

ABSTRACT

A door hinge assembly for a household appliance comprises a first hinge member (11, 12, 13) having a base (14) and at least one shaft portion (19 20) which projects from said base (14) and defines an axis of rotation (4), a second hinge member (8, 9) in which a bearing socket (10) is formed for rotatably receiving said shaft portion (19, 20) and a bearing bush (23), and a stopper member (26) which is displaceable along with said second hinge member (8, 9) and which, in a limiting position of the hinge assembly, abuts against said base (14), characterized in that the stopper member (26) and the bearing bush (23) are formed as one piece (21, 22).

Fig. 2

We claim :

1. A door hinge assembly for a household appliance, comprising
a first hinge member (11, 12, 13) having a base (14) and at least one shaft
5 portion (19, 20) which projects from said base (14) and defines an axis of
rotation (4),
a second hinge member (8, 9) in which a bearing socket (10) is formed for
rotatably receiving said shaft portion (19, 20) and a bearing bush (23), and
a stopper member (26) which is displaceable along with said second hinge
10 member (8, 9) and which, in a limiting position of the hinge assembly,
abuts against said base (14),
characterized in that the stopper member (26) and the bearing bush (23)
are formed as one piece (21, 22).
- 15 2. The door hinge assembly of claim 1, wherein said one piece (21, 22) is
fixed to the second hinge member (8, 9) by a single screw (38).
3. The door hinge assembly of claim 2, wherein a distance between said
20 screw (38) and the axis of rotation (4) is larger than a distance between an
abutting surface (29) of the stopper member (26) and the axis (4).
4. The door hinge assembly of any of the preceding claims, in which the
bearing bush (23) has a tubular portion (24) which is received in said
bearing socket (10) and a flange (25) which extends beyond said second
25 hinge member (8, 9) towards the base (14) of the first hinge member (12),
the stopper member (26) being connected to the flange (25).
5. The door hinge assembly of any of the preceding claims, in which the
second hinge member (8, 9) has a recess (31) in which a stub (32) of the
30 stopper member (26) is received.

6. The door hinge assembly of claims 4 and 5, wherein said one piece (21, 22) comprises a web (34) which extends between said stub (32) and said tubular portion (24) within a groove (33) of the second hinge member (8, 9).
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7. The door hinge assembly of claim 5 or 6, wherein a distance between said stub (32) and the axis of rotation (4) is larger than a distance between an abutting surface (29) of the stopper member (26) and the axis (4).
- 10 8. The door hinge assembly of any of the preceding claims, wherein said one piece (21, 22) has a plane of symmetry extending along said axis of rotation (4).
- 15 9. The door hinge assembly of any of the preceding claims, wherein said first hinge member (12) has a second shaft portion (19, 20), the two shaft portions (19, 20) extending from said base (14) into opposite directions.
- 20 10. The door hinge assembly of any of the preceding claims, wherein the second hinge member (8, 9) is elongate in a radial direction, said bearing socket (10) being located at one end of said second hinge member (8, 9), and a second bearing socket (10) being located at an opposite end thereof.
- 25 11. The door hinge assembly of any of the preceding claims, wherein the second hinge member is a top or bottom cover member (8, 9) of a door leaf (2, 3).

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12. A household appliance comprising a body (1) and a door (2, 3) which delimit a storage compartment and which are pivotally connected by the door hinge assembly of any of the preceding claims.

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The present invention relates to a door hinge assembly and to a household appliance, in particular a cooling appliance, in which such a door hinge assembly is used.

5 Conventional door hinge assemblies for appliances such as refrigerators, freezers and the like, comprise a first hinge member having a base which is mounted to a body of the appliance and at least one shaft portion which projects from said base and defines an axis of rotation for a door. A second hinge member that forms part of or is connected to the door has a bearing socket in which the shaft portion and a
10 bearing bush are received. A stopper member is fixed to the second hinge member so that it limits the range of rotation of the door by abutting against the base of the first hinge member.

The distance between the stopper member and the axis of rotation is much smaller
15 than the width of the door, so that when a rotation of the door comes to a halt by the stopper member abutting against the base, the stopper member can be subject to huge forces. In order to limit these forces, the stopper member is made of a material which is capable of yielding elastically to these forces, and which is fixed to unyielding second hinge member by screws. In order to prevent the stopper
20 member from yielding to pressure from the first hinge member by turning, it must be fixed by two screws, which makes installation of the stopper member lengthy and tedious. If the stopper member is destroyed under excessive pressure, one of the screws may abut against the first hinge member, and the forces that occur in that case may cause the second hinge member to crack.

25 One object of the present invention is to provide a hinge assembly in which the turning range of first and second hinge members with respect to each other is limited by a stopper member, and in which the stopper member is quick and easy to install.

