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Derby DE1 1GY (GB)**(54) **Gas burner**

(57) A gas burner (30) includes an outer cylindrical wall (16) defining an internal cavity (20) for receiving a gas and air mixture and the outer cylindrical wall (16) includes a plurality of apertures (26) to allow a gas and air mixture to pass from the internal cavity (20) to an outer surface (16a) of the outer cylindrical wall (16) for combustion. A securing member (32) is attached to one end (33) of the outer cylindrical wall (16) and includes a circumferential inner rim (36) defining a circular opening

(38). An inner cylindrical wall (18) is located inside the internal cavity (20) and defines at one end (50) thereof a circular flange (48), the circular flange (48) extending axially through the circular opening (38) and in a radially outwards direction to thereby secure the inner cylindrical wall (18) to the securing member (32). At least part of the circumferential inner rim (36) of the securing member (32) extends in a radially outwards direction and includes a slot (40).

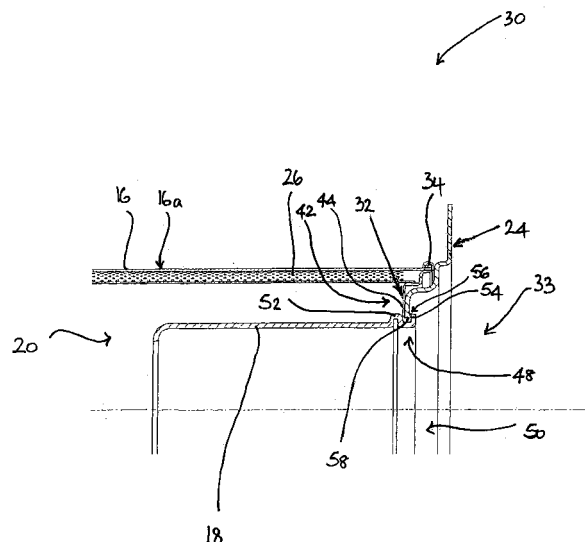


FIG. 6

EP 1 840 460 A1

Description

[0001] The present invention relates to a gas burner, and particularly but not exclusively to a gas burner for use in domestic heating appliances. The burner may be of the 'premix' type, meaning that all of the air required for complete combustion is mixed with the fuel gas prior to combustion.

[0002] Conventional premix burners include an outer cylindrical wall defining a cavity for receiving a gas and air mixture, and the gas and air mixture passes through apertures in the outer cylindrical wall for combustion. An inner cylindrical wall can be located inside, and secured to, the outer cylindrical wall and a mounting member can be provided to enable the burner to be mounted in a heating appliance.

[0003] It would be desirable to improve the way in which the outer and inner cylindrical walls, and the mounting member, are secured together.

[0004] According to a first aspect of the present invention, there is provided a gas burner including:

an outer substantially cylindrical wall defining an internal cavity for receiving a gas and air mixture and including a plurality of apertures to allow a gas and air mixture to pass from the internal cavity to an outer surface of the outer substantially cylindrical wall for combustion;

a securing member attached to one end of the outer substantially cylindrical wall and including a circumferential inner rim defining a substantially circular opening;

an inner substantially cylindrical wall located inside the internal cavity and defining at one end thereof a substantially circular flange, the substantially circular flange extending axially through the substantially circular opening in the securing member and in a radially outwards direction to secure the inner substantially cylindrical wall to the securing member;

characterised in that at least part of the circumferential inner rim of the securing member extends in a radially outwards direction and includes at least one slot.

[0005] At least part of the circumferential inner rim may be deformable to provide the radially outwardly extending part and the at least one slot may facilitate deformation to provide the radially outwardly extending part.

[0006] The circumferential inner rim may include a plurality of said slots extending therearound, and the slots may be equispaced around the circumferential inner rim.

[0007] The plurality of slots may be arranged so that the circumferential inner rim is defined by a plurality of projections. The projections may be equispaced around the circumferential inner rim.

[0008] Each projection may include a radially inwardly extending portion which may extend in a radially inwards direction. Each projection may include an axially extending portion and the axially extending portion may extend

in an axial direction outwardly away from said one end of the outer substantially cylindrical wall and outwardly away from the internal cavity. Each projection may include a radially outwardly extending portion which may extend in a radially outwards direction.

[0009] Each projection may have a generally C-shaped configuration and this configuration may be defined by the radially inwardly extending portion, the axially extending portion and the radially outwardly extending portion.

[0010] Part of the axially extending portion of each of the plurality of projections may be arranged to be deformed in a radially outwards direction, possibly to thereby define the radially outwardly extending portion.

[0011] The axially extending portions of the plurality of projections may together define the substantially circumferential inner rim of the substantially circular opening in the securing member. The axially extending portions may be arranged to facilitate location of the circular flange of the inner substantially cylindrical wall in the substantially circular opening.

[0012] The gas burner may include a mounting member, possibly for mounting the gas burner in a heating appliance, and the mounting member may be secured to the burner by the securing member.

