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(54) DOOR FOR A WASHING APPLIANCE

(57) An appliance (10) such as a washer, washer/dryer combination appliance, or the like, has a door assembly (16) to close off an opening (26) into a drum and tube assembly (14) that is positioned inside a housing unit (12). The door assembly (16) includes an outer door (18) and an inner door (20). The inner door (20) seals the door assembly (16) with the drum and tub assembly (14). The inner door (20) includes a mating contour (24) that mates with a corresponding contour (50) on a facia member 48 attached to a front ring (42) of the drum and tub assembly (14).

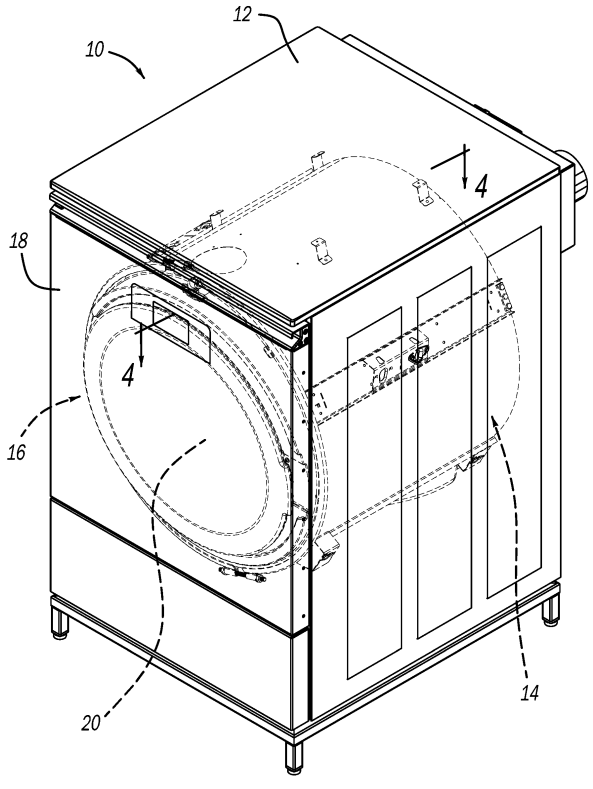

FIG - 1

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Description

FIELD

[0001] The present disclosure relates to a door assembly for an appliance such as a washer, washer/dryer combination appliance and, more particularly, to a door assembly including an inner and outer door.

BACKGROUND

[0002] In existing washers and washer/dryer combination appliances, there is a problem with accumulation of lint and detergent along the bellows seal. The bellows is a seal between the door and the movable drum and tub assembly. The bellows is subjected to lint and detergent and both accumulate on the bellows. Thus, the bellows has a tendency to wear out due to the accumulation. Also, in some types of commercial washers, the door is attached to a tub. Thus, the door moves with the suspension of the tub and drum assembly. This is not ideal for customers since the door will be moving with the suspension; however, it does eliminate the need for a bellow.

[0003] Accordingly, it is an object of the disclosure to provide a door that eliminates the bellows seal between the door and the drum and tub assembly. The present disclosure provides a door assembly with an inner and outer door to enable elimination of the bellows seal. The door assembly may include a stationary or floating inner door meshing with a tub opening access configuration.

SUMMARY

[0004] According to one aspect of the disclosure, a door assembly for an appliance, such as a washer, washer/dryer combination appliance or the like comprises a door assembly for a housing unit. The door assembly closes off an opening into the housing unit that enables access to the drum and tub assembly. The door assembly includes an outer door and an inner door. The inner door seals the door assembly with the drum and tub assembly inside the housing unit. The inner door includes a mating contour associated with drum and tub assembly opening. The inner door may be stationarily positioned on the drum and tub assembly. Alternatively, the inner door may be floatably positioned with the outer door. A facia member is coupled with the drum and tub assembly and defines the opening into the drum and tub assembly. The facia member has a corresponding contour that mates with the mating contour on the inner door. A flexible coupling secures the outer door with the inner door. The flexible coupling may be an elastomeric sleeve, a spring, or a dash pot. An aesthetic membrane is positioned between the housing unit and the drum and tub assembly, blocking access into a space between the housing unit and the drum and tub assembly.

[0005] According to another aspect of the present disclosure, a washer/dryer combination appliance is provided that includes a housing unit, a drum and tub assembly inside the housing unit, and a door assembly. The drum and tub assembly has an opening that enables ingress into the drum and tub assembly and the door assembly is positioned to close off the opening of the drum and tub assembly. The door assembly includes an outer door and an inner door. The inner door seals the door assembly with the drum and tub assembly. The drum and tub assembly includes a ring assembly that defines the opening of the drum and tub assembly. The ring assembly includes a facia member. The inner door includes a mating contour that enables mating with the opening of the drum and tub assembly and the facia member includes a corresponding contour that defines the opening of the drum and tub assembly. In accordance with this aspect of the present disclosure, the mating contour on the inner door has a stepped cross-section and the corresponding contour on the facia member is stepped to match the mating contour of the inner door. As a result, the mating contour of the inner door interacts with the opening of the drum and tub assembly to enable sealing of the inner door in the opening to eliminate the need for a bellows seal.

[0006] In accordance with another aspect of the present disclosure, a seal may be positioned on the facia member and is configured to be contacted by the stepped cross-section of the mating contour of the inner door to provide a watertight seal with the inner door.