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This object is achieved by a door hinge assembly for a household appliance, comprising

a first hinge member having a base and at least one shaft portion which projects from said base and defines an axis of rotation,

5 a second hinge member in which a bearing socket is formed for rotatably receiving said shaft portion and a bearing bush, and a stopper member which is displaceable along with said second hinge member and which, in a limiting position of the hinge assembly, abuts against said base member,

10 in which the stopper member and the bearing bush are formed as one piece.

By combining the stopper member and the bearing bush in one piece, not only the assembly process is simplified, since the number of pieces to be assembled is reduced; since the bush engages the bearing socket, fixing said one piece to the
15 second hinge member at just one further location is sufficient to prevent a rotation of the stopper member under a load.

Therefore, a single screw is sufficient for fixing the stopper member in a way in which rotation under load is safely excluded.

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Preferably, this screw is located farther away from the axis of rotation than abutting surfaces of the stopper member and the first hinge member. Thus, even if the stopper member is broken and missing, the screw will not hit against the abutting surface of the first hinge member, and the risk of the second hinge
25 member being damaged under such circumstances is substantially reduced.

Typically, the bearing bush has a tubular portion which is received in the bearing socket and prevents direct friction between the walls of the bearing socket and the shaft portion. Preferably, it should also comprise a flange which extends beyond
30 said second hinge member towards the base of the first hinge member and to which the stopper member is connected.

The second hinge member may have a recess in which a stub of the stopper member is received. By the stub frictionally engaging the recess, the one piece can be temporarily mounted to the second hinge portion, whereby a final attachment
5 by form fitting means such as the above-mentioned screw is facilitated.

The resistance of the stopper member against pressure from the abutment surface of the first hinge member may be improved further by said one piece comprising a web which extends between said stub and said tubular portion within a groove of
10 the second hinge member.

A distance between said stub and the axis of rotation is preferably larger than a distance between the axis and the abutting surfaces of stopper member and first hinge member, in order to reduce the shearing load to which the stub is subject
15 when the stopper member is under pressure from the first hinge member.

Preferably, the shearing resistance of the stub is further improved by the screw extending through it.

20 Said one piece in which are combined the stopper member and the bearing bush preferably has a plane of symmetry extending along said axis of rotation. This symmetry allows the one piece to be used at both sides of the door alike, so a user can swap the hinge from one side of the door to the other without a need for extra spare parts.

25 For swapping the hinge, it is useful that the first hinge member has a second shaft portion, the two shaft portions extending from said base into opposite directions. Such a hinge member is particularly appropriate for mounting two doors of multi-compartment appliances.

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The second hinge member is preferably elongate in a radial direction with respect to said axis of rotation, said bearing socket being located at one end of said second hinge member. If the second hinge member extends across the entire width of a door, a second bearing socket may be located at an opposite end of it, so that the
5 user may choose in which of the two sockets a shaft portion is to be installed.

Specifically, such an elongate second hinge member may be a top or bottom cover member of a door.

10 Another object of the invention is to provide household appliance comprising a body and a door in which the range of rotation of the door is limited, which is rugged, and which is quick and easy to assemble.

This object is achieved by a household appliance comprising a body and a door
15 which delimit a storage compartment and which are pivotally connected by the door hinge as described above.

Further features and advantages of the invention will become apparent from the subsequent description of embodiments thereof, referring to the appended
20 drawings. In the drawings,

Fig. 1 is a perspective view of a household appliance according to the present invention; and

25 Fig. 2 is an exploded view of a hinge assembly of the appliance of Fig. 1

Fig. 3 is a perspective view of a combination piece according to a second embodiment of the invention; and

30 Fig. 4 is a plan view of the combination piece of Fig. 3.

Fig. 1 illustrates a household refrigerator having a body 1 and doors 2, 3 which enclose e.g. a cooling compartment and a freezing compartment. As illustrated, both doors 2, 3 are pivotable about a same axis of rotation 4, close to their right-hand flanks 5.

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Each door 2, 3 comprises a sheet metal blank which is bent to extend in one piece over right and left-hand flanks 5, 6 and a front side 7, a deep-drawn plastic member at a rear side, not shown in Fig. 1, and injection-molded upper and lower cover members 8, 9. The sheet metal blank, the plastic member and the cover members delimit a cavity which is filled by thermally insulating plastic foam.

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Each cover member 8, 9 has two bearing sockets 10 at its right and left ends. In Fig 1, only the left bearing socket 10 of upper cover member 8 of door 2 is to be seen, the right bearing socket is hidden underneath a hinge member 11 and rotatably accommodates a shaft portion of said hinge member 11.

