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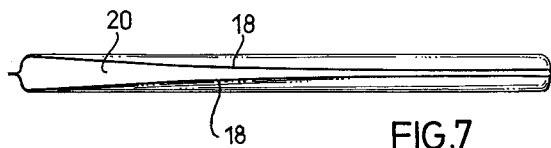
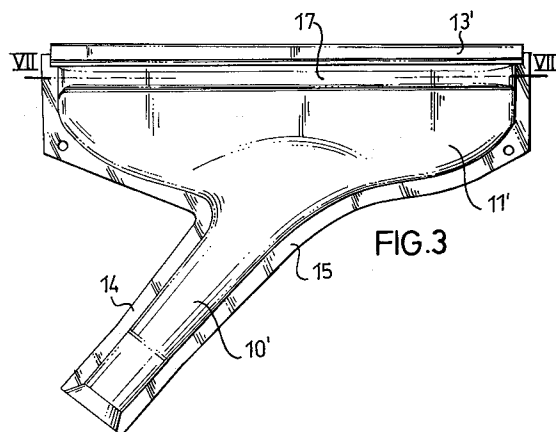
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I-20122 Milano (IT)(54) **A mixing diffuser element for an atmospheric burner.**

(57) A mixing diffuser element is disclosed which comprises a flattened box-type body (11') having an apertured edge for the outflow of air/gas mixture, and a conduit (10') connected to the body for the intake and mixing of air and gas within the box-type body.

To reduce space requirements while ensuring excellent uniformity for the outflow of air/gas mixture, the box-type body (11') is formed, near its apertured edge, with a throat (20) whose breadth varies inversely with the local velocity of the air/gas mixture.

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The present invention relates to gas burners of the atmospheric type, and in particular, to a mixing diffuser element for such a burner.

Known is a mixing diffuser element which comprises a flattened box-type body having an apertured edge, and a venturi conduit which connects to the box-type body. An element of this kind is shown in Figure 1 of the accompanying drawings. A gaseous fuel issuing from a respective nozzle, not shown, is drawn into the venturi, shown at 10 in the drawing, and admixed to air, and the resultant mixture is caused to flow, while undergoing expansion, through the box-type body, shown at 11, whence it comes out through openings 12 in a U-shaped section member 13 which defines one edge of the box-type body. Once ignited, the mixture burns in an array of flames which issue from the openings 12. A number of such elements can be mounted side-by-side in a respective supporting structure to form a burner having a desired thermal rating. A typical application of a burner of this kind is in the supply of heat to a heat exchanger for small to medium size boilers.

In order for the combustion to be complete and the flames of the same height all along the edge of the mixing diffuser element, it is necessary that the flow rate of the outgoing mixture be substantially the same through all of the openings. To achieve this, the box-type body should have a height dimension, as measured in a perpendicular direction to the edge with the mixture outlet openings, which is not below a value set by the structural characteristics of the body and the venturi, by the size of the openings, the pressure of the gas jet, etc.. It is indeed necessary to allow the mixture flow, which is being admitted to the venturi in a limited area of the body at a given pressure and along a given direction, to spread out all along the box-type body length and attain a steady state, to ultimately leave all the openings at one and the same flow rate.

In many applications, such as in wall-mounted boilers, it is desirable that the burner volume be minimized.

The object of the present invention is to provide a mixing diffuser element for a burner of the atmospheric type, which has reduced space requirements, while ensuring excellent outflow uniformity for the air/gas mixture which issues from its openings.

This object is achieved, according to the invention, by that the box-type body is formed, near its apertured edge, with a throat whose breadth varies inversely with the local velocity of the air/gas mixture. This arrangement enables the height of the box-type body to be significantly reduced, while keeping the mixture flow rate at the openings constant.

The invention can be better understood, and its advantages more clearly appreciated, from the following description of two exemplary, and hence in no way limitative, embodiments thereof, to be read in conjunction with the accompanying drawings, in which:

Figure 1, already mentioned hereinabove, is a full-size perspective view of a mixing diffuser element of known design;

Figure 2 is a full-size perspective view of a mixing diffuser element according to the invention;

Figures 3, 4 and 5 are a front, top and bottom view, respectively, of the mixing diffuser element according to the invention;

Figure 6 shows the same inventive element as viewed sideways from the left in Figure 3;

Figure 7 is a sectional view through the mixing diffuser element of this invention, taken in the plane of line VII-VII in Figure 3;

Figure 8 is a small scale front view of a mixing diffuser element in accordance with another embodiment of the invention; and

Figure 9 is a sectional view of the element shown in Figure 8, taken in the plane of line IX-IX.

