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⑤④ **Gas burner assembly.**

⑤⑦ A gas burner assembly of modular construction enabling the configuration to be varied to suit boiler of different types comprises a main burner (1), a control arrangement (3) including valves for controlling supply of gas to the burner, a manifold (2) made as a metal casting and including respective gas passages for conducting main gas and pilot gas, and an inlet shroud (7) interconnecting the main burner and manifold, the inlet shroud including a bracket (105) for mounting the pilot burner (102) and associated control devices (103, 104) and having a duct formed within its wall for carrying gas from the manifold to the pilot burner. The control arrangement (3) has alternative mounting locations on side and end faces for connection of the manifold thereto.

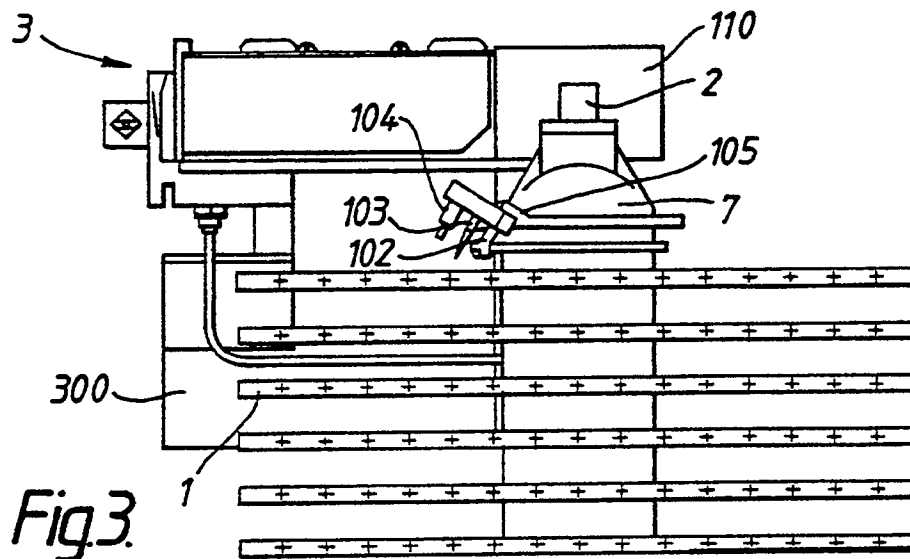


Fig.3.

This invention is concerned with a gas burner assembly and more especially the invention relates to improvements in and modifications to the gas burner assembly described in our pending UK Patent Application No. 2225848 (European Patent Application No. 0371715). The latter burner assembly incorporates several novel aspects by which the configuration of the assembly can be varied resulting in a versatile construction allowing the exact form of the assembly to be selected and adapted for use in different appliances, such as in different kinds of boilers for domestic heating and/or hot water systems. The basic components of the assembly are a burner, a control arrangement including means to control the supply of gas to the burner, and a manifold interconnecting the burner and the control arrangement. Described herein are further novel features which contribute to the basic objective of a construction of a gas burner assembly which is economic to manufacture and flexible in choice of its final design configuration.

The gas burner assembly particularly described in the aforementioned prior application has a pilot burner defined by an integral minor portion of the burner. More precisely it is formed by a first, smaller one of a series of burner blades. Ignition and/or flame monitoring devices are mounted directly on the pilot burner. By this arrangement there is precluded the need for separate mounting brackets which are commonly employed in prior art burner assemblies and which usually have an adverse influence on the air flow around the burner and hence the burner performance.

Provided in accordance with one aspect of the present invention is an alternative solution to the problem of mounting the pilot burner and control/ignition devices associated therewith. According to this solution the gas burner assembly comprises a main burner inlet shroud, connected between the main burner and the manifold, and including means for mounting the pilot burner and its associated devices.

By this arrangement the support for the pilot and its control/ignition devices is maintained well clear of the main burner and will not disturb the air flow around and over it. In a preferred embodiment the inlet shroud (or "air box" as it is frequently called) includes a duct for delivering the gas from the manifold directly to the pilot injector, whereby need for a pipe and its connections is avoided.

In accordance with a second novel feature embodied in the modified burner assembly described herein, the manifold comprises a unitary cast member including main gas and pilot gas passages. Manufacturing the manifold as die casting, e.g. of aluminium, allows production costs to be minimised. The respective passages for the main gas and pilot gas flows can be formed by coring during the casting process, whereby expensive machining operations are obviated.

In a preferred construction the die cast member

is elongate with first and second mounting faces at its respective ends and at which the gas passages open, said faces lying in mutually perpendicular planes for connection to the inlet shroud and the control arrangement respectively. Either, and possibly both, of the mounting faces are of such a form as to allow the manifold to be connected to the inlet shroud and/or control arrangement in any one of a plurality of different rotational orientations about an axis normal to the mounting face.

According to a further feature of the modified gas burner assembly disclosed herein, the body of the control arrangement has two alternative locations for connecting the manifold thereto, said locations being positioned on respective end and side faces of the body and each including main gas and pilot gas exit ports. By providing alternative connection positions for the manifold on the body of the control arrangement an additional degree of freedom is provided in the selection of the assembly configuration. Thus, it may be appropriate, for example, to connect the manifold to the end face of the body in an assembly to be installed in a floor standing boiler, and for the manifold to be connected to the side face in an assembly to be installed in a wall hung boiler. The gas exit ports at the connection location not utilised in any given assembly can be closed off in a convenient manner, such as by means of a blanking plate. The control arrangement is preferably constructed as described in the prior application mentioned above.

The foregoing and other features and advantages of the modified gas burner assembly will be understood more clearly from the following detailed description which follows, reference being made to the accompanying drawings, in which:-

Figure 1 is a side view of a gas burner assembly including burner, manifold and control arrangement;

Figure 2 is a front view of the assembly shown in Figure 1;

Figure 3 is a plan view of the assembly of Figure 1;

Figure 4a is a partially sectioned schematic side view of an assembly according to the invention in a configuration for a wall hung boiler;

Figure 4b is similar to Fig. 4a but showing an assembly suitable for a floor standing boiler;

Figure 5 is a front view of the manifold of the assembly of Figure 1;

Figure 6 is a vertical cross section through the manifold taken on the line X-X in Figure 5;

Figure 7 is a horizontal section through the manifold taken along the line Y-Y in Figure 5;

Figure 8 is an elevation showing a modified configuration for the manifold mounting face;

Figure 9 is a front view of the main gas inlet shroud of the assembly shown in Figure 1;

Figure 10 is a rear view of the inlet shroud;

Figure 11 is a side view of the inlet shroud; Figures 12 to 14, 15 to 17, 18 to 20 and 21 to 23 respectively show four modified gas burner assemblies in views corresponding to Figures 1 to 3;

Figure 24 is a front view of a modified main gas inlet shroud; and

Figure 25 is a detail cross section showing the pilot burner mounting on the inlet shroud of Figure 24.

The gas burner assembly illustrated in Figures 1 to 3 is generally similar to that described in the earlier patent application mentioned above and reference to that specification should be made for those details of the construction not described herein, such as the form of the burner 1 and the control arrangement 3 with its pre-assembled valve modules and other operating or control modules. Shown incorporated with the control arrangement 3 is a casing 300 housing the electronic sequencing controls with the logic circuitry to organise the operation of the assembly according to predetermined programmes. The assembly includes a manifold 2 which is made of die cast aluminium and which is described in greater detail below. In addition there is shown a manifold adaptor 101 connecting the manifold 2 to the body 20 of the control arrangement 3, although in a preferred alternative construction the adaptor 101 is unnecessary. The manifold can be connected directly to the connection location at the end face of the valve body 20, in which case the manifold and the body will be in longitudinal alignment. In the preferred alternative construction mentioned, the valve body is provided with a second connection location on a side face thereof, e.g. the top face as seen in Figures 1 and 2, so that the manifold can be connected to extend perpendicularly from the body in substantially the same configuration as that depicted in the drawings but without the adaptor 101. The said alternative construction for the valve body is embodied in the modified assemblies shown in Figures 12 to 23.