[0013] The mounting member may include a substantially circumferential inner rim which may be located, in use, between the radially inwardly extending portion and the radially outwardly extending portion of each of the plurality of projections to thereby secure the mounting member to the gas burner.

[0014] The radially inwardly extending portion, the axially extending portion and the radially outwardly extending portion of each of the plurality of projections may define a circumferential securing channel, and the circumferential inner rim of the mounting member may be located in the circumferential securing channel to secure the mounting member to the gas burner.

[0015] According to a second aspect of the present invention, there is provided a method for manufacturing a gas burner in accordance with any of the preceding definitions of the first aspect of the invention, the method comprising:

(i) locating the substantially circular flange in the substantially circular opening so that the substantially circular flange extends through the substantially circular opening, and

(ii) deforming the substantially circular flange in a radially outwards direction to secure the inner substantially cylindrical wall to the securing member;

wherein step (ii) causes deformation of at least part of the circumferential inner rim of the securing member in a radially outwards direction.

[0016] Step (ii) may include bending the substantially circular flange in a radially outwards direction. Step (ii) may be performed by a deformation operation, such as

a spinning operation.

[0017] The method may comprise locating the substantially circumferential inner rim of the mounting member radially outwardly of the axially extending portion of each of the plurality of projections, and may thereafter comprise performing step (ii), wherein step (ii) may cause deformation of part of the axially extending portion of each of the plurality of projections to form said radially outwardly extending portion.

[0018] The radially inwardly extending portions and the radially outwardly extending portions of each of the plurality of projections formed by step (ii) may define a circumferential securing channel, and the circumferential inner rim of the mounting member may be located in the circumferential securing channel.

[0019] According to a third aspect of the present invention, there is provided a heating appliance including a gas burner according to any of the preceding definitions of the first aspect of the invention or a gas burner manufactured in accordance with any of the preceding definitions of the second aspect of the invention.

[0020] An embodiment of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:-

Fig. 1 is a diagrammatic perspective view of a conventional gas burner in place within a heating appliance;

Fig. 2 is a diagrammatic perspective view of part of a gas burner according to one embodiment of the invention;

Fig. 3 is a diagrammatic top view of a securing member of the burner of Fig. 2;

Fig. 4 is a diagrammatic perspective view of the securing member of Fig. 3;

Fig. 5 is a diagrammatic cross-sectional view of the burner of Fig. 2 in a part-manufactured condition; and

Fig. 6 is a diagrammatic cross-sectional view of the burner of Fig. 5 in a manufactured condition.

[0021] Fig. 1 illustrates a gas burner 10 located within a heating appliance including a combustion zone 12 and a heat exchanger 14. The gas burner 10 is of a known design and is described here to facilitate understanding of the present invention, described later with reference to Figs. 2 to 6.

[0022] The gas burner 10 includes an outer cylindrical wall 16 defining an internal cavity 20 and a concentric inner cylindrical wall 18, for example in the form of a restrictor tube, located inside the internal cavity 20. An end cap 22 is attached to the outer cylindrical wall 16 and closes one axial end of the gas burner 10. A mounting member 24 is attached to the other axial end of the outer cylindrical wall 16 and extends radially outwardly therefrom. The gas burner 10 is attached to a housing 25 of the heating appliance via the mounting member 24.

[0023] The outer cylindrical wall 16 is provided with a plurality of apertures in the form of flame ports 26, just a

few of which are illustrated in Fig. 1. The flame ports 26 are about 0.8mm in diameter and their centres are about 2 to 3mm apart. The flame ports 26 may be arranged evenly over the whole of the outer cylindrical wall 16.

[0024] In use, a gas and air mixture is fed into the internal cavity 20, and this passes through the flame ports 26 in the outer cylindrical wall 16 to the outer surface 16a thereof and into the combustion zone 12, where combustion takes place. The heat thereby produced is utilised via the heat exchanger 14, with the flue products passing out of the unit as indicated by the arrow A.

[0025] Where the inner cylindrical wall 18 is in the form of a restrictor tube, its purpose is to eliminate the interaction of sound pressure waves, created as a result of combustion, with the incoming gas and air mixture to thereby reduce the likelihood of resonance and consequent flame and flow instability.

[0026] Figs. 2, 5 and 6 illustrate a gas burner 30 according to one embodiment of the invention. The gas burner 30 is similar to the known gas burner 10 described above, and corresponding components are therefore designated with corresponding reference numerals.

[0027] Like the gas burner 10, the gas burner 30 includes an outer cylindrical wall 16, defining an internal cavity 20 and including a plurality of flame ports 26, and a concentric inner cylindrical wall 18 open at both axial ends thereof, for example in the form of a restrictor tube.

[0028] As can be seen most clearly in Fig. 2, the gas burner 30 includes a securing member 32, the purpose of which will be described later in the specification, and this is attached to one of the axial ends 33 of the outer cylindrical wall 16, by a suitable deformation operation, such as spinning, in which the circumferential outer edge 34 of the securing member 32 is bent or folded over the circumferential edge of the of the axial end 33 of the outer cylindrical wall 16.

