



- (51) International Patent Classification:
F24C 15/32 (2006.01) *F16J 15/08* (2006.01)
- (21) International Application Number:
PCT/EP2014/055738
- (22) International Filing Date:
21 March 2014 (21.03.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
A 2013/03515 22 March 2013 (22.03.2013) TR
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- (81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

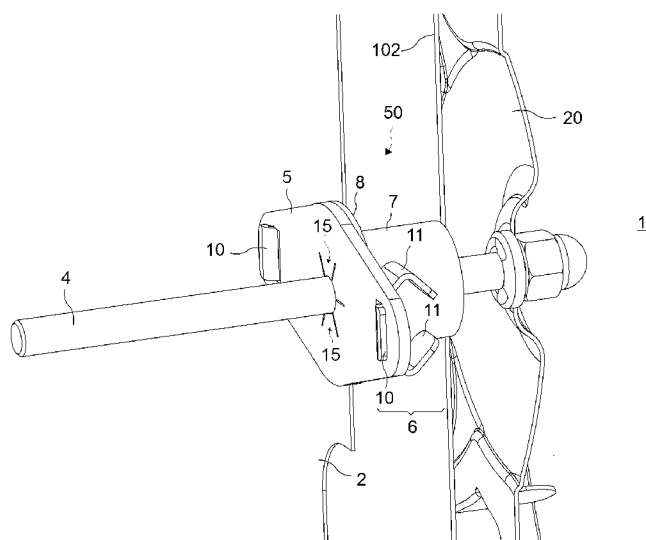
- (84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

- (54) Title: A SEALING APPARATUS AND THE OVEN WHEREIN THE SAME IS USED

Figure 5



(57) Abstract: The present invention relates to a sealing apparatus (50) that is suitable for providing leak-proofing between a cooking chamber (1) of an oven (100) and the outside environment and that has a gasket (5) disposed around a shaft (4) that extends into the cooking chamber (1) by passing through an opening (3, 103) disposed on a wall (2, 102) of the cooking chamber (1) and a fixing means (6) that enables the gasket (5) to be mounted on the wall (2, 102) around the opening (3, 103).

Description

A SEALING APPARATUS AND THE OVEN WHEREIN THE SAME IS USED

- [0001] The present invention relates to an oven wherein hot air circulation is provided inside the cooking chamber by means of a fan.
- [0002] During cooking of the food in ovens, the circulation of hot air inside the cooking chamber is provided by a motor and a fan disposed on the wall of the cooking chamber. The fan that is disposed inside the cooking chamber is moved by the motor shaft. An opening on the rear wall of the cooking chamber is required in order to connect the motor shaft to the fan inside the cooking chamber. This opening causes the hot and humid air to leak outside from the cooking chamber. The hot air and the vapor leaking outside causes the energy consumption of the oven to increase and the motor to malfunction. Hot air should be prevented from leaking through the opening by providing leak-proofing at the opening. Therefore, sealing gaskets are used between the said opening in ovens and the motor shaft, that provide leak-proofing between the cooking chamber and the outside environment. The said sealing gaskets become insufficient in providing leak-proofing by losing their ability of sealing in the course of time due to the effect of heat and the vibration of the motor shaft. On the other hand, in the case the axis of the motor shaft is eccentric, the sealing apparatus causes the shaft hub to be strained. The noise level increases due to straining and the motor that drives the fan may malfunction.
- [0003] In the state of the art Canadian Patent Application No. CA2712030 (A1), an o-ring seal disposed on the motor shaft in order to prevent the high temperature vapor from reaching the motor and a threaded bushing that positions the gasket and connects the fan-motor group to the oven are explained.
- [0004] The aim of the present invention is the realization of a sealing apparatus that can be easily mounted, that effectively provides leak-proofing between the cooking chamber and the outside environment and thus both enables energy saving and prevents malfunctioning of the motor that drives the fan, and the realization of an oven wherein the sealing apparatus is used.
- [0005] The sealing apparatus realized in order to attain the aim of the present

invention and explicated in the attached claims, is suitable to provide leak-proofing between the cooking chamber of an oven and the outside environment, and comprises a gasket disposed between the motor and the fan, around the shaft that extends from an opening on a wall of the cooking chamber into the cooking chamber, whereof the portion located around the shaft changes shape elastically in the radial direction and vertically to the shaft axis, and a fixing means that fixes the gasket in the rotational direction of the shaft and on the wall encircling the opening.

[0006] The oven realized in order to attain the aim of the present invention and explicated in the attached claims, comprises the sealing apparatus of the present invention. The sealing apparatus of the present invention is preferably mounted to the rear wall of the oven cooking chamber.

[0007] The gasket located in the sealing apparatus of the present invention, when mounted to an oven wherein the shaft axis is eccentric with respect to the center of the opening, changes shape elastically by being compressed or by being stretched in the radial direction the shaft vibrates, compensates the eccentricity of the shaft and effectively provides leak-proofing between the cooking chamber and the outside environment. The fixing means located in the sealing apparatus enables the gasket to be mounted to the opening so as not to be dislodged in the course of time.

[0008] In an embodiment of the present invention, the gasket comprises flexible fins that contact the periphery of the shaft. The fins compensate the eccentricity of the shaft axis, thus preventing the hot air from leaking through the gap between the shaft and the opening. In another embodiment of the present invention, the gasket has a brushed structure and the brush tips that extend from its periphery towards the interior contact the periphery of the shaft.

[0009] In an embodiment of the present invention, the fixing means comprises a flange seated on the opening arranged at the wall of the cooking chamber and a pipe connected to the flange, having larger diameter than the shaft and through which the shaft passes. The shaft extends freely through this pipe towards the interior of the cooking chamber and is connected to the fan. A gap is left between the pipe and the shaft that is enough to

compensate the eccentricity of the axis from the center of the opening such that the shaft does not hit the inner wall of the pipe while the motor operates.

