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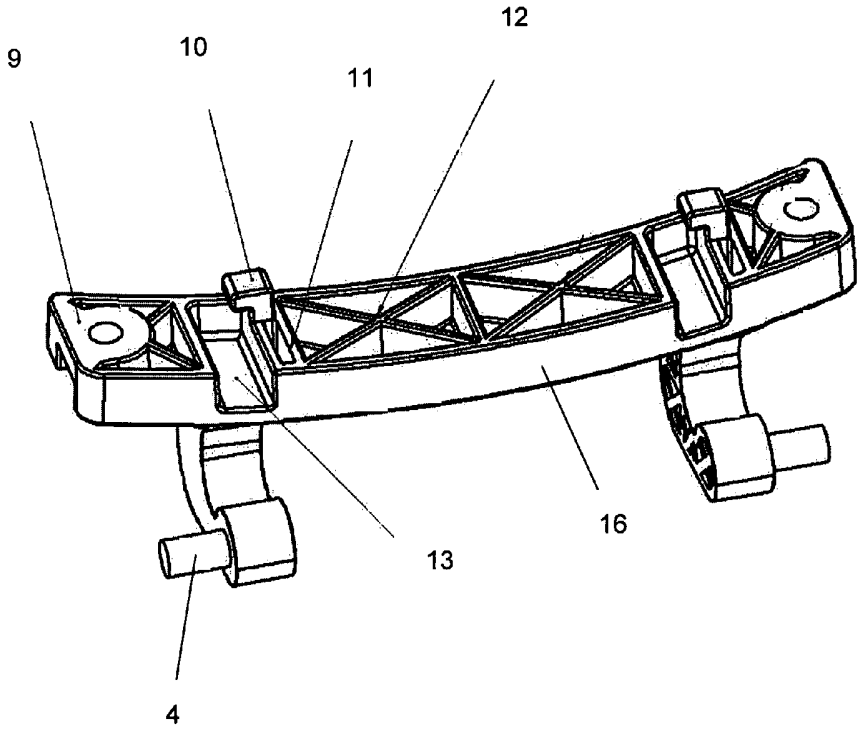
(54) Title: PLASTIC-BASED WASHING MACHINE DOOR HINGE



(57) Abstract: A hinge arranged between the washing machine door and the front sheet of the machine, comprising a body (16) and at least one arm (8) integrated to the body (16), wherein the hinge is embodied by plastic injection molding.

WO 2005/118995 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PLASTIC-BASED WASHING MACHINE DOOR HINGE

TECHNICAL FIELD

This invention relates to a washing machine door hinge made of plastic-based material. The invention more particularly relates to a plastic-based washing machine door hinge having ribbed components to enhance mechanical strength thereof and the hinge comprising various recesses for providing smooth water flow pattern in the vicinity of the washing machine door.

BACKGROUND ART

The present invention concerns a washing machine door hinge of the kind comprising a body immovably secured to the door housing frame and at least one arm integrated to the body. Such a washing machine door hinge is known from the background art. Known washing machine hinges are metal based and having in particular zamac body and arms (zinc aluminum metal alloy casting). As it is known, metal density is much higher than plastic materials, for instance zinc having 7,049 g/cc, aluminum having 2,77 g/cc whereas polyurethane having 1 g/cc and High Density Polyethylene (HDPE) having 0,95 g/cc., mounting such a metal-based hinge to the washing machine inevitably increases the overall weight of the machine. Furthermore, the production processes of such metal-based hinge lead to technical disadvantages in practicing the hinge to the machine, since casting must be remained in a strictly controlled manner, otherwise material discontinuities in the core of the cast material would induce mechanical instability which eventually leads failure to preserve the integrity of the cast material due to external forces.

Moreover, in principle it is quite challenging to arrange the metal-based hinge to the door frame of the washing machine, since a metal-based hinge is not sufficiently flexible to adapt the geometric formation of the door frame to which the hinge body is secured.

As a washing machine hinge is partially in contact with water in the washing machine, a metal-based hinge is unavoidably reacted to the water, actually the

water is a mixture of a chemical fluid due to presence of detergent and other softening agents in the water. This would lead to vulnerability of the hinge in the presence of the corrosive effects.

In practice, most critical parts, in the sense of mechanical tension, of washing machine hinges are the arms coupled to the body. As the hinge is exerted bending moment in typical working conditions, shear and in more immediate concern normal stresses take place in the sections of the hinge arms. Known washing machine hinge arms are so formed to exhibit sufficient strength to prevent failure of the arms under the external forces and bending moments. However, providing sufficient strength to such external forces are performed through increasing section thickness which leads to both material loss and weight increase of the hinge.

