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(71) Applicant (for all designated States except US): **PROTO ENERGY (PTY) LTD** [ZA/ZA]; Block C, Ground Floor, Little Fourways Office Park, 1 Leslie Avenue East, Fourways, 2191 Johannesburg (ZA).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **HALL, Kenneth, Michael** [ZA/ZA]; The Braes, 193 Bryanston Drive, Bryanston, 2021 Johannesburg (ZA).

(74) Agent: **HAHN & HAHN INC. C. BERNDT; JF LUTEREK; C MICHAEL; PCR VENTER; VC**

WILLIAMS; 222 Richard Street, Hatfield, 0083 Pretoria (ZA).

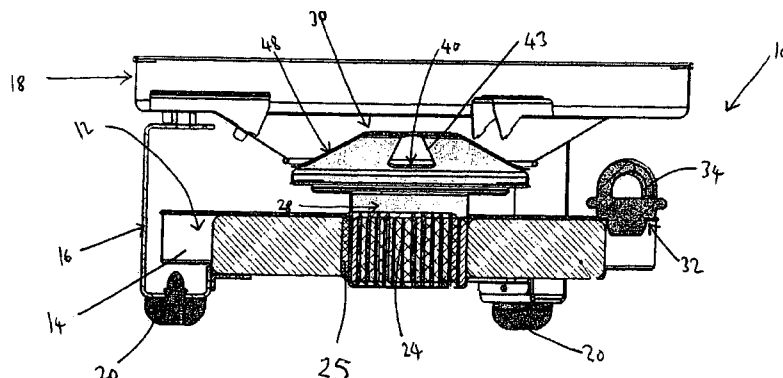
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(54) Title: BURNER AND STOVE



(57) Abstract: The invention provides a stove which includes a fuel tank 12 for storing a liquid hydrocarbon fuel 14 for combustion in the stove. A frame 16 made of sheet metal secures the tank 12 to a cooker portion 18 and permits feet 20 of a synthetic material such as PVC to be snapped into position to provide a stable base for the stove 10 when it stands on a surface such as a table or a counter. The tank 12 has in a central portion 22 thereof a ceramic porous element 24 made of a ceramic fibre mat which is spirally wound into a cylindrical shape with spaces so that the element 24 may retain a liquid hydrocarbon fuel such as ethanol. A burner 30 is secured in position above and in flow communication with the tank 12 with a cylindrical length 28 bridging the gap between the element 24 and the burner 30. A combustion chamber 40 is made of a base portion and an upper dished portion made of sheet metal 50, 52, the upper dished portion 52 having a conical, funnel-like, recessed portion 53 in which the apex of the cone or funnel is directly downwardly towards the tank 12 and has an opening in flow communication with the contents of tank 12.

BURNER AND STOVE

5 **Field of the Invention**

The invention relates to a burner and to stove using said burner. In particular the invention provides a burner for a liquid hydrocarbon fuel, such as ethanol.

10 **Background to the Invention**

The inventor is aware of a number of paraffin stove designs of the Primus™ type in which paraffin is pressurized in a fuel tank and then permitted to escape through an atomizing orifice around which a burning pre-heating fuel, such as ethanol alcohol
15 (methylated spirits) has been combusted to pre-heat the paraffin in the combustion zone, thereby permitting the atomized paraffin to be ignited. An unpressurised type of paraffin stove is the so called Panda™ stove.

These types of stoves are notoriously difficult to control in terms of flame height and
20 flame intensity and access to the paraffin and/or the flame is only from above. Furthermore, the oxygen for the flame to burn is also drawn in from above and cannot be adjusted.

Having considered the above and other design flaws of conventional paraffin stoves, the inventor now proposes the following invention which can be used for liquid hydrocarbon fuels, such as ethanol.

5 Summary of the Invention

According to a first aspect of the invention, there is provided an alkanol and other volatile liquid hydrocarbon fuel burner, said burner including:

- a combustion chamber having
 - 10 ○ one or more air holes provided below or laterally to a combustion zone for permitting airflow for combustion into the chamber; and
 - one or more air holes provided laterally or above the combustion zone for permitting air flow and flames from the combustion zone; and
- one or more displaceable cover portions for, in use, covering and uncovering any
15 or all of the air holes of the combustion chamber thereby to regulate the air flow into the combustion chamber.

20 The air holes may be radially extending apertures. The apertures may be circumferentially distributed between the centre of the combustion chamber and the circumferential edge thereof.

The combustion chamber may be made of a pair of dish portion having their concave faces directed towards each other thereby to form the chamber.

Two cover portions may be provided, sized and dimensioned complementarily to the combustion chamber dish portions, the two cover portions being secured to each other and being provided with an extending lever for rotatable displacement thereof by operation of the lever around an axis common to both the combustion chamber and the cover portions.

The cover portions may likewise be provided with air holes which, through the rotational displacement of the cover portions on the combustion chamber, bring the air holes of the cover portions into and out of register with the air holes in the combustion chamber, thereby opening and throttling air flow into and out of the chamber.

According to a second aspect of the invention, there is provided an alkanol and other volatile liquid hydrocarbon fuel burner, said burner including a combustion chamber having

- one or more air holes provided below or laterally to a combustion zone for permitting airflow for combustion into the chamber;
- one or more air holes provided laterally or above the combustion zone for permitting air flow and flames from the combustion zone; and
- a recessed portion provided laterally and/or above the combustion zone which recessed portion, in use, extends into the combustion zone so that the combustion zone has a torroidal zone over at least a portion of its depth.

The burner may include one or more displaceable cover portions for, in use, covering and uncovering any or all of the air holes of the combustion chamber thereby to regulate the air flow into the combustion chamber.

The recessed portion may be frustoconical, pyramidal, tetrahedral, or other cone like form.

5 The recessed portion may be a funnel or funnel like for receiving a liquid hydrocarbon, whether the liquid hydrocarbon to be filled into a fuel tank which supplies the burner, or a liquid hydrocarbon used to preheat the burner at start up thereof.

10 The recessed portion may include one or more apertures which permit the liquid hydrocarbon to empty therefrom through the one or more apertures, whether to a totally empty or a partially empty condition.

15 One or more of said apertures in the recessed portion may be centrally located at the apex of the recess.

The air holes may be radially extending apertures. The apertures may be circumferentially distributed between the centre of the combustion chamber and the circumferential edge thereof.

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The combustion chamber may be made of a pair of dish portions having their concave faces directed towards each other thereby to form the chamber, the upper dish portion having the recessed portion therein.

The combustion chamber may be made of a base plate and an upper dished portion having the recessed portion therein, wherein the concave side and the apex of the recessed portion face the base plate thereby to form the chamber, the air holes being provided in each of the base plate and the upper dished portion.

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Two cover portions may be provided, sized and dimensioned complementarily to the combustion chamber dish portions, the two cover portions being secured to each other and being provided with an extending lever for rotatable displacement thereof by operation of the lever around an axis common to both the combustion chamber and the cover portions.

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The cover portions may likewise be provided with air holes which, through the rotational displacement of the cover portions on the combustion chamber, bring the air holes of the cover portions into and out of register with the air holes in the combustion chamber, thereby opening and throttling air flow into and out of the chamber.

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According to a third aspect of the invention, there is provided a stove having an alkanol and other volatile liquid hydrocarbon fuel burner and a tank for said fuel with which the burner is in flow communication, said burner including a combustion chamber having

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- a combustion zone for permitting combustion of a hydrocarbon fuel;
- one or more air holes provided laterally, and or above and/or below the combustion zone for permitting air flow into and through the combustion zone;
- a recessed portion of the combustion chamber, said recessed portion having an upwardly directed mouth opening portion, said recessed portion being provided substantially above and/or extending into and through the

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combustion zone, said recessed portion having an awl and one or more apertures at a distal end thereof so that a fluid in the recessed portion flows out of the recessed portion through the apertures; and

- attachment means provided at or adjacent the mouth opening portion so that an opening of a fluid container sized and dimensioned complementarily to the attachment means is attachable thereto for the transfer of a fluid from the container after the awl has pierced a sealing membrane or film thereon, permitting the fluid to empty from the container into the recessed portion and through the apertures therein into the fuel tank of the stove.

The attachment means may be a female bayonet or screw thread type arrangement to which a container having a complementary arrangement is secureable.

Sealing means may be provided in conjunction with the attachment means so that the container may sealingly attach to the attachment means during the transfer of fluid from the container into the stove fuel tank.

The recessed portion may be frustoconical, decreasing in diameter from the mouth opening towards the aperture distal end.

The recessed portion may be a funnel or funnel like for receiving a liquid hydrocarbon, whether the liquid hydrocarbon to be filled into a fuel tank which supplies the burner, or a liquid hydrocarbon used to preheat the burner at start up thereof.

The recessed portion may include two or more apertures which permit the liquid hydrocarbon to empty therefrom through the two or more apertures, one of which apertures serves as a breather hole, whether to a totally empty or a partially empty condition.

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A closure means may be provided with an attachment means complementary to the attachment means of the recessed portion so that the mouth opening of the recessed portion may be sealed, if desired.

10 According to a fourth aspect of the invention, there is provided a system for filling a liquid hydrocarbon fuel stove with a hydrocarbon liquid, said system including:

- a stove substantially as described above; and
- a liquid fuel container having:

15 attachment means complementary to the attachment means of the stove with which it is to be used; and

a pierceable film or membrane closure means which, in use, is pierced by an awl to permit the fuel to run from the container.

20 The attachment means may include a male bayonet type fitting, a male screw thread fitting, or the like.

The attachments means may include a sealing member at a free end thereof so that when the container is attached to the stove, for example by screwing the container onto the complementary screw threaded socket, the container sealingly attaches thereto
25 thereby permitting the container to empty while reducing the chance of spillage.