- [0010] In another embodiment of the present invention, the fixing means has screws and the gasket and the flange are fixed to the wall of the cooking chamber with screws.
- [0011] In another embodiment of the present invention, the fixing means has claws disposed on the flange and retainers disposed between the gasket and the flange, and the gasket is grouped with the flange by means of the claws disposed on the flange and fixed to the cooking chamber wall by means of the retainers.
- [0012] In an embodiment of the present invention, the fixing means is configured as a bayonet clutch comprising a ring-shaped frame wherein the gasket is mounted, feet disposed on the frame and holes opened into the wall wherein the feet are inserted.
- [0013] The sealing apparatus of the present invention prevents the hot air from leaking from the cooking chamber to the outside environment and decreases the noise level by attenuating the vibrations of the shaft that enables the motor to drive the fan. Furthermore, the motor is prevented from malfunctioning by preventing the humid air leaving the cooking chamber from reaching the motor.
- [0014] The model embodiments relating to the sealing apparatus and the oven wherein the same is used, realized in order to attain the aim of the present invention are illustrated in the attached figures, where:
- [0015] Figure 1 – is the schematic view of an oven.
- [0016] Figure 2 – is the partial perspective view showing the openings on the rear wall of the oven cooking chamber and the position of the motor shaft in the opening.
- [0017] Figure 3 – is the partial perspective view of the sealing apparatus connected to the rear wall of the oven cooking chamber in an embodiment of the present invention.
- [0018] Figure 4 – is the partial perspective view of the sealing apparatus in Figure 3 from another angle.

- [0019] Figure 5 – is the partial perspective view of the sealing apparatus connected to the rear wall of the oven cooking chamber in another embodiment of the present invention.
- [0020] Figure 6 – is the partial perspective view of the sealing apparatus in Figure 5 from another angle.
- [0021] Figure 7 – is the partial perspective view of a sealing apparatus that comprises the fixing means configured as a bayonet clutch and that is connected to the rear wall of the oven cooking chamber.
- [0022] Figure 8 – is the partial perspective view of a sealing apparatus that comprises the fixing means configured as a groove and that is connected to the rear wall of the oven cooking chamber.
- [0023] The elements illustrated in the figures are numbered as follows:
1. Cooking chamber
 2. 102. Wall
 3. 103. Opening
 4. Shaft
 5. Gasket
 6. Fixing means
 7. Pipe
 8. Flange
 9. Screw
 10. Claw
 11. Retainer
 12. Frame
 13. Foot
 14. Hole
 15. Fin
 16. Fan
 17. Motor
- [0024] 50. Sealing apparatus
- [0025] 100. Oven
- [0026] The sealing apparatus (50) is suitable for providing leak-proofing between the outside environment and a cooking chamber (1) disposed inside an

- oven (100), wherein the cooking process is performed, and comprises
- [0027] - a shaft (4) that extends into the cooking chamber (1) through one or more than one opening (3, 103) arranged on one or more than one wall (2, 102) defining the cooking chamber (1) and that enables a fan (16) disposed in the cooking chamber (1) to be driven by means of a motor (17), and a gasket (5) disposed at the opening (3, 103) around the shaft (4).
- [0028] The sealing apparatus (50) of the present invention comprises,
- [0029] - the gasket (5) that changes shape elastically between the periphery of the shaft (4) and the edge of the opening (3, 103) in the radial direction with respect to the rotational axis of the shaft (4) and thus compensates the eccentricity of the shaft (4) from the center of the opening (3, 103) during assembly and operation, and
- [0030] - a fixing means (6) that enables the gasket (5) to be fixed on the wall (2, 102) surrounding the opening (3, 103) and that prevents the gasket (5) from moving in the direction of the shaft (4) axis and dislodging from the opening (3, 103).
- [0031] In an embodiment of the present invention, the fixing means (6) comprises a pipe (7) through which the shaft (4) passes and a flange (8) fixed to one end of the pipe (7), seated on the wall (2, 102) surrounding the opening (3, 103), and fixes the gasket (5) to the wall (2, 102) by means of the flange (8) (Figure 3 and Figure 4). During assembly, the gasket (5), the flange (8) and the pipe (7) are grouped and preferably mounted to the rear wall (2, 102) of the oven (100).
- [0032] In another embodiment of the present invention, the fixing means (6) has screws (9) that fix the flange (8) and the gasket (5) seated on the flange (8) together on the wall (2, 102) (Figure 3 and Figure 4). During the installation of the sealing apparatus (50) to the oven (100), the gasket (5), the flange (8) and the pipe (7) are grouped and preferably fixed to the rear wall (2, 102) of the oven (100) with the screws (9).
- [0033] In another embodiment of the present invention, the fixing means (6) comprises
- [0034] - at least one claw (10) disposed on the flange (8) that fixes the gasket (5)

on the flange (8) and

- [0035] - at least one retainer (11) that fixes the flange (8) and the gasket (5) to the wall (2, 102) (Figure 5 and Figure 6). During the installation of the sealing apparatus (50) to the oven (100), the gasket (5), the flange (8) and the pipe (7) are grouped and preferably fixed to the rear wall (2, 102) of the oven (100) by means of the retainers (11).
- [0036] In another embodiment of the present invention, the fixing means (6) is configured like a bayonet clutch having
- [0037] - a ring shaped frame (12) to the inner part of which the gasket (5) is connected,
- [0038] - one or more than one foot (13) that is disposed on the frame (12) and that enables the frame (12) to be mounted snap-fittingly on the wall (2, 102) surrounding the opening (3, 103) and
- [0039] - one or more than one hole (14) arranged on the wall (2, 102) wherein the feet (13) are inserted (Figure 7).
- [0040] During the installation of the sealing apparatus (50) to the oven (100), the frame (12) is preferably fixed to the rear wall (2, 102) of the cooking chamber (1).
- [0041] In another embodiment of the present invention, the sealing apparatus (50) comprises the gasket (5) and the fixing means (6) produced as a single piece. In this embodiment, the fixing means (6) is shaped as a circular groove formed around the gasket (5) and seated all around the edge of the opening (3, 103) from the inside (Figure 8). The sealing apparatus (50) is fixed preferably to the opening (3, 103) at the rear wall (2, 102) of the cooking chamber (1) by means of the groove-shaped fixing means (6) surrounding the periphery of the gasket (5).
- [0042] In a version of this embodiment, some amount of movement space is left between the groove-shaped fixing means (6) and the edge of the opening (3, 103). The eccentricity of the shaft (4) axis with respect to the center of the opening (3, 103) is compensated by allowing the gasket (5) to move inside the opening (3, 103) in a limited manner.
- [0043] In an embodiment of the present invention, the gasket (5) is produced from silicone.

