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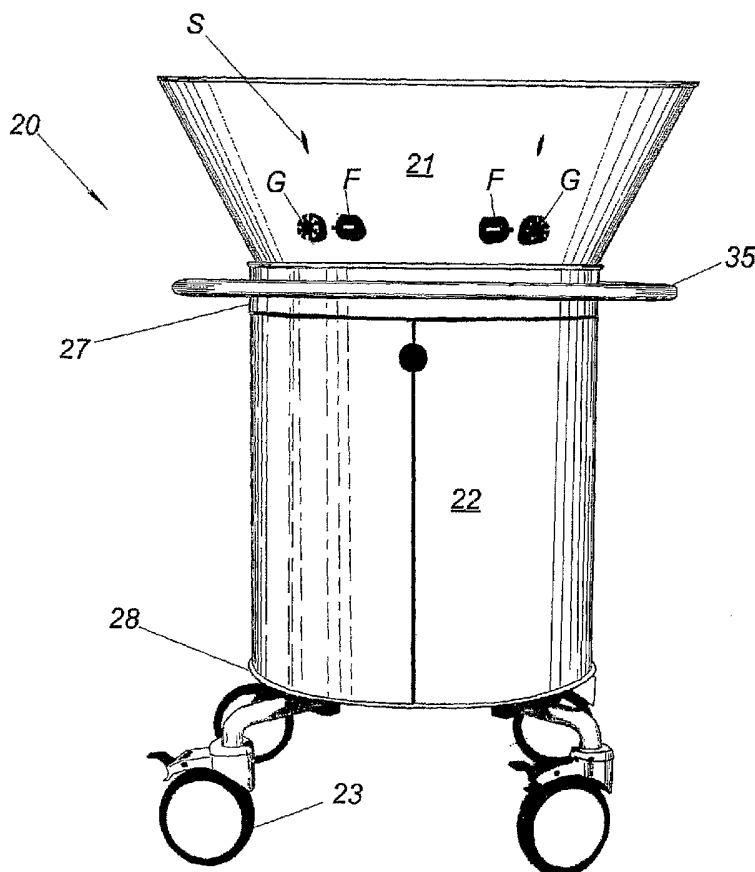
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[Continued on next page]

(54) Title: MOBILE APPARATUS PROVIDED WITH A SURFACE FOR COOKING BY CONTACT



(57) Abstract: Apparatus (20) for cooking food by contact comprising a continuous cooking surface (26) heated on its underside by one or more gas burners (33) which are housed in one or more combustion chambers (25) and which are supplied with fuel gas by a portable tank (B). The continuous cooking surface (26), the combustion chambers (25), the burners (33) and the valvular means (34) constitute a cooking unit (21) that is removably mounted on a supporting cart (22) suited to house said portable tank (B) and to allow the use of the apparatus (20) either in an indoor or in an outdoor environment.

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Mobile apparatus provided with a surface for cooking by contact

Description

The present invention pertains to a mobile apparatus provided with a surface for indoor/outdoor cooking food by direct contact.

5 In particular, the present invention relates to a new mobile apparatus provided with a continuous surface for cooking food by contact which can be advantageously used either in an indoor or in an outdoor environment and which permits to broaden, in both household and professional environment, the possibility of carrying out a cooking process that has been practiced up to now, exclusively with stationary appa-
10 ratuses and for professional cooking purposes.

In recent years, the consumers have increased the use of appliances for cooking food by direct contact with an heating source which can be heated by charcoal, by gas or electricity.

The cooking surface is generally formed by a rectangular or circular metallic grill
15 from welded rods or by a single metallic plate provided with through holes or openings for supporting food to be cooked.

Such types of grills present the following drawbacks.

It is to be pointed out that foods cooked on grills made of bars or rods tend to dis-
perse their nutrients because the working temperatures and the poor value of the
20 contact surface between the food and the cooking grill do not promote the forma-
tion of that pellicular crust which retains the nutrients inside the food.

Another disadvantage of the conventional grills is that they do not allow an healthy and balanced cooking of the food because they do not provide a device for draining excess grease and liquids coming from the food during the cooking process.

25 In particular, a portion of said grease and liquids drips from the food, falls on the

heating source and creates uncontrolled flames which not only constitute an hazard for the person and for the environment but also modify the taste and flavor of the cooked food.

A remaining portion of said secretions remains on the surface of the food causing
5 its boiling at first, then its burning and at last its carbonization with the relevant evolvment of harmful substances and unpleasant odors.

Another disadvantage caused by the absence of a drainage and fat collecting devices is that it makes difficult, time consuming and tiring the periodical cleaning and maintenance operations of the cooking grills.

10 In fact, cleaning of the grills requires a very laborious and vigorous manual action, often by means of a metallic brush, in order to remove the oil and grease residues which are encrusting their reticular structure. The residues, if not removed, can impart undesired and unpleasant flavor onto the food cooked during the next cooking processes.

15 It is also to be considered the fact that the grills from welded metal rods are susceptible to rust and corrosion and have a relatively short useful life.

As a consequence, the user is forced to replace the original grills looking for a new grill in a replacement market which is offering spare parts with sorted sizes and varied shapes.

20 The cleaning operations are also complicated by the fact that intermediate heat distribution devices, such as lava rocks or plates made of thermoconductive material, may be interposed between the heat source and the cooking surface in order to more uniformly distribute the heat but they also catch a majority of the secretions coming from food being cooked. If said heat distribution devices are not periodically
25 cleaned or replaced, all unwanted odors and vapors of previous cooking will be re-

turned to the food during the next cooking. In addition, the traditional grills have the disadvantage that many foods, such as fish and fresh vegetables, break apart easily during cooking and fall onto the heat source through the openings of the grill net.

