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(71) Applicant: **DUX MANUFACTURING LIMITED**
[AU/AU]; Level 1, 7-9 Irvine Place, Norwest Business
Park, Bella Vista, NSW 2153 (AU).

(72) Inventor: **MASON, Mark**; 16 Coles Street, Concord,
NSW 2137 (AU).

(74) Agent: **SPRUSON & FERGUSON**; GPO Box 3898,
Sydney, NSW 2001 (AU).

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(54) Title: A SENSOR MOUNTING DEVICE AND A RELATED WATER HEATER AND MOUNTING METHOD

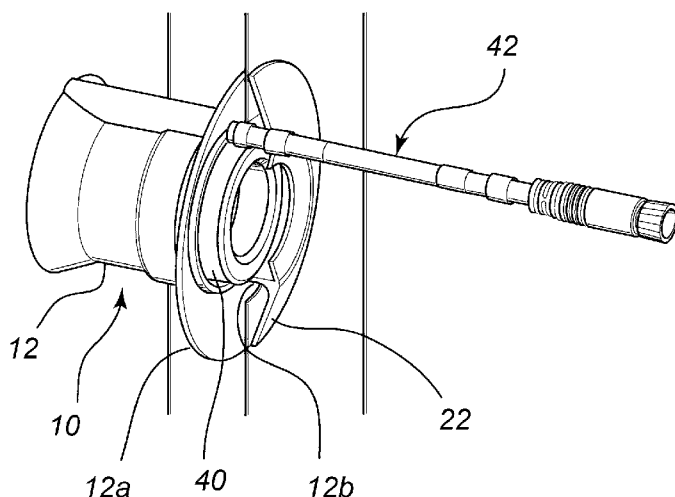


FIG. 6

(57) Abstract: A sensor mounting device (10) for mounting a sensor (42) to a water heater tank (32). The sensor mounting device (10) includes a body extending between a first end (14) and a second end (16). The body (12) has a first passage (18) extending through the body (12) from the first end (14) to the second end (16) and a second passage extending (20) through the body (12) from the first end (14) to the second end (16). The first passage (18) is adapted to receive a tank socket (40) therein and the second passage (20), which is smaller in cross sectional area than the first passage (18), is adapted to receive the sensor (42) therein such that one end of the sensor (42) is positionable substantially adjacent an outer surface of the water heater tank (32).

A SENSOR MOUNTING DEVICE AND A RELATED WATER HEATER AND MOUNTING METHOD

Field

[0001] The present invention relates to a sensor mounting device for mounting a sensor to a water heater tank, a water heater with such a sensor mounting device and a method of mounting a sensor to a water heater.

[0002] The invention has been primarily developed for use in mounting an electrical temperature sensor to the tank of an insulated water heater and will be described hereafter with reference to this application. However, the invention is not limited to this particular use and is also suitable for use in insulated storage water tanks where it is required to know the temperature of the water in the tank (e.g. a solar storage tank).

Background

[0003] It is known to mount temperature sensors to tanks of water heaters so that the temperature of the water in the tank can be monitored for temperature control and other purposes. One known method, referred to as foaming in, involves welding a stud on to the tank and bolting a sensor on to the stud, which is then foamed into the tank when the tank is insulated. A disadvantage of this method is that the sensor cannot be replaced without causing significant damage to the water heater, such that a sensor failure usually results in the replacement of the entire water heater. Another known method, referred to as dry well, requires additional sockets to be added to the tank and the insertion of a dry well into the tank insulation and outer casing. Disadvantages of this method include that it adds cost and time to manufacturing, results in additional heat loss from the tank due to the additional penetrations and provides additional potential leak points. It is also known to insert a dry well through a dual use flow fitting. This has additional disadvantages in that it requires extra parts and reduces the flow through the socket. Another known method, referred to as access point, involves making openings in the outer casing in order to allow access to the tank surface and then attaching the sensor to the tank surface via studs or spring clips. Disadvantages of this method include additional heat loss from the tank due to part of the tank wall being exposed (i.e. non insulated) and the requirement and

cost of additional components (e.g. covers) for the openings in the outer casing. Another known method is to mount a sensor to an external fitting associated with the water heater. A disadvantage of this method is that it does not provide accurate temperature measurement.

