line 11 - line 55 * -----	1,15,16	D06F39/14 D06F37/28
A	US 3 498 089 A (BEEBE WILLIAM B ET AL) 3 March 1970 (1970-03-03) * the whole document * -----	1	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D06F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		20 October 2004	Norman, P
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 O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 42 5335

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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20-10-2004

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