Connected to the upper end of the manifold is a main gas inlet shroud or air box 7, also described in more detail below, which serves the additional function of securing the burner 1 to the manifold 2. The air box 7 is made as an aluminium die casting and includes an integral mounting platform or bracket 105 which supports a prefabricated unit of known, commercially available form including a pilot burner and injector 102, an ignition electrode 103 for the pilot burner, and a pilot flame monitoring thermocouple 104. Formed through the wall of the air box 7 and extending from the mounting face at the rear of the air box to the mounting bracket 105 is a gas duct 106 (Figs. 4a and 4b) which conducts pilot gas from the manifold 2 directly to the pilot injector 102. It is not essential to employ the prefabricated pilot unit and in a preferred construction the pilot injector is fitted, e.g. screwed,

directly into a pilot gas port on the bracket 105 and carries the pilot burner, and an electrode which functions both as an ignition device and a flame sensor for the pilot is similarly mounted directly on the bracket 105.

To further illustrate the invention reference will now be made to Figure 4a. It should be understood that the manifold 2 includes respective passages for pilot gas and main gas flows, each extending from a first lower mounting face to a second upper mounting face, and isolated from each other over the entire lengths. Only the main gas passage 108 is visible in Figure 4a, which shows the burner assembly in essentially schematic representation. Adjacent, but spaced from its lower end, the manifold 2 has a flange 110 which is positioned against a partition wall 111 dividing the combustion chamber housing the burner from another compartment accommodating the control equipment, including the gas valve, within the boiler casing. The flange 110 and wall 111 are fastened together by screws (not shown) which are threaded into tapped holes 112 (Figure 7) provided in the flange. The lower end of the manifold is connected to the body 20 of the control arrangement either at the manifold location point at the top side of the body, as depicted in full line, which is appropriate if the boiler is a wall hung appliance, or at the manifold location point at the end face of the body 20, as depicted in dashed line, which may be appropriate for another form of boiler, such as floor mounted boiler. (It should be mentioned that for a floor mounted boiler the manifold will extend horizontally and accordingly the air box 7 and burner 1 would be rotated through 90° relative to the manifold from the position shown in Figure 4a, so that the burner outlets are uppermost.) In Figure 4b an assembly comprising the same components as that of Fig. 4a is shown in a configuration suitable for floor standing boiler. It will be noted that the manifold orientation is reversed compared with Figure 4a. The gas injector 115 for the main burner is fitted to the rear wall of the air box, e.g. screwed into a tapped hole in this wall, and it defines a rearwardly protruding spigot which enters the main gas outlet orifice of the manifold. The outlet orifice of the manifold pilot gas passage (not shown in Figure 4) communicates with the duct 106 in the air box for supplying gas to the pilot injector 102 screwed into a tapped section at the downstream end of the duct. Seals are provided and located appropriately to avoid leakage of gas either between the main gas and pilot gas flow paths, or from those paths to ambient.

The manifold 2 is shown in more detail in Figures 5 to 7. As already stated the manifold 2 is a unitary member of die cast aluminium. It includes a stem 120 with a cross section shaped substantially as a figure "8" with the main gas passage 108 having an area significantly greater than that of the pilot gas passage 109. The upper end of the stem is connected to a

square flange 121 having a central orifice 122 defining a lateral outlet of the main gas passage, and an eccentrically positioned orifice 123 forming an outlet of the pilot gas passage 109. The corner regions of the flange 121 are provided with tapped holes 124 to receive screws which fasten the air box 7 to the manifold. At its lower end the stem 120 is attached to the flange 110 mentioned above and below the flange is a mounting block 125 of square section and defining a mounting face substantially the same as that of the flange 121 with a central orifice defining the inlet to the main gas passage, a smaller, eccentric orifice defining the inlet to the pilot gas passage, and screw holes 126 in the corner regions for the screws used to fasten the manifold to the body 20 of the control valve arrangement. By virtue of the square formation of the manifold mounting faces, the manifold can be connected to each of the air box and the control valve body in any selected one of four rotational positions about the center axis of the respective mounting face. Of course steps are necessary to ensure the necessary connections will be established with the pilot gas passage inlet and outlet orifices for all possible rotational orientation, but the same does not apply to the main gas orifices as they are centrally located.

Because the mounting faces of the manifold are essentially identical it can be mounted in reverse position between the valve body and air box, i.e. with flange 121 attached to the valve body, without modification of the valve body or air box, whereby additional choice in assembly configuration is achieved.

Although the mounting block 125 is shown to have a shallow depth, it can be made longer to facilitate its direct connection to the valve body.

The air box 7 is shaped to ensure connection of the gas duct 106 therein with the pilot gas outlet orifice 123 whatever the relative rotational orientation chosen for the manifold and air box. Making reference to Figures 9, 10 and 11, the air box has a flat rear face which is shaped and dimensioned to match the flange 121 and has holes 128 positioned to register with the screw holes 124 so that the air box can be fixed to the flange by screws inserted into the holes from inside the air box. A central through hole 129 in the rear wall of the air box is tapped to receive the main gas injector nozzle in the manner generally shown in Figure 4. Coaxial with the hole 129 is an annular groove 130 in the rear face of the rear wall, and the pilot gas duct 106 opens into the bottom of this groove. Furthermore, the groove is so dimensioned that the pilot gas outlet orifice 123 confronts the groove 130 when the air box and manifold are assembled together. Thus, the communication between the orifice 123 and the duct 106 is ensured whatever angular orientation is selected between the air box and manifold. A gasket having respective apertures to register with the holes 122, 123 is located between the air box and manifold

flange to ensure the necessary sealing of the gas flow paths.

It will be appreciated that it is not essential for the groove 130 to be provided on the air box 7 and it could alternatively be formed in the mounting face of the manifold flange. Thus, the flange 121 could be as shown in Figure 8, as indeed could be the mounting face defined at the other end of the manifold by the mounting block 125.

The air box 7 has a flared side wall open towards the bottom (in its normal orientation) and at the front edge it is provided with means for attaching the burner 1. Said attachment means comprise a notch 140, for engagement by hook or the like provided on the burner, and at a generally diametrically opposite position an integral lug 141 with a tapped hole 142 for receiving a screw. The two point attachment thus provided allows rapid connection and disconnection of the burner 1 to facilitate assembly during manufacture and subsequent servicing operations.

Some modified gas burner assemblies put together from the same basic units are illustrated in Figures 12 to 23. In each case the manifold 2 and the air box 7 are as herein above described with reference to Figures 5 to 8 and Figures 9 to 11, respectively. The valve body 20 differs to that of the assembly shown in Figures 1 to 3 insofar as it has two alternative manifold mounting positions, a first-one at one end of the body and the second at a side face of the body adjacent to said one end. The gas outlet at the position not in use is covered with a blanking plate.

The assembly of Figure 12 is of a configuration suitable for a wall hung boiler and corresponds closely to the assembly shown in Figures 1 to 3. The manifold 2 is mounted to the said second mounting position on the valve body.

The assembly of Figures 15 to 17 is suitable for a floor standing boiler as is that of Figures 18 to 20. The manifold in the latter assembly is turned through 90° (about the burner axis) relative to the position of the manifold in the former assembly, and in each case the manifold is reversed between the valve body 20 and the air box, compared with the manifold in the assembly of Figures 12 to 14, and it is attached to the valve body at the first mounting position at the end of the body.