Summary of the Invention

[0004] Accordingly, in a first aspect, the present invention provides a sensor mounting device for mounting a sensor to a water heater tank, the sensor mounting device including:

- a body extending between a first end and a second end, the body having a first passage extending through the body from the first end to the second end and a second passage extending through the body from the first end to the second end,

- wherein the first passage is adapted to receive a tank socket therein and the second passage, which is smaller in cross sectional area than the first passage, is adapted to receive a sensor therein such that one end of the sensor is positionable substantially adjacent an outer surface of the water heater tank.

[0005] In a second aspect, the present invention provides a water heater including:

- a water heater tank;

- a socket welded to the tank;

- a sensor mounting device around the socket, the device including a body extending between a first end and a second end, the body having a first passage extending through the body from the first end to the second end and a second passage extending through the body from the first end to the second end;

- a sensor within the second passage having a distal end substantially adjacent the exterior of the water tank;

- an outer casing around the tank, through which a proximal end of the socket and a proximal end of the sensor mounting device passes; and

- insulation between the exterior of the water tank and the interior of the outer casing and the exterior of the sensor mounting device.

[0006] In one form, the first passage and the second passage open into each other. In another form, the device includes a barrier separating the first passage from the second passage.

[0007] The body preferably includes a substantially cylindrical part and an outwardly flanged part. The substantially cylindrical part and the outwardly flanged part are preferably separate components adapted for engagement with one another. The substantially cylindrical part preferably includes outwardly flared ends.

[0008] The first passage is preferably cylindrical. The second passage is preferably cylindrical.

[0009] The sensor is preferably an electrical temperature sensor.

[0010] In a third aspect, the present invention provides a method of mounting a sensor to a water heater, the method including the steps of:

constructing a water heater tank and welding a socket thereto;

positioning a sensor mounting device around the socket, the device including a body extending between a first end and a second end, the body having a first passage extending through the body from the first end to the second end and a second passage extending through the body from the first end to the second end;

surrounding the tank with an outer casing, with a proximal end of the socket and a proximal end of the sensor mounting device passing through the outer casing;

filling the space between the exterior of the water tank and the interior of the outer casing and the exterior of the sensor mounting device with insulation; and

positioning a sensor within the second passage with its distal end substantially adjacent the exterior of the water tank.

Brief Description of the Drawings

[0011] Embodiments of the invention will now be described, by way of examples only, with reference to the accompanying drawings in which:

[0012] Fig. 1 is a front view of an embodiment of a sensor mounting device;

[0013] Fig. 2 is a rear perspective view of the device shown in Fig. 1;

[0014] Fig. 3 is a cross sectional side view of the device shown in Fig. 1, mounted to a water heater;

[0015] Fig. 4 is a front perspective view of the device shown in Fig. 1;

[0016] Fig. 5 is cut away perspective view of a water heater with the sensor mounting device of Fig. 1 mounted thereon;

[0017] Fig. 6 is an enlarged detail view of the water heater and the sensor mounting device shown in Fig. 5;

[0018] Fig. 7 is a front perspective view of a second embodiment of a sensor mounting device.

Detailed Description of the Preferred Embodiments

[0019] Figs. 1 and 2 show a first embodiment of a sensor mounting device 10 for mounting a sensor (such as an electrical temperature sensor or thermistor) to a water heater tank. The device 10 includes a generally cylindrical body 12 which extends between a first end 14 and a second end 16. The body 12 is hollow and has a first passage 18 extending through the body 12 from the first end 14 to the second end 16. The body 12 also includes a second passage 20 extending through the body from the first end 14 to the second end 16. In the embodiment shown, the first passage 18 and the second passage 20 overlap or open into each other. However, in other embodiments (not shown), the two passages do not overlap and remain separate.

[0020] The body 12 includes an outwardly flange extending part 22 adjacent to the first end 14. The body 12 also includes a slightly outwardly flared conical part 24 adjacent the second end 16. As best shown in Fig. 3, the body 12 is formed in two parts 12a and 12b, with part 12a including the majority of the cylindrical body 12 and the flared part 24 and the part 12b including the flange part 22. The body 12 is assembled by pushing the first part 12a and the second part 12b into an overlapping or telescopic relationship with one another and are retained in this assembled configuration by a snug or interference fit between the two parts 12a and 12b.

[0021] The parts 12a and 12b are preferably injection moulded from a plastic material such as polypropylene.