[0029] The securing member 32 has a generally annular configuration and includes a circumferential inner rim 36 defining a circular opening 38. As best seen in Figs. 2 to 4, the circumferential inner rim 36 includes a plurality of equispaced slots 40 extending therearound and the circumferential inner rim 36 is thus defined by a plurality of equispaced projections 42.

[0030] In more detail, prior to manufacture of the burner 30, each projection 42 is generally L-shaped and includes a radially inwardly extending portion 44 and an axially extending portion 46 which extends in an axial direction outwardly away from the axial end 33 of the outer cylindrical wall 16 and away from the internal cavity 20.

[0031] Referring to Fig. 5, which shows the burner 30 in an assembled and part-manufactured condition, the inner cylindrical wall 18 includes a circular flange 48 at an axial end 50 thereof and the flange 48 is locatable inside the circumferential inner rim 36 of the securing member 32 so that it extends through the circular opening 38. The inner cylindrical wall 18 includes a circumferential radially outwardly projecting ridge 52 which partly defines

the flange 48 and in particular limits the extent to which the inner cylindrical wall 18 can extend through the circular opening 38.

[0032] In order to complete the manufacture of the burner 30 and secure the inner cylindrical wall 18 to the securing member 32, the circular flange 48 is deformed, for example by a spinning operation, to bend it in a radially outwards direction to the position shown in Fig. 6. As a result, the projections 42 are also deformed, and in particular the axially extending portion 46 of each projection 42 is bent in the radially outwards direction. Each projection 42 is thus defined by the radially inwardly extending portion 44, part of the original axially extending portion 46 and a radially outwardly extending portion 54, and together these define a circumferentially extending securing channel 56.

[0033] The purpose of the radially extending securing channel 56, once formed, is to secure the mounting member 24 to the burner 30 without the need for welding or similar operations. As can be seen in Figs. 5 and 6, the mounting member 24 defines a circumferential inner rim 58 which, when the burner 30 is in the part-manufactured condition, is located adjacent to, and radially outwardly of, the axially extending portions 46 of the projections 42. As the flange 48 is subsequently deformed in the manner described above, part of the axially extending portion 46 of each projection 42 deforms around the circumferential inner rim 58 to define the radially outwardly extending portion 54, thereby resulting in the formation of the circumferentially extending securing channel 56 with the circumferential inner rim 58 located therein.

[0034] The provision of a securing member 32 having a circumferential inner rim 36 including a plurality of slots 40 provides significant advantages over the prior art.

[0035] In particular, due to presence of the slots 40 and hence due to the fact that the circumferential inner rim 36 of the securing member 32 is discontinuous and defined by the plurality of projections 42, the force required to bend the circular flange 48 of the inner cylindrical wall 18 in the radially outwards direction to secure it to the securing member 32, and to thereby secure the mounting member 24 to the burner 30, is substantially reduced when compared to a securing member without slots. This is because the force required to bend the projections 42 is substantially less than the force that would be required to bend a securing member having a continuous circumferential inner rim defined, for example, by a continuous circumferential radially inwardly extending portion 44 and a continuous circumferential axially extending portion 46.

[0036] Stresses in the circular flange 48 and in the securing member 32 are consequently also reduced, leading to a reduced likelihood of failure of the burner 30 when it is subjected to cyclic stresses in use as a result of rapid temperature variations.

[0037] Although embodiments of the invention have been described in the preceding paragraphs with reference to various examples, it should be appreciated that

various modifications to the examples given may be made without departing from the scope of the present invention, as claimed.

[0038] For example, the securing member 32 may include any suitable number of slots 40, and hence projections 42. The projections 42 may have a different configuration to that illustrated in the drawings.

[0039] The slots 40, and hence projections 42, may not be equispaced. The securing member 32 may be secured to the outer cylindrical wall 16 by a method other than a spinning operation.

Claims

1. A gas burner (30) including:

an outer substantially cylindrical wall (16) defining an internal cavity (20) for receiving a gas and air mixture and including a plurality of apertures (26) to allow a gas and air mixture to pass from the internal cavity (20) to an outer surface (16a) of the outer substantially cylindrical wall (16) for combustion;

a securing member (32) attached to one end (33) of the outer substantially cylindrical wall (16) and including a circumferential inner rim (36) defining a substantially circular opening (38);

an inner substantially cylindrical wall (18) located inside the internal cavity (20) and defining at one end (50) thereof a substantially circular flange (48), the substantially circular flange (48) extending axially through the substantially circular opening (38) in the securing member (32) and in a radially outwards direction to thereby secure the inner substantially cylindrical wall (18) to the securing member (32);

characterised in that at least part of the circumferential inner rim (36) of the securing member (32) extends in a radially outwards direction and includes at least one slot (40).

2. A gas burner according to claim 1, wherein the circumferential inner rim (36) includes a plurality of said slots (40) extending therearound.