The mixing diffuser element illustrated by Figures 2 to 7 has a flattened box-type body 11' and a venturi-type of conduit 10' similar to those of the known element in Figure 1 and being comprised of two half-shells conventionally formed from sheet metal by a dimpling process. The half-shells have identical shapes which are the mirror image of each other, and are worked with mating edges 14, 15 which are then joined together. The two half-shells can be assembled to each other using conventional clinching or welding steps. Once assembled, the two half-shells form a structure which is open, at the top along a straight side of the body 11' and at the bottom, to one end of the conduit 10' which forms the venturi inlet. Mounted on the open top side is a U-shaped section member 13' which has multiple openings 12' quite similar to those in Figure 1. The section member 13' is joined to the two half-shells through interlocking means consisting of opposed elevations 16 formed at the edges of the U-shaped section member 13', and corresponding grooves formed in the two half-shells. In a modified embodiment, which may be an advantageous one in terms of manufacturing economy, the two half-shells can be formed from a single piece of sheet metal folded over at the apertured edge.

It can be seen that in this example, as well as in the prior art element shown in Figure 1, the venturi 10' connects to the box-type body 11' in a central area opposite the apertured side of the section member 13' and is slanted such that its

axis forms with this side an acute angle whose apex locates close to one end of the section member, the right-hand end in Figure 3. Notice that the height of the body 11' is smaller than that of the prior art element.

According to the invention, the two half-shells are shaped, along a band-like region next to the open side mounting the U-shaped section member 13', with a depression 17 whose depth increases gradually from left to right as viewed in Figure 3. The two depressions 17 form a throat 20 of varying breadth inside the body 13', as shown best in Figures 6 and 7. Due to this throat of varying breadth, the air/gas mixture flowing from the venturi 10' will be resisted more in the direction toward the right-hand end of the U-shaped section member 13', where the velocity of the mixture flow is greatest, and meet no or just very small resistance in the left-hand region, where the mixture velocity is less. To summarize, the outgoing mixture flow rate is the same for all the openings, regardless of their location along the section member 13'. Thus, the same effect is provided as would be obtained by making the element with a much taller body, which is obviously advantageous in terms of overall volume of the burner.

The throat border lines, indicated at 18 in Figure 7, follow a generally curvilinear pattern and are symmetrical about the centerline of the cross-section shown in Figure 7. It should be understood, however, that the actual pattern of the lines 18 could be other than that shown, to take account of a particular shape of the box-type body and the venturi, of the apertured area, and of other operational parameters of a specific application.

Another embodiment of the invention is shown in Figures 8 and 9. As can be seen, the venturi, indicated at 10'', has here its axis substantially at right angles to the edge of the box-type body 11''. In this example, said edge is also provided with a U-shaped section member 13'' quite similar to that of the previously described embodiment. In this case, the depressions 17' are shaped to produce a throat (20') which is narrowest at the center of the U-shaped section member 13'', i.e. in the opposite area from the connection region of the conduit 10'' to the box-type body 11'', and then expands gradually in a symmetrical fashion to full breadth at the two ends of the section member.

It can be appreciated that compromise embodiments, so to speak, would also be possible wherein the venturi is offset slightly from the orthogonal direction to the mixture outflow edge, so that the throat would no longer be symmetrical about the center like that shown in Figure 9, but still comprised of a narrow portion which spreads out towards both ends of the section member 13''.

While two embodiments only of the invention have been described and illustrated, it will be appreciated that several modifications would be feasible within the scope of this inventive concept. Thus, for example, the throat next to the apertured edge could be provided by securing within the box-type body an insert shaped to fit, rather than by suitably shaping the walls of the body itself.