- 5 The cooking surfaces formed from a single piece of metal and provided with a plurality of through holes or elongated slots have the disadvantage to be necessarily made with a reduced thickness so as to not complicate their working process, and therefore they are susceptible to warp under exposure to temperature variations.

After a short period of use, also this type of grills will not be able to support food to
10 be cooked and they also will suffer cleaning problems described above.

Cooking surfaces used for cooking by contact in professional kitchens of fast food restaurants and full-time chain restaurants are well known in the art.

Typically, such appliances consist of a quadrangular metal plate of various sizes which is electrically or fuel heated from the lower part and which returns heat from
15 the upper part where it is made as a cooking surface.

Generally, such plates have a width of from about 30 cm. to about 90 cm., an horizontal depth of from about 40 cm. to about 80 cm. and have a supporting structure that is sufficiently sturdy to support the cooking plate together with the heating elements and all the devices for controlling the temperature variations which occur in
20 the body of the cooking plate.

Such cooking appliances present the following drawbacks.

The periodical inspecting, repairing and maintenance operations of such type of appliances are complicated by the fact that they usually require more than one operator for moving the entire cooking plate or to disassembling a part or the entire apparatus to permit access to the device to be controlled.
25

The known cooking grills with a rectangular shape, have the disadvantage that they do not facilitate cleaning of the corner zones and do not ensure a uniform heat distribution within the entire cooking surface because there is more heat transfer at the points of heating elements contact than at other zones of the cooking plate.

- 5 In fact, such cooking plates have a 50-70 ° degree C. temperature variation between the zone close to the heating sources and the zones located away from the heating sources. As a result, if the user applies heat to cold areas further overheats hot areas, or vice-versa.

Finally, the cooking plates known in the prior art are not designed to be used either
10 in an indoor or in an outdoor environment.

This limitation is more particularly felt in all those restaurants offering inner banqueting-rooms, which are located close to the kitchens and which can be easily reached by the waiters, as well as open locations, i.e. roof gardens, terraces or outdoor-swimming pools, which are far away from the kitchens. In this latter case,
15 the waiters are forced to run quickly between the kitchen and the open-air tables in order to minimize the cooling of the food to be served.

It is, therefore, a principal object of the present invention to solve the above stated drawbacks by means of a mobile apparatus provided with a surface for indoor/outdoor cooking food by direct contact.

- 20 Another important object of the present invention is to provide an apparatus of the above type which can be easily used in household environment and by not professional users for carrying out a cooking process that has been practiced up to now, exclusively in professional kitchens and which allows to carry out the inspecting, servicing and maintenance operations of the apparatus in a more simple and rational way as compared to the known commercial cooking plates.
25

It is a further object of the present invention to provide a cooking appliance with a cooking plate that provides a uniform distribution of heat over the entire cooking surface and that permits the user to divide the cooking surface into separate temperature zones, if desired.

- 5 A further object of the present invention is to provide an appliance with a cooking surface that minimizes the formation of surface encrustments and facilitates cleaning operations.

These and other objects are attained according to the invention by a mobile apparatus provided with a surface for cooking food by contact and having the hereinafter
10 claimed features.

The objects and the features of the apparatus according to the invention will appear clear from the following description with reference to the accompanying schematic drawing, wherein:

- the Figure 1 is a frontal perspective view of an embodiment of the apparatus according to the present invention;
15
- the Figure 2 shows a side perspective view of the apparatus of figure 1;
- the Figure 3 is a front/top view of the apparatus with its housing in closed position;
- the Figure 4 is a front/top view of the apparatus with its housing in open position;
- 20 - the Figure 5 is a side view of the apparatus shown in Figure 4;
- the Figure 6 is a top view of the cooking surface incorporated in the apparatus of Figure 4;
- the Figure 7 is an exploded view of the main components of the cooking unit in a preferred embodiment of the apparatus according to the present invention;
- 25 - the Figure 8 is an exploded view of the main components of the cooking unit in an

alternate embodiment of the apparatus according to the present invention;

- the Figure 9 is an exploded longitudinal sectional view of the main components of the cooking unit shown in the Figure 7;

- the Figure 10 shows a longitudinal sectional view of the same components of the
5 Figure 9 in assembled position;

- the Figure 11 illustrates an exploded longitudinal sectional view of the main components of the cooking unit shown in the Figure 8;

- the Figure 12 shows a longitudinal sectional view of the same components of the Figure 11 in assembled position;

10 - the Figure 13 is a top view of the cooking surface of the apparatus according to the present invention;

- the Figure 14 is an enlarged detail of the draining device of the cooking surface;

- the Figures 15 and 16 are frontal perspective views of the apparatus according to the present invention.

15 The description and the drawings refer to a non-limiting example of an apparatus according to the invention which is generally represented by the reference numeral 20. The components of the apparatus 20 illustrated in the drawings are identified by reference numerals which remain the same for like or identical parts.

The apparatus 20 according to the invention substantially comprises a cooking unit
20 21 which is mounted on a supporting cart 22 movable on wheels 23.

The cooking unit 21 substantially presents a shape of a truncated cone and comprises a cooking surface 26 having a substantially circular shape, at least one inner combustion chamber 25 and an outer casing 24.

The supporting cart 22 is preferably made of stainless steel and substantially formed
25 by an upper annular element 27 and a lower disk-shaped plate 28 which are rigidly

connected together by means of a plurality of vertical stanchions 29.

A circular handle 35 is fixed to the upper annular element 27 to facilitate the manual movimentation of the cart 22.

The circular handle 35 allows for hanging cooking utensils, such as a spade, a spatula or a fork which are normally used for cooking purposes, as well as for supporting petal-shaped trays 60 (Figure 16).