In use, as the container is attached to the attachment means of the stove and is urged towards the awl, the awl pierces the sealing film or membrane of the container thereby to permit the contents of the container to empty into the fuel tank of the stove.

5

It will be understood by those of ordinary skill that by using a screw threaded arrangement to attach the container to the stove in accordance with the invention, the sealing film of the container is driven against the awl of the stove which will pierce the stove while the fact that the container is sealingly attached will result in a reduced risk of
10 leakage of a potentially flammable liquid fuel.

According to a fifth aspect of the invention, there is provided an alkanol and other volatile liquid hydrocarbon fuel burner, said burner including a combustion chamber having

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- one or more air holes provided laterally or above a combustion zone for permitting air flow and flames from the combustion zone;
 - a recessed portion provided laterally and/or above the combustion zone which recessed portion, in use, extends into the combustion zone so that the combustion zone has a torroidal zone over at least a portion of its
20 depth; and
 - a cylindrical neck portion located below the combustion zone extending from the burner downwardly towards a tank portion of a stove on which the burner is useable, the cylindrical neck portion having a plurality of radially directed air holes perpendicular to the a vertical axis of the stove.

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The burner may include one or more air holes provided below or laterally to a combustion zone for permitting airflow for combustion into the chamber.

5 The burner may include one or more displaceable cover portions for, in use, covering and uncovering any or all of the air holes of the combustion chamber thereby to regulate the air flow into the combustion chamber.

10 The displaceable cover portions may include a collar rotatably displaceable about the neck portion thereby to cover and uncover the radially directed air holes on the neck portion.

The recessed portion may be frustoconical.

The recessed portion may be pyramidal, tetrahedral, or other cone like form.

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The recessed portion may be a funnel or funnel like for receiving a liquid hydrocarbon, whether the liquid hydrocarbon to be filled into a fuel tank which supplies the burner, or a liquid hydrocarbon used to preheat the burner at start up thereof.

20 The recessed portion may include one or more apertures which permit the liquid hydrocarbon to empty therefrom through the one or more apertures, whether to a totally empty or a partially empty condition.

One or more of said apertures in the recessed portion may be centrally located at the apex of the recess.

5 The air holes may be radially extending apertures. The apertures may be circumferentially distributed between the centre of the combustion chamber and the circumferential edge thereof.

10 The combustion chamber may be made of a pair of dish portions having their concave faces directed towards each other thereby to form the chamber, the upper dish portion having the recessed portion therein.

15 The combustion chamber may be made of a base plate and an upper dished portion having the recessed portion therein, wherein the concave side and the apex of the recessed portion face the base plate thereby to form the chamber, the air holes being provided in each of the base plate and the upper dished portion.

20 Two cover portions may be provided, sized and dimensioned complementarily to the combustion chamber dish portions, the two cover portions being secured to each other and being provided with an extending lever for rotatable displacement thereof by operation of the lever around an axis common to both the combustion chamber and the cover portions.

The collar portion may likewise be secured to the lower cover portion or be integral therewith.

The cover portions and the collar portion may likewise be provided with air holes which, through the rotational displacement of the cover portions and collar portion on the combustion chamber, bring the air holes of the cover portions and the collar portion into and out of register with the air holes in the combustion chamber and the neck portion,
5 thereby opening and throttling air flow into and out of the chamber.

According to a sixth aspect of the invention, there is provided a stove which includes:

- a fuel tank for storing a liquid hydrocarbon fuel for combustion in the stove, wherein one or more porous elements are located in the tank; and
- 10 - a burner substantially as described above is secured in position above and in flow communication with the tank contents and the porous element.

The porous elements may be ceramic, metal sponge, sintered metal particles, mineral wool, glass fibre, cellulose, glass, plastics, or the like. The porous elements may be
15 arranged with a centrally positioned porous ceramic element surrounded by a radially extending metal or cellulose porous element.

The radially extending porous element may extend only partway to the side walls of the fuel tank.

20

Fine intertwined mineral fibres may be packed around the ceramic porous element in at least a portion of the remaining volume of the tank.

A cage of fine wire mesh may define a space in which the ceramic porous element is
25 located.

A fine wire mesh may form a screen between the ceramic porous element and the burner.

- 5 The ceramic porous element may be made of a ceramic fibre, typically of a ceramic fibre mat which is either a woven or non-woven mat. The ceramic porous element may be in the form of a length of ceramic fibre mat which is spirally wound to form a cylindrical element.

- 10 The intertwined mineral fibres may be in the form of a mineral wool.

The intertwined mineral fibres may be bound together by a binding material to form a mat or a blanket which is porous.

- 15 The mineral wool may be rockwool (this may be a trade name or a generic name).

The outermost peripheral space within the tank may be unobstructed for the storage of a fuel such as paraffin, ethanol, or the like.

- 20 A neck portion may bridge the gap between the ceramic fibre zone of the tank and the burner. The bridge may be a cylindrical pipe like element.

The tank has a filler opening and a filler cap for sealing the filler opening.

The radially directed air holes in the neck portion permit, in use, for air to be drawn by convection into the neck portion adjacent the ceramic porous element, such as mineral wool, where the draught of air picks up some of the volatile vapours and draws them
5 towards the combustion zone thereby assisting combustion.

According to a seventh aspect of the invention, there is provided a cover for covering a combustion chamber of a burner that uses liquid hydrocarbon fuel, the cover including:-

- 10 - a first pot-shaped member, which first member is in use secured over the combustion chamber in an inverted position and wherein spaced apart apertures are provided in a roof portion of the first member; and
- 15 - a second pot-shaped member, an internal diameter of which is larger than an external diameter of the first member so that, in use, the second member can be located over the first member in a loose fit to permit rotational displacement of the second member relative to the first member, wherein spaced apart apertures are provided in a roof portion of the second member and wherein the apertures in the roof portion of the second member are smaller than the apertures in the roof portion of the first member.

20 The roof portions of the first and second members may each include a centrally located recessed portion. The shape of the recessed portion may be selected from the group including: frusto-conical, pyramidal, tetrahedral, or other suitable cone-shape.

It is to be appreciated, that the recessed portions of the first and second members are
25 complementary in shape so as to in use fit into each other in a nested fashion which does not inhibit rotation of the second member about the first member.

The first and second pot-shaped members may be circular when viewed in plan.

5 The apertures in the roof portions of the first and second member may be arranged in a circular fashion around the recessed portions. The shape of the apertures in the respective roof portions may be the same or at least similar in shape and number, bearing in mind that the apertures in the roof portion of the second member are smaller than those in the roof portion of the first member.

10 A wall may extend from a circumferential edge of the roof portions of the first and second members to form a pot shape. Spaced apart apertures may be provided along the circumference of the wall. The apertures provided in walls of the first and second pot-shaped members may be the same in shape and size. The apertures in the walls permit lateral flow of air into the combustion chamber.

15

A rim may extend laterally from a circumferential free edge region of the walls of the first and second members. The rim of the first member may be wider than that of the second member.

20 Two spaced apart upright portions may be provided on a section of the rim of the first member.

An attachment means for in use attaching a handle thereto may be provided on the rim of the second member. The attachment means may be in the form of an aperture
25 configured and dimensioned to co-operate with a free end of the handle portion.

The first and second pot-shaped members may be manufactured from any suitable metal or metal alloy. The metal or metal alloy may be provided as a sheet having a thickness of between 0.2 and 1.2 mm, preferably about 0.8 mm.

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In use, the first pot-shaped member may be attached to a stove base so as to cover the combustion chamber of the stove. The second pot-shaped member may be located over the first member so that its handle portion rests intermediate the upright portions of the rim of the first member.

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The second member may be freely rotatable about the first member. The rotational displacement of the second member is however limited by the spacing between the upright portions which limit the displacement of the handle of the second member.

15 Once a flame has been lit in the combustion chamber, the first and second members are heated by the flame. Even when the apertures in the roof portions of the first and second pot-shaped member are in register, the roof portion of the second member partially overlays the apertures in the roof portion of the first member due to the dimensions of the apertures. The second member is therefore heated by the direct heat
20 of the flame and expands more than the first member, thereby maintaining its ability to rotate freely about the first member.

It is to be appreciated, that the rotational displacement of the second member relative to the first member brings the apertures in the roof portions and walls of the first and
25 second pot-shaped members into or out of alignment with each other, thereby permitting more or less lateral air flow into the combustion chamber as well as regulating the height of the flame.

The invention extends to a stove including a cover for a combustion chamber as described above.

5 **Specific Description of the Invention**

The invention will now be described, by way of non-limiting example only, with reference to the accompanying diagrammatic drawings. In the drawings,

Figure 1 shows a cross section through a stove in accordance with the invention;

10 Figure 2 shows in exploded view the fuel tank and burner of the stove of Figure 1;

Figure 3 shows a cross section through a specific example of a stove in accordance with the invention; and

Figure 4 shows in orthographic projection the recessed dish portion of the burner of the stove of Figure 3;

15 Figure 5 shows a photograph of a first view of the stove filling arrangement showing the top of the burner and the container of the invention;

Figure 6 shows a second view of the stove filling arrangement burner of Figure 5;

Figure 7 shows a third view of the stove filling arrangement of the invention with the container attached to the burner of the stove;

20 Figure 8 shows a cross section through a specific example of a stove in accordance with the invention;

Figure 9 shows in orthographic projection the recessed dish portion of the burner of the stove of Figure 8;

Figure 10 shows, in cross section, an embodiment of a stove having a burner of the invention in which radially directed holes are provided in the neck portion in accordance with the invention;

Figure 11 shows a three-dimensional view of a second pot-shaped member;

5 Figure 12 shows a top plan view of the member of Figure 11;

Figure 13 shows a side view of the member of Figure 11;

Figure 14 shows a three-dimensional view of a first pot-shaped member;

Figure 15 shows a top plan view of the member of Figure 14;

Figure 16 shows a side view of the member of Figure 14;

10 Figure 17 shows a three-dimensional view of a connector member for connecting the first member to a stove base;

Figure 18 shows a three-dimensional view of the cover when mounted on the stove base;

Figure 19 shows a sectioned side view of the stove base of Figure 18;

15 Figure 20 shows a three-dimensional view of a fully assembled stove including a cover in accordance with the present invention; and

Figure 21 shows a sectioned side view of the stove of Figure 20.