3. A gas burner according to claim 2, wherein the slots (40) are equispaced around the circumferential inner rim (36).

4. A gas burner according to claim 2 or claim 3, wherein the plurality of slots (40) are arranged so that the circumferential inner rim (36) is defined by a plurality of projections (42).

5. A gas burner according to claim 4, wherein the projections (42) are equispaced around the circumfer-

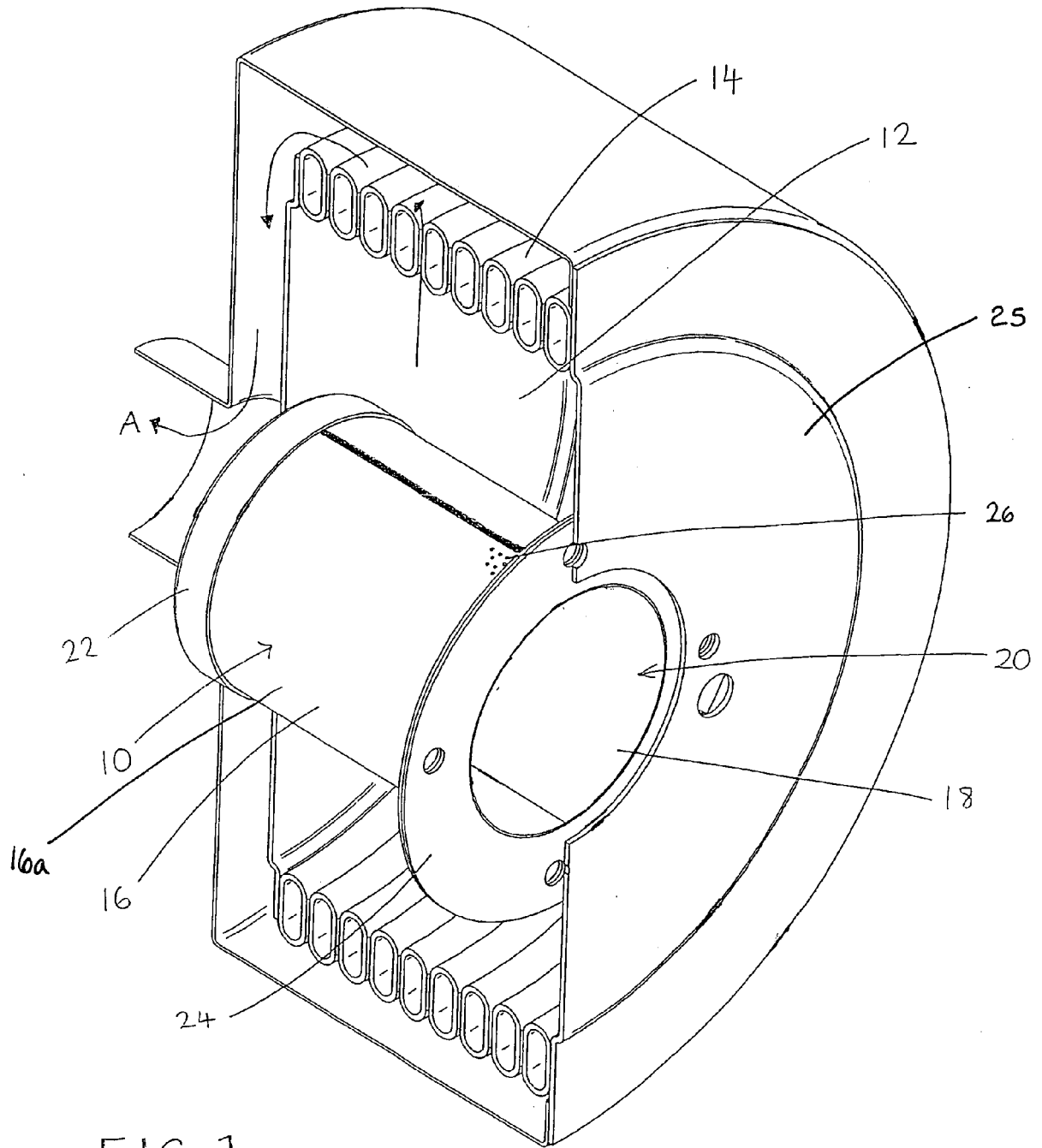
ential inner rim (36).