In Figures 21 to 23 there is shown an assembly configured for use in a back boiler unit. The manifold orientation is generally similar to that in the assembly of Figures 18 to 20, but the control arrangement is positioned to lie horizontally to provide a substantially flat assembly.

As a modification to the gas burner assemblies described above and illustrated in the drawings, the thermocouple 104 may be omitted and the electrode 103 employed to serve a dual function of ignition device and pilot flame sensor.

The modified air box or inlet shroud illustrated in

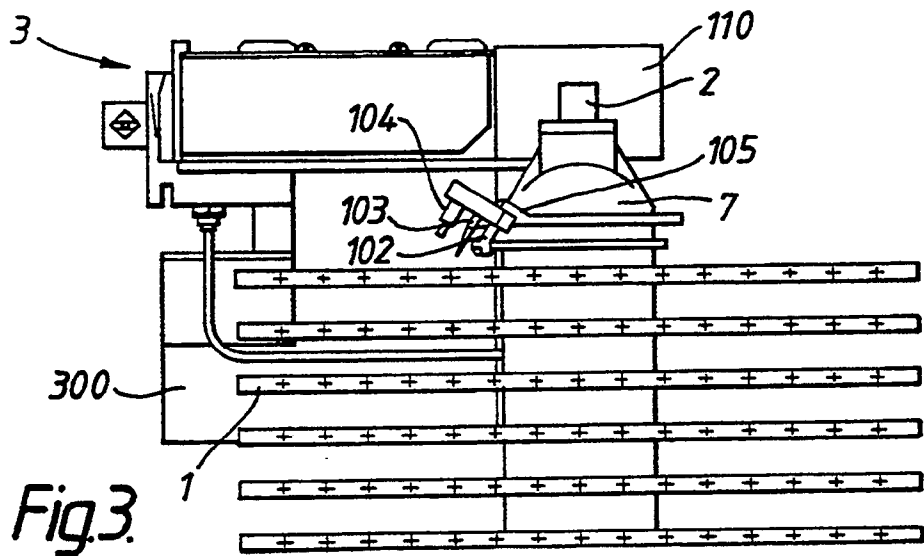
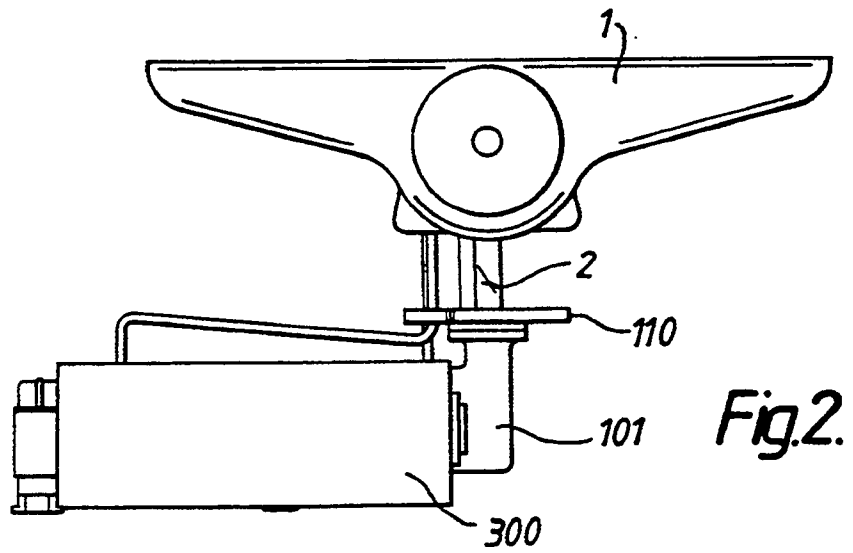
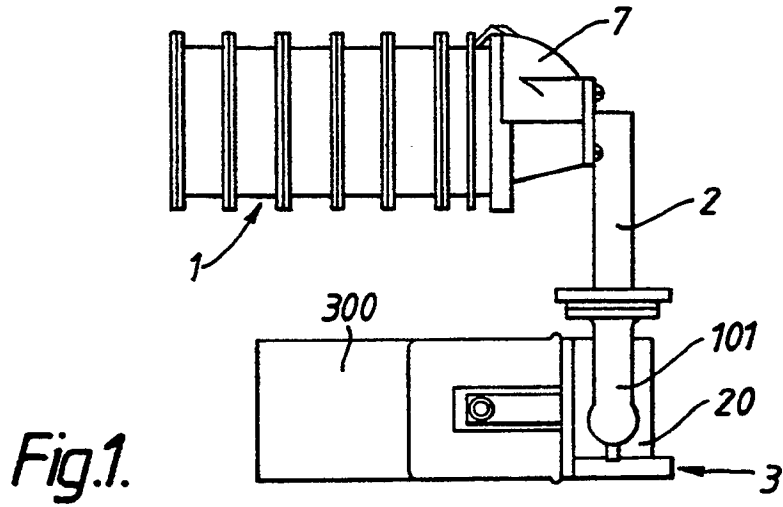
Figure 24 is generally the same as that described above and shown in Figs. 9-11, and the same reference numerals are used to denote corresponding features. The inlet shroud has a flat rear wall with screw holes 128, and a central hole 129 tapped to receive a threaded main gas injector. The side wall is forwardly divergent and includes openings 150 in its top and sides to enhance the air flow to the injector. A two-point attachment arrangement for connection to the main burner comprises an outwardly directed lip 152 at a position diametrically opposite a lug 141 having a tapped hole 142. The lug 141 also provides reinforcement for the laterally directed integral projection 105. This projection defines a bracket 155, and a platform 156. A pilot gas duct 106 extends through the side and rear walls and opens at a port 157 formed in the bracket 155 and threaded to receive the pilot burner injector 102, as shown in Figure 25. At its other end the duct 106 opens into a groove on the outer surface of the rear wall, which groove extends concentrically around the hole 129 through about 225° of arc. Also formed in the bracket 155 are a socket 158 for receiving the thermocouple 104, and a tapped hole 159 for receiving a screw 160 which secures to the bracket a pilot burner unit 161 (Fig. 25). The platform 156 is adapted to mount the ignition electrode (not shown) and has a hole 162 for this purpose.

It will be appreciated by those readers skilled in the art that a gas burner assembly incorporating the features described herewith has improved versatility in the selection of its configuration, and hence adaptability to different appliances, and is also economic to manufacture.

Claims

1. A gas burner assembly comprising a main burner (1), a pilot burner (102), a control arrangement (3), a manifold (2) interconnecting the main burner and the control arrangement, the manifold including passages (108, 109) for conducting gas to the burners from the control arrangement, the control arrangement including means to control the supply of gas to the main burner, and a main burner inlet shroud (7) coupled between the manifold and the main burner, characterised in that the main burner inlet shroud is provided with means (105) supporting a pilot burner (102) and an ignition and/or control device (103; 104) associated therewith.
2. An assembly according to claim 1, wherein the main burner inlet shroud (7) comprises a rear wall for attachment to the manifold, a side wall structure extending forwardly from the rear wall and having means (140, 141) adjacent the front edge thereof for attachment to the main burner, and the pilot burner support means comprises a laterally outwardly directed projection means (105) on the side wall structure adjacent said front edge.
3. An assembly according to claim 2, wherein said projection means includes a pilot gas port for connection to the pilot burner injector (102).
4. An assembly according to claim 1, 2 or 3, wherein the main burner inlet shroud (7) has a pilot gas duct (106) formed therein for conducting gas from the manifold (2) to the pilot burner.
5. An assembly according to claim 3, wherein said pilot gas port is connected by a pilot gas duct (106) formed in the side wall structure of the main burner inlet shroud for direct connection to an associated port of the manifold.
6. An assembly according to claim 2, 3 or 5, wherein said attachment means (140, 141) at the front of the main burner inlet shroud defines a two point mounting for connection of the main burner (1) to the shroud.
7. An assembly according to claim 2, 3, 5 or 6, wherein the rear wall of the main burner inlet shroud has a hole (129) receiving a main gas injector nozzle (115), said nozzle projecting rearwardly through the wall for cooperation with a main gas outlet orifice (120) of the manifold (2).
8. An assembly according to any one of claims 1 to 7, wherein the main gas inlet shroud (7) comprises a metal casting.
9. A gas burner assembly comprising a main burner (1), a control arrangement (3), a manifold interconnecting the main burner and the control arrangement for conducting gas to the burner from the control arrangement, the control arrangement including means to control the supply of gas to the burner, a main burner inlet shroud (7), and a pilot burner (102), characterised in that the manifold is a unitary cast member including main gas and pilot gas passages (108, 109) mutually isolated from each other.
10. An assembly according to claim 9, wherein the gas passages (108, 109) are formed by coring during manufacture of the cast member.
11. An assembly according to any one of the preceding claims, wherein the manifold (2) has first and second mounting faces (121, 125) connected to corresponding mounting faces of the control arrangement and the inlet shroud, respectively, the main gas and pilot gas passages (108, 109)