[0022] The installation and use of the device 10 shall now be described with references to Figs. 3 to 6. Fig. 3 to 6 show a water heater 30 which has a tank 32, outer casing 34 and foam insulation

36 therebetween. A socket 40 is welded to the tank 32, to allow connection of water piping to the tank 32.

[0023] Figs. 3 to 6 also show a temperature sensor, in the form of a thermistor 42 having a distal end 42a and a cable 42b.

[0024] The first step in construction of the water heater 30 is the welded construction of the water tank 32, which then has the socket 38 welded thereto. The device 10 is then positioned around the socket 38 with the part 40 therebetween. The tank 32 is then surrounded by the casing 34 and the space therebetween filled with the foam insulation 36. The thermistor 42 is then inserted into the second passage 20 such that its distal end 42a is substantially adjacent to the exterior of the water tank 32. The thermistor 42 is a snug fit within the second passage 20.

[0025] Fig. 7 shows a second embodiment of a sensor mounting device 10'. The device 10' is similar to the embodiment described with reference to Figs 1 to 6 and like features have been indicated with like reference numerals. However, the device 10' also includes a radial channel 44 through the flared part 24. The thermistor is installed in a similar manner to that previously described except that the cable is inserted through the device 10' both radially and axially.

[0026] The sensor mounting devices 10, 10' have several advantages. Firstly, the positioning of the distal end of the thermistor in close proximity to the outer surface of the tank provides for accurate measurement of the temperature of the tank. Secondly, the device allows the temperature sensor to be quickly and easily replaced by pulling and then re-insertion, without requiring significant disassembly of the water heater or causing any damage thereto. Thirdly, the device can be used with an existing socket and does not require any additional sockets to be added to the tank, therefore avoiding additional cost, penetrations, heat loss and leak points, or the use of dry wells and associated covers. Fourthly, the device also avoids the use of dual use flow fittings, and therefore allows the full flow potential of the socket to be utilised. Fifthly, the device can be installed at point of manufacture without the need for the thermistor to be installed at the same time, which allows later upgrading of the heater.

[0027] Although the invention has been described with reference to a preferred embodiment, it will be appreciated by persons skilled in the art that the invention may be embodied in many other forms.

CLAIMS

1. A sensor mounting device for mounting a sensor to a water heater tank, the sensor mounting device including:

a body extending between a first end and a second end, the body having a first passage extending through the body from the first end to the second end and a second passage extending through the body from the first end to the second end,

wherein the first passage is adapted to receive a tank socket therein and the second passage, which is smaller in cross sectional area than the first passage, is adapted to receive the sensor therein such that one end of the sensor is positionable substantially adjacent an outer surface of the water heater tank.

2. The sensor mounting device as claimed in claim 1, wherein the first passage and the second passage open into each other.

3. The sensor mounting device as claimed in claim 1, wherein the device includes a barrier separating the first passage from the second passage.

4. The sensor mounting device as claimed in claim 1, 2 or 3, wherein the body includes a substantially cylindrical part and an outwardly flanged part.

5. The sensor mounting device as claimed in claim 4, wherein the substantially cylindrical part and the outwardly flanged part are separate components adapted for engagement with one another.

6. The sensor mounting device as claimed in claim 4 or 5, wherein the substantially cylindrical part includes outwardly flared ends.

7. The sensor mounting device as claimed in any one of the preceding claims, wherein the first passage is cylindrical.

8. The sensor mounting device as claimed in any one of the preceding claims, wherein the second passage is cylindrical.

9. The sensor mounting device as claimed in any one of the preceding claims, wherein the sensor is an electrical temperature sensor.
10. A water heater including:
a water heater tank;
a socket welded to the tank;
a sensor mounting device around the socket, the device including a body extending between a first end and a second end, the body having a first passage extending through the body from the first end to the second end and a second passage extending through the body from the first end to the second end;
a sensor within the second passage having a distal end substantially adjacent the exterior of the water tank;
an outer casing around the tank, through which a proximal end of the socket and a proximal end of the sensor mounting device passes; and
insulation between the exterior of the water tank and the interior of the outer casing and the exterior of the sensor mounting device.
11. The water heater as claimed in claim 10, wherein the first passage and the second passage open into each other.
12. The water heater as claimed in claim 10, wherein the device includes a barrier separating the first passage from the second passage.
13. The water heater as claimed in claims 10, 11 or 12, wherein the body includes a substantially cylindrical part and an outwardly flanged part.
14. The water heater as claimed in claim 13, wherein the substantially cylindrical part and the outwardly flanged part are separate components adapted for engagement with one another.
15. The water heater as claimed in claim 13 or 14, wherein the substantially cylindrical part includes outwardly flared ends.
16. The water heater as claimed in any one of claims 10 to 15, wherein the first passage is cylindrical.