20 It is important to note that the reference numerals used on each of the Figures relate only to that specific Figure being described and the same reference numeral may be used also in the description of another Figure for a different part or component and there is no intention that reference numerals be unique to a part or component type throughout the description that follows.

In Figures 1 and 2, reference numeral 10 generally indicates a stove which includes a fuel tank 12 for storing a liquid hydrocarbon fuel 14 for combustion in the stove. A frame 16 made of sheet metal secures the tank 12 to a cooker portion 18 and permits feet 20 of a synthetic material such as PVC to be snapped into position to provide a stable base for the stove 10 when it stands on a surface such as a table or a counter.

The tank 12 has in a central portion 22 thereof a ceramic porous element 24 made of a ceramic fibre mat which is spirally wound into a cylindrical shape with spaces so that the element 24 may retain a liquid hydrocarbon fuel such as ethanol. Optionally, around the element 24 or the cage of fine wire mesh in which it is located, there is provided a rockwool material 26 which fills most of the free space around the ceramic element 24 but ends short of the perimeter of the tank so that a portion of the tank 12 is not filled with either rockwool or ceramic fibre mat.

A burner 30 is secured in position above and in flow communication with the tank 12 and the ceramic porous element 24 with a cylindrical length 28 bridging the gap between the element 24 and the burner 30.

The tank 12 has a filler opening 32 and a filler cap 34 for sealing the filler opening. Ethanol is poured through the opening 32 from a bottle or other container, or can be transferred by means of a hose or pipe which is sized and dimensioned complementarily with the opening 32. If desired, a cap like element can be provided on the hose or pipe so that the hose or pipe may be secured to the tank 12 at the opening 32 during filling thereof.

The burner 30 includes a combustion chamber 40 having a number of air holes 42 provided below and laterally to a combustion zone 44 for permitting airflow for

combustion to flow into the chamber 40 and a number of air holes 43 provided laterally and above the combustion zone 44 for permitting air flow and heat flow from the combustion zone 44 as well as access for a flame which is used to light the fuel in the burner 30.

5

The burner 30 further includes a pair of dished displaceable cover portions 46, 48 for, in use, covering and uncovering any or all of the air holes 42, 43 of the combustion chamber 40 thereby to regulate the air flow into the combustion zone 44. The air holes 42, 43 are radially extending apertures. The apertures 42, 43 are circumferentially distributed between the centre of the combustion chamber 40 and the circumferential edge thereof 49. The combustion chamber 40 is made of a pair of dish portions made of sheet metal 50, 52 having their concave faces directed towards each other thereby to form the chamber 40.

15 The two cover portions 46, 48 are provided, sized and dimensioned complementarily to the combustion chamber dish portions 50, 52, the two cover portions 46, 48 being secured to each other and being provided with an extending lever 54 for rotatable displacement thereof by operation of the lever around an axis 56 common to both the combustion chamber 40 and the cover portions 46, 48. The relative rotational displacement of the cover portions 46, 48 on the combustion chamber 40, brings the air holes 43 of the cover portions into and out of register with the air holes 42 in the combustion chamber, thereby opening and throttling air flow into and out of the chamber 40.

25 In Figures 3 and 4, reference numeral 10 generally indicates a stove which includes a fuel tank 12 for storing a liquid hydrocarbon fuel 14 for combustion in the stove. A frame 16 made of sheet metal secures the tank 12 to a cooker portion 18 and permits

feet 20 of a synthetic material such as PVC to be snapped into position to provide a stable base for the stove 10 when it stands on a surface such as a table or a counter.

5 The tank 12 has in a central portion 22 thereof a ceramic porous element 24 made of a ceramic fibre mat which is spirally wound into a cylindrical shape with spaces so that the element 24 may retain a liquid hydrocarbon fuel such as ethanol. Optionally, around the element 24 or the cage of fine wire mesh in which it is located, there is provided a rockwool material 26 which fills most of the free space around the ceramic element 24 but ends short of the perimeter of the tank so that a portion of the tank 12 is not filled
10 with either rockwool or ceramic fibre mat.

A burner 30 is secured in position above and in flow communication with the tank 12 and the ceramic porous element 24 with a cylindrical length 28 bridging the gap between the element 24 and the burner 30.

15

The burner 30 includes a combustion chamber 40 having a number of air holes 42 provided below and laterally to a combustion zone 44 for permitting airflow for combustion to flow into the chamber 40 and a number of air holes 43 provided laterally and above the combustion zone 44 for permitting air flow and heat flow from the
20 combustion zone 44 as well as access for a flame which is used to light the fuel in the burner 30.

The burner 30 further includes a pair of displaceable cover portions (not shown) for, in use, covering and uncovering any or all of the air holes 42, 43 of the combustion
25 chamber 40 thereby to regulate the air flow into the combustion zone 44. The air holes 42, 43 are radially extending apertures. The apertures 42, 43 are circumferentially

distributed between the centre of the combustion chamber 40 and the circumferential edge thereof 49.

5 The combustion chamber 40 is made of a base portion and an upper dished portion made of sheet metal 50, 52, the upper dished portion 52 having a conical, funnel-like, recessed portion 53 in which the apex of the cone or funnel is directly downwardly towards the tank 12 and has an opening in flow communication with the contents of tank 12, the upper dished portion 52 having its concave face directed towards the base portion 50 thereby to form the chamber 40. As can be seen in the Figures, the chamber
10 40 is thus torroidal about the funnel portion 53. In use, ethanol is poured through the funnel 53 from a bottle or other container, or can be transferred by means of a hose or pipe which is sized and dimensioned complementarily with the funnel 53.

15 It is thus an advantage of the embodiment as shown in Figures 3 and 4 that filling of the tank with ethanol or any liquid hydrocarbon fuel is made easy.

In Figures 5 to 7, the system and method of filling a stove with a liquid fuel as described above can be seen, as illustrated by the attachment of a container to the recess portion of a burner shown in Figure 7.

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In Figures 5 and 6, the container in which fuel may be stored is shown as well as the burner assembly in which in the centre thereof a recessed portion having a female screw threaded portion protruding therefrom. The container neck has a similarly sized and dimensioned male screw thread provided thereon so that the container may be
25 screwed into the female screw threaded portion thereby securing it thereto and sealing the container to the screw thread of the burner's recessed portion.

When the awl in the recessed portion pierces a sealing film closing the container, the contents of the container will run out of the container into the funnel like recessed portion and, as the burner would in use be part of a stove and in flow communication with a fuel tank of the stove, the fuel would run through apertures in the bottom of the funnel like recessed portion and into the fuel tank where it is stored for use.

In Figures 8 and 9, reference numeral 10 generally indicates a stove which includes a fuel tank 12 for storing a liquid hydrocarbon fuel 14 for combustion in the stove. A frame 16 made of sheet metal secures the tank 12 to a cooker portion 18 and permits feet 20 of a synthetic material such as PVC to be snapped into position to provide a stable base for the stove 10 when it stands on a surface such as a table or a counter.

The tank 12 has in a central portion 22 thereof a ceramic porous element 24 made of a ceramic fibre mat which is spirally wound into a cylindrical shape with spaces so that the element 24 may retain a liquid hydrocarbon fuel such as ethanol. Optionally, around the element 24 or the cage of fine wire mesh in which it is located, there is provided a rockwool material 26 which fills most of the free space around the ceramic element 24 but ends short of the perimeter of the tank so that a portion of the tank 12 is not filled with either rockwool or ceramic fibre mat.

A burner 30 is secured in position above and in flow communication with the tank 12 and the ceramic porous element 24 with a cylindrical length 28 bridging the gap between the element 24 and the burner 30.

The burner 30 includes a combustion chamber 40 having a number of air holes 42 provided below and laterally to a combustion zone 44 for permitting airflow for combustion to flow into the chamber 40 and a number of air holes 43 provided laterally

and above the combustion zone 44 for permitting air flow and heat flow from the combustion zone 44 as well as access for a flame which is used to light the fuel in the burner 30.

- 5 The burner 30 further includes a pair of displaceable cover portions (not shown) for, in use, covering and uncovering any or all of the air holes 42, 43 of the combustion chamber 40 thereby to regulate the air flow into the combustion zone 44. The air holes 42, 43 are radially extending apertures. The apertures 42, 43 are circumferentially distributed between the centre of the combustion chamber 40 and the circumferential
10 edge thereof 49.

The combustion chamber 40 is made of a base portion and an upper dished portion made of sheet metal 50, 52, the upper dished portion 52 having a conical, funnel-like, recessed portion 53 in which the apex of the cone or funnel is directly downwardly
15 towards the tank 12 and has an opening in flow communication with the contents of tank 12, the upper dished portion 52 having its concave face directed towards the base portion 50 thereby to form the chamber 40. As can be seen in the Figures, the chamber 40 is thus torroidal about the funnel portion 53. In use, ethanol is poured through the funnel 53 from a bottle or other container, or can be transferred by means of a hose or
20 pipe which is sized and dimensioned complementarily with the funnel 53.

In Figure 10, reference numeral 100 generally indicated a portion of a stove of the invention.

- 25 The stove 100 includes a fuel tank 112 for storing a liquid hydrocarbon fuel 114 for combustion in the stove.

The tank 112 has in a central portion 122 thereof a rockwool material 126 which fills most of the free space in the tank 112 but ends short of the perimeter of the tank so that a peripheral portion of the tank 112 is not filled with rockwool.