6. A gas burner according to claim 4 or claim 5, wherein each projection (42) includes a radially inwardly extending portion (44), an axially extending portion (46) extending in an axial direction outwardly away from said one end (33) of the outer substantially cylindrical wall (16), and a radially outwardly extending portion (54).
7. A gas burner according to claim 6, wherein the axially extending portions (46) of the plurality of projections (42) define the substantially circumferential inner rim (36) of the substantially circular opening (38) and are arranged to facilitate location of the circular flange (48) of the inner substantially cylindrical wall (18) in the substantially circular opening (38).
8. A gas burner according to claim 6 or claim 7, wherein part of the axially extending portion (46) of each projection (42) is arranged to be bent in a radially outwards direction to define the radially outwardly extending portion (54).
9. A gas burner according to any of the preceding claims, wherein the gas burner (30) includes a mounting member (24) secured thereto by the securing member (32).
10. A gas burner according to claim 9 when dependent on any of claims 6 to 8, wherein the mounting member (24) includes a substantially circumferential inner rim (58) located between the radially inwardly extending portion (44) and the radially outwardly extending portion (54) of each of the plurality of projections (42) to thereby secure the mounting member (24) to the gas burner (30).
11. A method for manufacturing a gas burner (30) according to any of the preceding claims, the method comprising:
 - (i) locating the substantially circular flange (48) in the substantially circular opening (38) so that the substantially circular flange (48) extends through the substantially circular opening (38), and
 - (ii) deforming the substantially circular flange (48) in a radially outwards direction to secure the inner substantially cylindrical wall (18) to the securing member (32);

wherein step (ii) causes deformation of at least part of the circumferential inner rim (36) of the securing member (32) in a radially outwards direction.
12. A method according to claim 11 when dependent on any of claims 6 to 10, wherein the method comprises

locating the substantially circumferential inner rim (36) of the mounting member (24) radially outwardly of the axially extending portion (46) of each of the plurality of projections (42), and thereafter performing step (ii), wherein step (ii) causes deformation of part of the axially extending portion (46) of each of the plurality of projections (42) to form said radially outwardly extending portion (54).

13. A method according to claim 12, wherein the radially inwardly extending portions (44) and the radially outwardly extending portions (54) of each of the plurality of projections (42) formed by step (ii) define a circumferential securing channel (56) in which the circumferential inner rim (58) of the mounting member (24) is located.
14. A heating appliance including a gas burner (30) according to any of claims 1 to 10 or a gas burner (30) manufactured in accordance with the method of any of claims 11 to 13.



