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(54) **SPRAY GUN HEADS**

SPRÜHPISTOLENKÖPFE

TETES DE PISTOLETS PULVERISATEURS

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(73) Proprietor: **BWI plc**
Prescote, Merseyside L34 9JS (GB)

(72) Inventor: **LYON, Barry**
Huyton
Merseyside L36 4QG (GB)

(74) Representative: **Cawley, Aimee Elizabeth et al**
Marks & Clerk LLP
Sussex House
83-85 Mosley Street
Manchester
M2 3LG (GB)

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Description

[0001] This invention relates to spray gun heads.

[0002] Multiple fluid atomiser spray guns are used for spraying fluid solutions in the food, agricultural, pharmaceutical and similar industries. Such spray guns generally have a spray delivery head that has a central nozzle for say a coating fluid, an orifice for introducing atomising air to the fluid to produce a spray plume and additional orifices for air to control the pattern of spray plume. Document US6494387 discloses a spray head according to the preamble of claim 1.

[0003] In one known nozzle arrangement the atomising air orifice is an annulus surrounding a projecting fluid delivery nozzle and control fluid orifices are provided either side of the central nozzle in angled faces of the spray head, so that the central nozzle is in a trough.

[0004] A drawback with this arrangement is that there is a tendency for droplets of the fluid to fall back and adhere to surfaces of the nozzle body, which is known as bearding. This droplet build up continues whilst spraying leading to a loss in nozzle performance including blockage. Furthermore, the build up of droplets can solidify and break off and fall into and contaminate the process. This results from the presence of low-pressure zones adjacent to the outlet orifices due to the sudden geometrical enlargement, through which the escaping air is emitted. These low-pressure zones generate recirculating eddy currents in the air flow, which entrain fluid droplets and deliver them onto the local external faces of the spray head adjacent to the orifices and annulus. Over time these droplets stick to each other forming the undesirable build up mainly in the nozzle region.

[0005] It has been proposed to make the face of a spray gun nozzle completely flat but this does not prevent bearding.

[0006] An object of this invention is to provide a spray nozzle for a multiple fluid spray gun, which at least reduces the effect of bearding.

[0007] According to the invention a spray head for a multiple fluid atomiser spray gun has all the features of claim 1.

[0008] Preferable embodiments of the invention are defined by the dependent claims.

[0009] Spray heads of the invention are preferably made of metal or of plastics material may be served to a spray gun by means of a locking collar or nut.

[0010] This invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a spray nozzle according to the invention;

Figure 2 is a plan view of the spray nozzle of Figure 1;

Figure 3 is a section on line AA of Figure 2;

Figure 4 shows the spray nozzle of Figure 1 from above the side;

Figure 5 is a sectional view of the spray nozzle of

Figure 1 showing spray patterns;

Figure 6 is another side view of the spray nozzle of Figure 1;

Figure 7 is a view from below and one side of the spray nozzle of Figure 1; and

Figure 8 is an end view of the spray nozzle of Figure 1.

[0011] Referring to the accompanying drawings, a spray head 10 for a multiple fluid atomiser spray gun has a body 12 having a circular base 14 for mounting on a spray gun apparatus and sloping faces 16 leading to a narrow spray delivery face 18.

[0012] The body 12 has a central passage 20 for delivery of coating fluid to a delivery nozzle 22 end part only and for delivery of atomising fluid through an annular orifice 24 surrounding the main fluid delivery nozzle. The nozzle 22 for the coating fluid protrudes beyond the spray face 18, which enables interaction of air and fluid streams beyond the spray face helping to inhibit atomised fluid droplets being picked up by air currents in the vicinity of the face. At the tip of the nozzle 22 its outer edge is chamfered at 23 to reduce a low pressure zone at the nozzle tip. Figure 5 of the drawings shows the zone of low pressure at 25. By contrast a conventional nozzle has a generally square tip, which creates a larger low pressure zone at the nozzle tip. On opposite sides of the delivery nozzle are spray pattern controlling fluid delivery orifices 26, 28, whose axes are inclined relative to the axis of the coating fluid delivery nozzle 22. The orifices 26, 28 are served by bores 30, 32 respectively, which are interconnected via an annular channel 34 in the base of the spray head. Annular wall 36, which separates the passage 20 from the channel 34 serves to locate the spray head relative to the spray gun apparatus. The spray head may be of metal or plastics material.