- each extending between the first and second mounting faces, and at least one of the first and second mounting faces being arranged to allow connection thereof to the corresponding mounting face of the main gas inlet shroud or control arrangement in any one of a plurality of different rotational positions about an axis normal to said mounting face. 5
- 12.** An assembly according to claim 11, wherein at said connection of said at least one of the first and second mounting faces (121, 125) and the corresponding mounting face of the main gas inlet shroud and the control arrangement, one of the connected mounting faces has a central main gas orifice (122 (Fig. 8); 129 and a pilot gas orifice (130) extending along a circular path concentric with the main gas orifice, and the other mounting face has respective ports (122, 123 (Fig. 5)) spaced from each other and in register with the respective orifices. 10 15 20
- 13.** An assembly according to claim 11 or 12, wherein the first and second mounting faces (121, 125) lie in mutually perpendicular planes. 25
- 14.** An assembly according to claim 11, 12 or 13 wherein the manifold comprises an integral flange (110) located adjacent and substantially parallel to the first mounting face of the manifold. 30
- 15.** An assembly according to any one of claims 11 to 14, wherein the first and second mounting faces are substantially identical whereby the manifold is reversible. 35
- 16.** An assembly according to any one of claims 11 to 15, wherein the first and second mounting faces are substantially square. 40
- 17.** An assembly according to any one of the preceding claims wherein the manifold comprises an elongate portion of substantially "8"- shape cross-section, the cross-sectional area of the pilot gas passage (109) being substantially smaller than the corresponding area of the main gas passage (108). 45
- 18.** A gas burner assembly comprising a main burner (1), a pilot burner (102), a control arrangement (3), a manifold (2) interconnecting the main burner and the control arrangement, the control arrangement including means to control the supply of gas to the main burner, and the manifold including respective passages (108, 109) for conducting gas to the main and pilot burners, characterised in that the control arrangement has two alternative mounting locations for the manifold 50 55
- positioned on respective faces thereof, and main gas and pilot gas exit ports are provided at each location for delivery of gas to the respective passages of the manifold.
- 19.** An assembly according to claim 18, wherein the control arrangement has a blanking member closing the exit ports at the mounting location to which the manifold is not connected.
- 20.** An assembly according to claim 18, wherein the control arrangement is of generally rectangular configuration, and the respective faces are on an end face and a side face thereof.



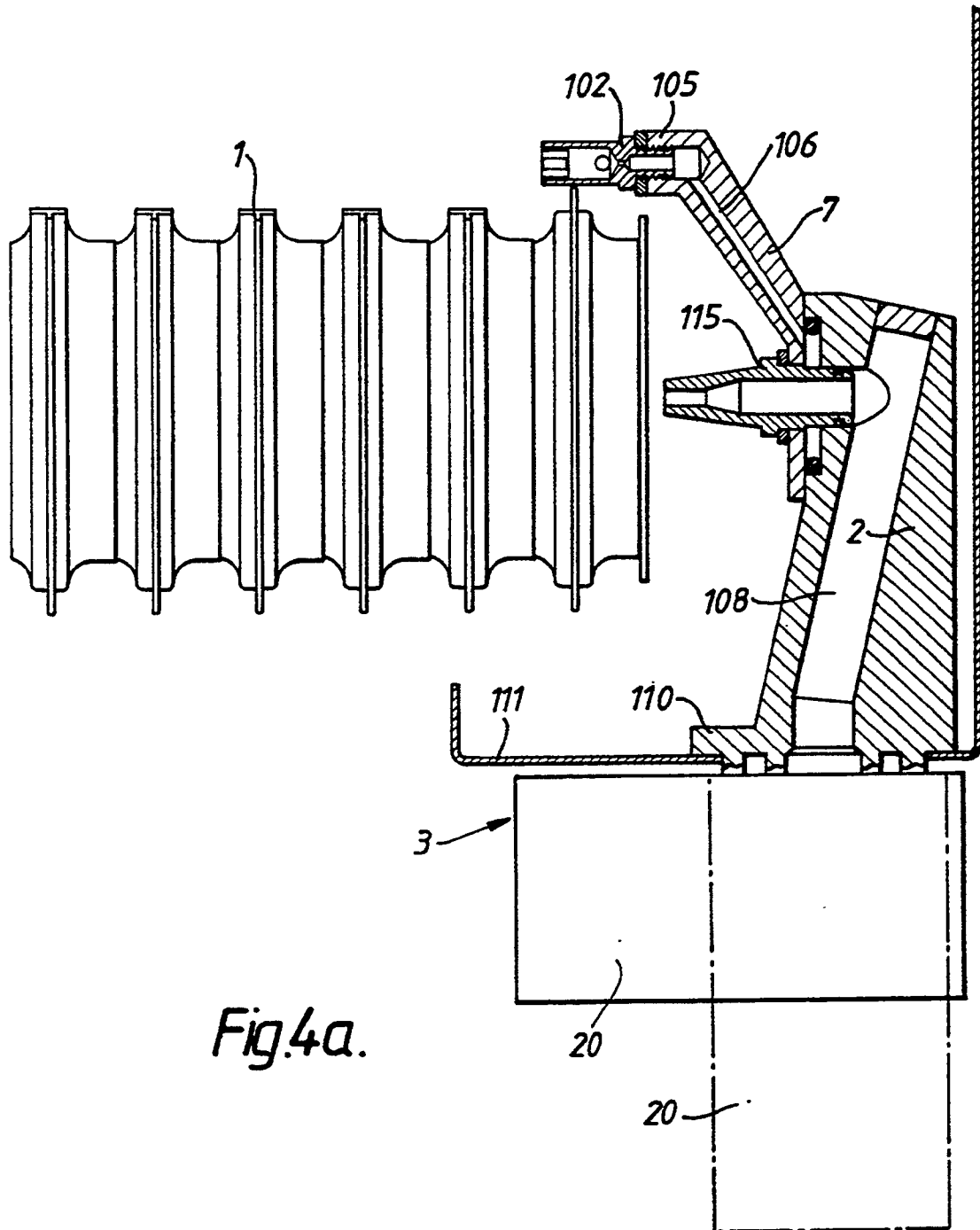


Fig.4a.