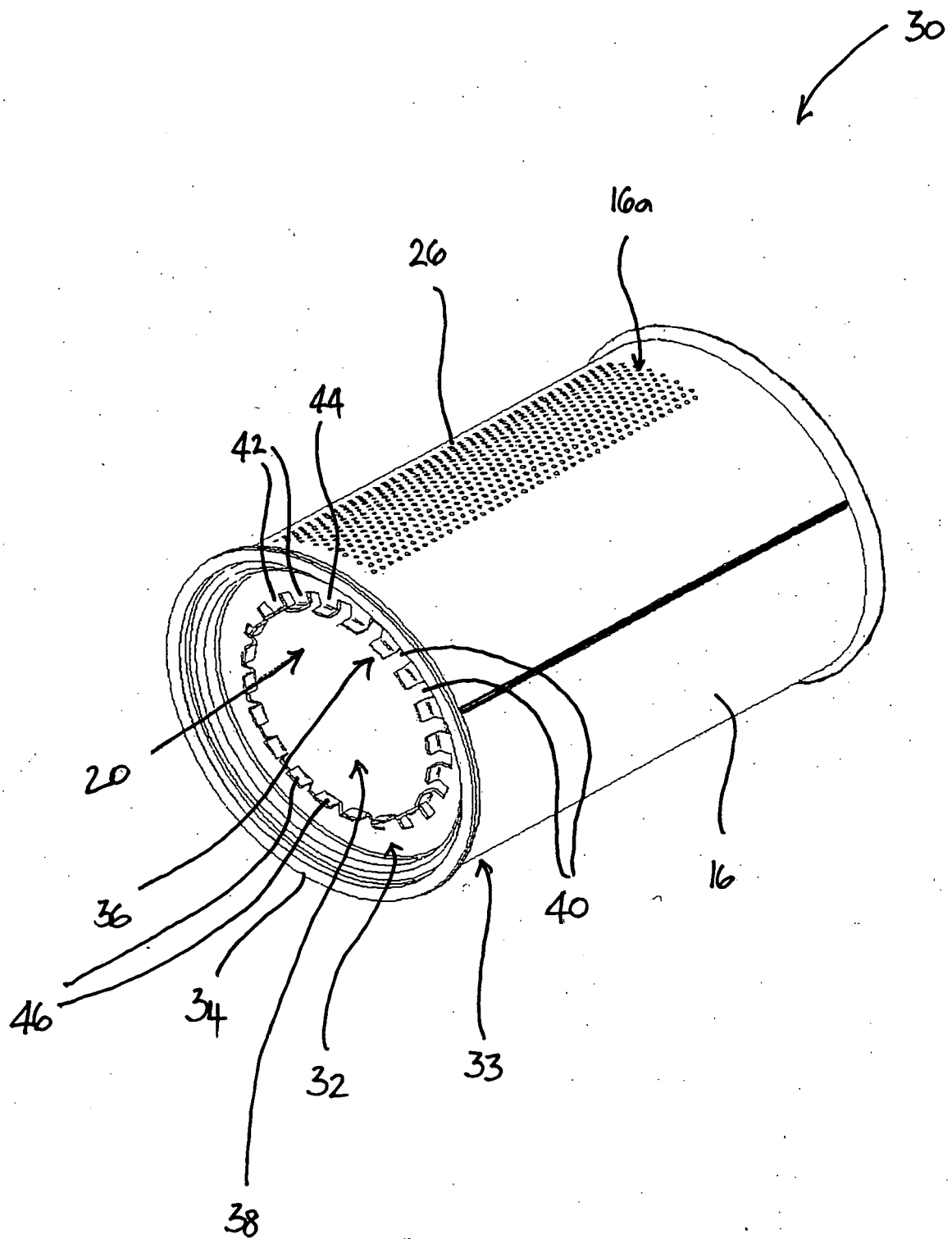
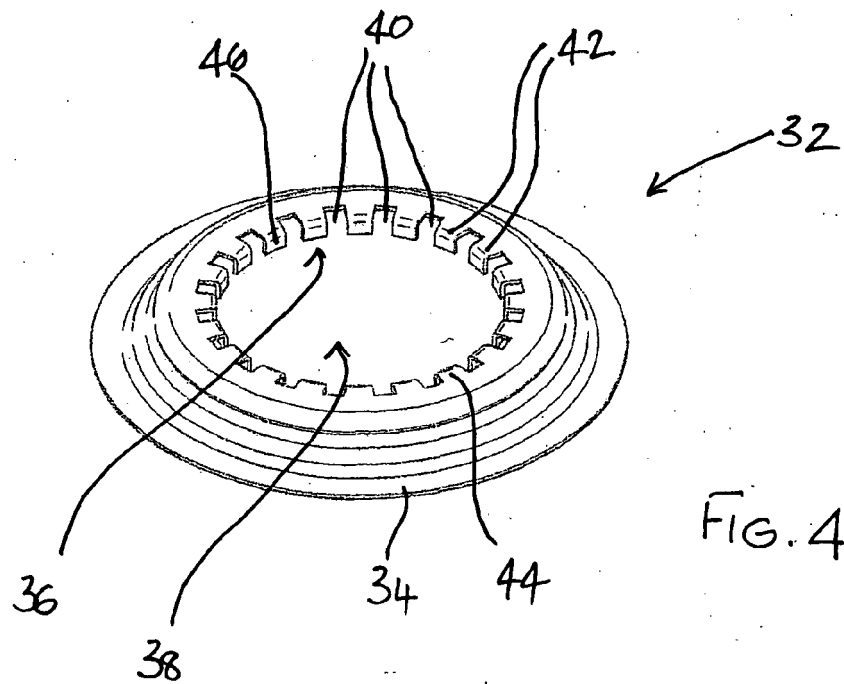