Claims

1. A mixing diffuser element for a gas burner of the atmospheric type, comprising
 - a flattened box-type body (11') having an apertured edge (12') for the outflow of air/gas mixture, and
 - a conduit (10') for the intake and mixing of air and gas within the box-type body, which connects to the box-type body, characterized in that the box-type body (11') is formed, near its apertured (12') edge, with a throat (20) whose breadth varies inversely with the local velocity of the air/gas mixture.
2. An element according to Claim 1, characterized in that the apertured edge (13') is substantially rectilinear, that the conduit (10') connects to the box-type body in an opposite area thereof from the edge and its axis forms with the edge an acute angle whose apex lies close to one end of the edge, and that the breadth of the throat (20) varies gradually from a minimum at said end to a maximum at the opposite end of the edge.
3. An element according to Claim 1, characterized in that the apertured edge (13'') is substantially rectilinear and that the conduit (10'') connects to the box-type body (11'') in an opposite area thereof from the central portion of the edge (13'') and its axis forms with the edge substantially a right angle, and that the breadth of the throat (20') varies gradually from a minimum at said central portion to a maximum at either ends of the edge (13').
4. An element according to any of the preceding claims, characterized in that the box-type body (11') and the conduit (10') are formed in one piece from dimpled sheet metal folded over into two juxtaposed half-shells interconnected by said apertured (12') edge and joined to each other along part of their respective edges (14,15) to leave the conduit (10') inlet uncovered.
5. An element according to any of Claims 1 to 3, characterized in that the box-type body (11')

and the conduit are formed essentially by two half-shells of dimpled sheet metal which are joined to each other along part of their respective edges (14,15) to leave one side of the body (11') and the conduit (10') inlet uncovered, and that the apertured (12') edge is formed by a U-shaped section member (13') joined to the two half-shells at the uncovered side of the body.

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6. An element according to Claims 4 or 5, characterized in that the edges (14,15) of the half-shells are joined together by clinching.

7. An element according to either Claim 4 or 5, characterized in that the edges (14,15) of the half-shells are joined together by welding.

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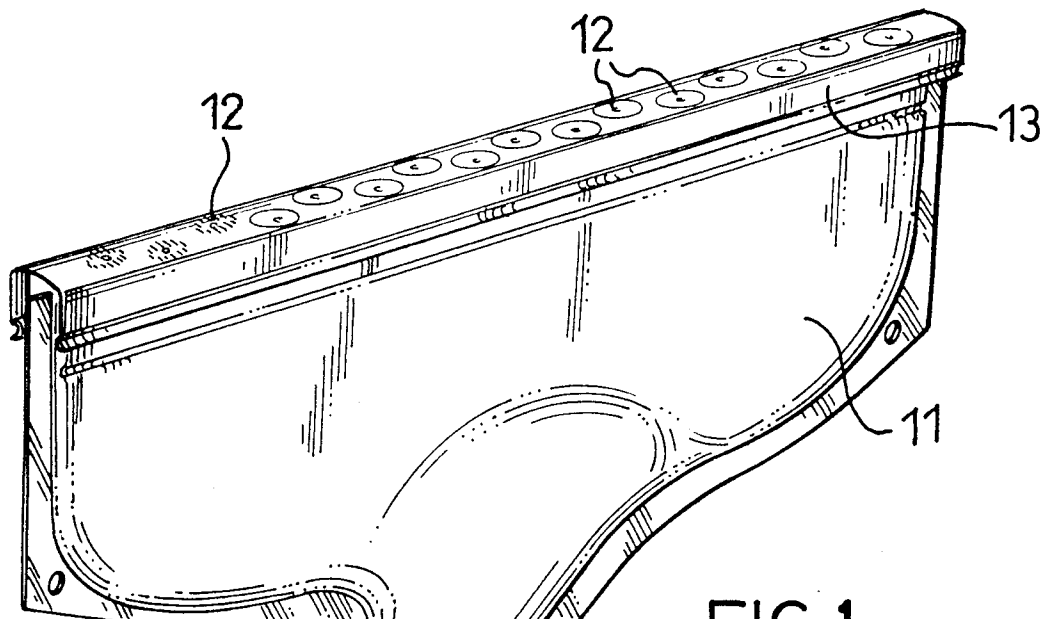