[0013] Through the spray head a coating fluid is delivered via the nozzle 22 and air delivered through the annular orifice 24 atomises the coating fluid to create a spray plume, which is generally conical in shape (see particularly Figure 5). However, the spray pattern controlling fluid orifices 26, 28 deliver air from either side of the coating fluid spray plume to change the shape of the spray plume to being of generally oval section in order to control the area of delivery of the coating fluid. Typically, the coating fluid is applied to tablets in the pharmaceutical industry.

[0014] The spray delivery face 18 is shaped in the region of the delivery nozzle 22 and the orifices 24, 26 and 28 in order to allow atomising air and spray pattern controlling air to drive droplets of main fluid from the region to inhibit bearding.

[0015] The part of the face surrounding the annular orifice is dish shaped (38) and at opposite ends of the dish the face 40 slopes down to the spray shaping fluid orifices at 26 and 28. Smooth transitions between the dish 38 at opposite ends and the respective slopes 40 are shown at 42. The sides of the dish 38 and the sloping

faces 40 are generally at less than 90° to the axes of their respective orifices, so that the air from those orifices tends to drive any droplets of the coating fluid from the delivery face in the region of the nozzle and orifices.

[0016] More specifically, the spray face 18 of the spray head is so profiled in the region of the main coating fluid nozzle, atomising fluid annulus and spray pattern controlling orifices that the escaping air is provided with a gradual geometrical enlargement as defined by the dish 38, slopes 40 and smooth transitions 42. The effect of the gradual geometrical enlargement is a gradual air release (as opposed to a sudden release) in that the air does not form recirculating eddy currents and thus little or no entrapment of coating fluid droplets back onto the spray face occurs.

[0017] Figure 5 illustrates the atomising air plume 50 emitted from the annular orifice 24, the spray pattern controlling air plume 52 emitted from orifices 26 and 28 and the zone of interaction between both air plumes 50 and 52 to provide a combined air plume 54. The air streams shown as 50 and 52 keep the local external surfaces free from droplets, which would otherwise stick to the surfaces and cause bearding.

[0018] Broken line 56 represents the typical shape of existing nozzle designs. Considering the likely shape of the air plumes as they emerge from orifices 26 and 28 it is probable that a low pressure zone is created in the region between these orifices and the annular orifice, which generates recirculating eddy currents in the air-flow, which entrain small droplets back onto the spray face adjacent to the orifices 24, 26 and 28. The invention eliminates this low pressure zone with solid material as shown at 58, which then through geometrical form provides a gradual geometrical enlargement which has the effect of eliminating the recirculating eddy currents normally produced with a face shown by the line 56.

[0019] Figure 8 shows the sloping faces 16, which provide a path for spray plume replenishing air 60 to enter the vicinity of the orifices 24, 26 and 28 and replace air consumed by the air plumes 50 and 52. On existing designs shallow angled faces illustrated by line 62 do not allow replenishing air 60 to enter the vicinity of the atomising and pattern air outlets akin to orifices 24, 26 and 28 creating low-pressure zones that result in bearding.

Claims

1. A spray head (10) for a multiple fluid atomiser spray gun comprising a spray delivery face (18) having a main fluid delivery nozzle (22) and an atomising fluid delivery orifice (24) associated therewith, the spray delivery face (18) being shaped to cause droplets of said main fluid to be driven away from the spray delivery face (18) by atomising fluid from the atomising fluid delivery orifice (24), wherein the main fluid delivery nozzle (22) is surrounded by the annular atomising fluid delivery orifice (24), characterised in that the spray delivery face surrounding this orifice is in the form of an elongate cavity (38) having a continuous surface from which the main fluid delivery nozzle (22) projects.