[0007] In accordance with another aspect of the present disclosure, the drum and tub assembly includes a tub and the ring assembly includes a front ring that is attached to the tub. In accordance with this aspect of the present disclosure, the facia member generally covers the front ring and may be configured to define a cavity between the facia member and the front ring. Also, a seal (46) may be positioned between the front ring and the tub to seal the front ring with the tub.

[0008] In accordance with another aspect of the present disclosure, the inner door includes a hinge that is secured to the front ring.

[0009] In accordance with another aspect of the present disclosure, the inner door may be stationarily positioned on the tub.

[0010] In accordance with another aspect of the present disclosure, an aesthetic membrane may be positioned between the housing unit and the tub to block ingress into a gap between the housing unit and the tub.

[0011] In accordance with another aspect of the present disclosure, the washer/dryer combination appliance may include a flexible coupling that secures the outer door with the inner door, while permitting the inner door to float relative to the outer door. In accordance with this aspect of the present disclosure, the flexible coupling may include one or more of the following: an elastomeric sleeve, a spring, and/or a dash pot.

[0012] Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended for purposes of illustration only and are not intended to

limit the scope of the present disclosure.

DRAWINGS

[0013] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations and are not intended to limit the scope of the present disclosure.

Fig. 1 is a perspective view of a washing appliance in accordance with the disclosure;
Fig. 2 is a perspective view of Fig. 1 with the door opened;
Fig. 3 is an exploded view of Fig. 2;
Fig. 4 is a cross-sectional view of Fig. 1 along line 4-4;
Fig. 5 is a schematic cross-sectional view of a second embodiment of the disclosure;
Figs. 6A and 6B are an additional embodiment of the disclosure; and
Fig. 7 is a rear perspective view of the inner door of Fig. 6A.

DETAILED DESCRIPTION

[0014] Example embodiments will now be described more fully with reference to the accompanying drawings.

[0015] Turning to the figures, a washing appliance, such as washing machine or a combination washer/dryer appliance is illustrated and designated with the reference numeral 10. The machine 10 includes a housing unit 12 that houses a drum and tub assembly 14. A door assembly 16 covers egress into the drum and tub assembly 14. The door assembly 16 includes an outer door 18 and an inner door 20. The outer door 18 secures to the housing unit 12, via a hinge. The outer door 18 includes a catch assembly 60 to enable locking of the outer door 18 with the housing unit 12 during operation. The inner door 20 is stationarily fixed to the drum and tub assembly 14. The inner door 20 includes a seal 22 that provides a thermal seal with the drum and tub assembly 14. The inner door 20 has a mating contour 24 with a stepped cross-section that enables mating with an opening 26 of the drum and tub assembly 14. Thus, the mating contour 24 interacts with the opening 26 to enable sealing of the inner door 20 in the opening 26 to eliminate the need for a bellows seal. The inner door 20 includes a hinge 30 that secures with the drum and tub assembly 14.

[0016] The drum and tub assembly 14 includes a ring assembly 40 that defines the opening 26. The ring assembly 40 includes a front ring 42 attached to tub 44. The front ring 42 is secured, by clamping, welding or the like, to the tub 44. A seal 46 is positioned between the front ring 42 and the tub 44 to seal the front ring 42 with the tub 44. The hinge 30 is secured onto the front ring 42.

[0017] The ring assembly 40 includes a facia member 48 that covers the front ring 42. The facia member 48 and the front ring 42 define a cavity 54 between the two. The facia member 48 includes a corresponding contour 50 that defines the opening 26. The corresponding contour 50 is stepped to match the mating contour 24 of the inner door 20. A seal 52 is positioned on the facia member 48 to provide a watertight seal with the inner door 20. The seal 52 is contacted by the stepped cross-section of the mating contour 24 of the inner door 20, sealing the two to prohibit water from exiting the tub 44 during operation. The catch assembly 60 is also mounted on the front ring 42 to mate with a striker 62 or door hook on the inner door 20 to enable a self-locking of the inner door 20 with the drum and tub assembly 14. The drum and tub assembly 14 is mounted in the housing unit 12 by conventional elements such as springs, dash pots, and the like.

[0018] Also, a recirculation inlet 68 passes through the cavity 54 between the facia member 48 and the front ring 42. This enables water in the tub 44 to be recirculated during a washing cycle.

[0019] Turning to Figs. 5-7, an additional embodiment is shown.

[0020] Fig. 5 illustrates a second embodiment of the disclosure. The reference numbers, which are the same, are identified as such. The housing unit 12 houses a drum and tub assembly 14 and includes a door assembly 16. The door assembly 16 includes an outer door 18 and an inner door 20. The inner door 20 is floating relative to the outer door 18.

[0021] The inner door 20 may include springs 80 and dash pots 82 securing the inner door with the outer door 18. Also, the inner door 20 includes a mating contour 24 mating with the corresponding contour 50 of the drum and tub assembly 14. The floating inner door 20 with the springs 80 and dash pots 82 enable the inner door 20 to move with the drum and tub assembly 14 during the washing/drying operations. The inner door 20 is sealed with the drum and tub assembly 14 to prohibit water from exiting the drum and tub assembly 14. Thus, the springs 80 and dash pots 82 provide a suspension that enables the inner door 20 to bounce with the drum and tub assembly 14 during the washing and if present, drying, cycle while enabling the outer door 18 to remain stationarily positioned on the housing unit. This enables the inner door 20 to seal with the drum and tub assembly 14 during operation.