Such trays 60 are made from a composite material (as for example the material characterized by the trademark CORIAN® a denomination of E. I. du Pont de Nemours and Company) or from a tempered crystal and are appropriately shaped to stuck, with their inner curvilinear edge 61, between the protruding rim 56 of the upper annular element 27 of the cart 22 and the upper surface of the circular handle 35 (Figure 17).

In the present embodiment of the cooking apparatus, the lower plate 28 is connected to four wheels 23 mounted at the ends of a spider but it can alternatively be connected to a three wheels cart or to similar supporting devices.

The circular cooking surface 26 is preferably made from metallic material (for example steel) having a thickness sufficient to provide the thermal inertia required by the cooking process.

In particular, it is preferred the use of a polished steel plate having a thickness in the range of from approximately 12 mm. to approximately 15 mm.

In a well known manner, the upper side of the cooking surface 26 is electroplated with a layer of chromium which has an average thickness of about 50 micron and with a diamond-pyramid hardness (Vickers) number of about 1000 HV.

The upper side of the cooking surface 26 is polished so as to minimize the surface roughness to a value of 0,1 micron.

Such type of mirror finish improves the anti-sticking properties of the cooking surface 26, facilitates the operations for cleaning the cooking surface and reduces the amount of infrared radiation that is radiated into the environment surrounding the cooking apparatus and emitted in the direction of the user.

- 5 In this way, there are advantageously no overheating of the environment surrounding the cooking apparatus as well as of the person attending to the cooking process.

Moreover, the layer of chromium coating keeps heat in the outermost layer of the cooking surface 26 and ensures a constant surface temperature which is adequate
10 for cooking food, thereby consuming an amount of energy which is less than that required by the traditional cooking plates.

It is also to be pointed out that the cooking surface 26 is inclined from the rear end to the front end, at an angle ranging from 1° degree to 2° degrees with respect to a horizontal plane, and presents a recess 30 in its front edge for reasons that will be
15 explained later.

With particular reference to the Figure 6, the cooking surface 26 is associated, for example by welding, with a periferal raised frame 36 which is formed by a inner strip 37 which is obliquely raising from the surface 26 and by an outer strip 38 which is substantially horizontal.

- 20 In the rear arch of the periferal frame 36, said outer strip 38 includes a plurality of through holes 39 having a function which will be described hereinafter.

In the exemplary embodiment of cooking unit 21 shown in the Figures 7, 9 and 10, only one combustion chamber 25 is disposed under the cooking surface 26 and is preferably manufactured of stainless steel sheet.

- 25 The combustion chamber 25 is defined by a periferal sheet having a shape of a trun-

cated cone which at the top is closed by the cooking surface 26, and at the bottom by a bottom wall 31 provided with ventilation through holes 32.

The through holes 32 are of such size, shape and location to supply outside air to the burner 33 by a sufficient amount to allow a right gas combustion.

- 5 The combustion chamber 25 houses at least a traditional gas burner 33 which is preferably made of chromed steel with a tubular cross section extending in a substantially circular shape which is particularly well suited for providing a more uniformly heated cooking surface 26.

In a well known manner, the burner 33 is suitably fixed to the lower wall 31 of the
10 combustion chamber 25 and it is connected to a gas valve group 34 which is housed externally to said combustion chamber 25.

The gas valve group 34 comprises two knobs F and G which respectively function for igniting the gas in said burner 33, for example by means of a conventional piezoelectric ignition, and for regulating the gas flow to the burner 33 until a predeter-
15 mined temperature is reached.

The right operation of the burner 33 can be checked by the user through a view port S which is made in the outer casing 24 at a location that corresponds with an opening in the outer sheet of the combustion chamber 25.

The valve group 34 is associated with all those control devices commonly used to
20 regulate and to watch the right operating of this type of apparatuses and sufficiently known in the art as not to require further description.

It is sufficient to say that the gas regulating knob G is not activated until a pilot light of the burner 33 is lighted.

Heat sensors of well known type, such as a plurality of thermocouple sensors 40
25 (Figure 13) , may be associated with the cooking surface 26, for example housed in

corresponding grooves provided in the body of the cooking surface 26, for sensing the difference between the temperature of the cooking surface 26 and the predetermined cooking temperature.

After igniting the pilot light, the valve group 34 provides a supply of gas to the gas burner 33 if the temperature of the cooking surface 26 is below the temperature selected by the user.

When there is a need for increasing the temperature of the cooking surface, the gas flows to the burner 33 where it is ignited by pilot light.

The gas burner 33 continues to operate until the temperature of the cooking surface 26 is below the temperature which has been predetermined by the user or until the gas regulating knob G is returned to its off position by the user.

It is obvious that the apparatus of the invention comprises automatic safety devices which are activated in the event of malfunctions, as for example the malfunctions caused by an accidental breaking of the system for supplying gas to the burner 33.

In a well known manner, the fuel gas, such as natural gas or propane gas, is supplied by a portable gas tank B which is connected to the control valve 34 through a flexible pipe not illustrated in the drawings.

The portable gas tank B is housed on the lower disk-shaped plate 28 of the supporting cart 22 and it is secured into place by known and not described anchoring means.

A supporting shelf 43 is placed under the cooking unit 21 and it is fixed to the vertical stanchions 29 of the cart 22, for example by welding, in order to support a container 44 having a function which will be described hereinafter.

Two doors 50, having a semicircular cross section, are hingedly coupled to the upper annular element 27 and to the lower disk shaped element 28 of the cart 22 in

such a way as to be movable between a closed position, wherein the doors define the cylindrical body of the cart 22 (Figures 1, 2 and 3) , and an open position wherein they permit access to the inner shelves 28 and 43 of the cart 22 (Figures 4, 5 and 6).