2. A spray head (10) as claimed in claim 1, wherein the main fluid delivery nozzle (22) projects beyond the annular orifice (24).
3. A spray head (10) as claimed in claim 1 or 2, wherein the spray delivery face (18) outwardly of and adjacent to the atomising fluid delivery orifice (24) is at an angle of less than 90° to the axis of the orifice.
4. A spray head (10) as claimed in any one of claims 1 to 3 having one or more orifices (26, 28) for delivery of spray pattern controlling fluid to shape the atomised fluid spray.
5. A spray head (10) as claimed in claim 4, wherein the spray delivery face (18) is shaped to cause droplets of said main fluid to be driven away from the spray delivery face in the region of the spray pattern controlling fluid delivery orifice or orifices (26, 28).
6. A spray head (10) as claimed in claim 5, wherein the or each shaping fluid delivery orifice (26, 28) has an axis at an angle to deliver its fluid across the main fluid atomised spray.
7. A spray head (10) as claimed in claim 5 or 6, wherein the spray delivery face (18) inwards of the or each shaping fluid orifice (26, 28) is at an angle of less than 90° to the axis of the orifice.
8. A spray head (10) as claimed in any one of claims 1 to 7 having it generally circular base (14) and a pair of opposed sloping sides (16) towards to the spray delivery face (18).
9. A spray head (10) as claimed in any one of claims 1 to 8, having a generally central passage (20) leading to the main fluid delivery nozzle (22) and the associated atomising fluid delivery nozzle (24).
10. A spray head (10) as claimed in any one of claims 4 to 9, wherein the or each spray pattern controlling fluid delivery orifices (26, 28) is supplied through its own bore (30, 32).
11. A spray head (10) as claimed in claim 10, wherein, where more than one spray pattern controlling fluid delivery orifice (26, 28) is provided, their bores (30, 32) are interconnected.
12. A spray head (10) as claimed in claim 11, wherein the bores (30, 32) are interconnected by means of an annular passage (34).

13. A spray head (10) as claimed in any one of claims 1 to 12, wherein, at opposite ends of the elongate cavity (38), the delivery face (18) slopes down to a spray pattern controlling fluid delivery orifice (26, 28).

Patentansprüche

1. Sprühkopf (10) für eine Mehrfluidzerstäuber-Spritzpistole, der eine Sprühnebel-Abgabefläche (18) umfasst, die eine Hauptfluid-Abgabedüse (22) und eine mit derselben verknüpfte Zerstäubungsfluid-Abgabeöffnung (24) hat, wobei die Sprühnebel-Abgabefläche (18) so geformt ist, dass sie bewirkt, dass Tröpfchen des Hauptfluids durch ein Zerstäubungsfluid aus der Zerstäubungsfluid-Abgabeöffnung (24) von der Sprühnebel-Abgabefläche (18) weggetrieben werden, wobei die Hauptfluid-Abgabedüse (22) durch die ringförmige Zerstäubungsfluid-Abgabeöffnung (24) umschlossen wird, **dadurch gekennzeichnet, dass** die Sprühnebel-Abgabefläche, welche diese Öffnung umschließt, die Form eines länglichen Hohlraums (38) hat, der eine durchgehende Oberfläche hat, von der die Hauptfluid-Abgabedüse (22) vorspringt.
2. Sprühkopf (10) nach Anspruch 1, wobei die Hauptfluid-Abgabedüse (22) über die ringförmige Öffnung (24) hinaus vorspringt.
3. Sprühkopf (10) nach Anspruch 1 oder 2, wobei die Sprühnebel-Abgabefläche (18) von der Zerstäubungsfluid-Abgabeöffnung (24) nach außen und angrenzend an dieselbe in einem Winkel von weniger als 90° zu der Achse der Öffnung verläuft.
4. Sprühkopf (10) nach einem der Ansprüche 1 bis 3, der eine oder mehrere Öffnungen (26, 28) zur Abgabe eines Sprühmuster-Steuerungsfluids hat, um den zerstäubten Fluid-Sprühnebel zu formen.
5. Sprühkopf (10) nach Anspruch 4, wobei die Sprühnebel-Abgabefläche (18) so geformt ist, dass sie bewirkt, dass Tröpfchen des Hauptfluids in dem Bereich der Sprühmuster-Steuerungsfluid-Abgabeöffnung oder -öffnungen (26, 28) von der Sprühnebel-Abgabefläche weggetrieben werden.
6. Sprühkopf (10) nach Anspruch 5, wobei die oder jede Sprühmuster-Steuerungsfluid-Abgabeöffnung (26, 28) eine Achse in einem Winkel hat, um ihr Fluid durch den zerstäubten Hauptfluid-Sprühnebel abzugeben.
7. Sprühkopf (10) nach Anspruch 5 oder 6, wobei die Sprühnebel-Abgabefläche (18) von der oder jeder Sprühmuster-Steuerungsfluid-Abgabeöffnung (26,

28) nach innen in einem Winkel von weniger als 90° zu der Achse der Öffnung verläuft.