- 5 A burner 130 is secured in position above and in flow communication with the tank 112 with a cylindrical neck 128 bridging the gap between the tank 112 and the burner 130.

The burner 130 is made similarly to burner 30 and combustion chamber 140 is made similarly to the combustion chamber 40 of Figures 1 and 2, with the exception of the
10 addition of radially directed air holes 129 in the neck portion 128.

The burner 130 further includes a displaceable collar 127 with apertures therein for covering and uncovering the air holes 129 in the neck portion 128 thereby to regulate the air flow into the combustion zone 144.

15

Thus, in use, when the burner is combusting fuel and the collar 127 is positioned such that the airholes 129 in the neck portion 128 are at least partially open, air is drawn in by convection into the burner 130 through the peripheral opening between the metal from which the neck is made and the mineral wool (rock wool) 126 thereby collecting
20 volatile fuel vapour from the rock wool 126 and assisting combustion in the burner.

The dimensions shown in the Figures 8 to 10 are those of one specific example are not intended, and do not, in any way limit the scope of the invention hereinbefore described.

Thus, it is an advantage of having the air holes 129 in the neck 128 and being able to control the airflow therethrough by collar 127, in that better combustion of fuel is achieved.

- 5 In Figures 11 to 21, reference numeral 10 generally indicates an embodiment of a cover for a combustion chamber in accordance with the present invention.

A cover 10 for covering a combustion chamber 12 of a burner 14 that uses liquid hydrocarbon fuel includes a first pot-shaped member 16 (see Figures 14 to 16), which
10 first member 16 is in use secured over the combustion chamber 12 in an inverted position (see Figures 19 and 21) and wherein spaced apart apertures 18 are provided in a roof portion 20 of the first member 16.

The cover 10 further includes a second pot-shaped member 22, an internal diameter of
15 which is larger than an external diameter of the first member 16 so that, in use, the second member 22 can be located over the first member 16 in a loose fit to permit rotational displacement of the second member 22 relative to the first member 16.

Spaced apart apertures 24 are provided in a roof portion 26 of the second member 22.
20 As can be seen best when comparing Figures 2 and 5, the apertures in the roof portion 26 of the second member 22 are smaller than the apertures 18 in the roof portion 20 of the first member 16.

The roof portions 20, 26 of the first and second members 16, 22 each include a centrally
25 located recessed portion 28, 30. In the embodiment shown, the shape of the recessed portions 28, 30 is frusto-conical.

It is to be appreciated, that the recessed portions 28, 30 are complementary in shape so as to in use fit into each other in a nested fashion (see Figures 19 and 21) which does not inhibit rotation of the second member 22 about the first member 16.

5

The first and second pot-shaped members 16 and 22 are circular when viewed in plan (see Figures 12 and 15).

The apertures 18, 24 in the roof portions 20, 26 of the first and second members 16, 22 are arranged in a circular fashion around the recessed portions 28, 30 as shown in Figures 12 and 15. In the embodiment shown, the shape of the apertures 18, 24 in the respective roof portions 20, 26 are the same in shape and number, bearing in mind that the apertures 24 in the roof portion 26 of the second member 22 are smaller than those in the roof portion 20 of the first member 16.

15

A wall 32, 34 extends from a circumferential edge of the roof portions 20, 26 of the first and second members 16, 22 to form a pot shape. Spaced apart apertures 36, 38 are provided along the circumference of the walls, 32, 34. The apertures 36, 38 are the same in shape and size. The apertures 36, 38 permit lateral flow of air into the combustion chamber 12.

20

A rim 40, 42 extends laterally from a circumferential free edge region of the walls 32, 34. The rim 40 of the first member 16 is wider than that of the second member 22.

A U-shaped member 44 defining two spaced apart upright portions 46 is provided on a section of the rim 40.

25

An attachment means for in use attaching a handle 48 thereto is provided on the rim 42 of the second member 22. The attachment means is in the form of an aperture 50 configured and dimensioned to co-operate with a free end of the handle portion 48 as shown in Figures 19 and 21.

The first and second pot-shaped members 16, 22 are manufactured from any suitable metal or metal alloy. The metal or metal alloy is provided as a sheet having a thickness of between 0.6 and 1.2 mm, preferably about 0.8 mm.

In use, the first pot-shaped member 16 is attached to a stove base 52 (Figures 18 and 19) so as to cover the combustion chamber 12. This is achieved using a connector member 54 as shown in Figure 17. The connector member 54 has a circular wall 56 and a rim 58 extending laterally therefrom.

As can best be seen in Figure 19, the connector member 54 is mounted on the stove base 52 and the first pot-shaped member 16 is located thereon so that rims 40 and 58 overlay each other.

The second pot-shaped member 22 is located over the first member 16 so that its handle portion rests 48 intermediate the upright portions 46 as shown in Figure 18.

The second member 22 is freely rotatable about the first member 16. The rotational displacement of the second member 22 is however limited by the spacing between the upright portions 46 which limit the displacement of the handle portion 48 of the second member 22.

- Once a flame has been lit in the combustion chamber 12, the first and second members 16, 22 are heated by the flame. Even when the apertures 18, 24 in the roof portions 20, 26 are in register as shown in the Figures, the roof portion 26 of the second member 22 partially overlays the apertures 18 in the roof portion 20 of the first member 16 due to the dimensions of the apertures 18, 24. The second member 22 is therefore heated by the direct heat of the flame and expands more than the first member 16, thereby maintaining its ability to rotate freely about the first member 16.
- It is to be appreciated, that the rotational displacement of the second member 22 relative to the first member 16 brings the apertures 18, 24 in the roof portions 20, 26 and the apertures 36, 38 in the walls 32, 34 into or out of alignment with each other, thereby permitting more or less lateral air flow into the combustion chamber 12 as well as regulating the height of the flame.

Claims

1. An alkanol and other volatile liquid hydrocarbon fuel burner, said burner including a combustion chamber having

- 5 ○ one or more air holes provided below or laterally to a combustion zone for permitting airflow for combustion into the chamber;
- one or more air holes provided laterally or above the combustion zone for permitting air flow and flames from the combustion zone; and
- 10 ○ a recessed portion provided laterally and/or above the combustion zone which recessed portion, in use, extends into the combustion zone so that the combustion zone has a torroidal zone over at least a portion of its depth.

2. A burner as claimed in claim 1, wherein the recessed portion is frustoconical, pyramidal, tetrahedral, or other cone like form.

15

3. A burner as claimed in claim 1 or claim 2, whereun the recessed portion is a funnel for receiving a liquid hydrocarbon, whether the liquid hydrocarbon to be filled into a fuel tank which supplies the burner, or a liquid hydrocarbon used to preheat the burner at start up thereof.

20

4. A burner as claimed in any one of the preceding claims, wherein the recessed portion includes one or more apertures which permit the liquid hydrocarbon to empty therefrom through the one or more apertures, whether to a totally empty or a partially empty condition.

25

5. A burner as claimed in any one of the preceding claims, wherein the combustion chamber is made of a pair of dish portions having their concave faces directed towards each other thereby to form the chamber, the upper dish portion having the recessed portion therein.

5

6. A burner as claimed in claim 4 or claim 5, wherein an awl is provided adjacent one or more apertures so that, in use, the awl pierces a closure member of a container of fluid which then flows out of the container and once in the recessed portion flows out of the recessed portion through the apertures.

10

7. A burner as claimed in any one of the preceding claims, wherein combustion chamber has

- one or more air holes provided laterally or above a combustion zone for permitting air flow and flames from the combustion zone;
- 15 ○ a recessed portion provided laterally and/or above the combustion zone which recessed portion, in use, extends into the combustion zone so that the combustion zone has a torroidal zone over at least a portion of its depth; and
- a cylindrical neck portion located below the combustion zone extending from the burner downwardly towards a tank portion of a stove on which the burner is useable,
20 the cylindrical neck portion having a plurality of radially directed air holes perpendicular to the a vertical axis of the stove.

20

25

8. A stove having an alkanol and other volatile liquid hydrocarbon fuel burner and a tank for said fuel with which the burner is in flow communication, said burner including a combustion chamber having

- a combustion zone for permitting combustion of a hydrocarbon fuel;
- one or more air holes provided laterally, and or above and/or below the combustion zone for permitting air flow into and through the combustion zone;
- a recessed portion of the combustion chamber, said recessed portion having an upwardly directed mouth opening portion, said recessed portion being provided substantially above and/or extending into and through the combustion zone, said recessed portion having an awl and one or more apertures at a distal end thereof so that a fluid in the recessed portion flows out of the recessed portion through the apertures; and
- attachment means provided at or adjacent the mouth opening portion so that an opening of a fluid container sized and dimensioned complementarily to the attachment means is attachable thereto for the transfer of a fluid from the container after the awl has pierced a sealing membrane or film thereon, permitting the fluid to empty from the container into the recessed portion and through the apertures therein into the fuel tank of the stove.

9. A stove as claimed in claim 8, wherein the attachment means is a female bayonet or screw thread type arrangement to which a container having a complementary arrangement is secureable.

10. A stove as claimed in claim 8 or claim 9, wherein sealing means is provided in conjunction with the attachment means so that the container sealingly attaches to the attachment means during the transfer of fluid from the container into the stove fuel tank.

11. A stove as claimed in any one of claims 8 to 10, wherein the recessed portion is a funnel and includes two or more apertures which permit the liquid hydrocarbon to

empty therefrom through the two or more apertures, one of which apertures serves as a breather hole, whether to a totally empty or a partially empty condition.

12. A system for filling a liquid hydrocarbon fuel stove with a hydrocarbon liquid, said
5 system including:

- a stove as claimed in any one of claims 8 to 11; and
- a liquid fuel container having:

attachment means complementary to the attachment means of the stove
with which it is to be used; and

10 a pierceable film or membrane closure means which, in use, is pierced by
an awl to permit the fuel to run from the container.