Water flow pattern is another issue when designing the hinge, since the hinge is partially introduced into the internal machine volume i.e. where the clothes are washed. The washing machine producers foresee a smooth water flow pattern in the machine volume for the most effective washing. However the present hinges comprise various sharp edges deteriorating the water flow in the machine.

BRIEF DISCLOSURE OF THE INVENTION

The invention seeks to provide a washing machine door hinge rendering sufficient strength against external forces and simultaneously decreasing overall weight of the washing machine.

In accordance with the invention, this object is accomplished in a washing machine of above kind in that the hinge is embodied by plastic injection molding and in that the arms having ribbed structure.

The washing machine hinge according to the present invention further comprises that the body has a ribbed structure and optionally bent i.e. having a certain radius to adapt door housing frame.

The hinge according to invention further comprises channels through which holes embodied to secure the body to the frame.

DESCRIPTION OF THE FIGURES

Further objects and advantages of the present invention will become apparent upon reading the following description taken in conjunction with the appended drawings wherein:

Figure 1 illustrates washing machine door assembly by the hinge according to the present invention.

Figure 2a illustrates the hinge from perspective right view according to the present invention.

Figure 2b illustrates the hinge from perspective left view according to the present invention.

Figure 2c illustrates the hinge from perspective rear side view according to the present invention.

Figure 3a illustrates the hinge arm in perspective view according to the present invention.

Figure 3b illustrates the hinge body securing housing in perspective view according to the present invention.

Figure 3c illustrates the hinge body securing housing in perspective view according to the present invention.

REFERENCE NUMBERS OF THE COMPONENTS

1	Arm rib	8	Arm
2	Arm external radius	9	Seat
3	Arm internal radius	10	Protrusion
4	Boss	11	Aperture
5	Hole	12	Body rib
6	Body edge radius	13	Aperture
7	Arm connection radius	14	Sheet

15 Door
16 Body
17 Channel

DISCLOSURE OF THE INVENTION

Figure 1 illustrates washing machine door assembly by the hinge according to the present invention. As seen in the figure, the hinge is placed between the washing machine door (15) and the front sheet (14) of the machine. In particular, hinge body (16) is secured to door housing frame and hinge arms (8) – at least one arm - are secured to the door.

Figure 2a illustrates the hinge from perspective right view according to the present invention. The hinge comprises arms (8) integrated to the body (16) and the hinge is embodied by plastic injection moulding, so defining a plastic-based washing machine door hinge.

The arms (8) comprise a ribbed structure (1) to strengthen thereof against external forces and bending moments in particular. In a preferred embodiment of the invention, outer faces of the arms (8) are moulded in a closed-form structure unlike the inner faces having ribbed structure. However, the outer faces can have a ribbed structure optionally.

Figure 2c illustrates the hinge from perspective rear side view according to the present invention. The body (16) of the hinge, optionally, can have ribbed structure (12) for both strengthening the hinge and decreasing the weight of the hinge. At the rear face of the body (16), seats (9) – at least one seat - are provided in the vicinity of the two ends. The seats (9) are foreseen for distributing the local stresses induced by attachment means, like screws, when the body (16) is secured to the housing frame.

Two protrusions (10) are embodied at the rear side of the body (16) for facilitating the body to arrange to the housing frame. Along side the protrusions (10), plurality of apertures (11,13) are formed to ease extracting the protrusions (10) from the mould. Moreover, the apertures (11,13) provides that the cross section of the body

(16) remains even, through the longitudinal direction of the body (16), in the presence of the ribbed structure. Otherwise, uneven cross section would lead to stress propagation at the section transitions.

In Figure 3a, detailed view is illustrated of the arm (8). According to the figure, the arm (8) has an external radius (2) at the corner region thereof and an internal radius (3) for preventing stress propagations that are induced by the external forces. Bosses (4) are placed at the two ends of the body (16), the bosses (4) are engaged to corresponding housings in the door (15).

As seen in Figure 3b and 3c, the body (16) includes channels (17) at both ends, and the channels (17) comprise holes (5) through which securing means, like bolts, screws etc., are introduced for connecting the body (16) to the housing frame. As the bolt head is seated in the channel (17), relatively short bolt can be utilized for connecting the body (16) to the sheet of the machine. So, bending moments that would be induced by external forces can be decreased by the decreasing bolt length.