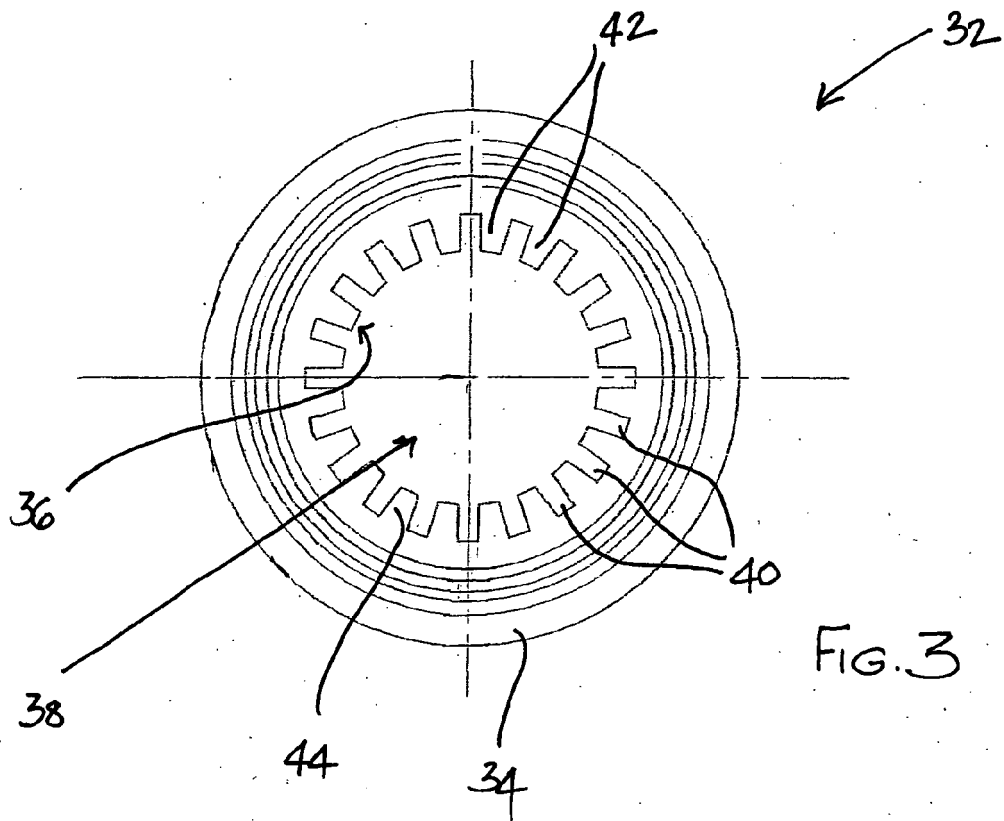
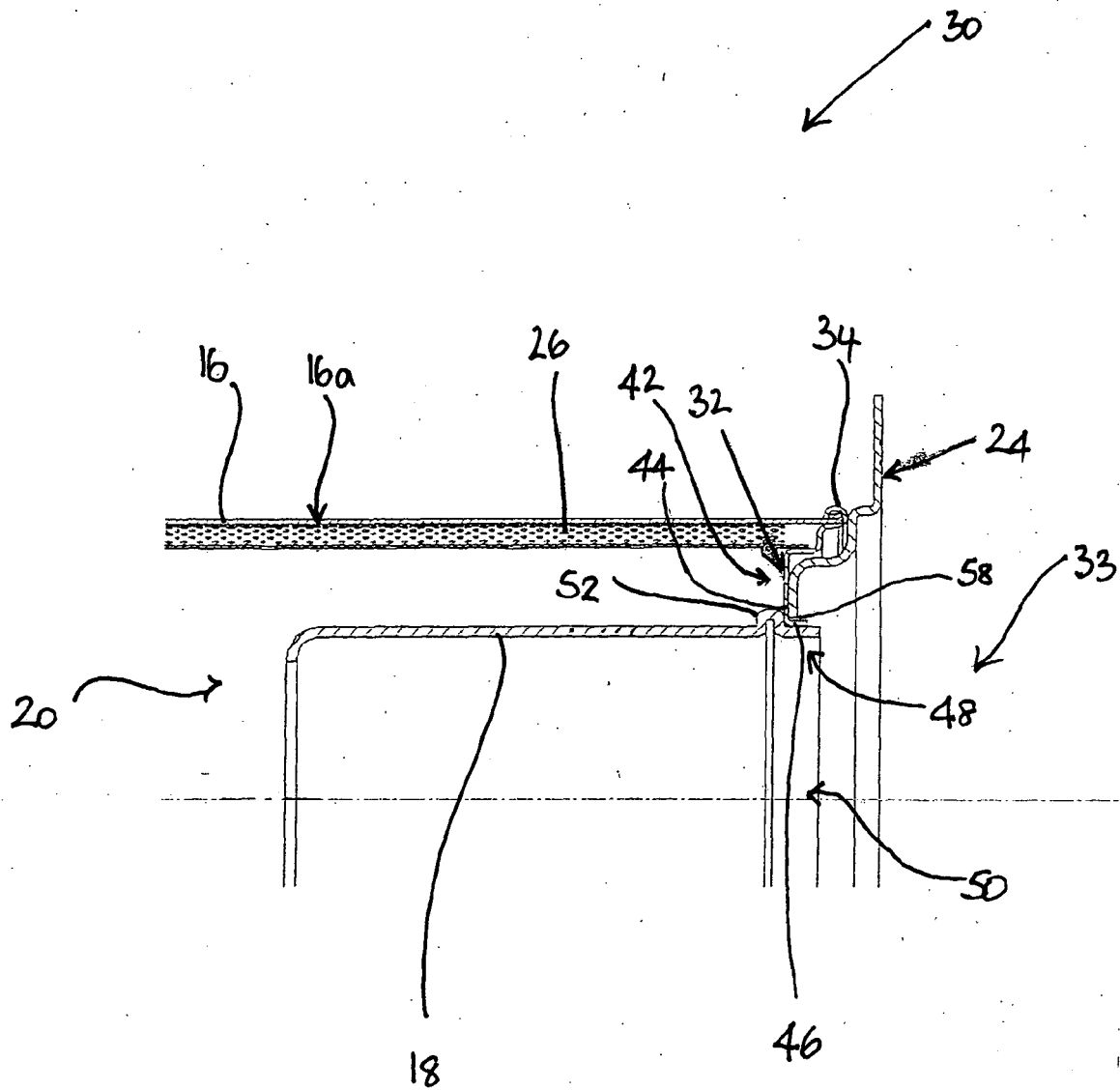