- 5 A plurality of through holes 41 are formed through the lower disk shaped shelf 28 of the cart 22 for allowing fresh inlet air to flow towards the burner 33 even when the doors 50 are in their closed position.

In alternate embodiment, or in combination with such ventilation openings, the peripheral edge of the shelf 28 of the cart 22 may be provided with recesses 42 as shown
10 in the Figures 4 and 5.

In the exemplary embodiment of the cooking unit 21 as shown in the Figures 8, 11 and 12, two combustion chambers 25 are disposed side by side under the cooking surface 26. At the top, the combustion chambers are closed by the cooking surface 26, and at the bottom by a wall 31 provided with a plurality of ventilation through
15 holes 32.

Each of the combustion chambers 25 houses a corresponding gas burner 33 fabricated from a chromed steel having a tubular cross section which extends to form one or more semicircular branches which are particularly suitable to more uniformly distribute the heat within a semicircular portion of the cooking surface 26.

20 In this way, the apparatus according to the invention offers the possibility of heating only an half of the cooking surface 26, in the case of small quantities of foods to be cooked, or of heating the cooking surface 26 in two segments having a different surfaces temperatures, one temperature for cooking the food and the other temperature for preheating the food to be cooked or for warming the cooked food.

25 The hot convective air produced by the gas burners 33 within a single combustion

chamber (Figure 10) or within two combustion chambers 25 disposed side by side (Figure 12), runs along the underside of the cooking surface 26 and exits the previously described ports 39 in the periferal edge 36.

It is to be pointed out that the single combustion chamber 25 or the two combustion chambers 25 disposed side by side, housing one or more burners 33, are designed to be easily removed from the cart 22 and from the cooking surface 26 in the event of malfunction or of periodical inspection and maintenance operations.

In particular, simple screw systems, not shown in the drawings, connect the bottom wall 31 of the combustion chambers 25 to corresponding threaded seats 55 (Figure 13) which are formed in the underside of the cooking surface 26.

After the simple removing of the said screw systems and the disconnection of the gas feeding pipe from the valve group 34, the combustion chamber 25 and all functional components housed thereinto, such as one or more valvular groups 34 and all the connections to the control devices which are normally used to regulate and to check the right operating of this type of cooking apparatuses 20, may be easily removed from the apparatus 20.

A collecting tube 45 is fixed to the underside of the cooking surface 26 at a location corresponding to the recess 30 in the front edge. Said collecting tube 45 extends downwardly in slant direction, it passes through an opening in the bottom of the combustion chamber 25 and it has the spout placed directly over the container 44 described above.

With particular reference to Figure 14, the tube 45 is suited for collecting and for directing toward the container 44 all those fluids which come from the food A during the cooking process and run along the inclined cooking surface 26 until they reach the recess 30.

As can be seen in the enlarged detail of the Figure 14, the edge of the recess 30 is inclined to facilitate the dripping of the fluids toward the tube 45 which directs them toward the container 44. The latter may be periodically removed from the cart 22 for cleaning up the residues collected inside it.

5 From what stated, it will be seen that the primary object of present invention is achieved by a mobile indoor/outdoor cooking apparatus 20 which overcomes the disadvantages associated with the known apparatuses of the prior art.

Moreover, the apparatus 20 according to the invention can be easily utilized for household cooking purposes as well as for commercial and professional cooking
10 purposes.

In fact, the household user may utilize the apparatus 20 according to the invention in place of traditional grills , while the professional user may advantageously solve all the limitations of the known cooking apparatuses.

The cooking apparatus according to the present invention is provided with a cook-
15 ing plate 26 for cooking food by contact which allows to carry out the cleaning and maintenance operations of the apparatus in a more simple and rational way and which permits to improve, or at least to equal, the cooking quality achieved by the professional kitchens.

Moreover, the apparatus 20 according to the invention is easy to inspect and to
20 maintain as a result of the removable mounting of the combustion chamber 25 and of its associated valvular devices 24.

Further objects achieved by the apparatus 20 according to the present invention are those to minimize the formation of surface encrustments and to allow the drainage, the collection and the removal of all cooking residues.

25 A further object achieved by the apparatus according to the invention is that it al-

lows preparation of foods that could not be prepared on known cooking grills due to their limited size or their instability during cooking.

The apparatus 20 according to the invention achieves also the objects to obtain uniform heat distribution over the entire cooking surface 26 and , if desired by the user, to divide heating of the cooking surface 26 by means of more combustion chamber which can be selectively and separately heated.

It is well understood that modifications and variations may be made to the apparatus 20 forming the object of the present invention without departing however from the scope defined by the following claims with reference to the accompanying drawings and thence from the protection extent of the present industrial invention.

For example, the cooking surface 26 could also have an oval or quadrangular shape and it could include one or more portions provided with superficial grooves or undulations.

On the other hand, the cart 20 could be realized with a configuration and formed of materials which are differing from those described above.

Instead of the folding doors 50 used in the described embodiment of the present invention, sliding doors or doors which are removably fixed to the vertical stanchions 29 of the supporting frame can be used , or alternatively only one folding or sliding door can be used.