- [0044] In an embodiment of the present invention, the gasket (5) has flexible fins (15) that contact the periphery of the fan shaft (4) (Figure 3 to Figure 6).
- [0045] In another embodiment of the present invention, the gasket (5) is shaped as a brush, the tips of which contact the fan shaft (4) all around.
- [0046] The oven (100) comprises
- [0047] - a cooking chamber (1),
- [0048] - a fan (16) that is disposed inside the cooking chamber (1) and that provides the circulation of the hot air,
- [0049] - a motor (17) that is mounted to the rear wall (2, 102) of the cooking chamber (1) and that has a shaft (4) whereon the fan (16) is connected,
- [0050] - one or more than one opening (3, 103) opened into the rear wall (2, 102) and through which the fan shaft (4) passes to enter the cooking chamber (1), and
- [0051] - the sealing apparatus (50) that is disposed in the opening (3, 103) around the shaft (4) and that provides leak-proofing between the cooking chamber (1) and the outside environment (Figure 1).
- [0052] The sealing apparatus (50) of the present invention provides leak-proofing in the case the shaft (4) axis is eccentric with respect to the center of the opening (3, 103), preventing heat loss from the cooking chamber (1) of the oven (100) to the outside environment and decreases the noise level by attenuating the vibrations of the fan shaft (4). The fixing means (6) located in the sealing apparatus (50) enables the gasket (5) to be firmly mounted to the rear wall (2, 102) of the cooking chamber (1) in the rotational axis direction of the fan shaft (4) and prevents the gasket (5) from being dislodged from the opening (3, 103) by being deformed due to vibration.

Claims

1. A sealing apparatus (50) suitable for providing leak-proofing between the outside environment and a cooking chamber (1) of an oven (100) wherein the cooking process is performed, comprising a gasket (5) disposed around a shaft (4) that extends into the cooking chamber (1) by passing through one or more than one opening (3, 103) disposed on one or more than one wall (2, 102) defining the cooking chamber (1) and that enables a fan (16) disposed inside the cooking chamber (1) to be driven by means of a motor (17), **characterized in that**
 - the gasket (5) that changes shape elastically between the periphery of the shaft (4) and the edge of the opening (3, 103) in the radial direction with respect to the rotational axis of the shaft (4) and compensates the eccentricity of the shaft (4) from the center of the opening (3, 103), and
 - a fixing means (6) that enables the gasket (5) to be fixed on the wall (2, 102) surrounding the opening (3, 103) and that prevents the gasket (5) from moving in the direction of the shaft (4) axis.
2. A sealing apparatus (50) as in Claim 1, **characterized in that** the fixing means (6) having a pipe (7) through which the shaft (4) passes and a flange (8) fixed to one end of the pipe (7) and seated on the wall (2, 102) surrounding the opening (3, 103), the fixing means (6) enabling the gasket (5) to be fixed the wall (2, 102) by means of the flange (8).
3. A sealing apparatus (50) as in Claim 2, **characterized in that** the fixing means (6) having screws (9) that fix the flange (8) together with the gasket (5) seated on the flange (8) to the wall (2, 102).
4. A sealing apparatus (50) as in Claim 1 or 2, **characterized in that**
 - the fixing means (6) comprising at least one claw (10) disposed on the flange (8) that fixes the gasket (5) on the flange (8) and
 - at least one retainer (11) that is mounted between the claw (10) and the gasket (5) and that enables the flange (8) and the gasket (5) to be fixed to the wall (2, 102).
5. A sealing apparatus (50) as in Claim 1, **characterized in that** the fixing means (6) configured as a bayonet clutch comprising
 - a ring-shaped frame (12) to the center of which the gasket (5) is connected,

- one or more than one foot (13) that is disposed on the frame (12) and that enables the frame (12) to be mounted snap-fittingly on the wall (2, 102) surrounding the opening (3, 103), and
 - one or more than one hole (14) arranged on the wall (2, 102), wherein the feet (13) are inserted.
6. A sealing apparatus (50) as in Claim 1, **characterized in that** the fixing means (6) configured as a circular groove that is formed around the gasket (5) and seated all around the edge of the opening (3, 103) from the inside.
 7. A sealing apparatus (50) as in any one of the above claims, **characterized in that** the gasket (5) having more than one fin (15) that contacts the periphery of the shaft (4).
 8. A sealing apparatus (50) as in any one of the claims 1 to 6, **characterized in that** the gasket (5) configured as a brush, the tips of which contact the shaft (4) all around.
 9. An oven (100) **characterized in that**
 - a cooking chamber (1),
 - a fan (16) that is inside the cooking chamber (1) and that provides the circulation of the hot air,
 - a motor (17) that is mounted to the rear wall (2, 102) of the cooking chamber (1) and that has a shaft (4) whereon the fan (16) is connected,
 - one or more than one opening (3, 103) opened into the rear wall (2, 102) and through which the fan shaft (4) passes to enter the cooking chamber (1) and
 - a sealing apparatus (50) as in any one of the above claims, disposed in the opening (3, 103) around the shaft (4).