8. Sprühkopf (10) nach einem der Ansprüche 1 bis 7, der eine im Allgemeinen kreisförmige Basis (14) und ein Paar von entgegengesetzten abfallenden Seiten (16) zu der Sprühnebel-Abgabefläche (18) hin hat.
9. Sprühkopf (10) nach einem der Ansprüche 1 bis 8, der einen im Allgemeinen mittigen Durchgang (20) hat, der zu der Hauptfluid-Abgabedüse (22) und der Zerstäubungsfluid-Abgabeöffnung (24) führt.
10. Sprühkopf (10) nach einem der Ansprüche 4 bis 9, wobei die oder jede Sprühmuster-Steuerungsfluid-Abgabeöffnung (26, 28) durch ihre eigene Bohrung (30, 32) versorgt wird.
11. Sprühkopf (10) nach Anspruch 10, wobei, wenn mehr als eine Sprühmuster-Steuerungsfluid-Abgabeöffnung (26, 28) bereitgestellt wird, deren Bohrungen (30, 32) miteinander verbunden sind.
12. Sprühkopf (10) nach Anspruch 11, wobei die Bohrungen (30, 32) mit Hilfe eines ringförmigen Durchgangs (34) miteinander verbunden sind.
13. Sprühkopf (10) nach einem der Ansprüche 1 bis 12, wobei die Abgabefläche (18), an entgegengesetzten Enden des länglichen Hohlraums (38), zu einer Sprühmuster-Steuerungsfluid-Abgabeöffnung (26, 28) hinab abfällt.

Revendications

1. Tête de pulvérisation (10) pour un pistolet pulvérisateur atomiseur de fluides multiples, comprenant une face de distribution d'un fluide de pulvérisation (18), comportant une buse de distribution d'un fluide principal (22) et un orifice de distribution d'un fluide à atomisation (24) qui y est associé, la face de distribution du fluide de pulvérisation (18) étant formée de sorte à entraîner des gouttelettes dudit fluide principal à l'écart de la face de distribution du fluide de pulvérisation (18) en atomisant le fluide à partir de l'orifice de distribution du fluide à atomisation (24), dans lequel la buse de distribution du fluide principal (22) est entourée par l'orifice annulaire de distribution de fluide à atomisation (24), **caractérisée en ce que** la face de distribution du fluide de pulvérisation entourant cet orifice a la forme d'une cavité allongée (38), comportant une surface continue à partir de laquelle déborde la buse de distribution du fluide principal (22).
2. Tête de pulvérisation (10) selon la revendication 1,

dans laquelle la buse de distribution du fluide principal (22) déborde au-delà de l'orifice annulaire (24).