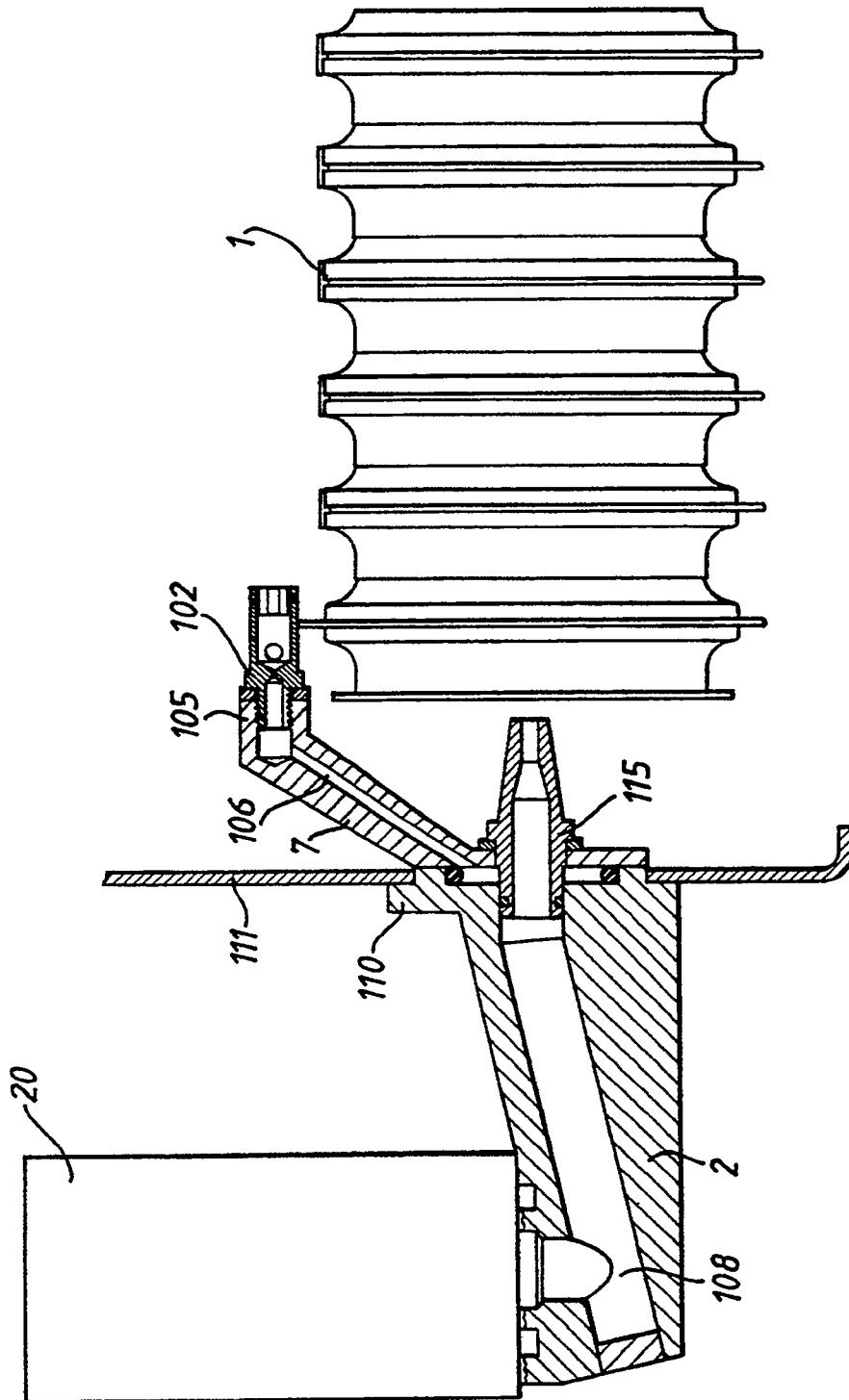


Fig. 4b.

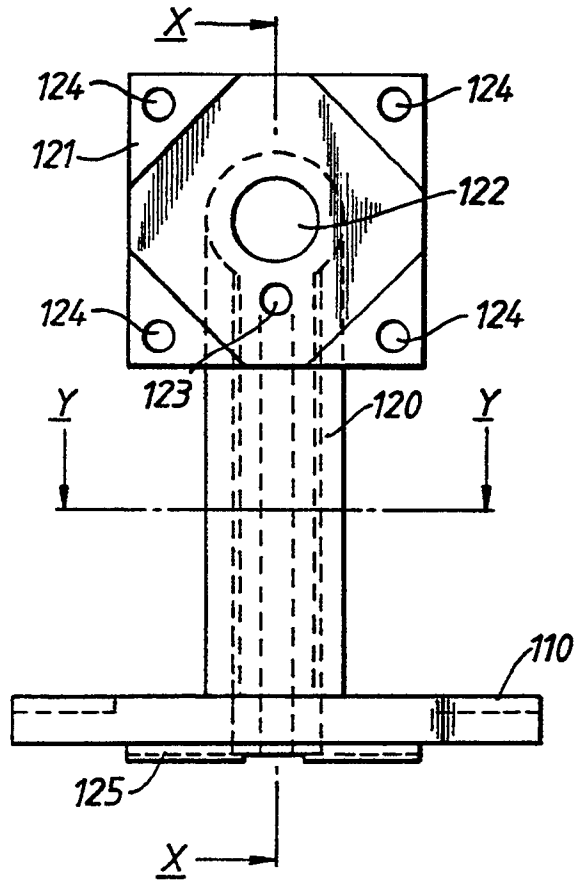


Fig. 5.

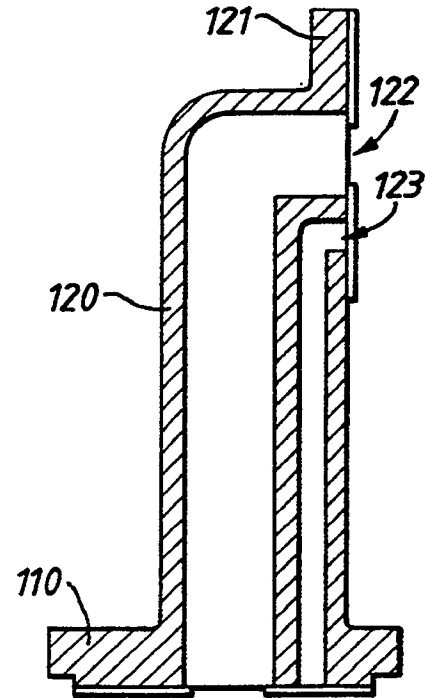


Fig. 6.

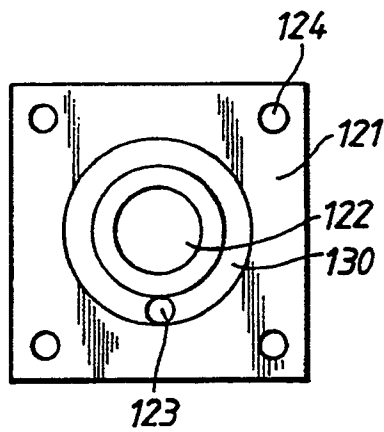


Fig. 8.