17. The water heater as claimed in any one of claims 10 to 16, wherein the second passage is cylindrical.

18. The water heater as claimed in any one of claims 10 to 17, wherein the sensor is an electrical temperature sensor.

19. A method of mounting a sensor to a water heater, the method including the steps of :
constructing a water heater tank and welding a socket thereto;

positioning a sensor mounting device around the socket, the device including a body extending between a first end and a second end, the body having a first passage extending through the body from the first end to the second end and a second passage extending through the body from the first end to the second end;

surrounding the tank with an outer casing, with a proximal end of the socket and a proximal end of the sensor mounting device passing through the outer casing;

filling the space between the exterior of the water tank and the interior of the outer casing and the exterior of the sensor mounting device with insulation; and

positioning a sensor within the second passage with its distal end substantially adjacent the exterior of the water tank.

1/4

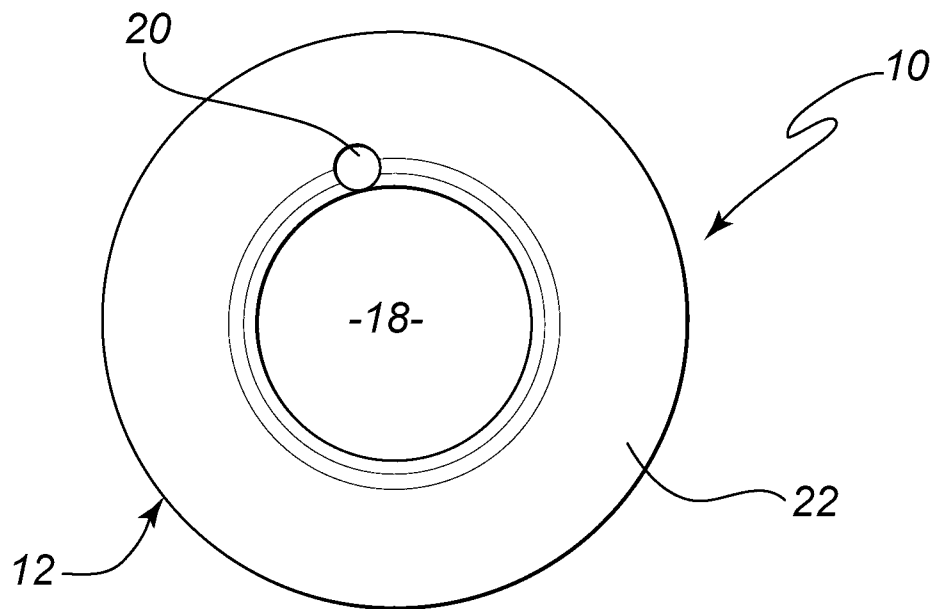


FIG. 1

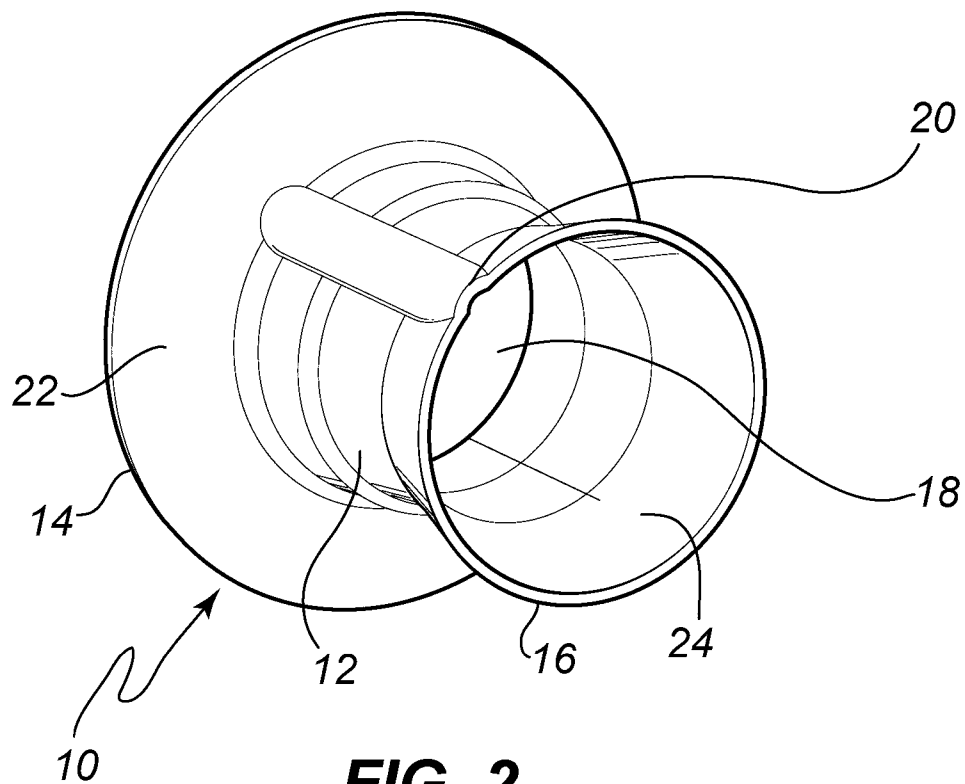


FIG. 2

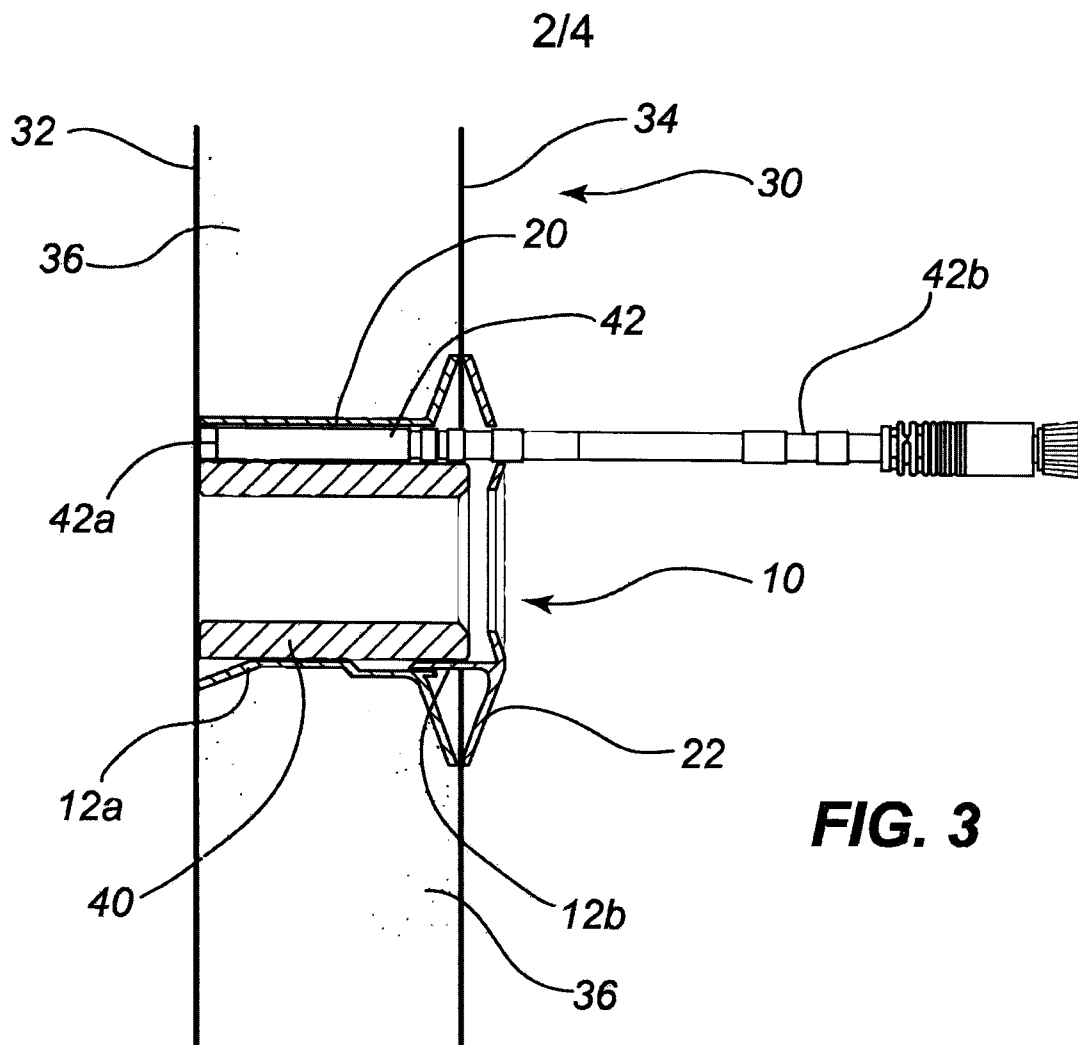


FIG. 3

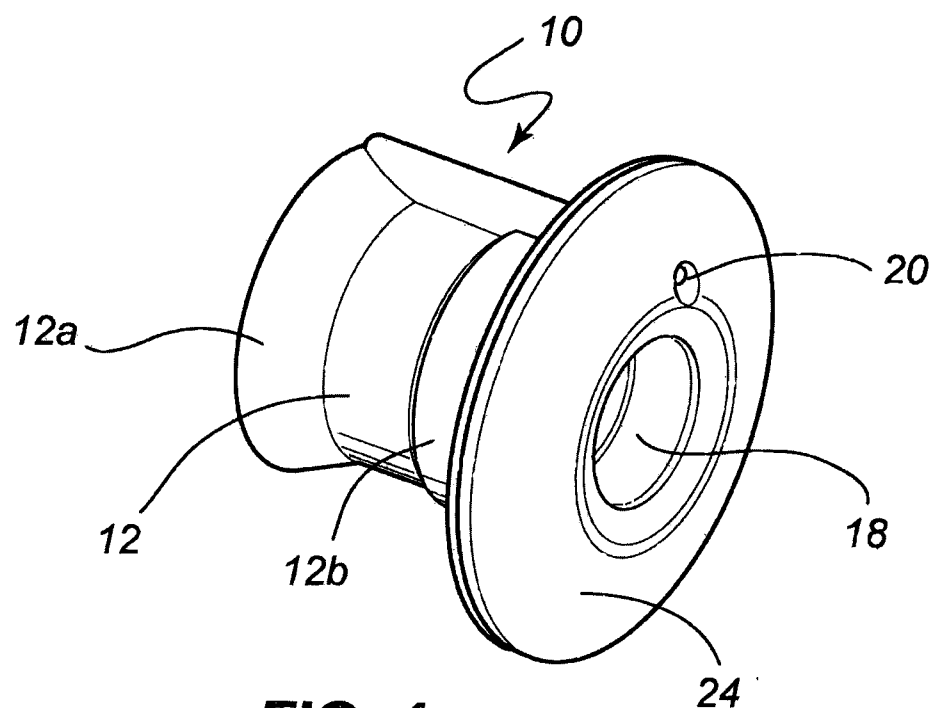


FIG. 4

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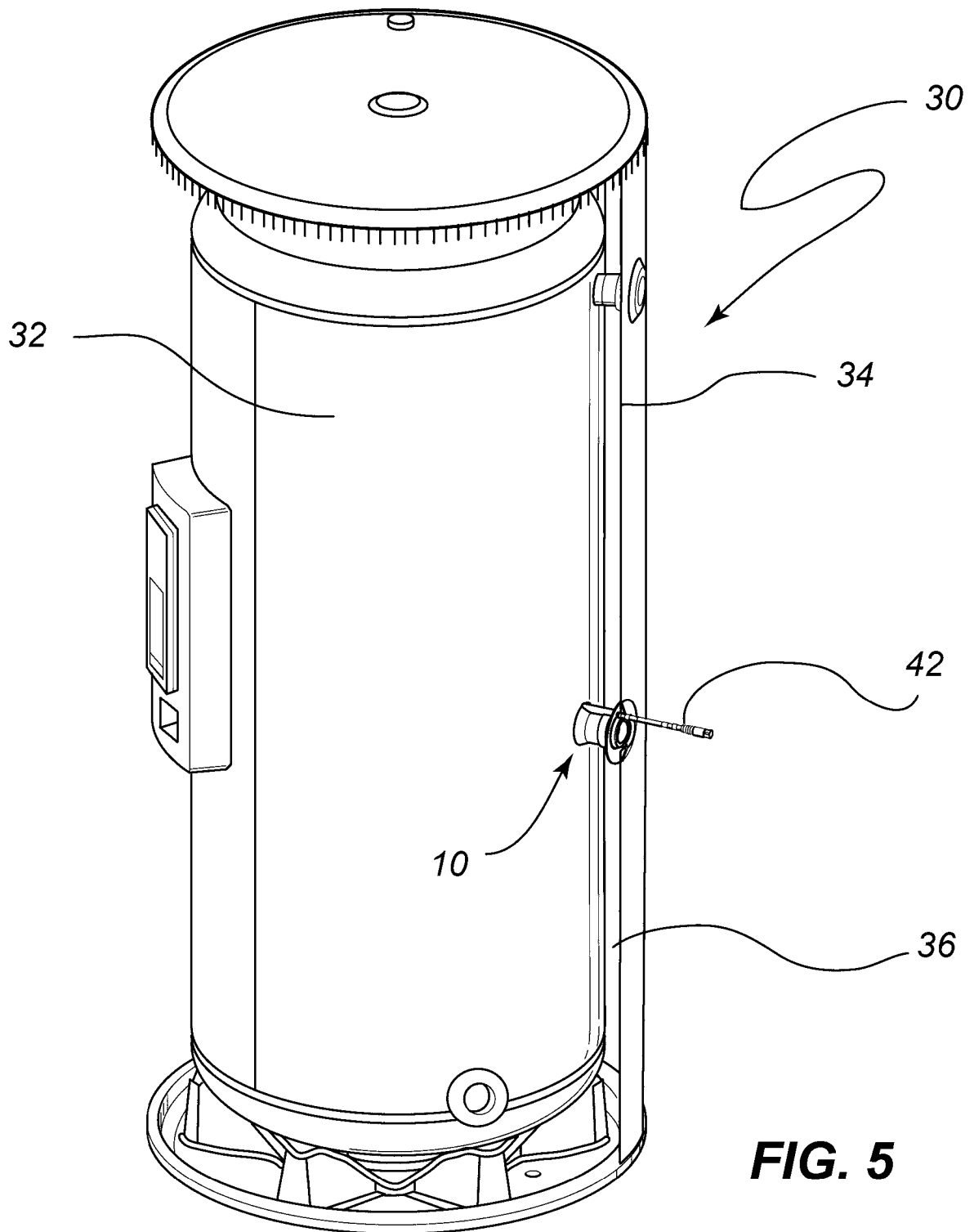