3. Tête de pulvérisation (10) selon les revendications 1 ou 2, dans laquelle la face de distribution du fluide de pulvérisation (18), agencée vers l'extérieur de l'orifice de distribution du fluide à atomisation (24) et adjacente à celui-ci, forme un angle de moins de 90° par rapport à l'axe de l'orifice. 5
4. Tête de pulvérisation (10) selon l'une quelconque des revendications 1 à 3, comportant un ou plusieurs orifices (26, 28) pour distribuer un fluide contrôlant le motif de la pulvérisation, en vue de former la pulvérisation de fluide atomisé. 10 15
5. Tête de pulvérisation (10) selon la revendication 4, dans laquelle la face de distribution du fluide de pulvérisation (18) est formée de sorte à entraîner des gouttelettes dudit fluide principal à l'écart de la face de distribution du fluide de pulvérisation dans la région de l'orifice ou des orifices de distribution contrôlant le motif de pulvérisation (26, 28). 20
6. Tête de pulvérisation (10) selon la revendication 5, dans laquelle le ou chaque orifice de distribution du fluide de formage (26, 28) comporte un axe pour distribuer son fluide à travers la pulvérisation atomisée du fluide principal. 25 30
7. Tête de pulvérisation (10) selon les revendications 5 ou 6, dans laquelle la face de distribution du fluide de pulvérisation (18), située vers l'intérieur de ou de chaque orifice de formage du fluide (26, 28), forme un angle inférieur à 90° par rapport à l'axe de l'orifice. 35
8. Tête de pulvérisation (10) selon l'une quelconque des revendications 1 à 7, comportant une base généralement circulaire (14) et une paire de côtés inclinés opposés (16) orientés vers la face de distribution du fluide de pulvérisation (18). 40
9. Tête de pulvérisation (10) selon l'une quelconque des revendications 1 à 8, comportant un passage généralement central (20) menant vers la buse de distribution du fluide principal (22) et la buse de distribution du fluide atomisé associée (24). 45
10. Tête de pulvérisation (10) selon l'une quelconque des revendications 4 à 9, dans laquelle le ou chaque orifice de distribution du fluide contrôlant le motif de pulvérisation (26, 28) est alimenté à travers son propre alésage (30, 32). 50
11. Tête de pulvérisation (10) selon la revendication 10, dans laquelle, en cas de présence de plus d'un orifice de distribution du fluide contrôlant le motif pulvérisation (26, 28), les alésages correspondants (30, 32) 55

sont interconnectés.

12. Tête de pulvérisation (10) selon la revendication 11, dans laquelle les alésages (30, 32) sont interconnectés par l'intermédiaire d'un passage annulaire (34).
13. Tête de pulvérisation (10) selon l'une quelconque des revendications 1 à 12, dans laquelle, au niveau des extrémités opposées de la cavité allongée (38), la face de distribution (18) est inclinée vers le bas vers un orifice de distribution d'un fluide contrôlant le motif de pulvérisation (26, 28).