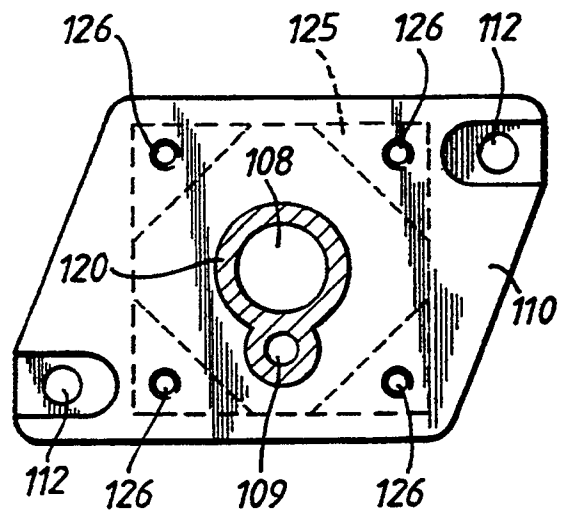
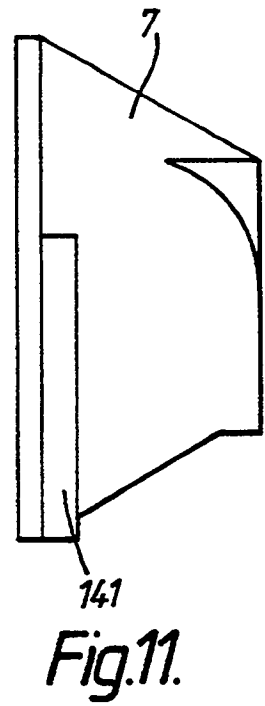
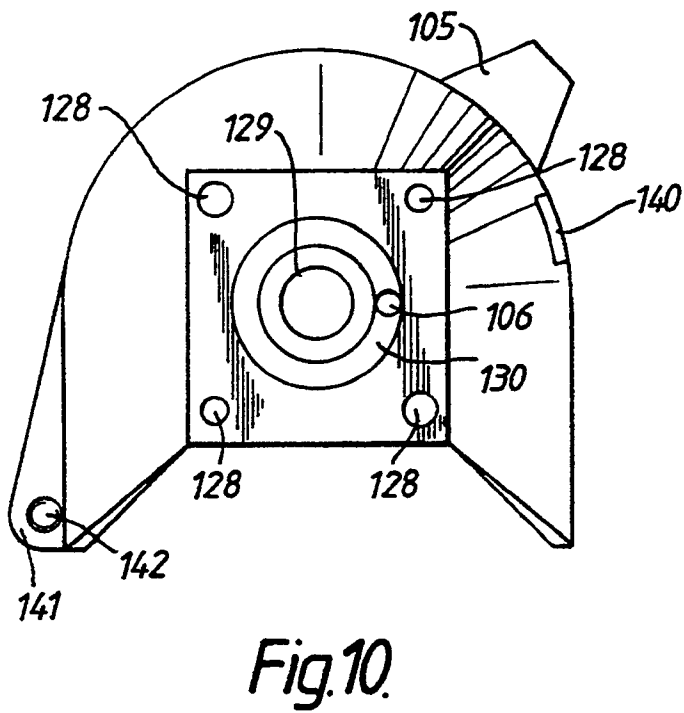
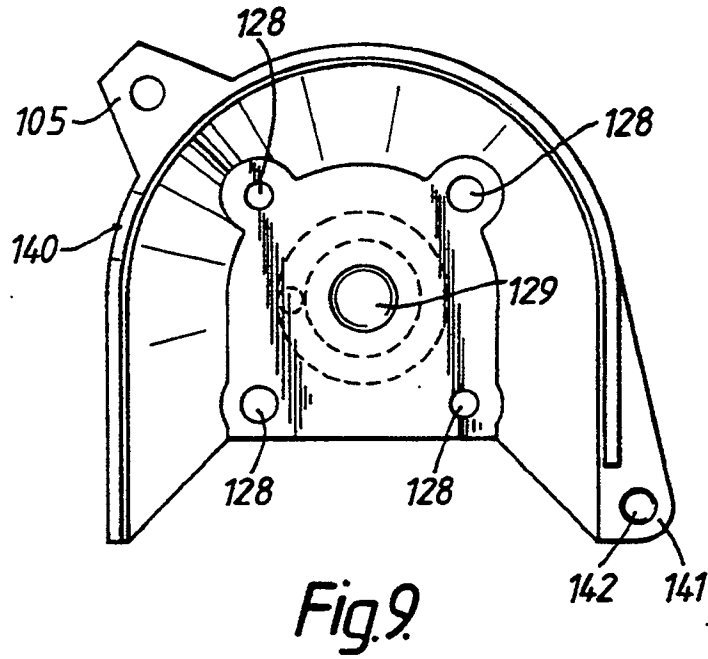


Fig. 7.



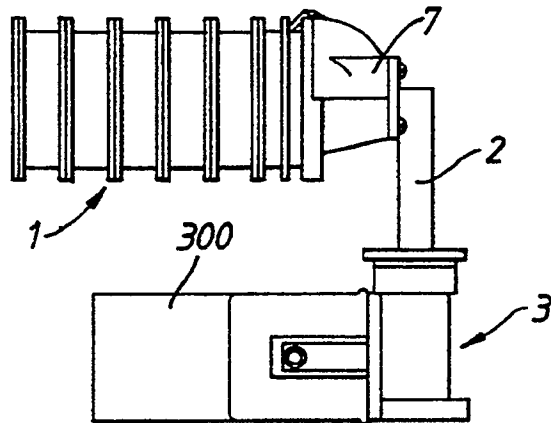


Fig.12.

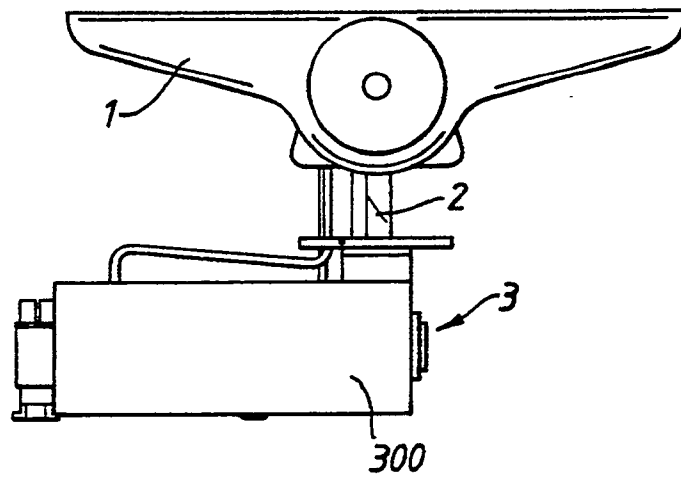


Fig.13.

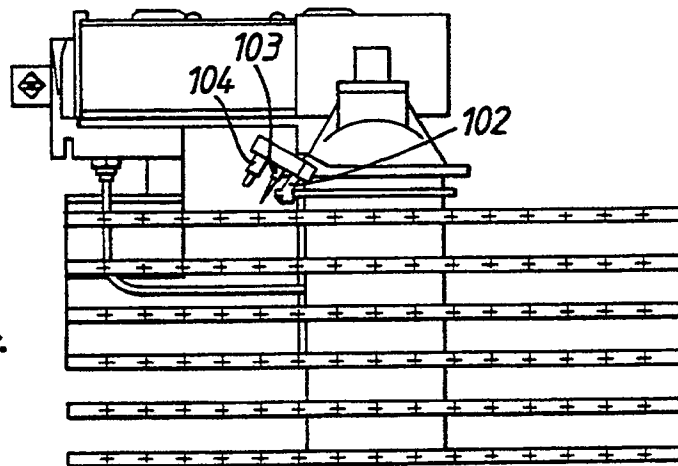


Fig.14.

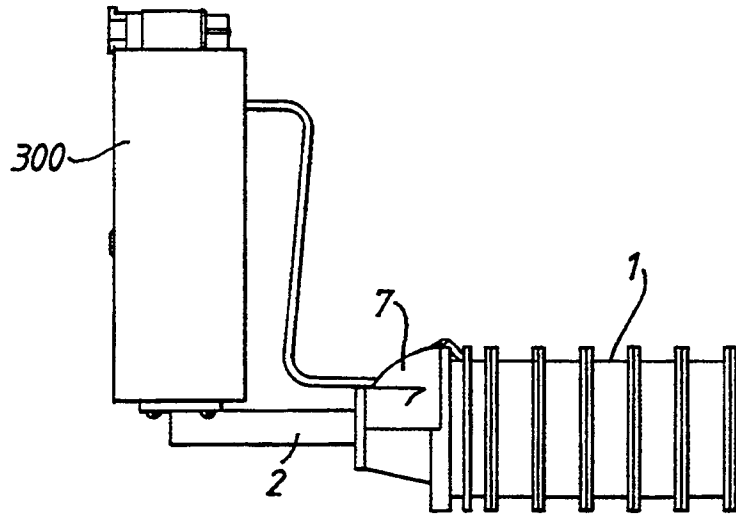


Fig.15.