[0022] In an additional design as illustrated in Figs. 6A and 6B, a flexible elastomeric or rubber sleeve 90 can be substituted for the springs 80 and dash pots 82 shown in Fig. 5. This accordion type flexible elastomeric sleeve 90 would be strong enough so that it maintains the inner door 20 in its position with respect to the outer door 18. The flexible elastomeric sleeve 90 enables the inner door 20 to hang and move or bounce with the drum and tub assembly 14 during the washing, and if present, drying cycle. The flexible elastomeric sleeve 90 provides the suspension to hold the inner door 20 with respect to the outer door 18. The stiffness of the flexible elastomeric sleeve 90 may be strong enough to keep the inner door 20 in contact with the opening of the tub and drum as-

sembly 14. Alternatively, a spring 80 could be placed between the inner door 20 and outer door 18 to ensure that the inner door 20 stays in contact with the opening of the drum and tub assembly 14 during the wash cycle. In another solution, a second electronic door latch and lock are attached to the inner door 20. When the existing outer door lock engages at the start of the wash cycle, the additional door lock would also engage the inner door 20 and lock it with the tub 44.

[0023] Fig. 7 illustrates the inner door 20. Here the door includes a single door lock striker 62 in order to retain the inner door 20 closed during the washing or drying cycle. A biasing means, such as a spring 80, is not needed to maintain pressure between the inner door 20 and the drum and tub assembly 14. Additionally, on the opposing side of the inner door 20, a hook 110 is secured to the inner door 20. The hook 110 passes through an aperture or slot in hook receiver 112 of the drum and tub assembly 14. The hook receiver 112 includes a cavity to receive the hook 110. The hook 110 passes through the slot into the cavity to provide a floating securement point of the inner door 20 with the drum and tub assembly. Thus, the inner door 20 is removable from the drum and tub assembly 14 during assembly and provides a hingeless type of connection with the drum and tub assembly 14 since the inner door 20 is not permanently secured with the drum and tub assembly 14.

[0024] With the removal of the bellows seal (52), a gap 98 exists between the tub 44 and the housing unit or cabinet 12 that a consumer could reach into the cabinet or housing unit 12. Thus, an aesthetic membrane 100 has been positioned between the housing unit 12 and the tub 44 to eliminate the gap 98. The membrane 100 could be of a rubber or silicone material or any other type of material to prevent ingress of objects between the housing unit 12 and the tub 44. Additionally, the membrane 100 would not come in contact with water during the wash cycle. This is due to the fact that the inner door 20 would be in contact with the tub opening 26 and sealed with it. Accordingly, the aesthetic membrane 100 closes the gap 98 and does not provide for sealing as does the rubber bellows seal on current existing washers.

[0025] The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

Claims

1. A washer/dryer combination appliance, comprising:

   a housing unit (12);
   a drum and tub assembly (14) with an opening (26) enabling ingress into the drum and tub assembly (14) inside the housing unit (12); and
   a door assembly (16) for closing off the opening (26) of the drum and tub assembly (14), the door assembly (16) including an outer door (18) and an inner door (20), the inner door (20) sealing the door assembly (16) with the drum and tub assembly (14),
   wherein the drum and tub assembly (14) includes a ring assembly (40) that defines the opening (26) of the drum and tub assembly (14), wherein the ring assembly (40) includes a facia member (48), the inner door (20) includes a mating contour (24) that enables mating with the opening (26) of the drum and tub assembly (14), and the facia member (48) includes a corresponding contour (50) that defines the opening (26) of the drum and tub assembly (14).

2. The washer/dryer combination appliance according to Claim 1, wherein the mating contour (24) on the inner door (20) has a stepped cross-section and the corresponding contour (50) on the facia member (48) is stepped to match the mating contour (24) of the inner door (20).

3. The washer/dryer combination appliance according to Claim 2, wherein a seal (52) is positioned on the facia member (48) and is configured to be contacted by the stepped cross-section of the mating contour (24) of the inner door (20) to provide a watertight seal with the inner door (20).

4. The washer/dryer combination appliance according to any one of the preceding claims, wherein the mating contour (24) of the inner door (20) interacts with the opening (26) of the drum and tub assembly (14) to enable sealing of the inner door (20) in the opening (26) to eliminate the need for a bellows seal.

5. The washer/dryer combination appliance according to Claims 1 or 2, wherein the drum and tub assembly (14) includes a tub (44) and the ring assembly (40) includes a front ring (42) attached to the tub (44).

6. The washer/dryer combination appliance according to Claim 5, wherein the facia member (48) covers the front ring (42) and defines a cavity (54) between the two.

7. The washer/dryer combination appliance according to any of Claims 5-6, wherein a seal (46) is positioned

between the front ring (42) and the tub (44) to seal the front ring (42) with the tub (44).

8. The washer/dryer combination appliance according to any of Claims 5-7, wherein the inner door (20) includes a hinge (30) that is secured to the front ring (42).

9. The washer/dryer combination appliance according to any of Claims 5-8, wherein the inner door (20) is stationarily positioned on the tub (44).

10. The washer/dryer combination appliance according to any of previous Claims, wherein an aesthetic membrane (100) is positioned between the housing unit (12) and the tub (44) to block ingress into a gap (98) between the housing unit (12) and the tub (44).

11. The washer/dryer combination appliance according to any of previous Claims, wherein the inner door (20) is configured to float relative to the outer door (18).

12. The washer/dryer combination appliance according to Claim 11, wherein a flexible coupling secures the outer door (18) with the inner door (20).

13. The washer/dryer combination appliance according to Claim 12, wherein the flexible coupling is an elastomeric sleeve (90).