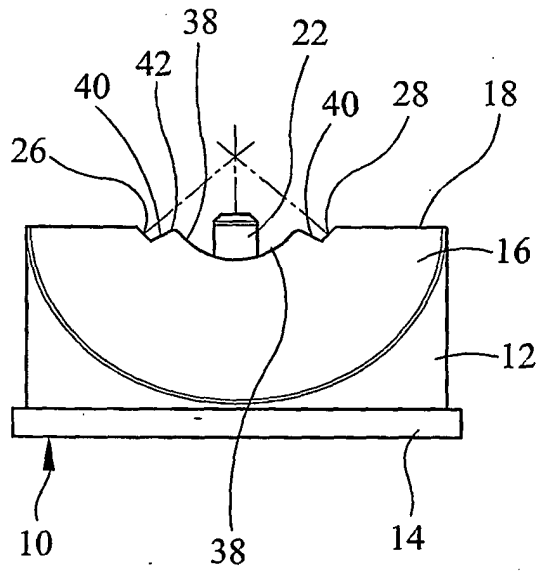


FIG 1

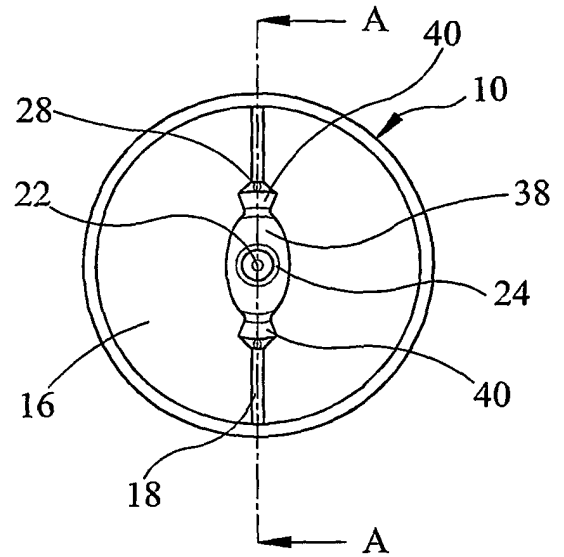


FIG 2

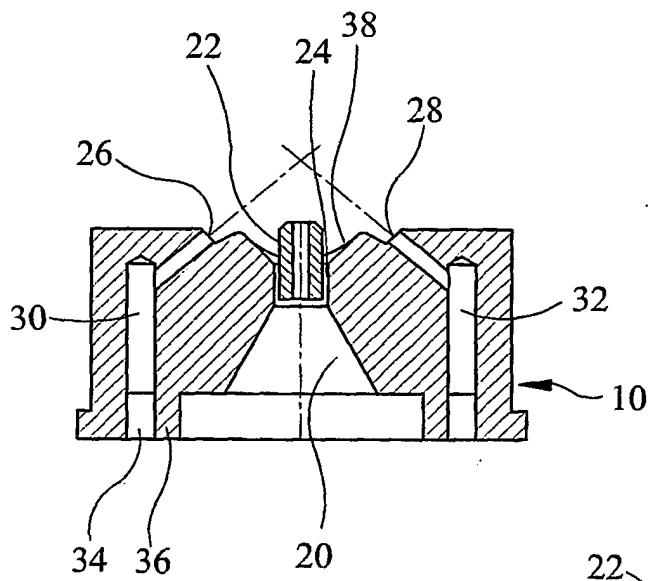


FIG 3

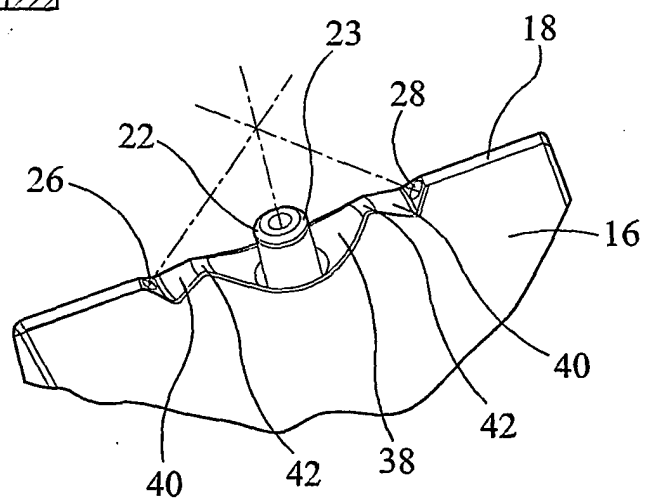


FIG 4

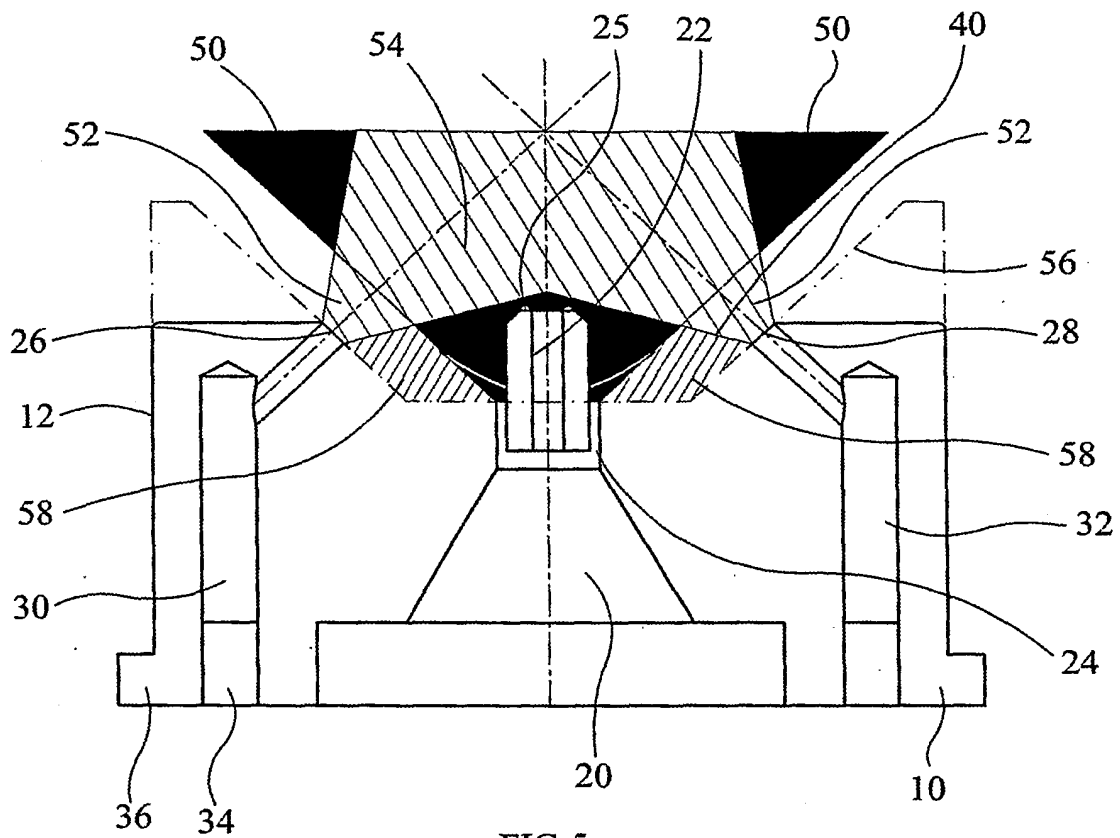