FIG.1

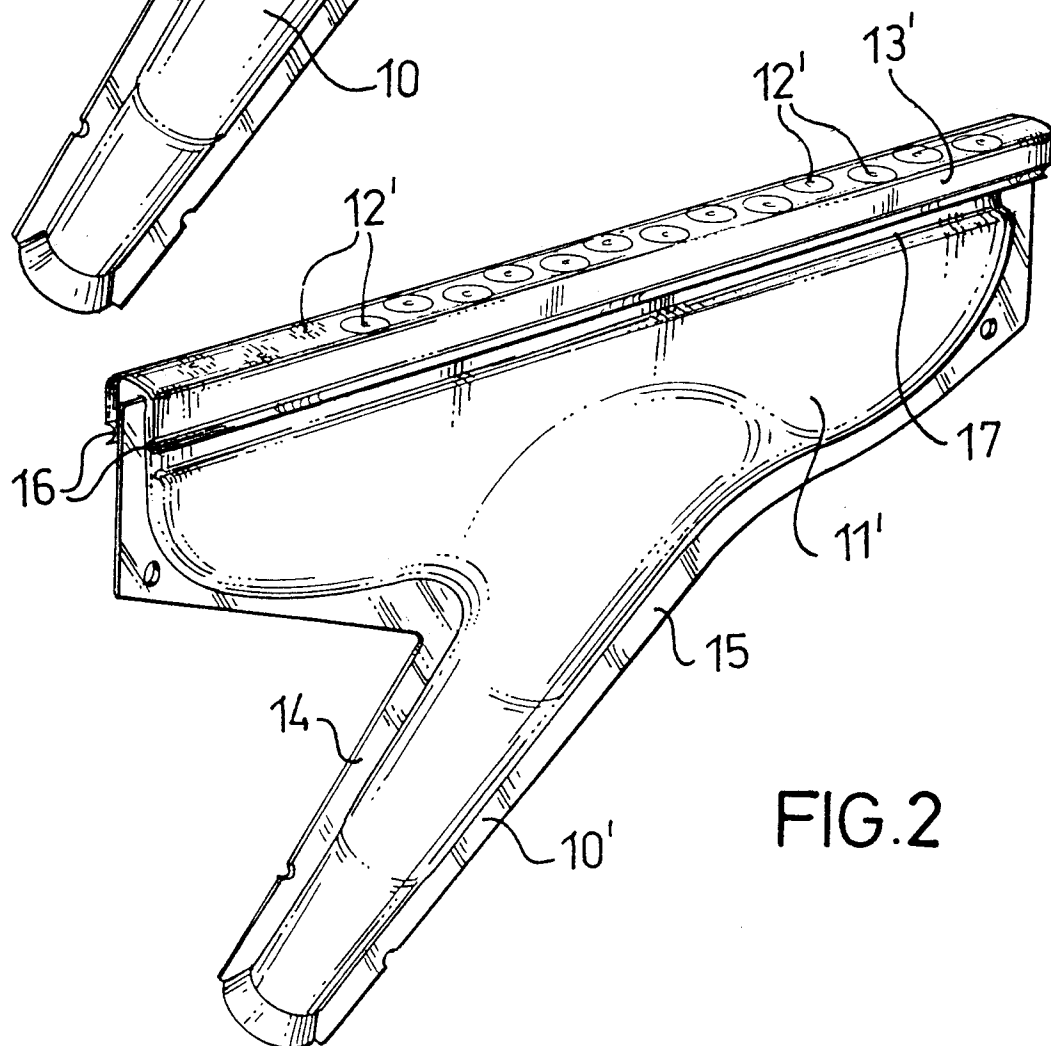
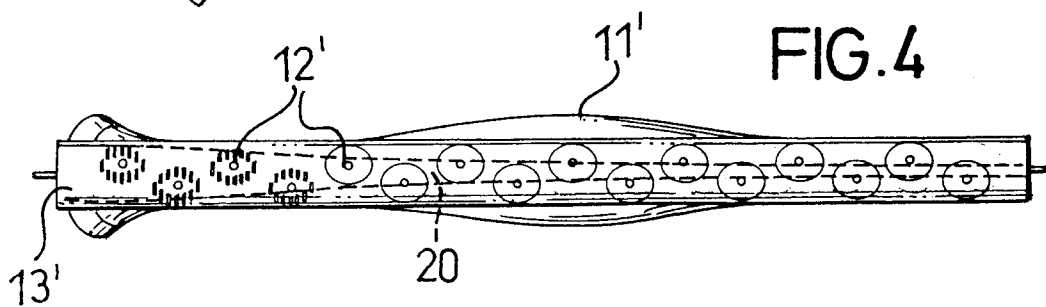