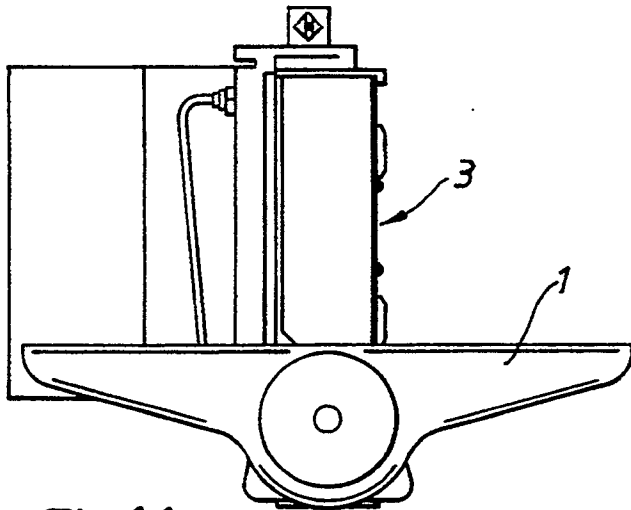


Fig.16.

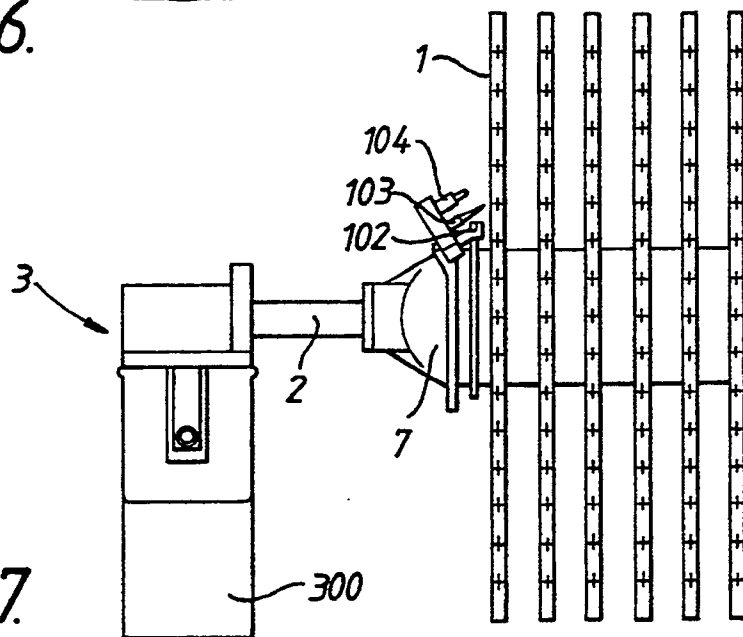


Fig.17.

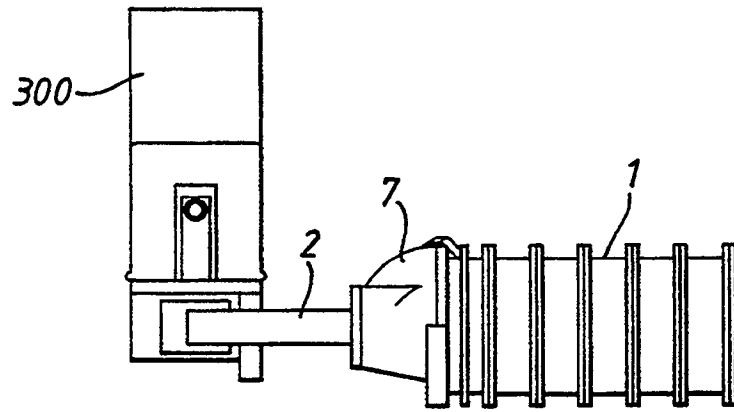


Fig.18.

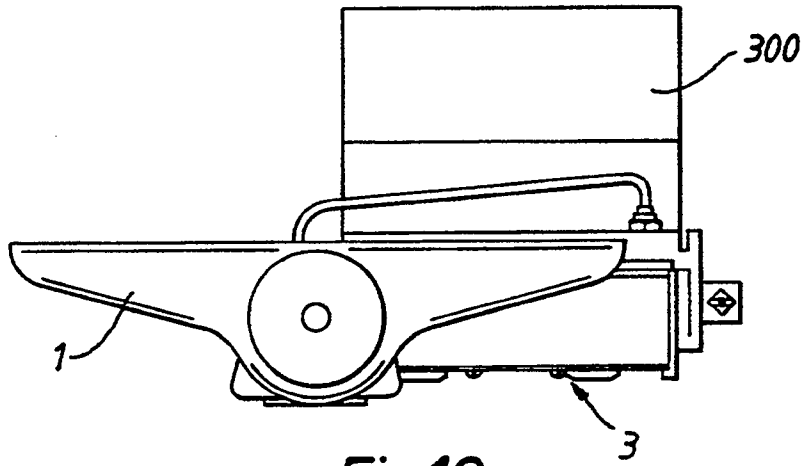


Fig.19.

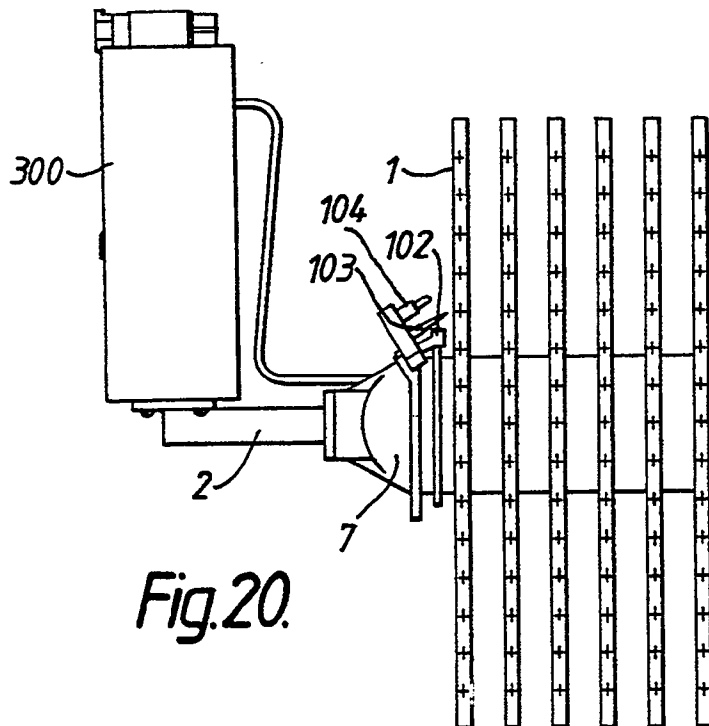


Fig.20.