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Between the two doors, a tip of another hinge member 12 is to be seen. This hinge member has two shaft portions, one engaging a left bearing socket of lower cover member 9 of door 2, the other engaging a left bearing socket of upper cover member 8 of door 3.

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Underneath door 3, there is a further hinge member 13, having a single shaft portion engaging a left bearing socket of lower cover member 9 of door 3.

Fig. 2 is an exploded view of hinge member 12 and its surroundings. A base 14 of hinge member 12 comprises a horizontally extending plate 15 and a vertically extending plate 16 connected thereto. In plate 16, holes 17, 18 are provided for screwing base 14 to a front side of body 1.

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Metallic shaft portions extending upwards and downwards from horizontally extending plate 15 carry reference numerals 19, 20, respectively. Both shaft portions 19, 20 extend along the same axis of rotation 4.

- 5 Close to the forward tip of horizontally extending plate 15, a surface portion 35 is formed which extends substantially in radial direction with respect to axis 4.

No detailed drawing of hinge members 11 and 13 is provided, since these are similar to hinge member 12 in most respects. Hinge member 13 lacks downwardly
10 projecting shaft portion 20, but has upwardly projecting shaft portion 19 and surface portion 35. In hinge member 11, there is only downwardly projecting shaft portion 20, and surface portion 35 may be missing.

Above and below hinge member 12, there are identical combination pieces 21, 22,
15 injection molded from a tough plastics material, such as polyoxymethylene (POM). Each combination piece comprises a bearing bush 23. A tubular portion 24 of the bearing bush 23 will rotatably accommodate one of shaft portions 19, 20. At one end of tubular portion 24, a flange 25 is formed, which is integrally connected to a stopper member 26.

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Stopper member 26 can be regarded as a substantially cylindrical body having a central bore 27 for receiving a fixation screw 38, and a portion 28 which projects radially from said cylindrical body towards bearing bush 23, the lateral flanks of which projecting portion 28 form abutment surfaces 29.

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Above and below the combination pieces 21, 22, respectively, fragments of lower cover member 9 of door 2 and upper cover member 8 of door 3 are shown. These cover members can be injection molded from a plastics material which is less tough and shock resistant than that of combination pieces 21, 22. They comprise
30 flat base plates 30, at one end of which, as shown in Fig. 2, there is formed bearing socket 10 for receiving one of shaft portions 19, 20 and its associated

tubular portion 24, a recess 31 for receiving a stub 32 of stopper member 26, and a groove 33 which extends between bearing socket 10 and recess 31 and will receive a web 34 by which stub 32 is connected to tubular portion 24. Similar sockets 10, recesses 31 and grooves 33 are provided in a mirror symmetric arrangement at the opposite ends of cover members 8, 9.

Upon assembly of the refrigerator, it must be decided whether the axis of rotation of the doors 2, 3 shall extend along the right or left side of body 1. If it is decided that the axis 4 shall be at the right, combination pieces 21, 22 are installed at the right ends of cover members 8, 9. The combination pieces 21, 22, being mirror symmetric with respect to a symmetry plane extending along axis 4 and through bore 27, can be installed at any end of the cover members 8, 9. Unused bearing sockets 10, grooves 33 and recesses 31 at the left ends may be hidden under a cap, not shown. Upon installation, tubular portion 24 is pushed into bearing socket 10 until flange 25 rests on the surface of base plate 30, stub 32 engages recess 31, and web 34 is received in groove 33. Since combination pieces 21, 22 are held in position by friction, it is easy to place a screw 38 in bore 27 for final fixation of the combination pieces 21, 22. Hinge member 13 is screwed to the bottom of body; door 3 is placed on top, and is fixed to body 1 by placing hinge member 12 in socket 10 of its upper cover member 8 and screwing it to body 1, too. Door 2 is now placed upon hinge member 12 and is fixed by screwing hinge member 11 to body 1.

In this configuration, when one of doors 2, 3 is turned, it will finally be stopped by abutment surface 29 of at least one of its combination pieces 21, 22 coming into contact with surface portion 35 of one of hinge members 11, 12, 13. Door 3, being rather large and heavy, should be stopped by both combination pieces 21, 22 abutting against hinge members 11, 12; in case of smaller door 2, it may be sufficient if only one of combination pieces 21, 22 makes contact.

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When abutment surface 29 makes contact with surface portion 35, large forces may occur. POM, being tough by nature, is well suited to absorb such forces without damage. However, in order to reduce the risk of such damage, it may be advantageous to make the combination pieces 21, 22 slightly yielding not only by
5 the choice of material, but also by their structure. Therefore, a preferred embodiment of a combination piece 21, 22 is shown in perspective in Fig. 3 and, in plan view, in Fig. 4. A difference between this combination piece 21, 22 and those shown in Fig. 2 is in that its projecting portion 28 is not solid, but has some cavities 36, 37 at either side of web 34. A particularly spacious cavity 36 is
10 provided immediately behind abutment surfaces 29.