14. The washer/dryer combination appliance according to Claim 12, wherein the flexible coupling is a spring (80).

15. The washer/dryer combination appliance according to Claim 12, wherein the flexible coupling is a dash pot (82).

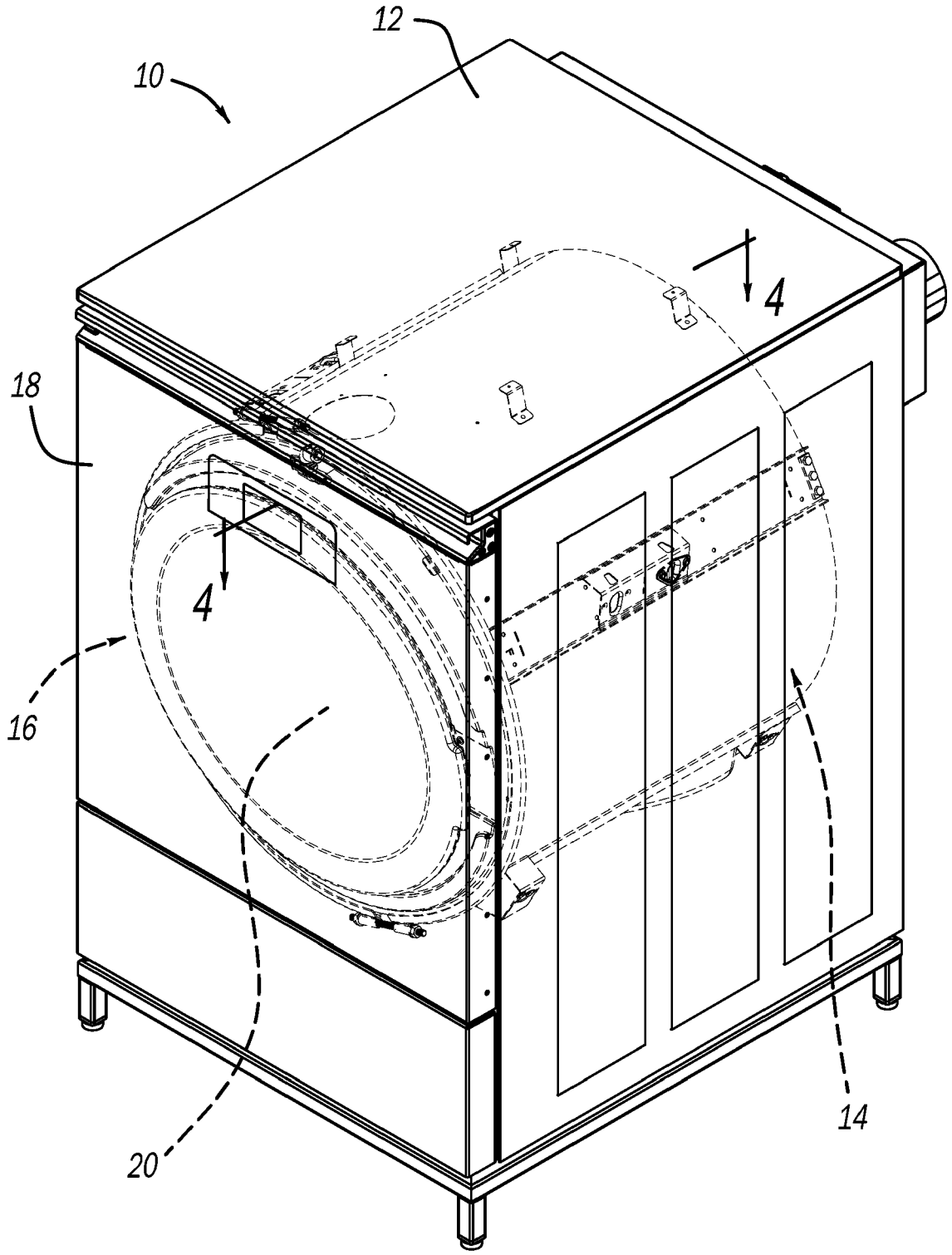


FIG - 1