FIG 5

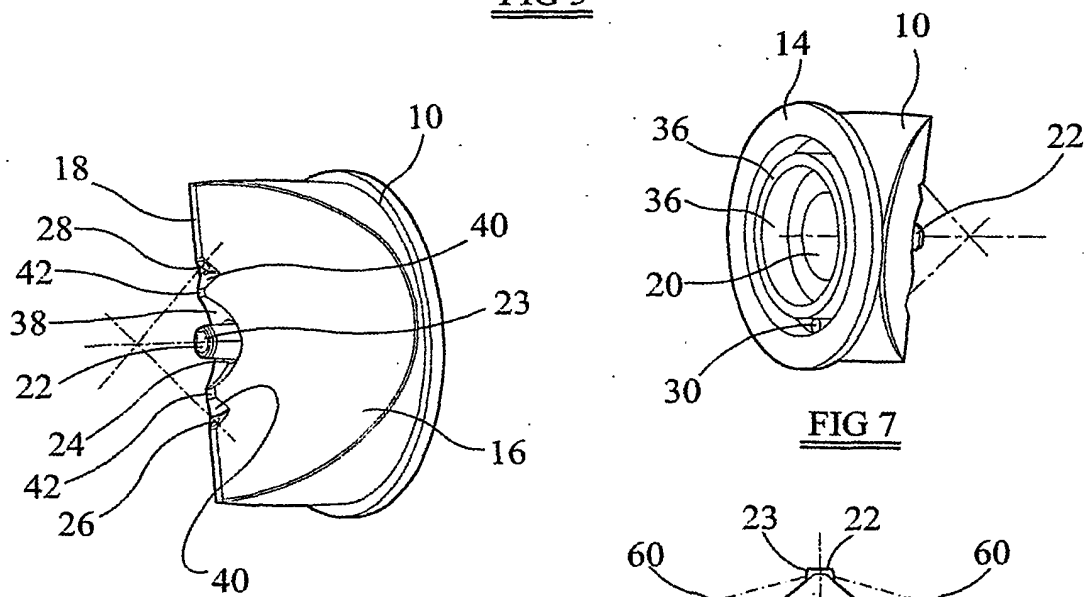


FIG 6

FIG 7

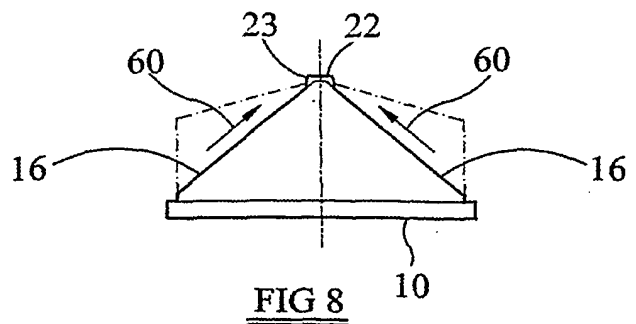


FIG 8

REFERENCES CITED IN THE DESCRIPTION

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