Between the arms (8) and the body (16), connection radiuses are formed to smoothen section transitions, so minimizing stress propagations at the connection points. At the edges of the body (16), radiuses (6) can be formed optionally.

CLAIMS

1. A hinge arranged between the washing machine door and the front sheet of the machine, comprising a body (16) and at least one arm (8) integrated to the body (16), characterized in that the hinge is embodied by plastic injection molding.

2. A hinge according to claim 1, characterized in that said at least one arm (8) comprises a ribbed structure (1).

3. A hinge according to anyone of the preceding claims, characterized in that the body (16) comprises optionally a ribbed structure (12).

4. A hinge according to anyone of the preceding claims, characterized in that channels (17) are provided at two ends of the body (16) and the channels (17) comprising holes (5) through which securing means being introduced.

5. A hinge according to anyone of the preceding claims, characterized by comprising plurality of apertures (11,13) for providing uniform stress distribution through the section of the body (16).

6. A hinge according to anyone of the preceding claims, characterized by comprising at least one seat (9) for uniformly distributing stresses induced by the securing means.

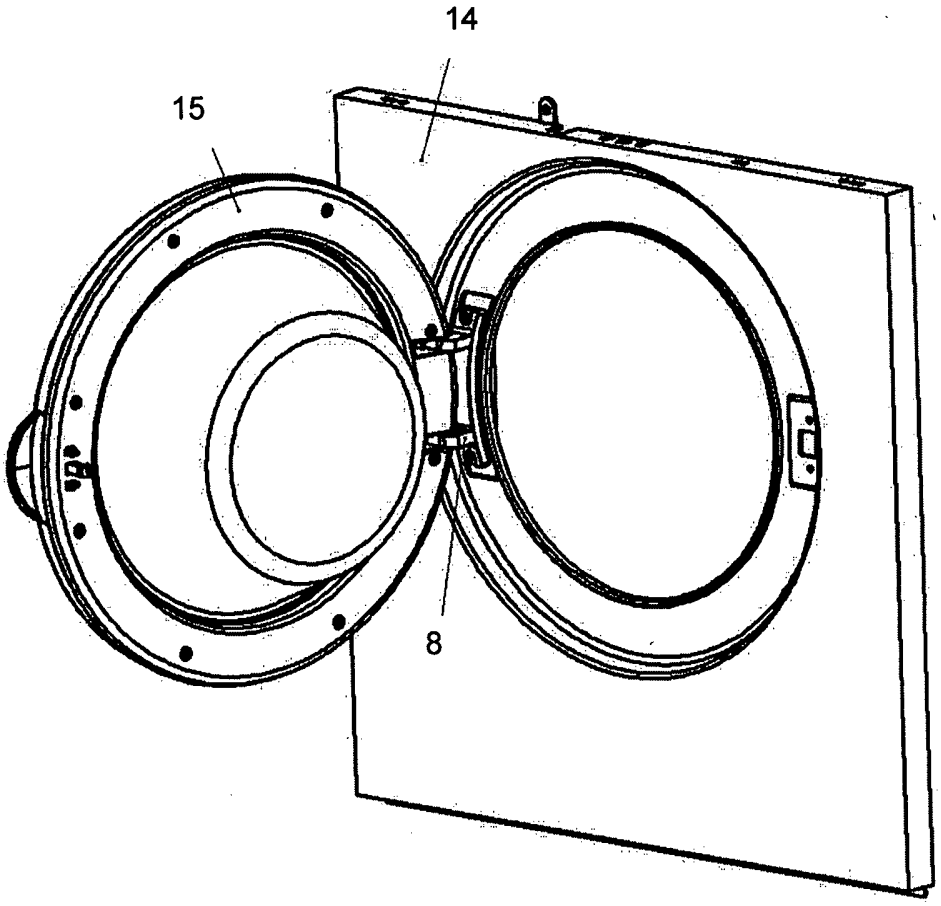


Fig.1

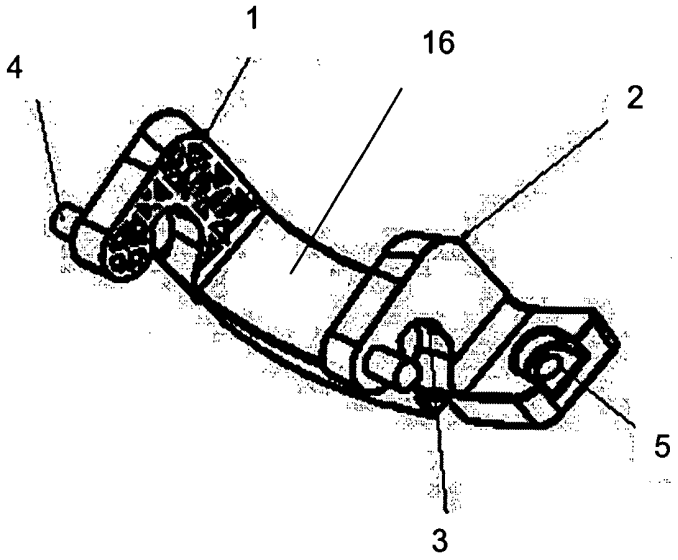


Fig.2a

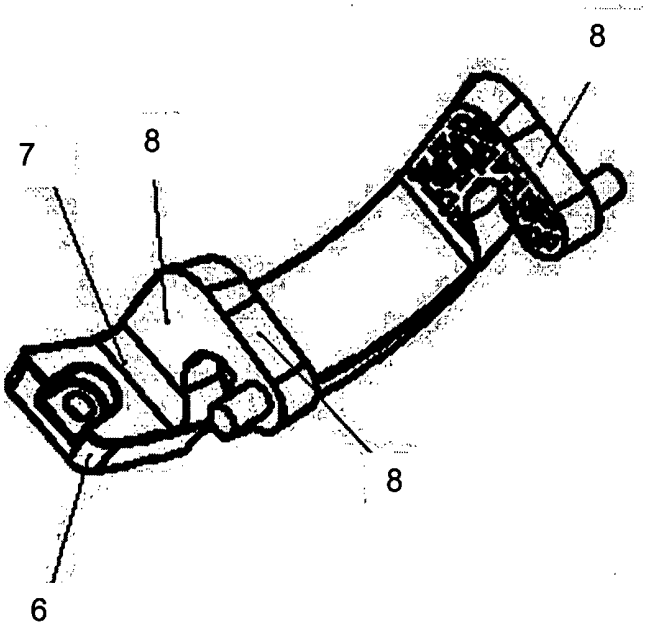


Fig.2b

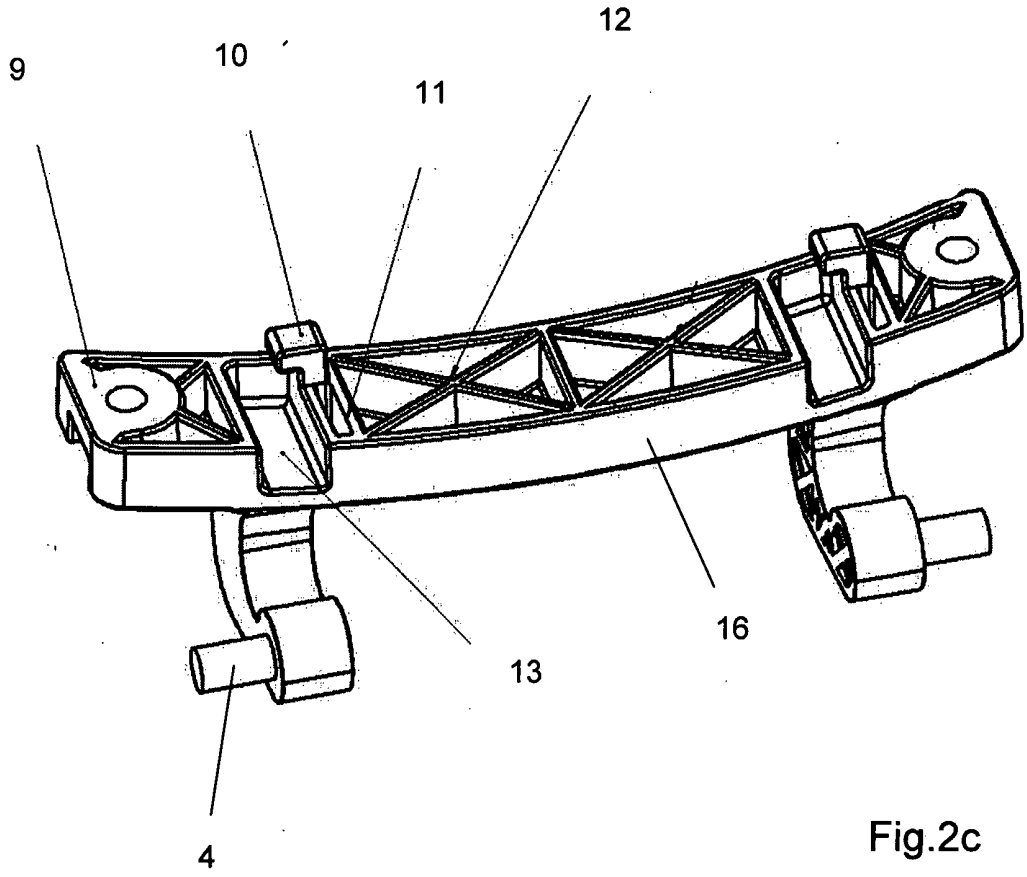


Fig.2c

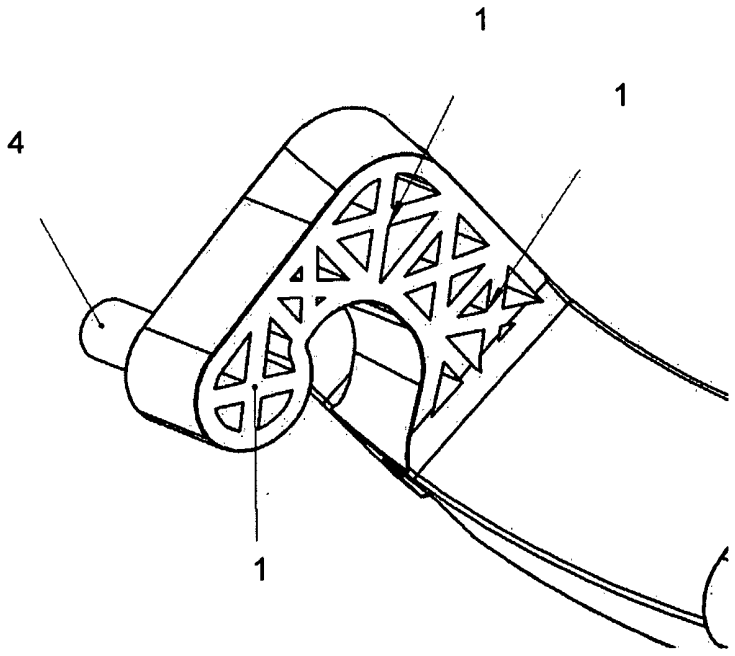


Fig.3a

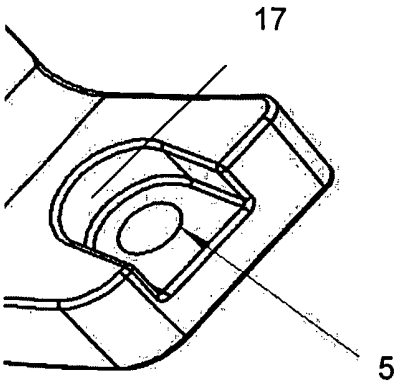


Fig.3b

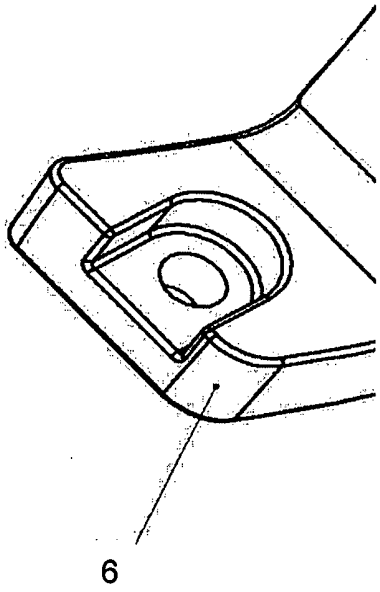


Fig.3c

INTERNATIONAL SEARCH REPORT

Inte ›nal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E05D9/00 E05D5/06 A47L15/42 D06F39/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E05D D06F A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 914 781 A (SOKN ET AL) 10 April 1990 (1990-04-10) column 3, line 36 - line 41 column 3, line 53 - line 59; figures 1-7	1,5,6
X	US 4 115 901 A (SCHMIDT ET AL) 26 September 1978 (1978-09-26) column 3, line 45 - column 4, line 13 column 4, line 46 - line 51 column 5, line 21 - line 51; figures 1-8	1-3,5,6
X	US 6 058 566 A (KERR ET AL) 9 May 2000 (2000-05-09) column 4, line 53 - line 61 column 5, line 57 - line 67 column 6, line 37 - line 46; figures 2-6	1,3,5,6

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
8 February 2005	18/02/2005

Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 952 369 A (ERICKSON ET AL) 27 April 1976 (1976-04-27) column 2, line 5 - line 23 column 3, line 4 - line 6; figures 1-4	1,6

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