FIG. 5

4/4

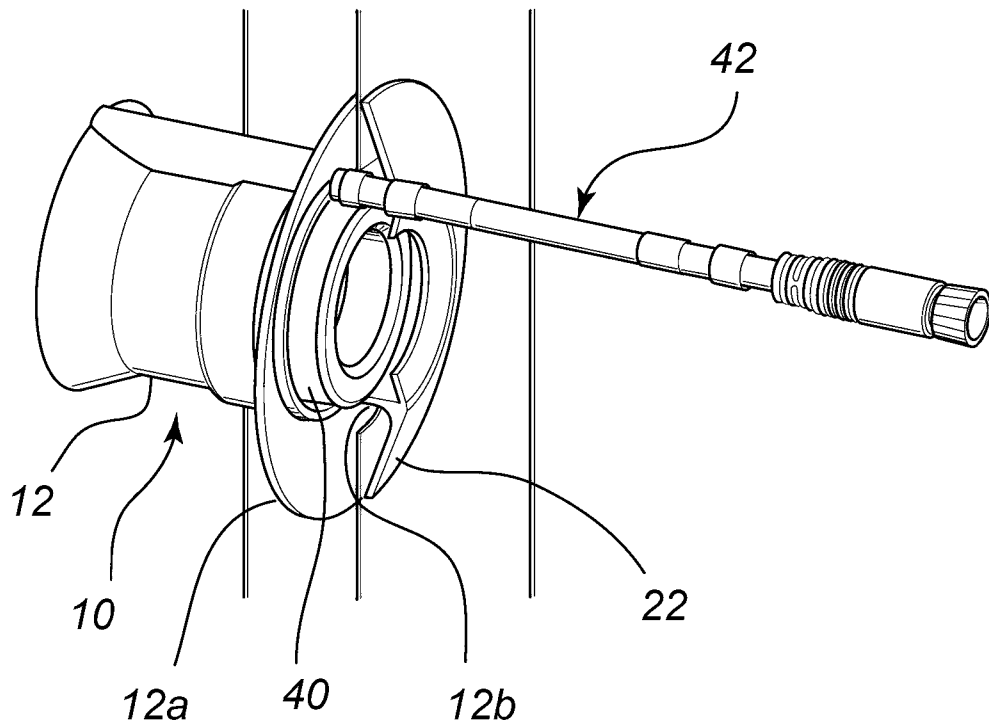


FIG. 6

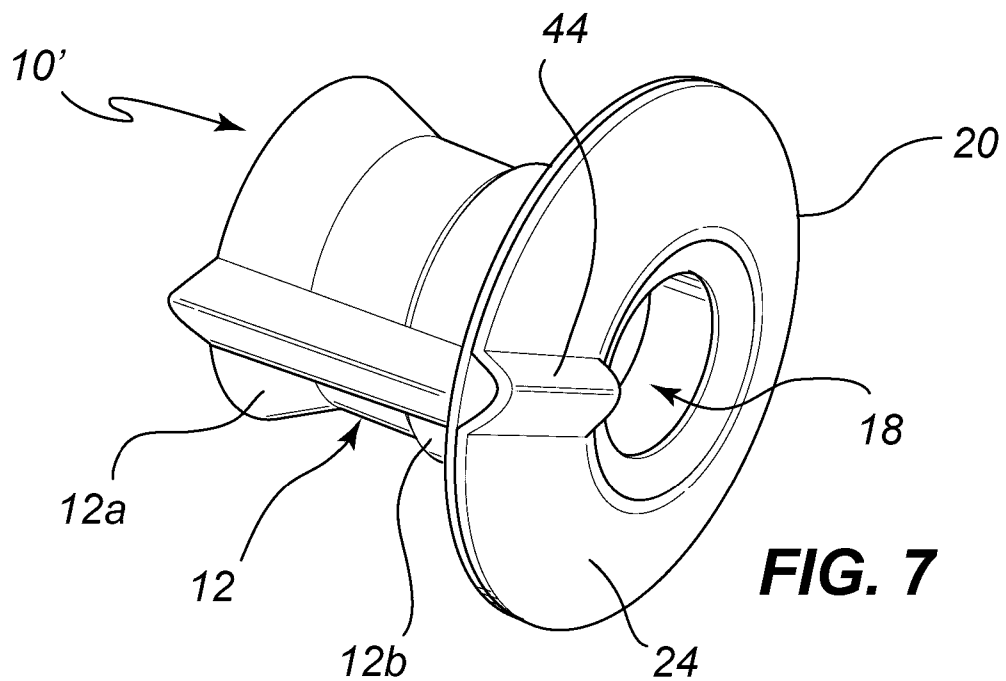


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2015/000008

A. CLASSIFICATION OF SUBJECT MATTER

G01K 1/14 (2006.01) G01K 13/00 (2006.01) F24H 1/00 (2006.01)

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)

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)

Database: WPI, EPODOC

Keywords: Temperature, thermistor, hot water heater, reservoir, attach, mount, socket, outlet, surround, surface, channel and similar terms
IPC/CPC marks: G01K13, G01K1/14, F24H1

Database: Google Patents, Espacenet

Keywords: hot water, boiler, water tank, attach, support, couple, mount, fix, bracket, sensor, temperature, socket, outlet, port, annulus, collar, surround, passage, bore, surface, wall, lag, insulate and similar terms

Applicant: DUX Manufacturing Limited and similar combinations of terms

Inventor: Mark Mason

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
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Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
Email address: pct@ipaustalia.gov.au

Authorised officer

Susan Bellm
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No. 0262832751

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/AU2015/000008
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7162150 B1 (WELCH ET AL.) 09 January 2007 figures 1, 2, 8; title; (col 3, lines 7-16), (col 4, lines 36-44), (col 5, lines 27-32), (col 6, lines 1-8)	1-19
A	US 1585366 A (BIRTCH) 18 May 1926 col 1, lines 1-43	10-19
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INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2015/000008	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
US 7162150 B1	09 January 2007		
US 1585366 A	18 May 1926		
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