20

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CLAIMS

- 1) Apparatus (20) for cooking food by contact comprising a continuous cooking surface (26) that is heated on its underside by heating means (33) which are housed in at least a combustion chamber (25) and supplied by a portable gas fuel tank (B), the operation of said heating means (33) is controlled by valvular means (34), thermostatic means (40) and user interface means (F, G, S) which are well known in the art, characterized in that said continuous cooking surface (26), said combustion chamber (25), said heating means (33) and said valvular means (34) constitute a cooking unit (21) that is removably mounted on a supporting cart (22) suited to house said portable gas fuel tank (B) and to allow the use of the apparatus (20) either in an indoor or in an outdoor environment.
- 2) Mobile cooking apparatus (20) according to the claim 1, characterized in that said cooking unit (21) is associated with said cooking surface (26) by means of screw systems connecting the bottom wall (31) of the one or more combustion chambers (25) to corresponding threaded seats (55) which are formed in the underside of the cooking surface (26), and that after removing of the said screw systems and disconnecting of the gas feeding pipe from the valve group (34), the combustion chambers (25), together with all functional components housed inside it or disposed outside it, may be easily removed from the apparatus (20).
- 3) Mobile cooking apparatus (20) according to the claim 1, characterized in that said cooking unit (21) comprises a continuous cooking surface (26) heated on its underside by one or more combustion chambers (25) which are arranged side by side and which are housing respective gas burners (33), that said cooking surface (26) may be entirely or partially heated according to a plurality of different temperature zones and in response to the activation or deactivation of the gas

- heating means (33) housed in the respective combustion chambers (25).
- 4) Mobile cooking apparatus (20) according to the claim 1, characterized in that the cooking unit (21) comprises an outer casing (24) having essentially a shape of a truncated cone, a cooking surface (26) having a substantially circular shape and at least one inner combustion chamber (25) housing a gas burner (33) which is preferably made of chromed steel with a tubular cross section extending in a substantially circular shape, said combustion chamber (25) is defined by a peripheral sheet having a shape of a truncated cone which, at the top, is closed by the cooking surface 26 and, at the bottom, by a bottom wall (31) provided with ventilation through holes (32) which are of such size, shape and location to supply outside air to the burner (33) by a sufficient amount to allow a right gas combustion.
- 5) Mobile cooking apparatus (20) according to the claims 1 and 2, characterized in that the cooking unit (21) comprises two combustion chambers (25) arranged in a side by side relationship, and that each of the combustion chambers (25) houses a respective gas burner (33) preferably constructed of chromed steel having a tubular cross section which extends to form one or more semicircular branches which are particularly suitable to more uniformly distribute the heat within a semicircular portion of the cooking surface (26).
- 6) Mobile cooking apparatus (20) according to the claims 1, 2 and 4, characterized in that the cooking surface (26) is inclined toward a recess (30) in its peripheral edge at an angle ranging from 1° degree to 2° degrees with respect to a horizontal plane, and it is provided with a peripheral raised frame (36) which is formed by an inner strip (37), which is obliquely raising from the surface (26), and by an outer strip (38) which is substantially horizontal and includes a plurality of

- through holes (39) for exhausting hot air from the cooking chamber (25).
- 7) Mobile cooking apparatus (20) according to the claims 1, 2, 4 and 5, characterized in that a collecting tube (45) is fixed to the underside of the cooking surface (26) at a location corresponding to said recess (30), said collecting tube (45) extends downwardly in slant direction and it has the spout placed directly over a container (44) housed in the cart (22) and suited to be periodically removed from the cart (22) for cleaning up the residues collected inside it.
- 8) Mobile cooking apparatus (20) according to the previous claims, characterized in that the supporting cart (22) is preferably made of stainless steel and substantially formed by an upper annular element (27) and a lower disk-shaped plate (28) which are rigidly connected together by means of a plurality of vertical stanchions (29), that a circular handle (35) is fixed to the upper annular element (27) for facilitating the manual movimentation of the cart (22), for hanging cooking utensils which are normally used for cooking purposes as well as for supporting petal-shaped trays (60) which are appropriately shaped to stuck, with their inner curvilinear edge (61), between a protruding rim (56) of said upper annular element (27) of the cart (22) and the upper surface of the said circular handle (35).
- 9) Mobile cooking apparatus (20) according to the previous claims, characterized in that a portable gas fuel tank (B) is housed on the lower disk-shaped plate (28) of the supporting cart (22) and is secured into place by known anchoring means, that a supporting shelf (43) is placed under the cooking unit (21) and fixed to the vertical stanchions (29) of the cart (22) in order to support said container (44) for collecting the cooking residues.
- 10) Mobile cooking apparatus (20) according to the previous claims, characterized

in that two doors (50) having a semicircular cross section, are hingedly coupled to the upper annular element (27) and to the lower disk shaped element (28) of the cart (22) in such a way that they are movable between a closed position, wherein they define the cylindrical body of the cart (22), and an open position
5 wherein they permit access to the inner shelves (28) and (43) of the cart (22).

11) Mobile cooking apparatus (20) according to the previous claims, characterized in that said lower disk-shaped plate (28) of the cart (22) presents at least one through hole (41) and at least one recess (42) in its periferal edge, said hole (41) and said recess (42) are suited for allowing fresh inlet air to flow towards the
10 burner (33) even when the doors (50) of the cart (22) are in their closed position.