13. A system as claimed in claim 12, wherein, in use, as the container is attached to
the attachment means of the stove and is urged towards the awl, the awl pierces the
15 sealing film or membrane of the container thereby to permit the contents of the
container to empty into the fuel tank of the stove.

14. A burner as claimed in any one of claims 1 to 7, wherein the air holes are radially
extending apertures.

20 15. A burner as claimed in any one of claims 1 to 7, wherein the apertures are
circumferentially distributed between the centre of the combustion chamber and the
circumferential edge thereof.

16. A stove as claimed in any one of claims 8 to 11, which includes:

- a fuel tank for storing a liquid hydrocarbon fuel for combustion in the stove, wherein one or more porous elements are located in the tank; and
- a burner substantially as described above is secured in position above and in flow communication with the tank contents and the porous element.

17. A stove as claimed in claim 16, wherein the porous elements are ceramic, metal sponge, sintered metal particles, mineral wool, glass fibre, cellulose, glass, or plastics, and arranged with a centrally positioned porous ceramic element surrounded by a radially extending metal or cellulose porous element extending at least partway to the side walls of the fuel tank.

18. A stove as claimed in any one of claims 16 or 17, wherein the outermost peripheral space within the tank is unobstructed for the storage of a liquid hydrocarbon fuel such as paraffin or ethanol.

19. A stove as claimed in any one of claims 16 to 18, wherein a neck portion bridges the gap between the ceramic fibre zone of the tank and the burner and wherein the bridge is a cylindrical pipe like element.

20. A cover for covering a combustion chamber of a burner as claimed in any one of claims 1 to 8, 14, or 15, the cover including:-

- a first pot-shaped member, which first member is in use secured over the combustion chamber in an inverted position and wherein spaced apart apertures are provided in a roof portion of the first member; and

- a second pot-shaped member, an internal diameter of which is larger than an external diameter of the first member so that, in use, the second member can be located over the first member in a loose fit to permit rotational displacement of the second member relative to the first member, wherein spaced apart apertures are provided in a roof portion of the second member and wherein the apertures in the roof portion of the second member are smaller than the apertures in the roof portion of the first member.

21. A cover as claimed in claim 20, wherein the roof portions of the first and second member each include a centrally located recessed portion selected from the group including: frusto-conical, pyramidal, tetrahedral, or other suitable cone-shape.

22. A cover as claimed in claim 20 or claim 21, wherein the apertures in the roof portions of the first and second member are arranged in a circular fashion around the recessed portions.

23. A cover as claimed in any one claims 20 to 22, wherein a wall extends from a circumferential edge of the roof portions of the first and second members to form a pot shape.

24. A cover as claimed in any one of claims 20 to 23, which includes a rim extending laterally from a circumferential free edge region of the walls of the first and second members, which rim of the first member is wider than that of the second member, and two spaced apart upright portions are provided on a section of the rim of the first member with an attachment means for in use attaching a handle thereto provided on the rim of the second member.