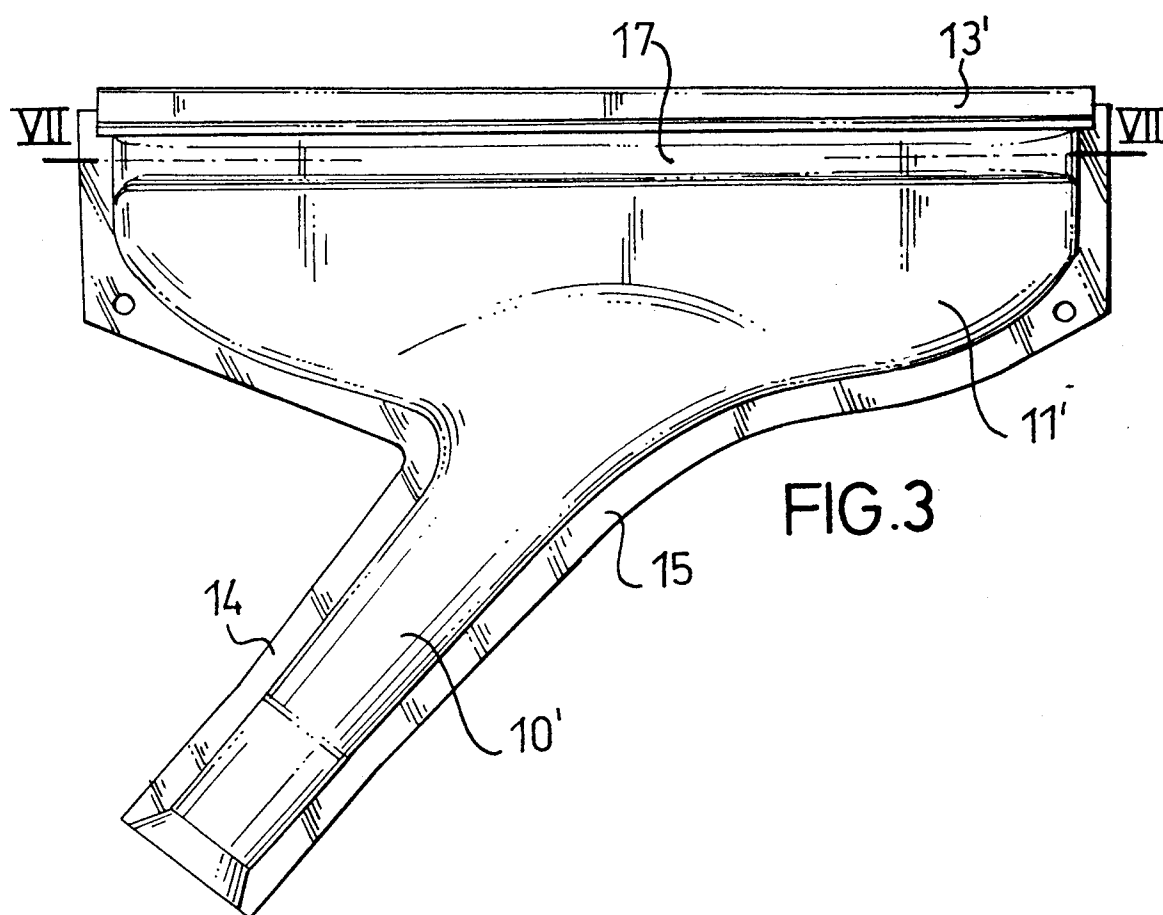
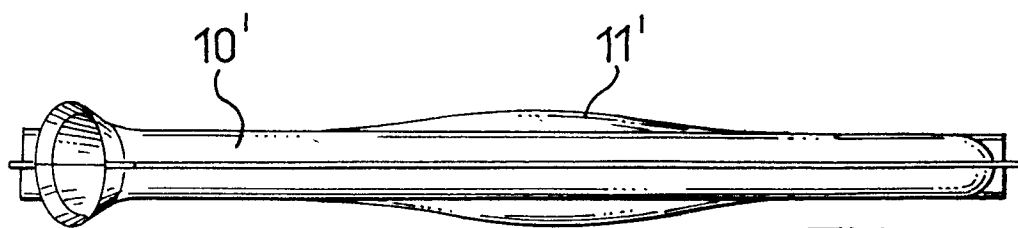