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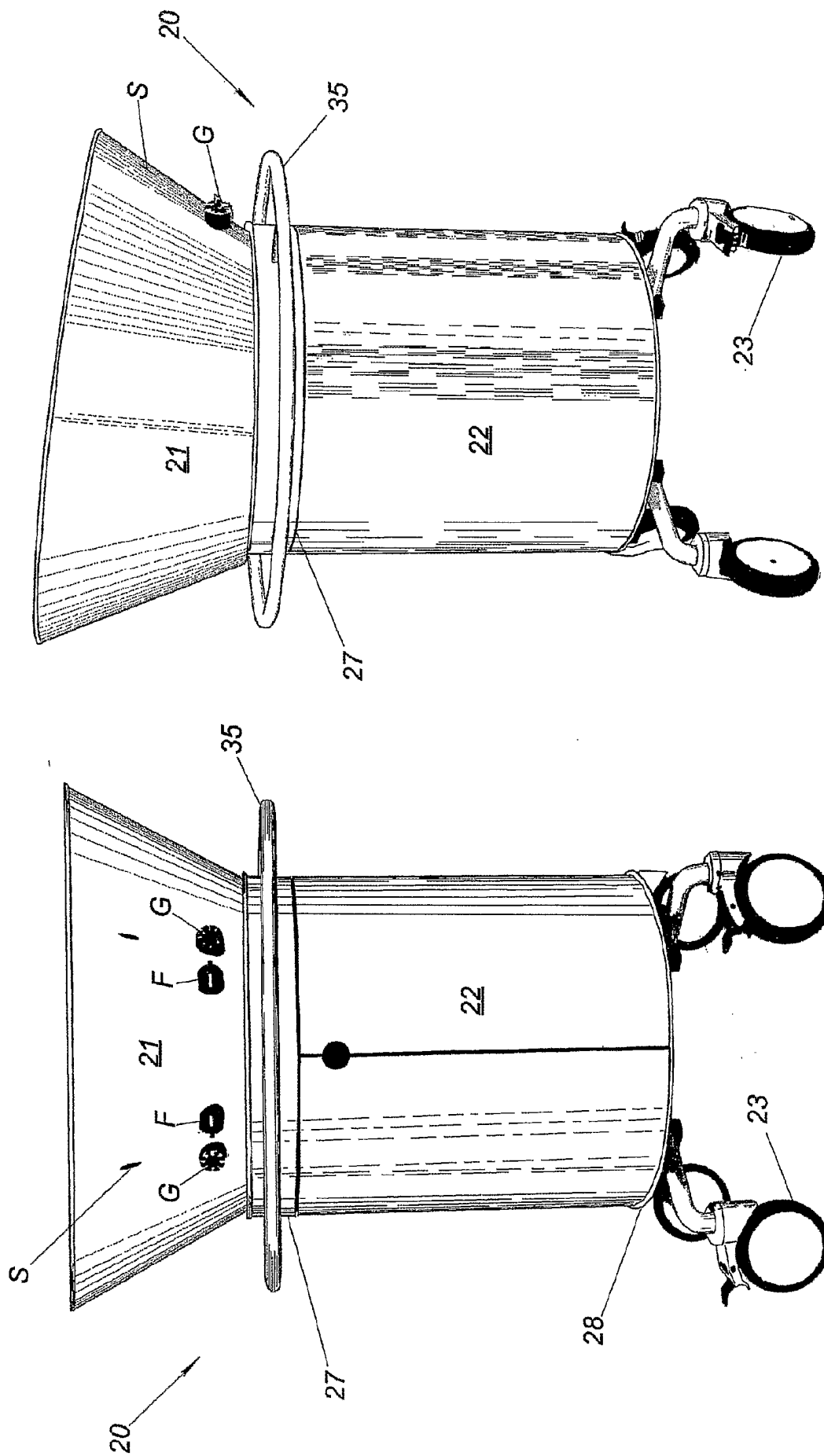