The distance between bore 27 and the screw 38 received in it, and the axis of rotation is larger than the distance between the abutment surfaces 29 and the axis
4. Therefore, if one of the abutment surfaces of a combination piece 21, 22 is
15 subject to pressure from surface portion 35, this pressure will be transmitted not only to cover member 8 or 9 by the stub 32 and the screw extending through it, but also to bearing bush 23, and, thereby, to shaft portion 19 or 20 engaging it. In this way, the stress of cover member 8, 9 is reduced substantially. Further, if the pressure of surface portion 35 is large enough to break the combination piece 21,
20 22, and the door 2, 3 turns beyond the limiting position defined by the combination piece 21, 22, the screw will not hit against surface portion 35 and cause further damage to its cover member. Instead, in such a case, web 34 will be drawn out of groove 33, and, by being squeezed between horizontally extending plate 15 and cover member 8 or 9, will bring the door 2, 3 to a smooth stop. The
25 damage, being confined to the combination piece, is straightforward and economic to repair.

REFERENCE NUMERALS

	1	body
	2	door
5	3	door
	4	axis of rotation
	5	right hand flank
	6	left-hand flank
	7	front side
10	8	upper cover member
	9	lower cover member
	10	bearing socket
	11	hinge member
	12	hinge member
15	13	hinge member
	14	base
	15	horizontally extending plate
	16	vertically extending plate
	17	hole
20	18	hole
	19	upwardly projecting shaft portion
	20	downwardly projecting shaft portion
	21	combination piece
	22	combination piece
25	23	bearing bush
	24	tubular portion
	25	flange
	26	stopper member
	27	bore
30	28	projecting portion
	29	abutment surface

- 30 base plate
- 31 recess
- 32 stub
- 33 groove
- 5 34 web
- 35 surface portion
- 36 cavity
- 37 cavity
- 38 screw

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We claim :

1. A door hinge assembly for a household appliance, comprising
a first hinge member (11, 12, 13) having a base (14) and at least one shaft
5 portion (19, 20) which projects from said base (14) and defines an axis of
rotation (4),
a second hinge member (8, 9) in which a bearing socket (10) is formed for
rotatably receiving said shaft portion (19, 20) and a bearing bush (23), and
a stopper member (26) which is displaceable along with said second hinge
10 member (8, 9) and which, in a limiting position of the hinge assembly,
abuts against said base (14),
characterized in that the stopper member (26) and the bearing bush (23)
are formed as one piece (21, 22).
- 15 2. The door hinge assembly of claim 1, wherein said one piece (21, 22) is
fixed to the second hinge member (8, 9) by a single screw (38).
3. The door hinge assembly of claim 2, wherein a distance between said
20 screw (38) and the axis of rotation (4) is larger than a distance between an
abutting surface (29) of the stopper member (26) and the axis (4).
4. The door hinge assembly of any of the preceding claims, in which the
bearing bush (23) has a tubular portion (24) which is received in said
bearing socket (10) and a flange (25) which extends beyond said second
25 hinge member (8, 9) towards the base (14) of the first hinge member (12),
the stopper member (26) being connected to the flange (25).
5. The door hinge assembly of any of the preceding claims, in which the
second hinge member (8, 9) has a recess (31) in which a stub (32) of the
30 stopper member (26) is received.

6. The door hinge assembly of claims 4 and 5, wherein said one piece (21, 22) comprises a web (34) which extends between said stub (32) and said tubular portion (24) within a groove (33) of the second hinge member (8, 9).
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7. The door hinge assembly of claim 5 or 6, wherein a distance between said stub (32) and the axis of rotation (4) is larger than a distance between an abutting surface (29) of the stopper member (26) and the axis (4).
- 10 8. The door hinge assembly of any of the preceding claims, wherein said one piece (21, 22) has a plane of symmetry extending along said axis of rotation (4).
- 15 9. The door hinge assembly of any of the preceding claims, wherein said first hinge member (12) has a second shaft portion (19, 20), the two shaft portions (19, 20) extending from said base (14) into opposite directions.
- 20 10. The door hinge assembly of any of the preceding claims, wherein the second hinge member (8, 9) is elongate in a radial direction, said bearing socket (10) being located at one end of said second hinge member (8, 9), and a second bearing socket (10) being located at an opposite end thereof.
- 25 11. The door hinge assembly of any of the preceding claims, wherein the second hinge member is a top or bottom cover member (8, 9) of a door leaf (2, 3).

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12. A household appliance comprising a body (1) and a door (2, 3) which delimit a storage compartment and which are pivotally connected by the door hinge assembly of any of the preceding claims.

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