Figure 1

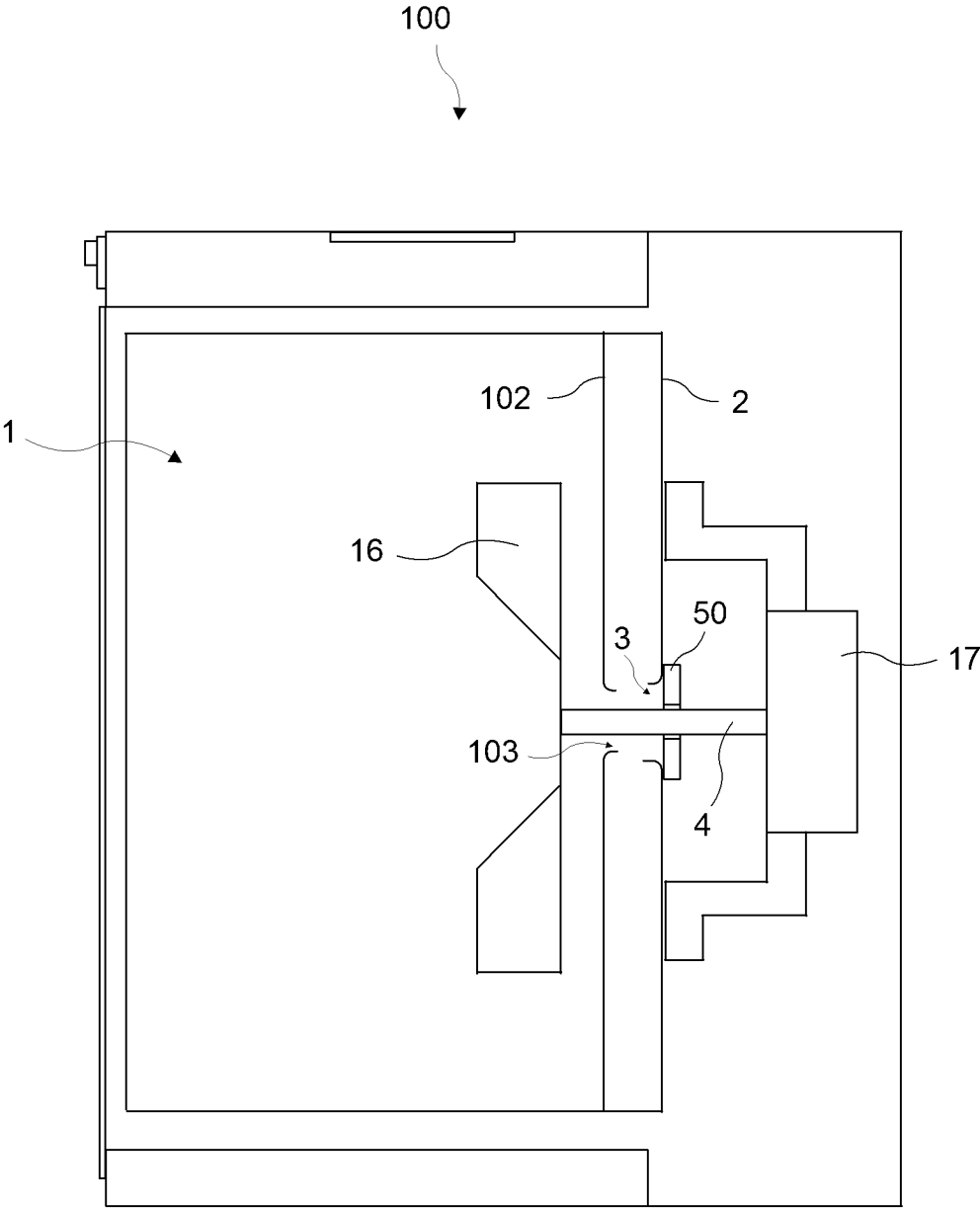


Figure 2

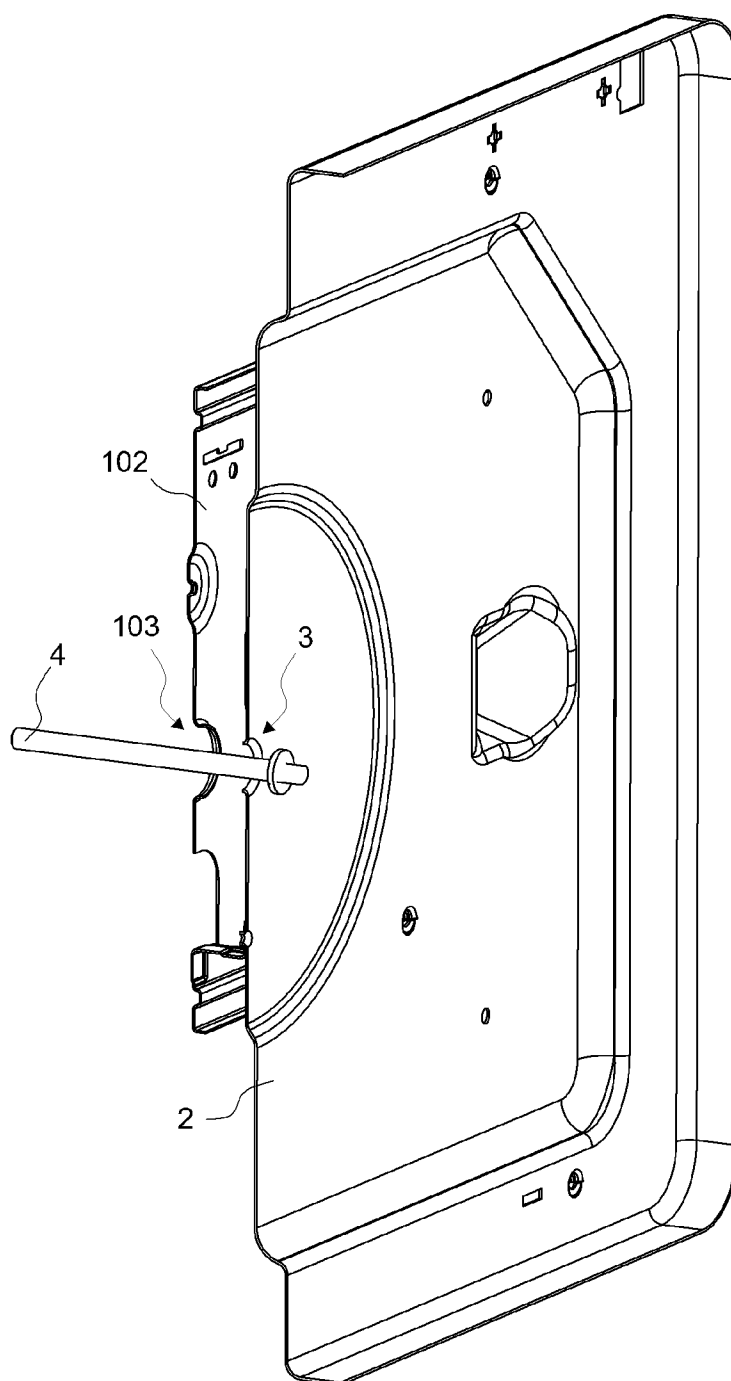


Figure 3

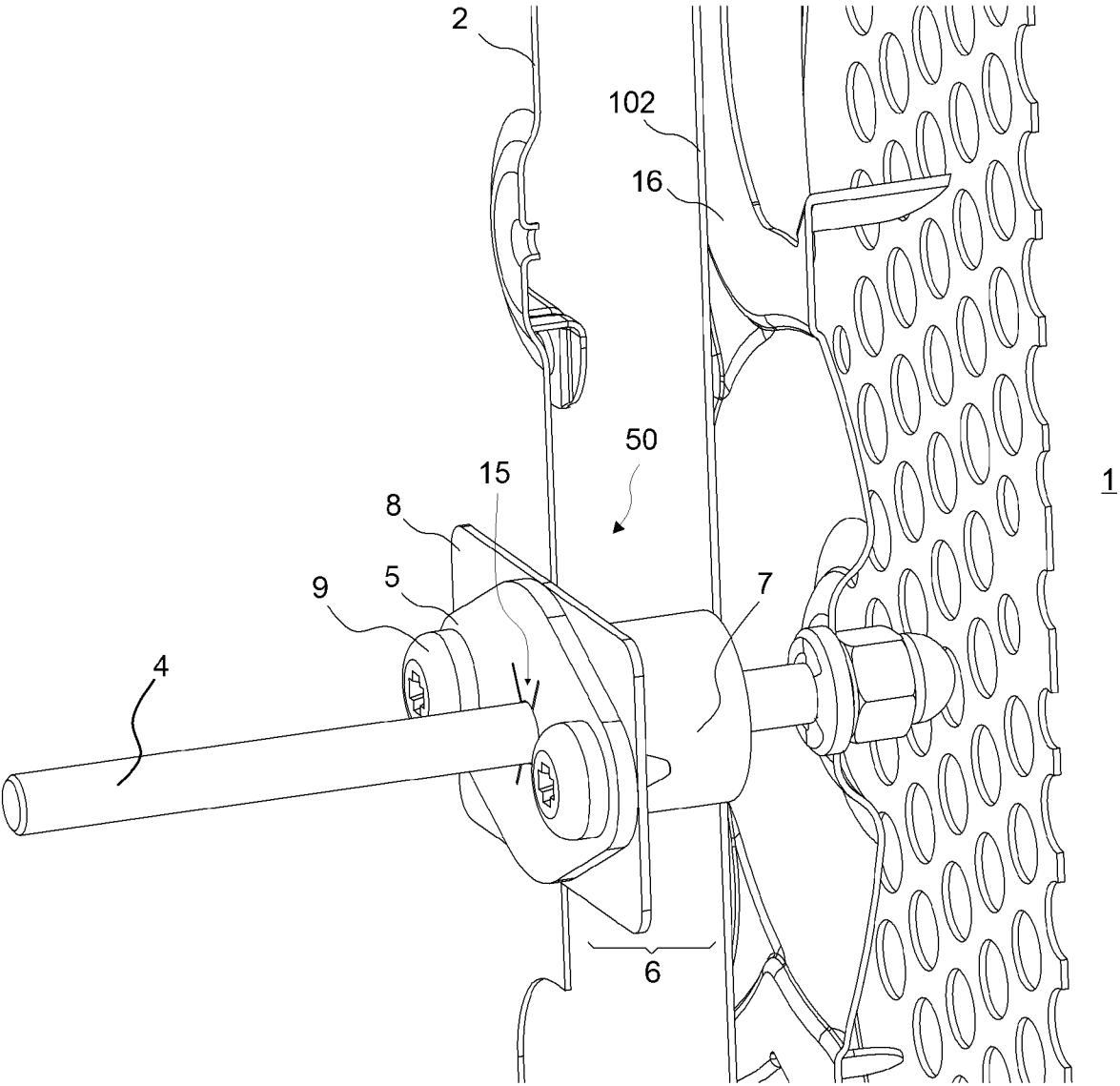


Figure 4

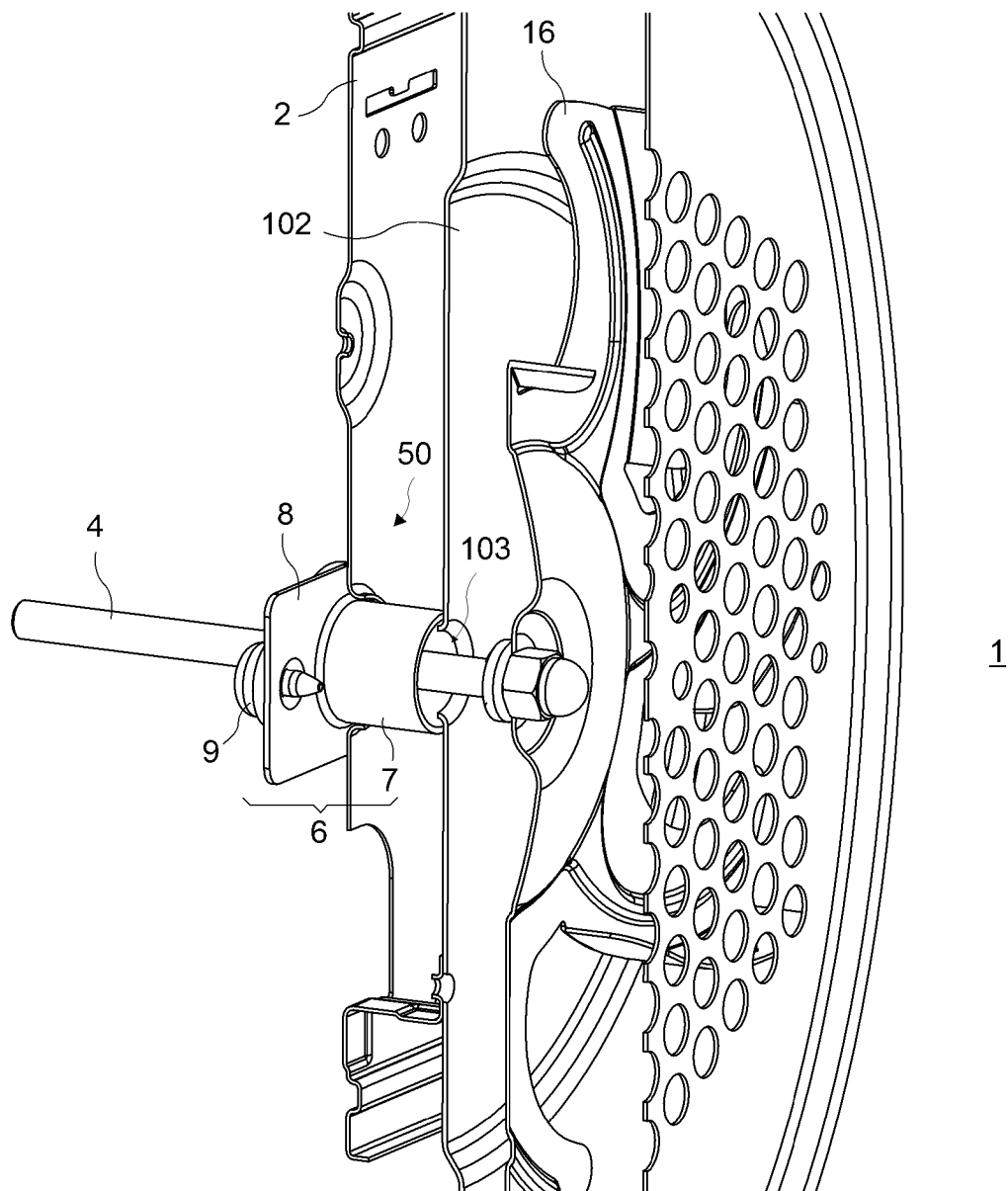


Figure 5

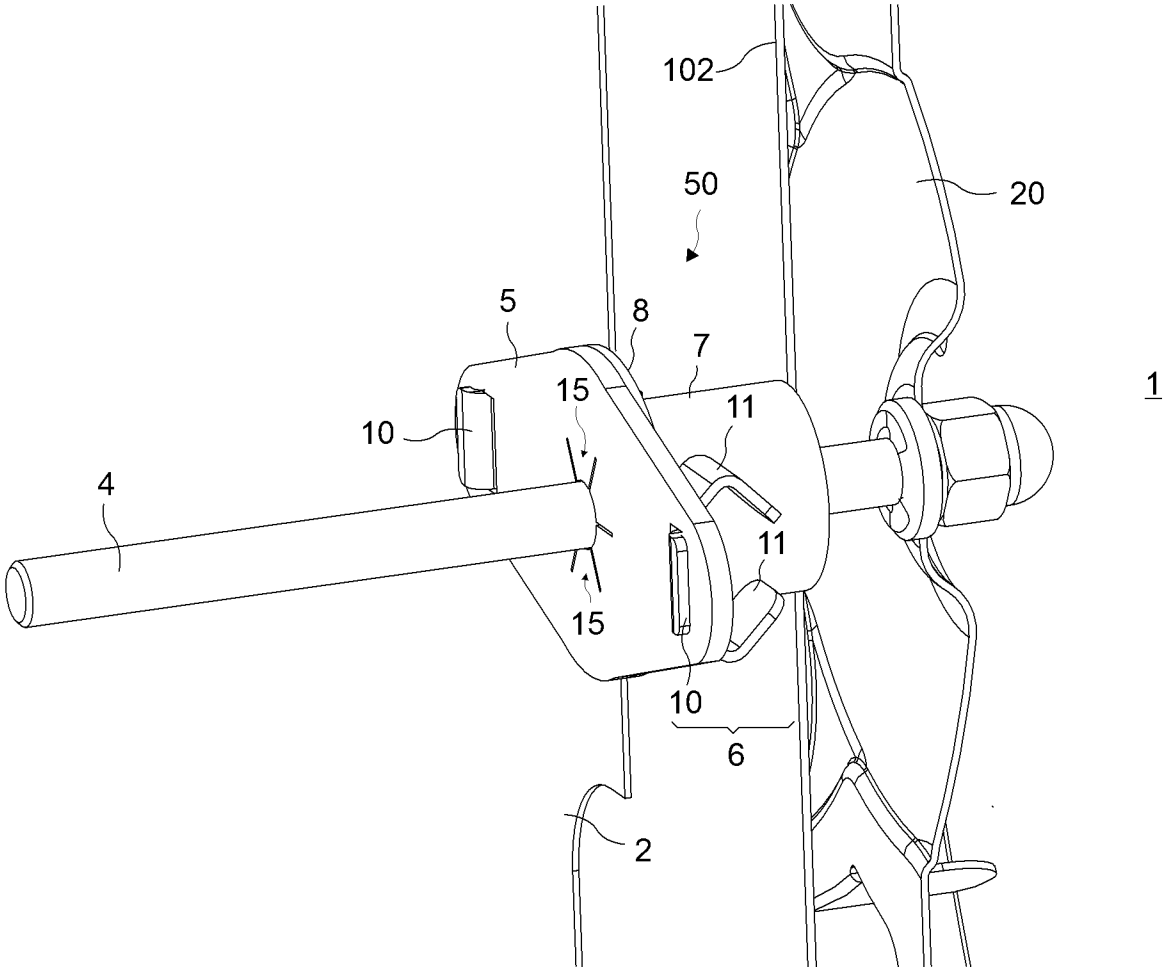