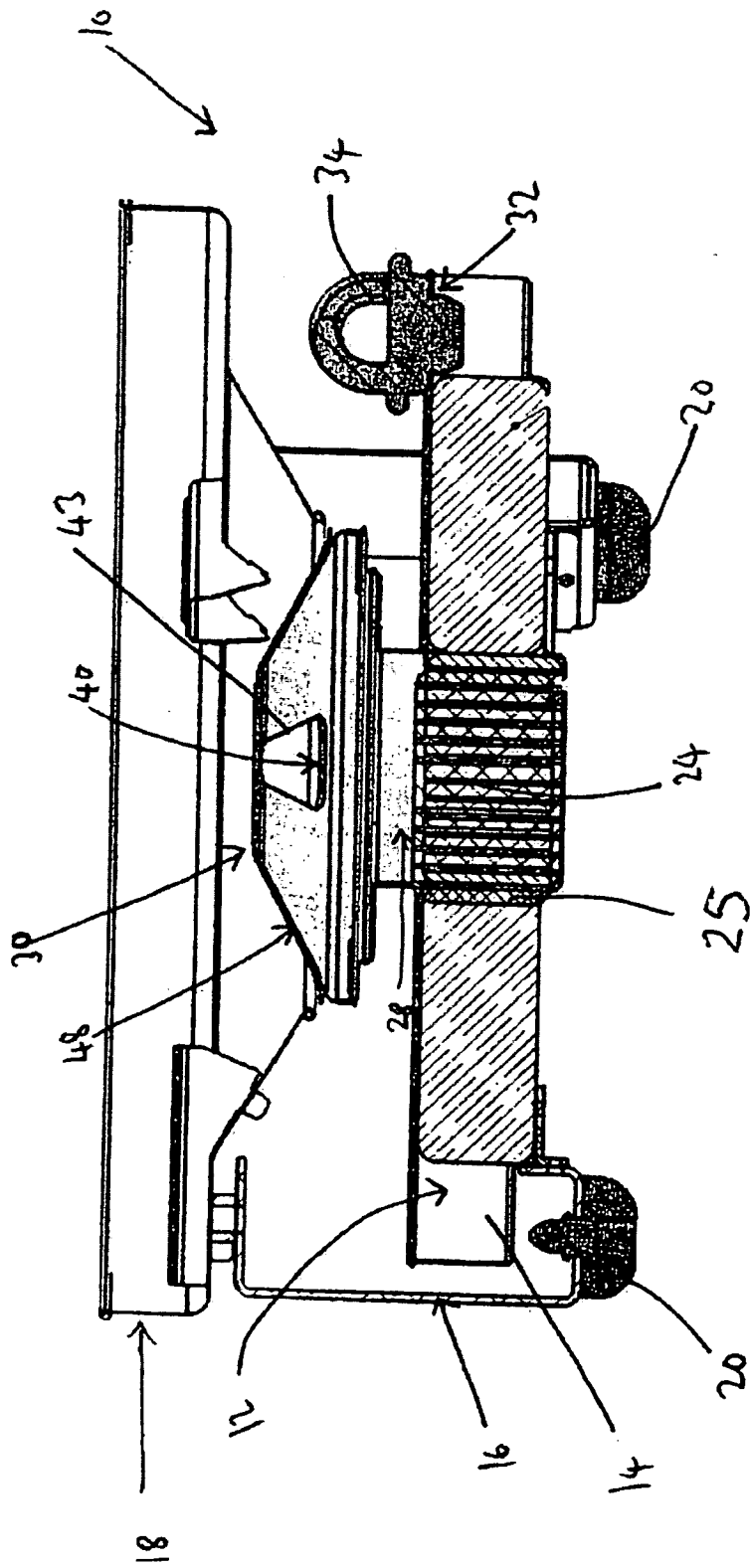


Figure 1

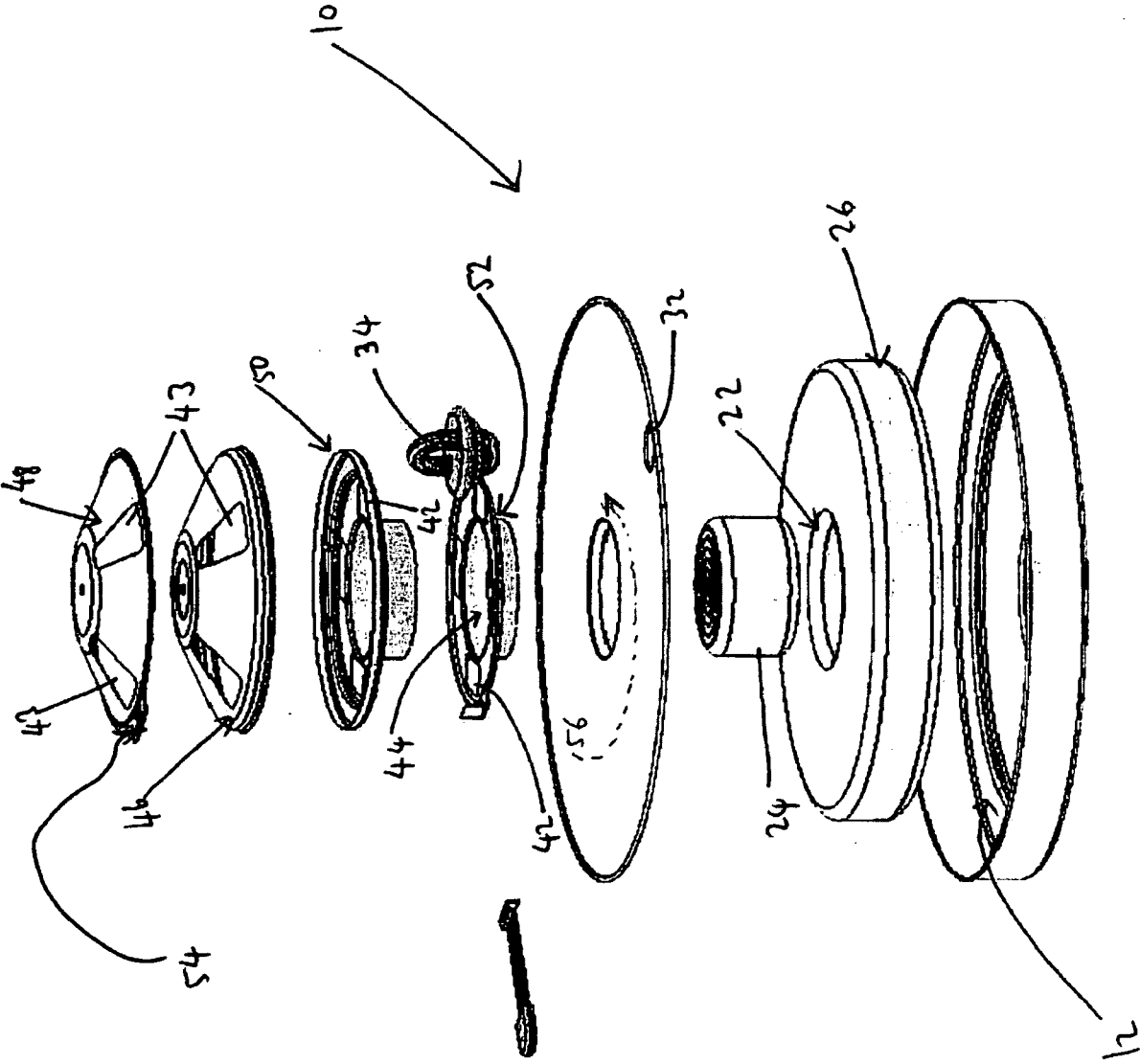


Figure 2

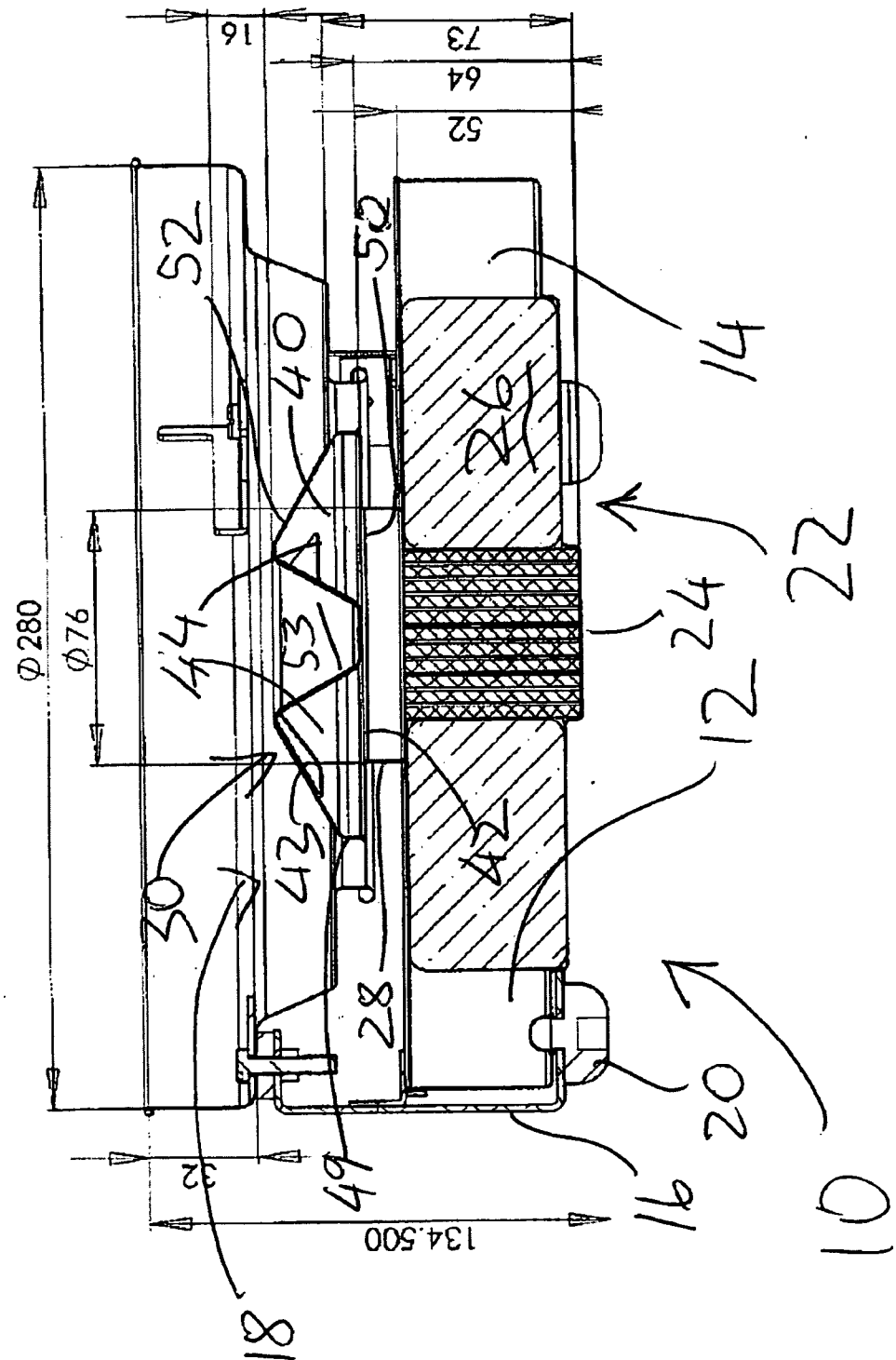


Figure 3

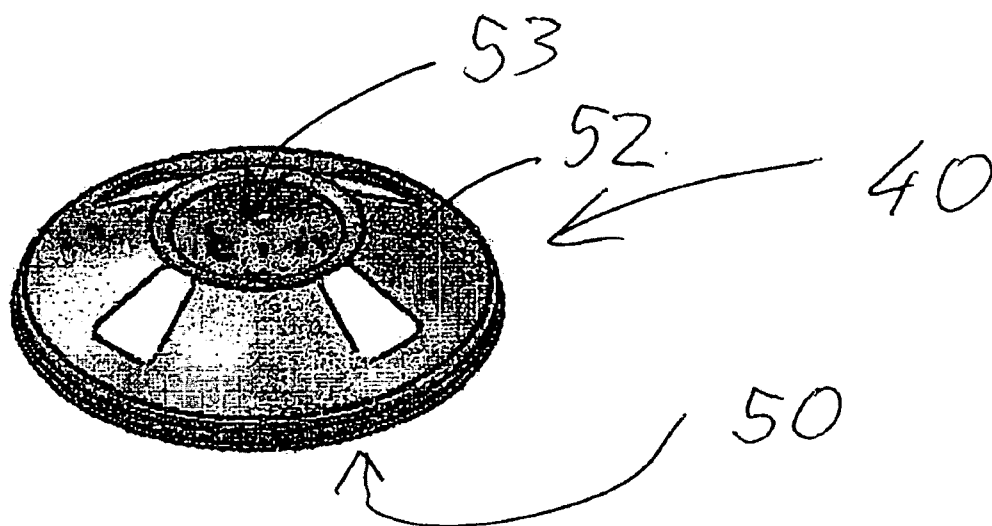


Figure 4

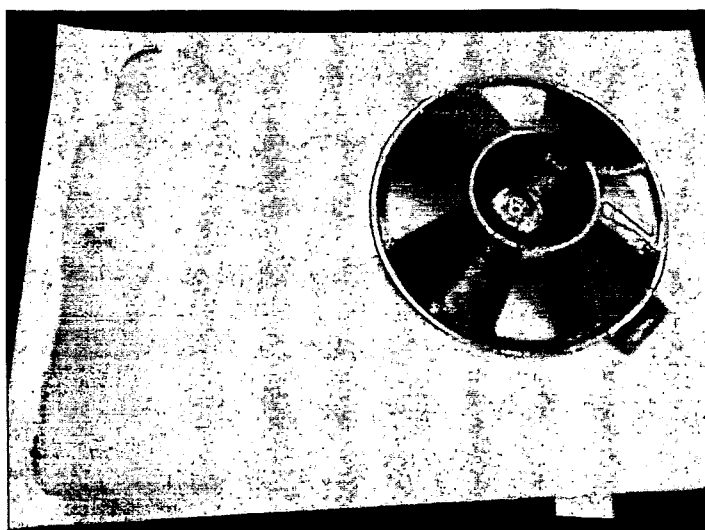


Figure 5

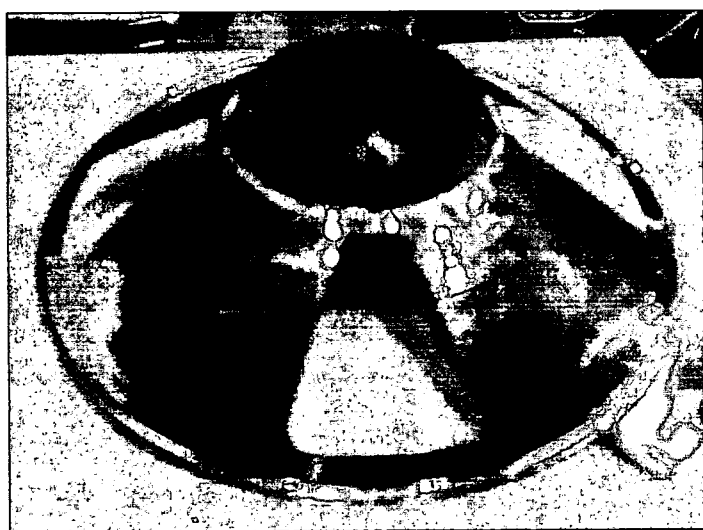


Figure 6