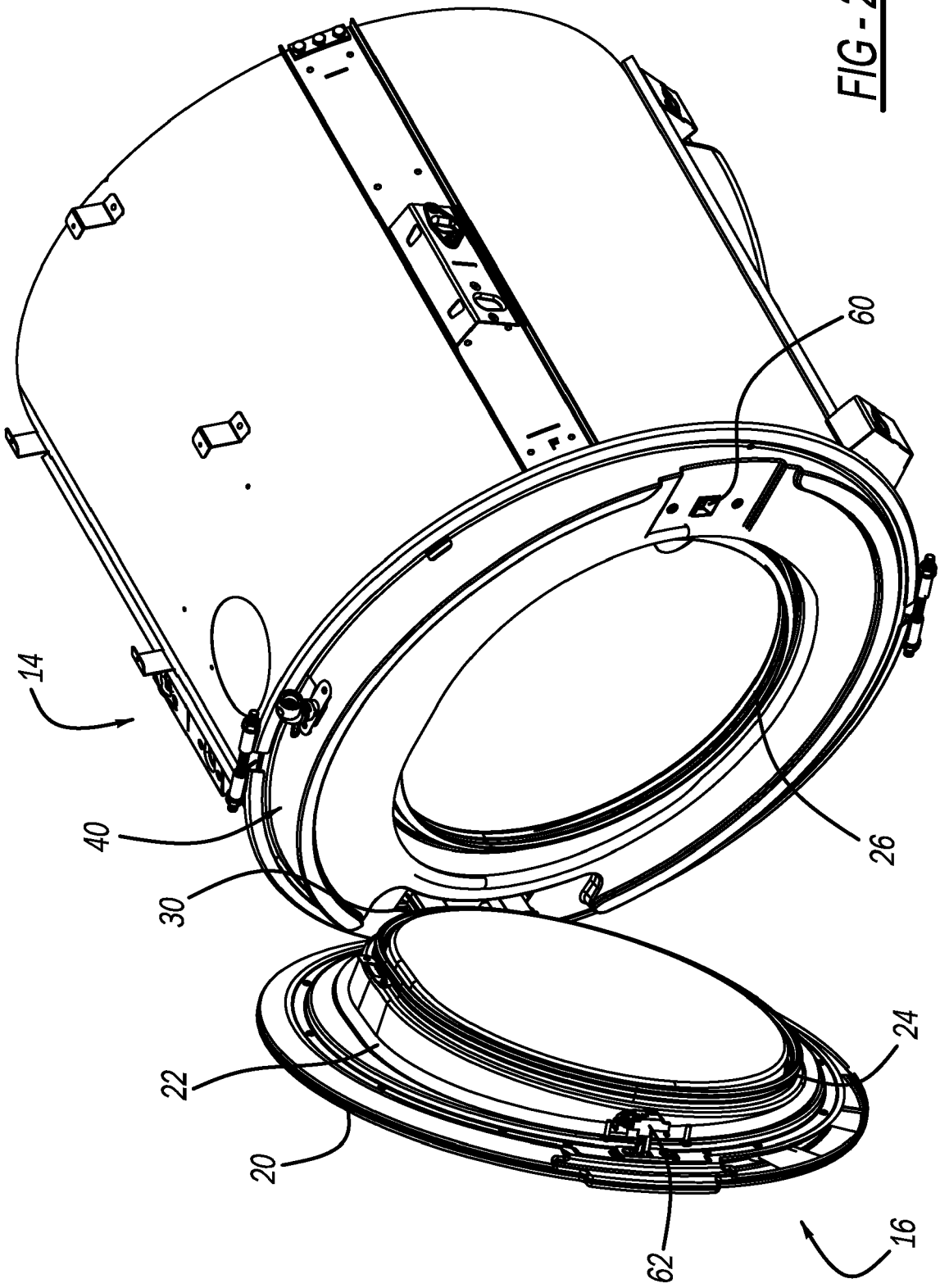


FIG - 2

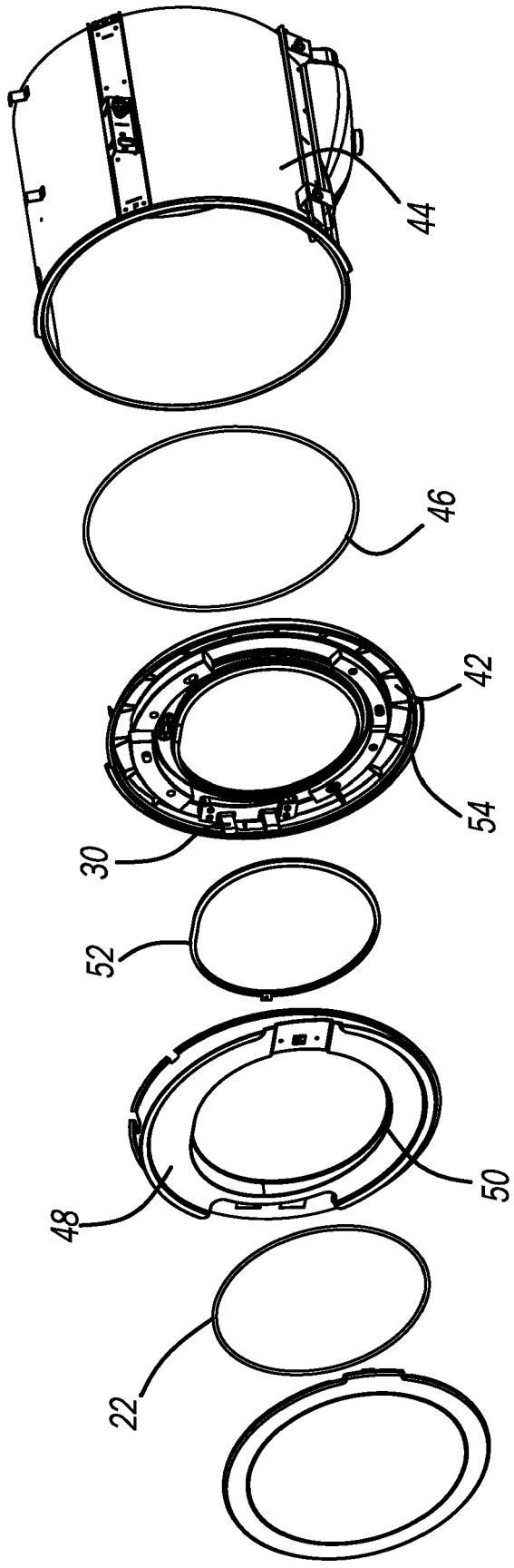
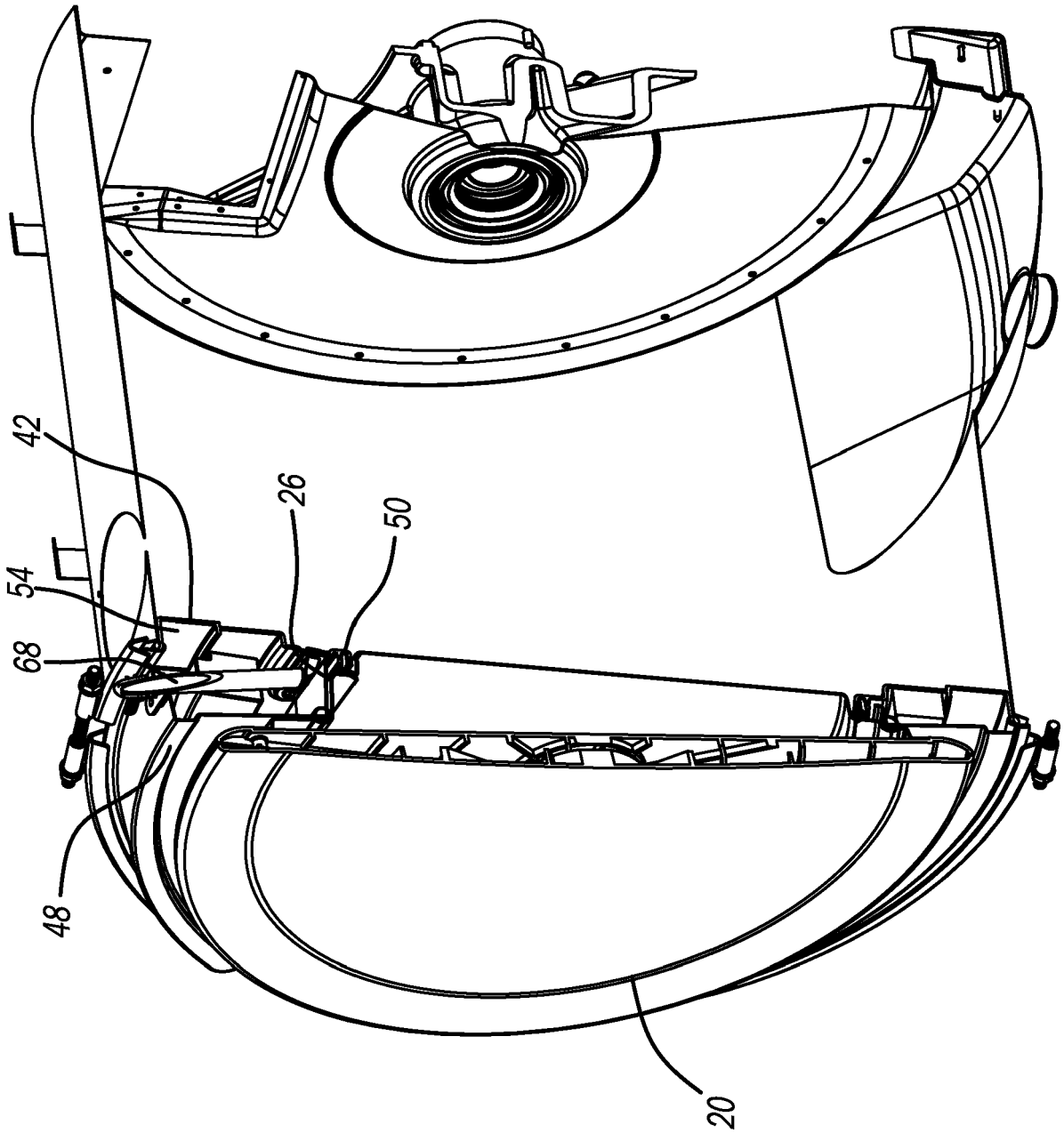