Figure 6

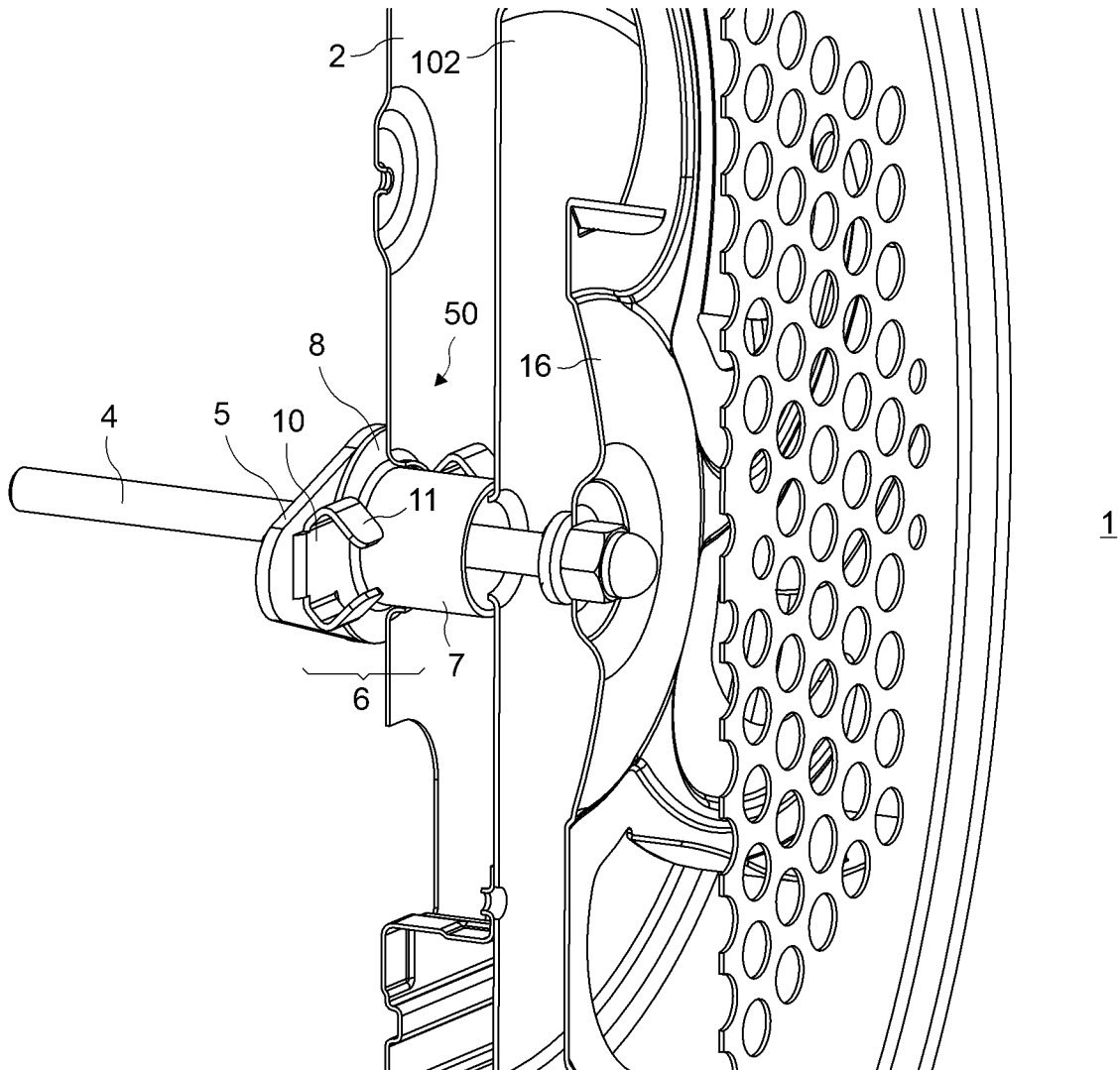


Figure 7

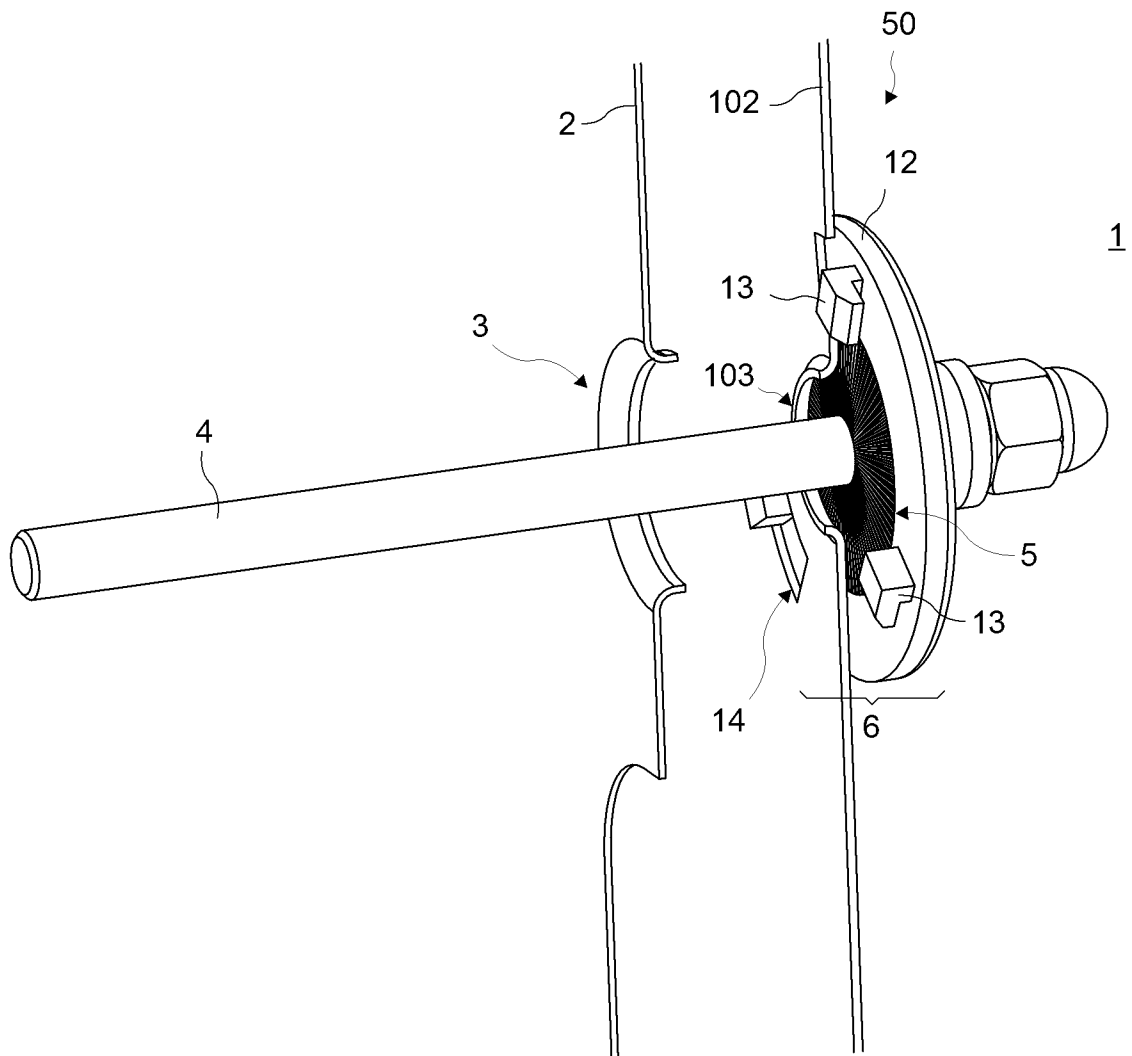
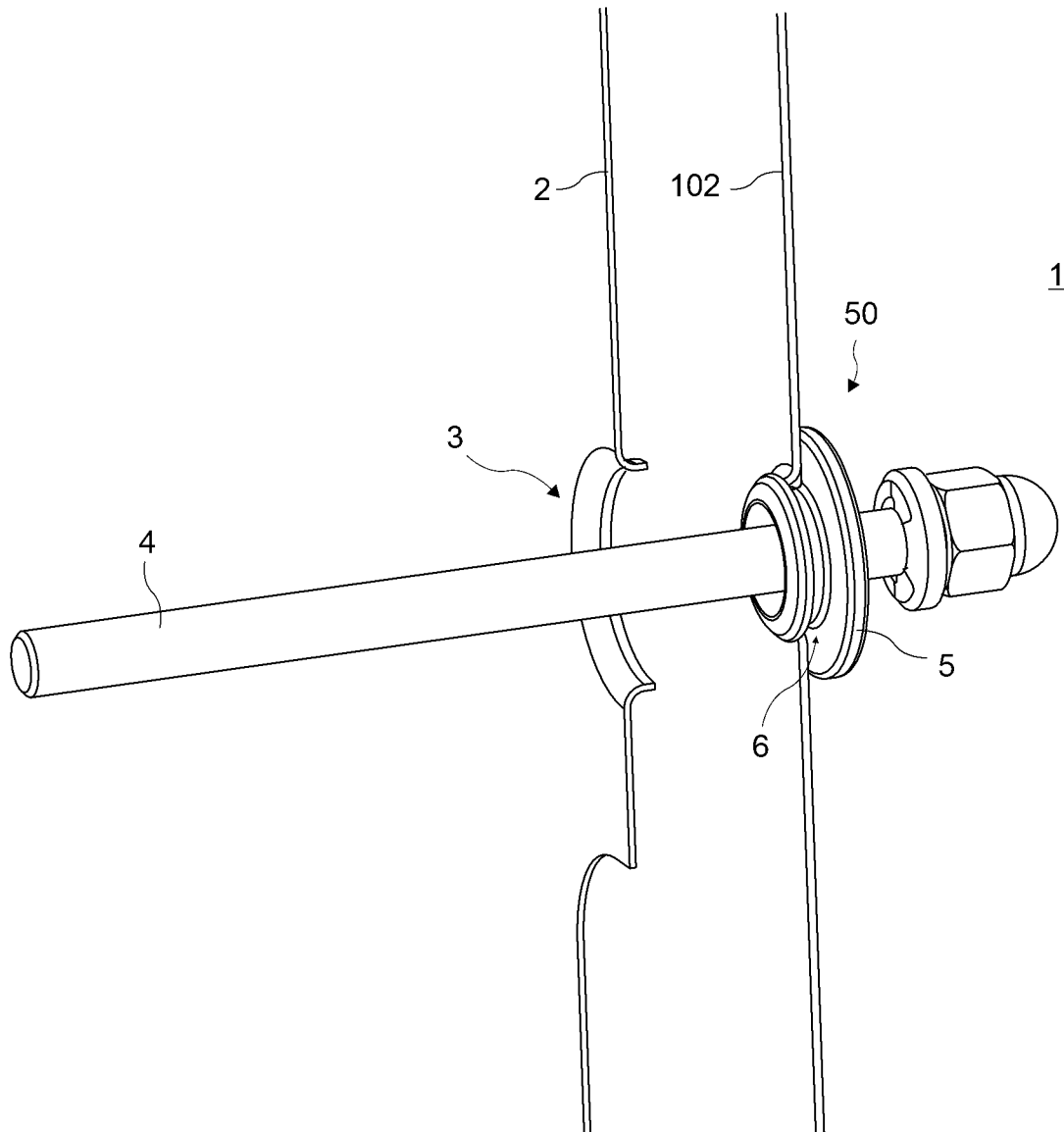


Figure 8



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/055738

A. CLASSIFICATION OF SUBJECT MATTER
INV. F24C15/32 F16J15/08
ADD.

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)
F16J F24C

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	column 3, line 22 - column 4, line 21; figures 1-4	3,7,8
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Y	US 2003/173744 A1 (MACDONALD GEORGE [US]) 18 September 2003 (2003-09-18) paragraph [0051]; figure 1	3
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	-/-	



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

27 May 2014

Date of mailing of the international search report

04/06/2014

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2014/055738

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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