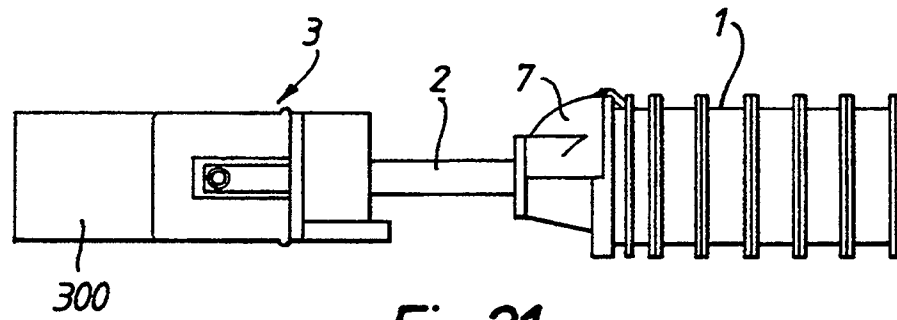


Fig.21.

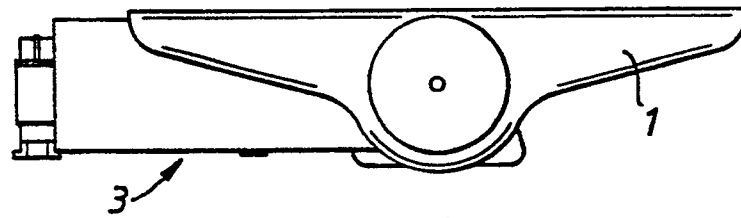


Fig.22.

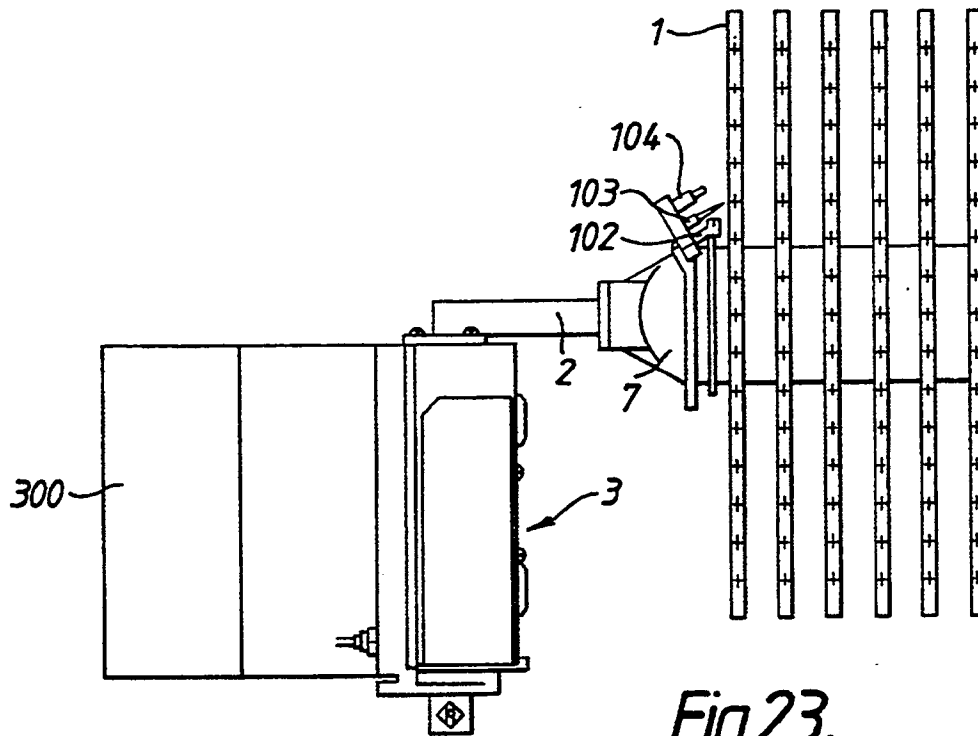


Fig.23.

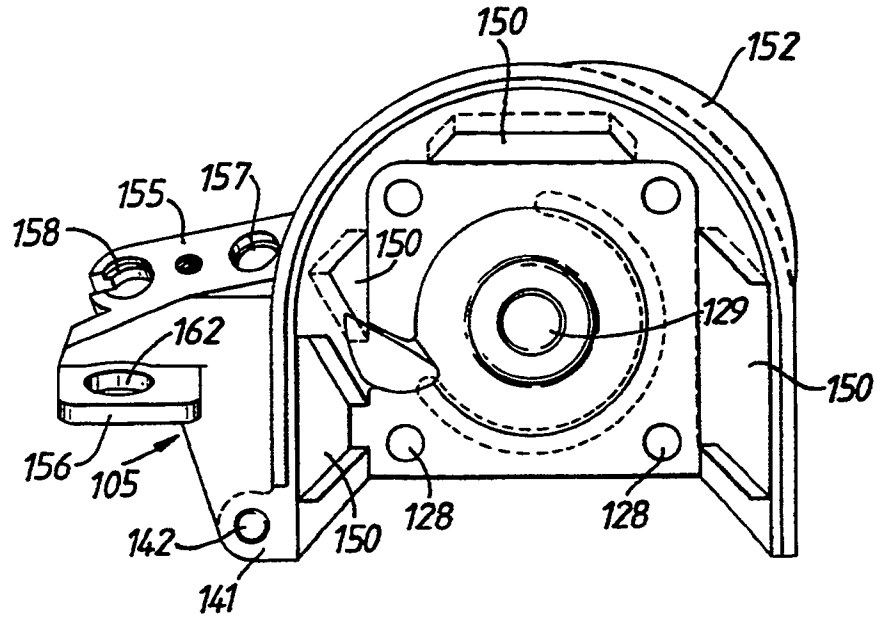


Fig. 24.

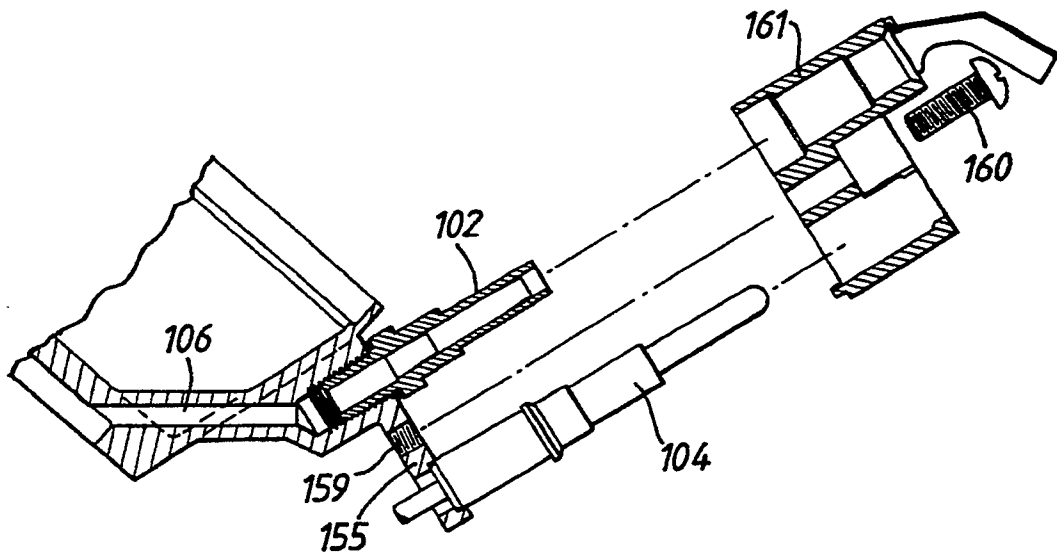


Fig. 25.

European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 3154

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-1 084 409 (JUNKERS) * page 3, lines 12-21,34-54; figure 1 * ---	1	F23D14/10 F23D14/46 F23Q9/04
A	DE-A-1 947 129 (PARKINSON COWAN) * page 3, lines 16-20; page 4, lines 26-34 * * figure * ---	1	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 JULY 1991	Examiner PHOA Y. E.
<p style="text-align: center;">CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p style="text-align: center;">T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document</p>			

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