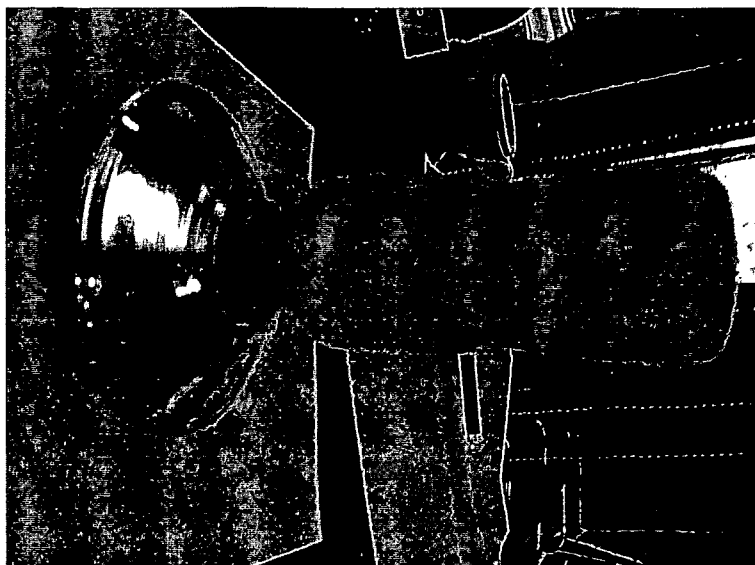


Figure 7

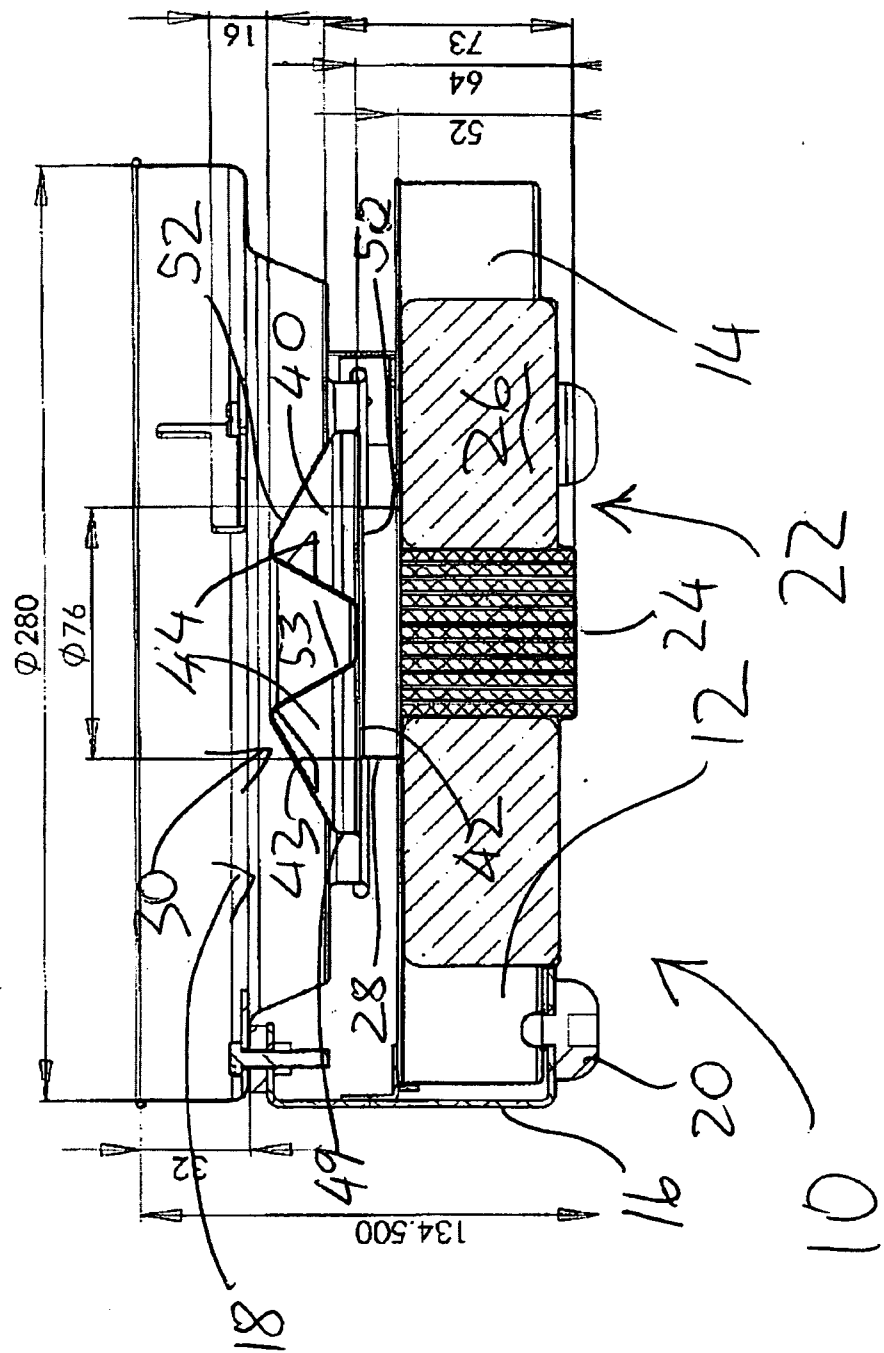


Figure 8

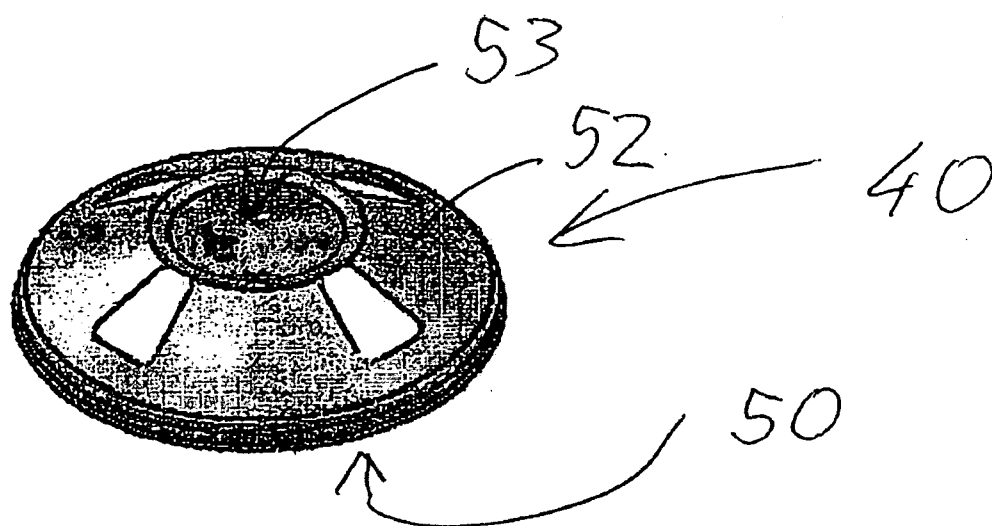


Figure 9

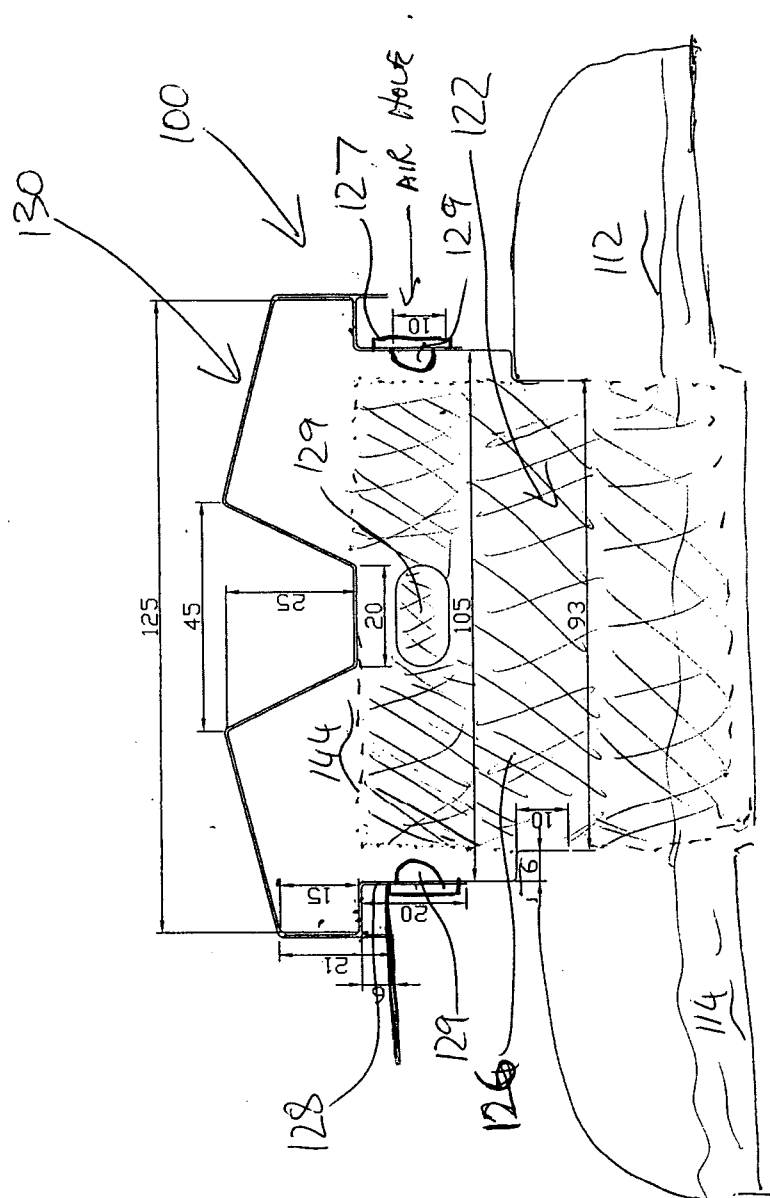
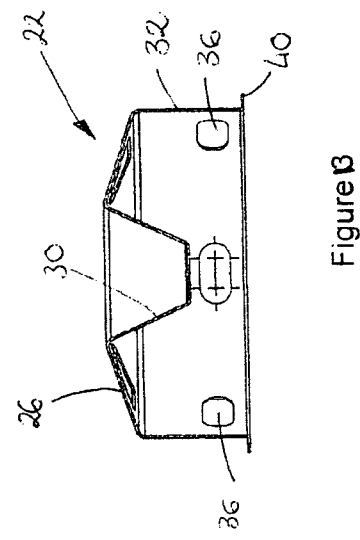
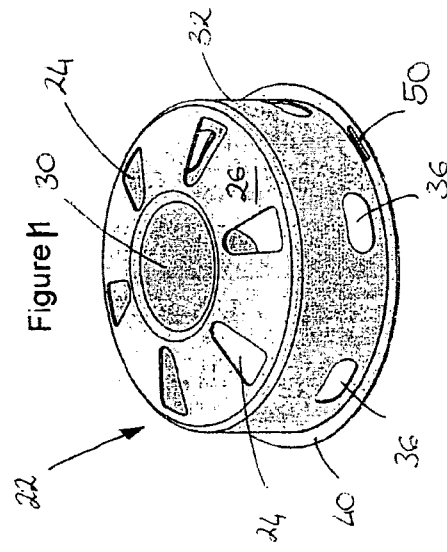
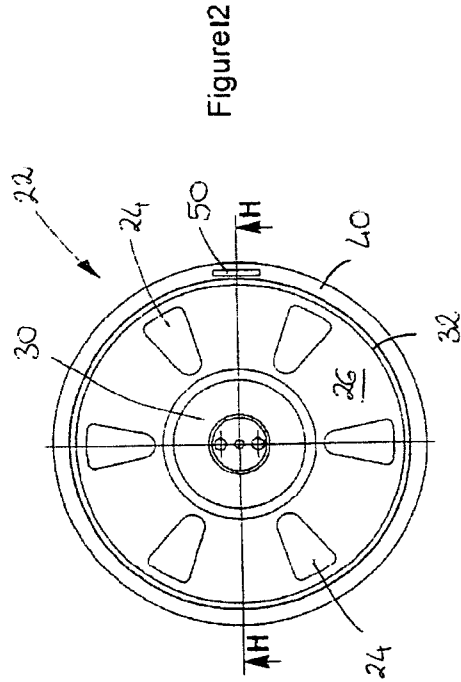