Fig. 2

Fig. 1

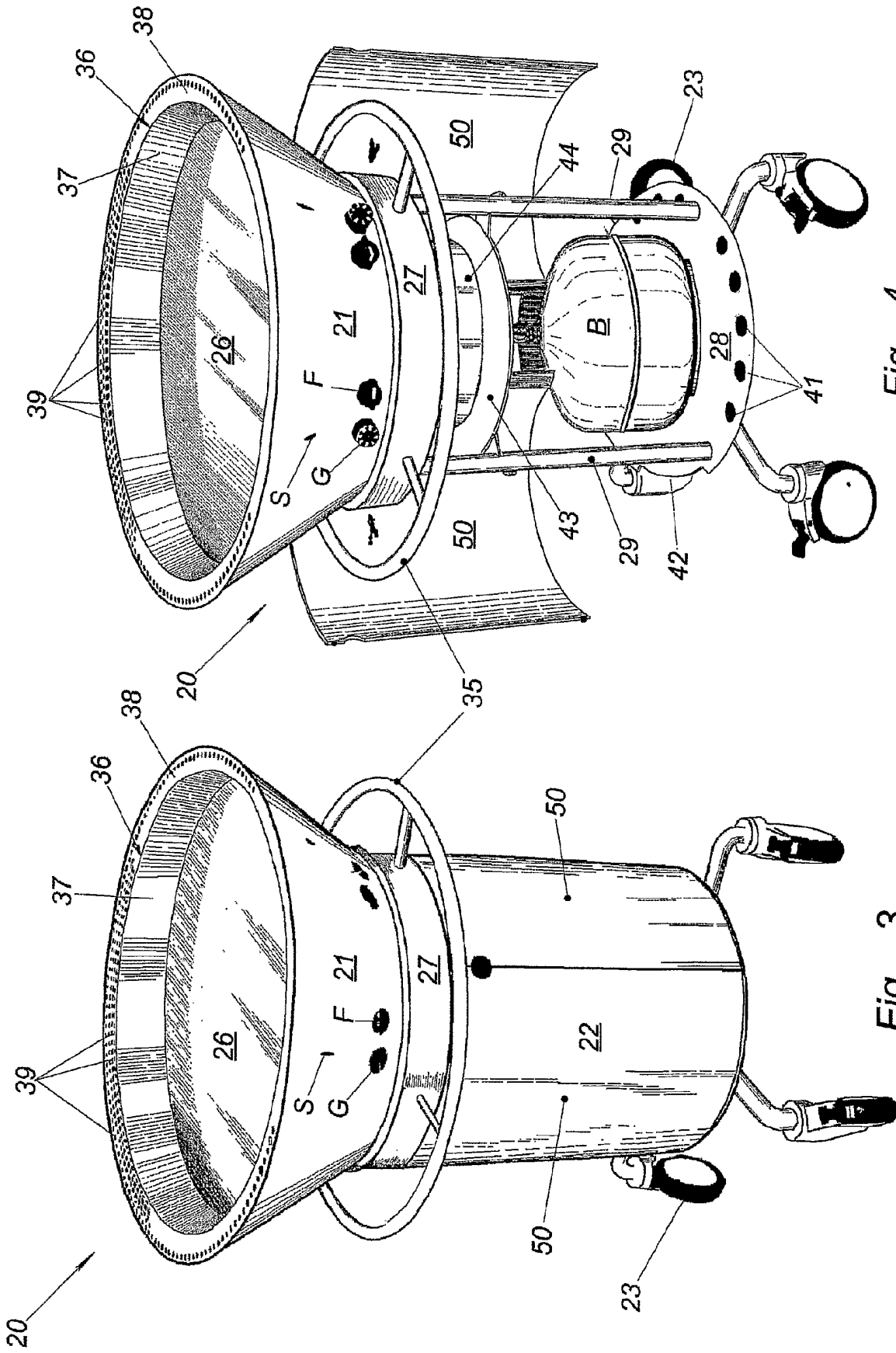


Fig. 4

Fig. 3

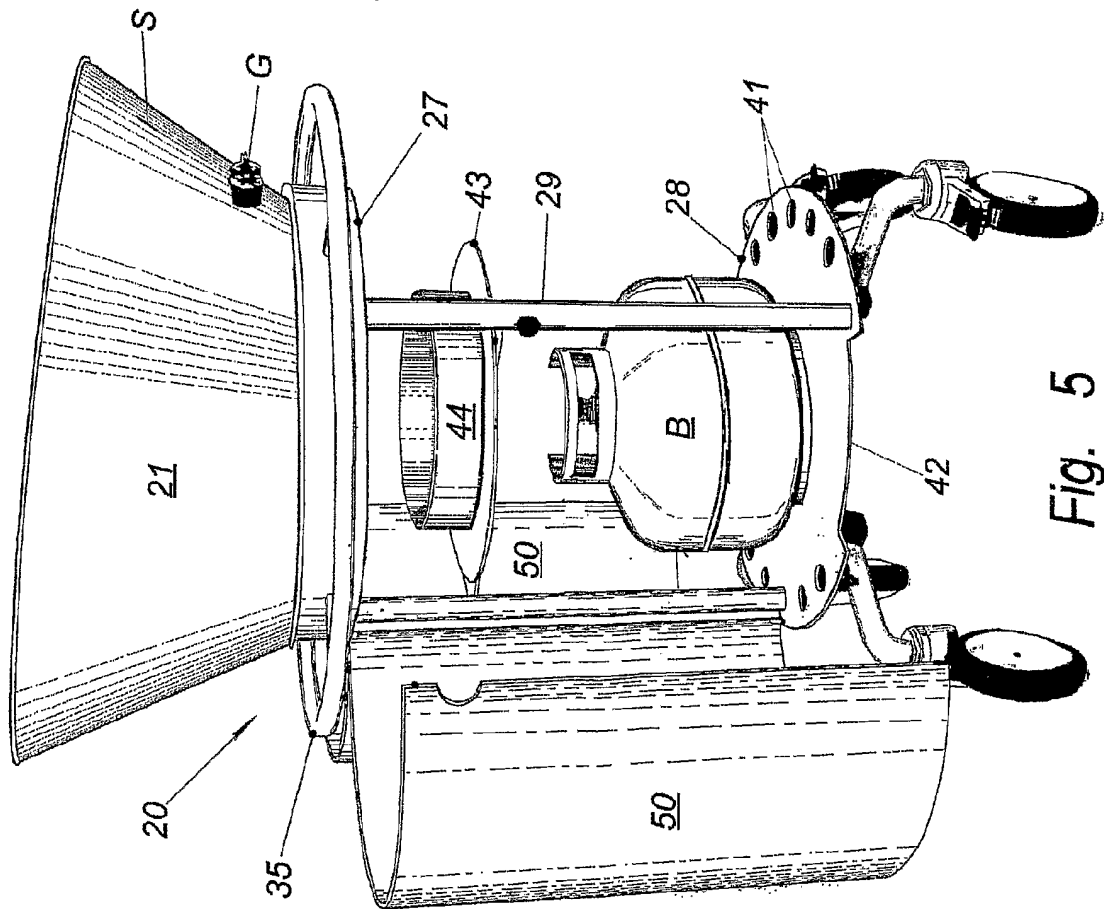