FIG - 3

FIG - 4



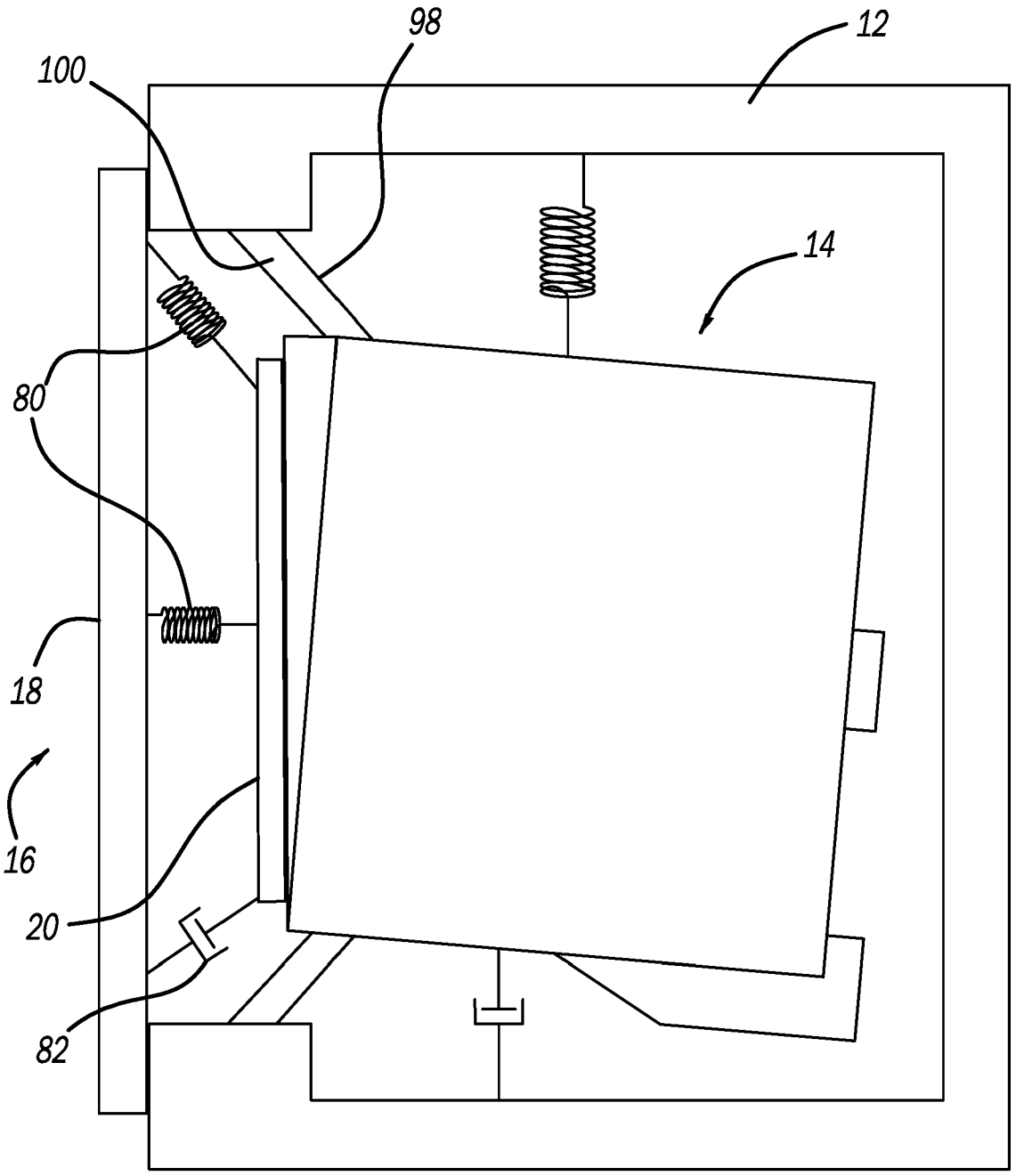


FIG - 5

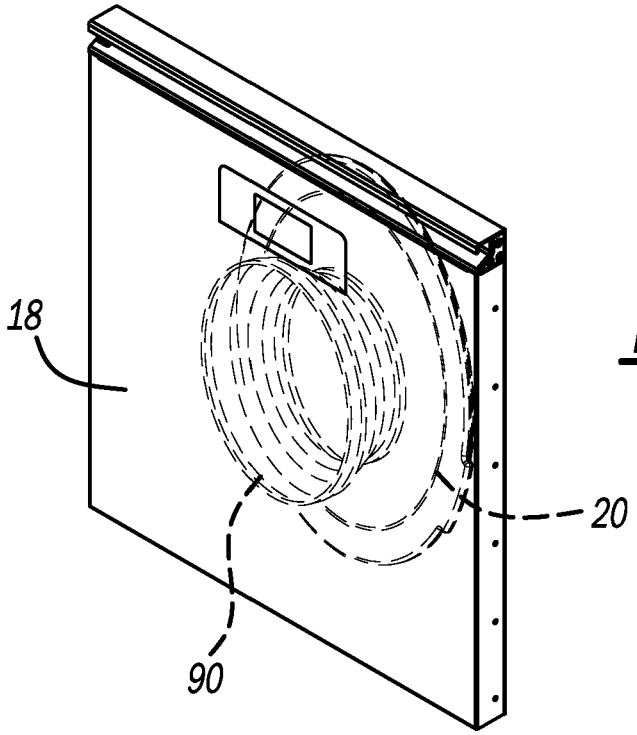


FIG - 6A

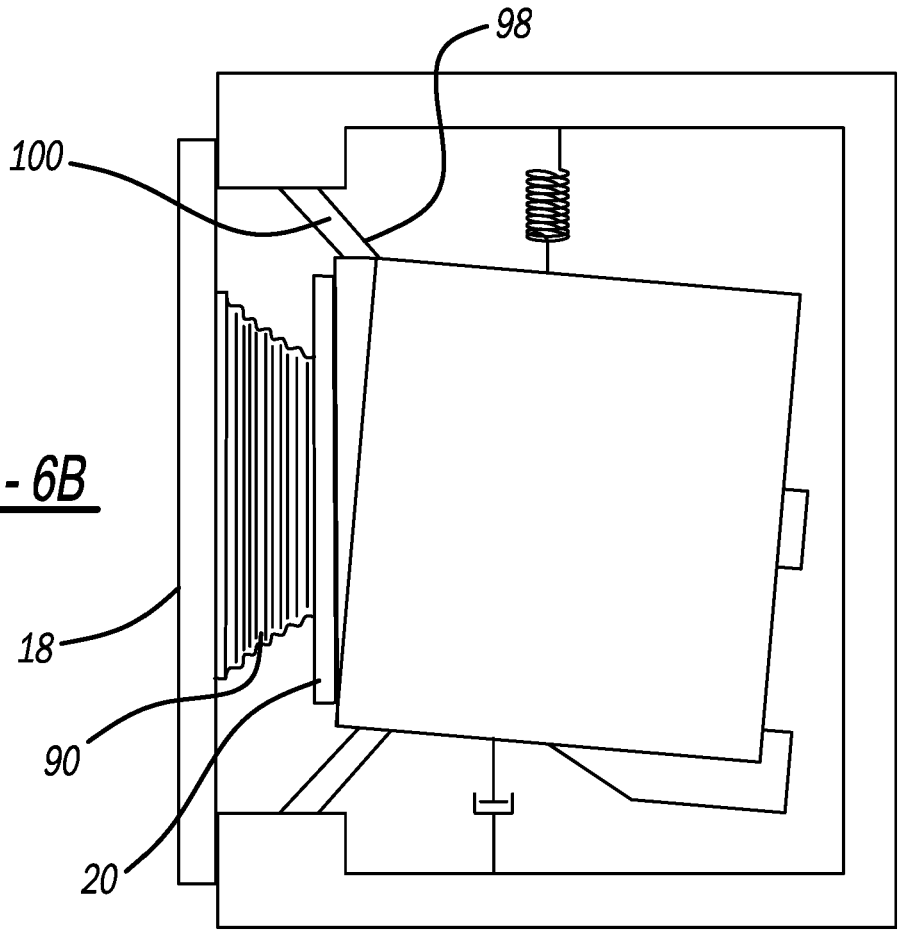


FIG - 6B

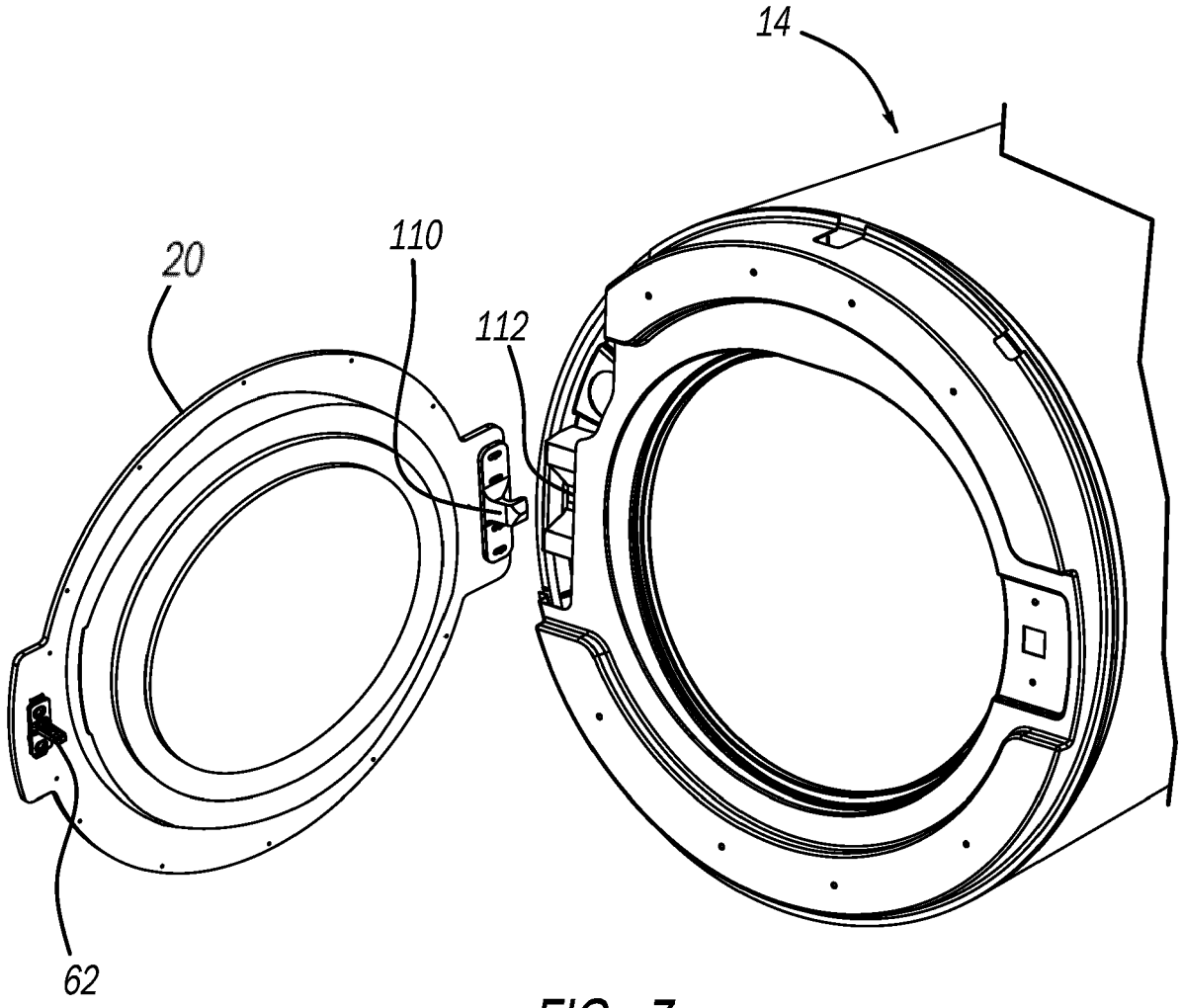


FIG - 7

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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 9344

DOCUMENTS CONSIDERED TO BE RELEVANT

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X Y	EP 3 779 020 A1 (WHIRLPOOL CO [US]) 17 February 2021 (2021-02-17) * paragraphs [0012], [0018] - [0023], [0035]; claims; figures * -----	1,2,4-6, 8-12,15 3,5,7, 13,14	INV. D06F39/14 D06F37/28 ADD. D06F37/04 D06F25/00
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 September 2022	Popara, Velimir

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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