FIG. 2





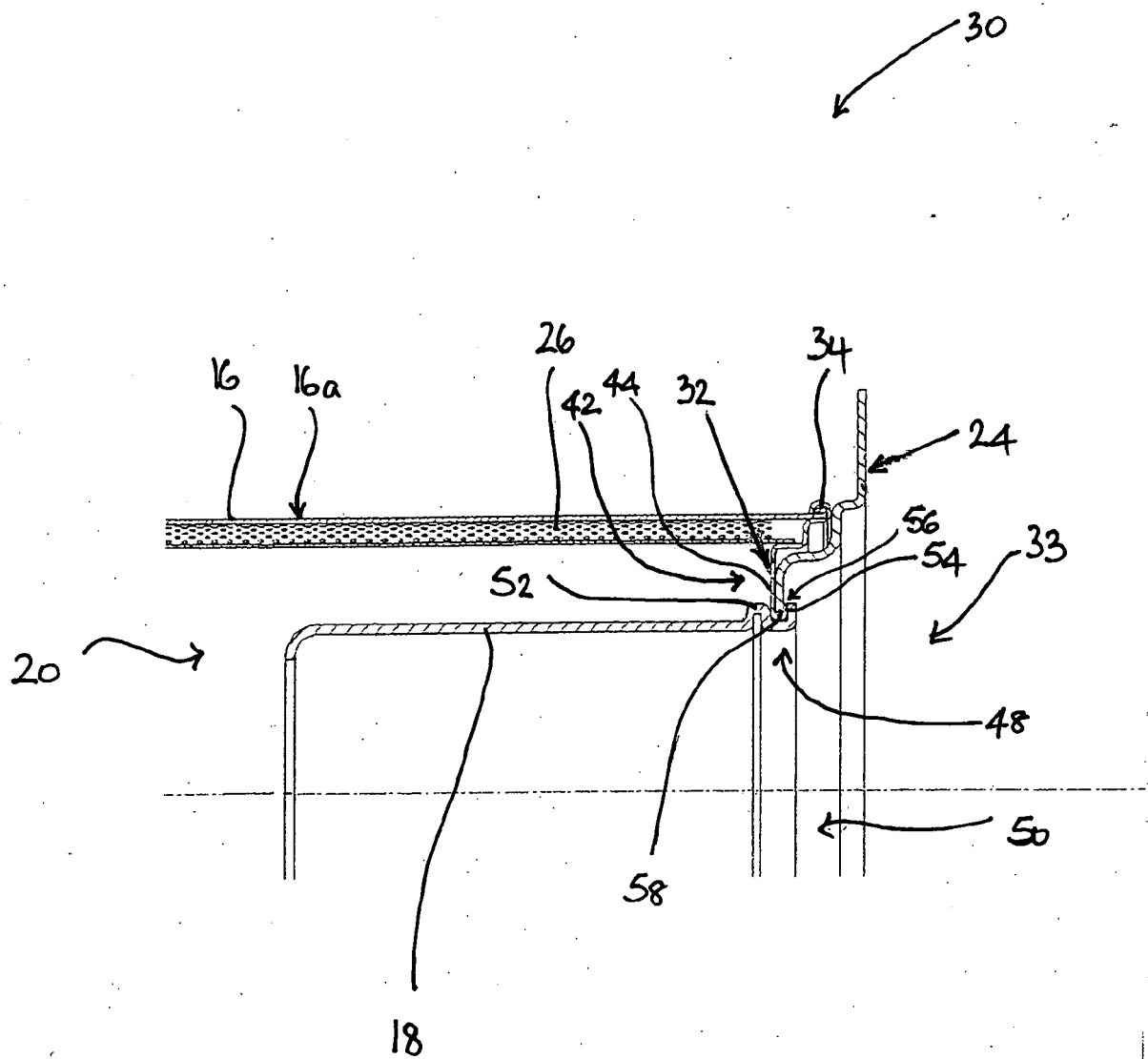


FIG. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 25 1695

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 0 172 945 A (FURIGAS B.V) 5 March 1986 (1986-03-05) * figure 2 *	1-14	INV. F23D14/10
A	----- PATENT ABSTRACTS OF JAPAN vol. 007, no. 037 (M-193), 15 February 1983 (1983-02-15) & JP 57 187511 A (AKIRA MURAMOTO), 18 November 1982 (1982-11-18) * abstract *	1-14	
A	----- GB 2 149 904 A (* AEROMATIC COMPANY LIMITED) 19 June 1985 (1985-06-19) * page 2, line 46 - line 62; figure 3 *	1-14	
A	----- US 4 960 378 A (JANNEMANN ET AL) 2 October 1990 (1990-10-02) * figure 8 *	1-14	
A	----- EP 1 087 180 A (JOH. VAILLANT GMBH U. CO; VAILLANT GMBH) 28 March 2001 (2001-03-28) * paragraph [0014]; figure 1 *	1-14	TECHNICAL FIELDS SEARCHED (IPC) F23D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 September 2006	Examiner Coquau, Stéphane
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 25 1695

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14-09-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0172945	A	05-03-1986	NONE	
JP 57187511	A	18-11-1982	NONE	
GB 2149904	A	19-06-1985	NONE	
US 4960378	A	02-10-1990	CA 1303958 C EP 0309838 A1	23-06-1992 05-04-1989
EP 1087180	A	28-03-2001	AT 409537 B AT 164199 A DE 10048630 A1 DE 50005964 D1	25-09-2002 15-01-2002 05-04-2001 13-05-2004

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