FIG.2



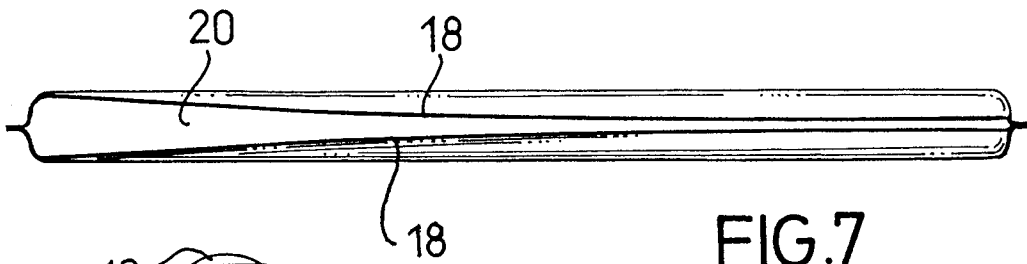


FIG. 7

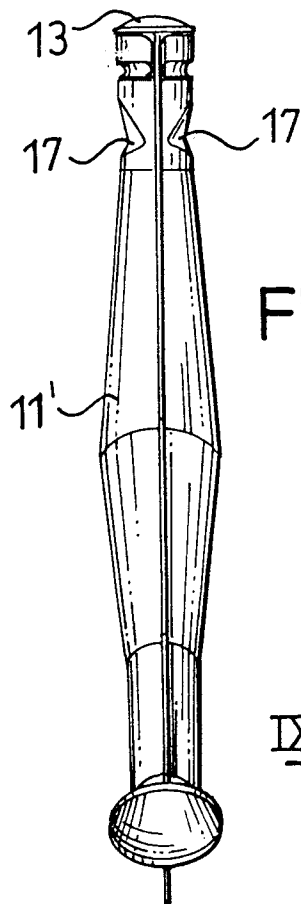


FIG. 6

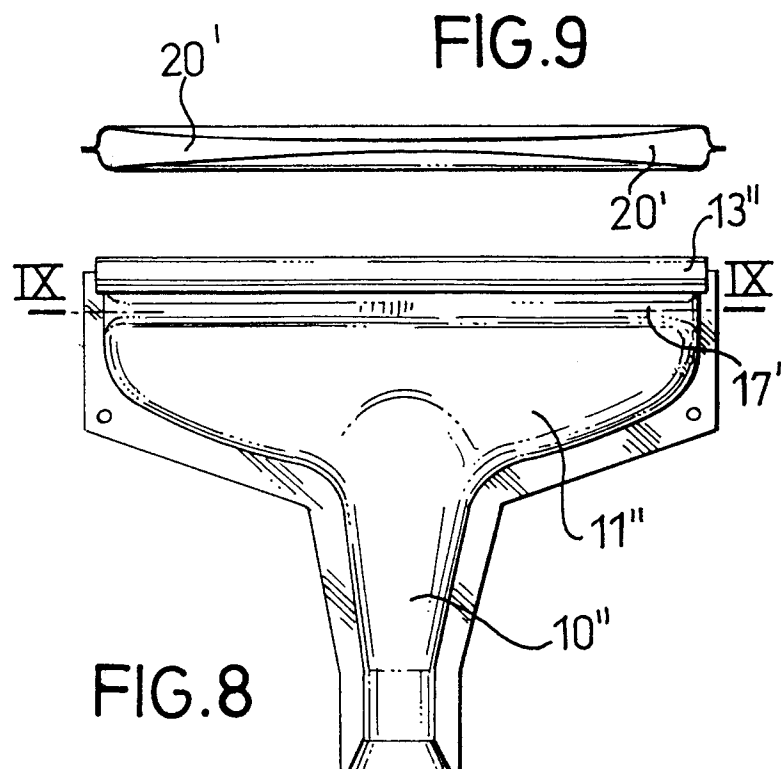


FIG. 9

FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 3004

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.6)
X	GB-A-1 111 556 (GUEREL) * page 1, line 59 - line 74 * * page 1, line 81 - page 2, line 11; figures 1-5 *	1,4,7	F23D14/10 F23D14/46
Y	---	2,5,6	
X	FR-A-2 102 802 (ZAEGEL-HELD) * page 2, line 14 - line 19; figure 3 *	1,3	
Y	---		
Y	FR-A-2 505 454 (BOSCH) * page 2, line 40 - page 3, line 6 * * page 3, line 40 - page 4, line 3; figures 1-3 *	5,6	
Y	---		
Y	DE-U-86 13 880 (VAILLANT) * claims 1-3; figure 2 *	2	
A,P	---		
A,P	EP-A-0 606 527 (SEBASTIANI) * figures 5,6 *	2	
A	---		
A	GB-A-2 031 579 (T.I. DOMESTIC APPLIANCES) * the whole document *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) F23D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 March 1995	Examiner Coli, E
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