Figure 10



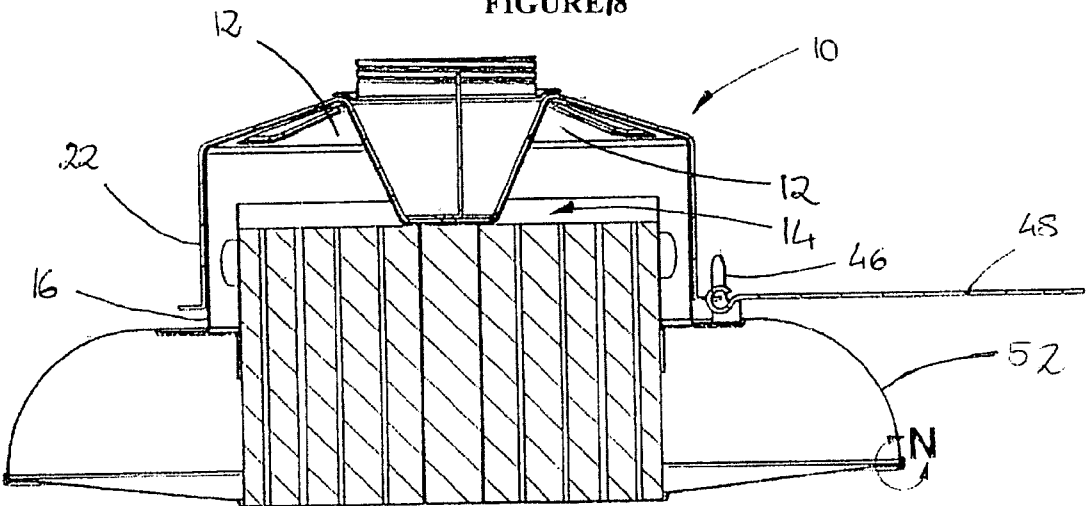
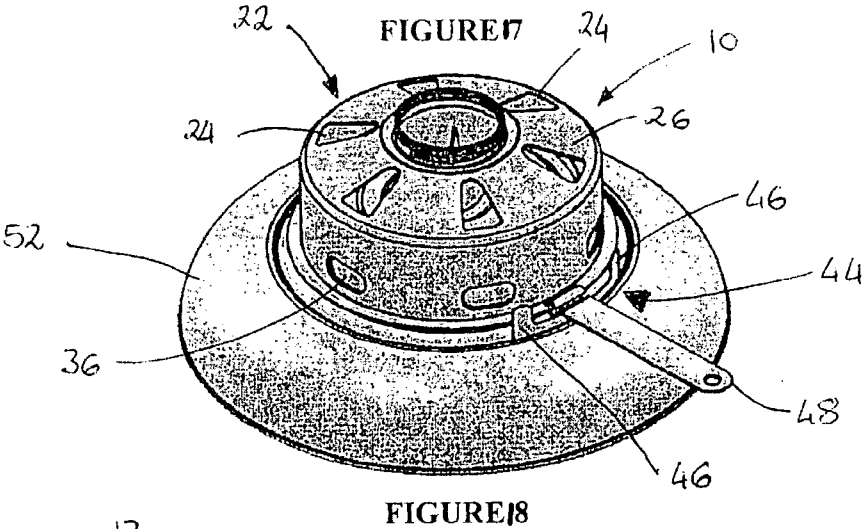
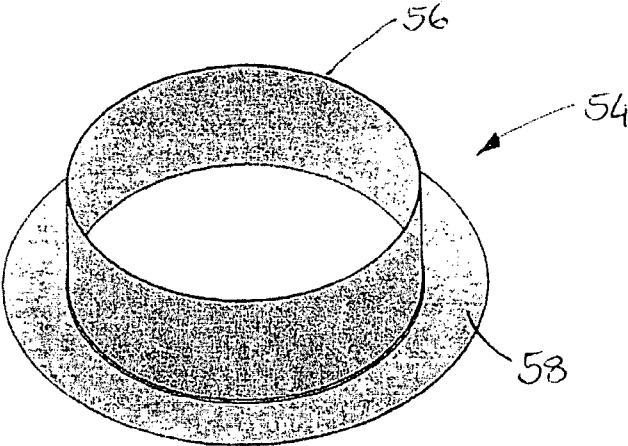


Figure 19

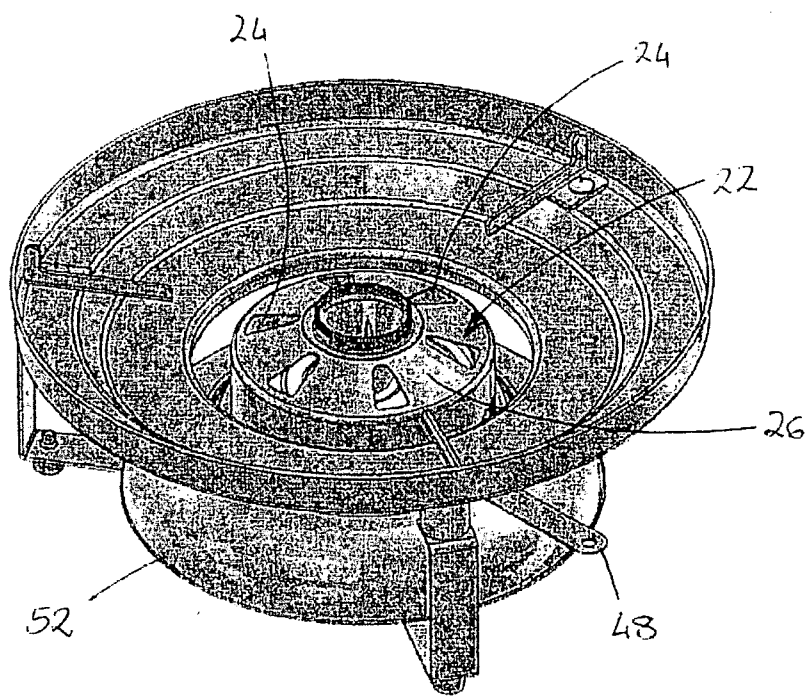


FIGURE 20

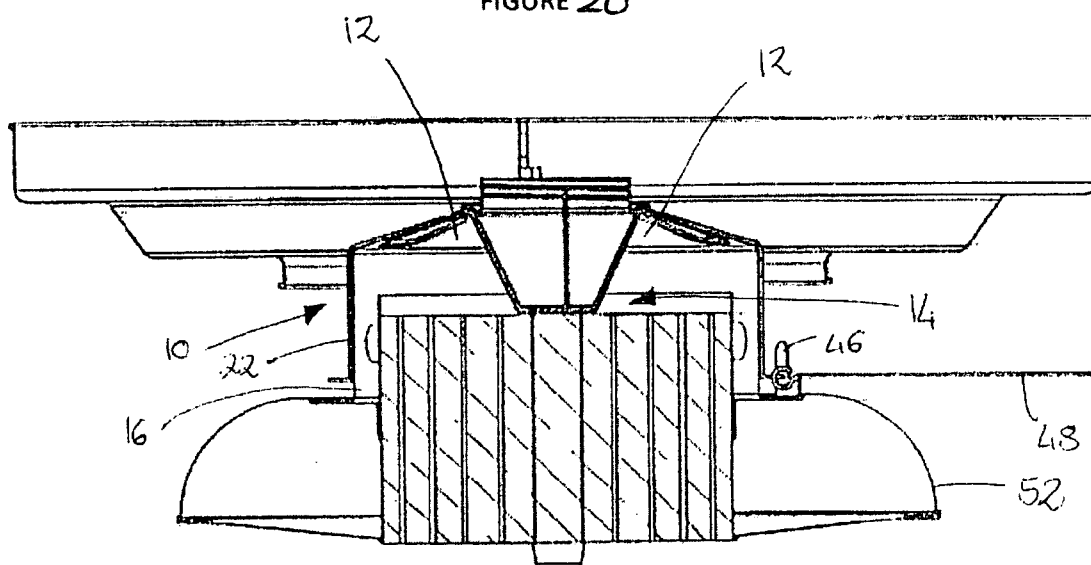


FIGURE 21