Fig. 5

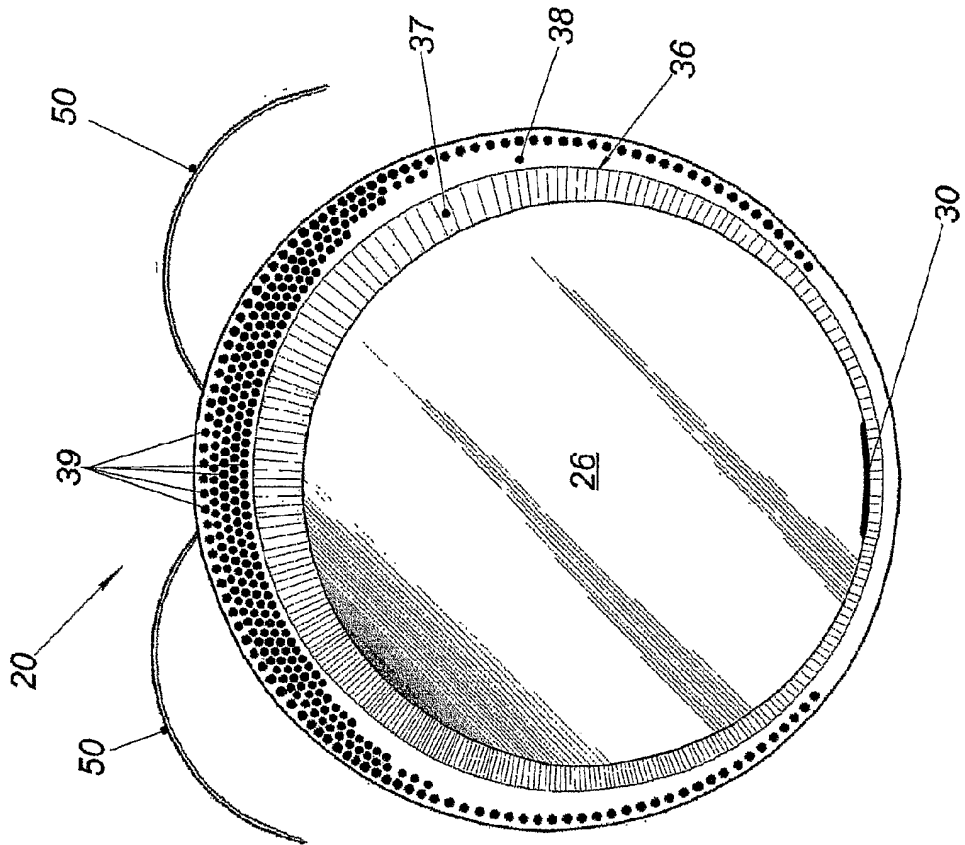


Fig. 6

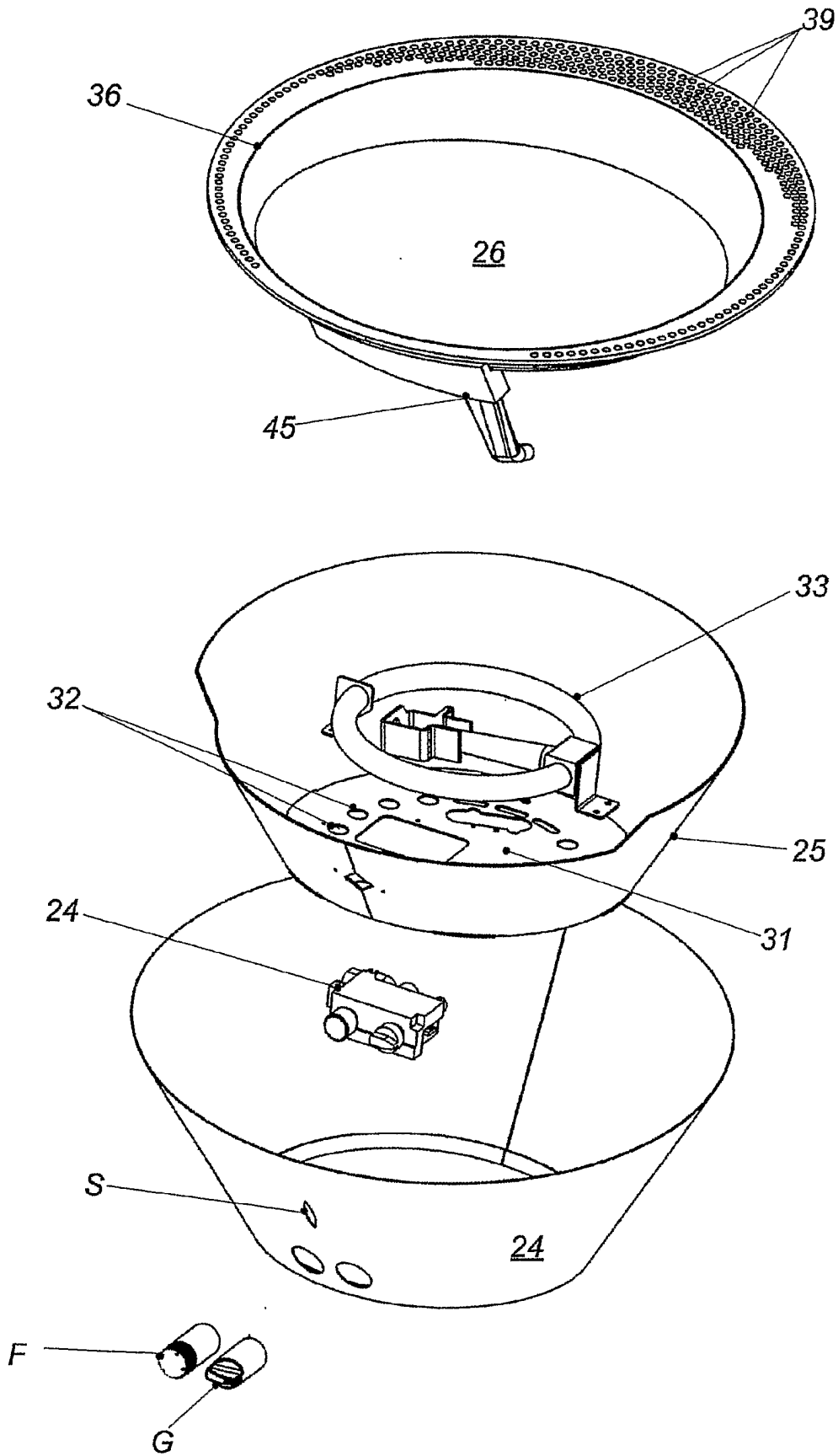


Fig. 7

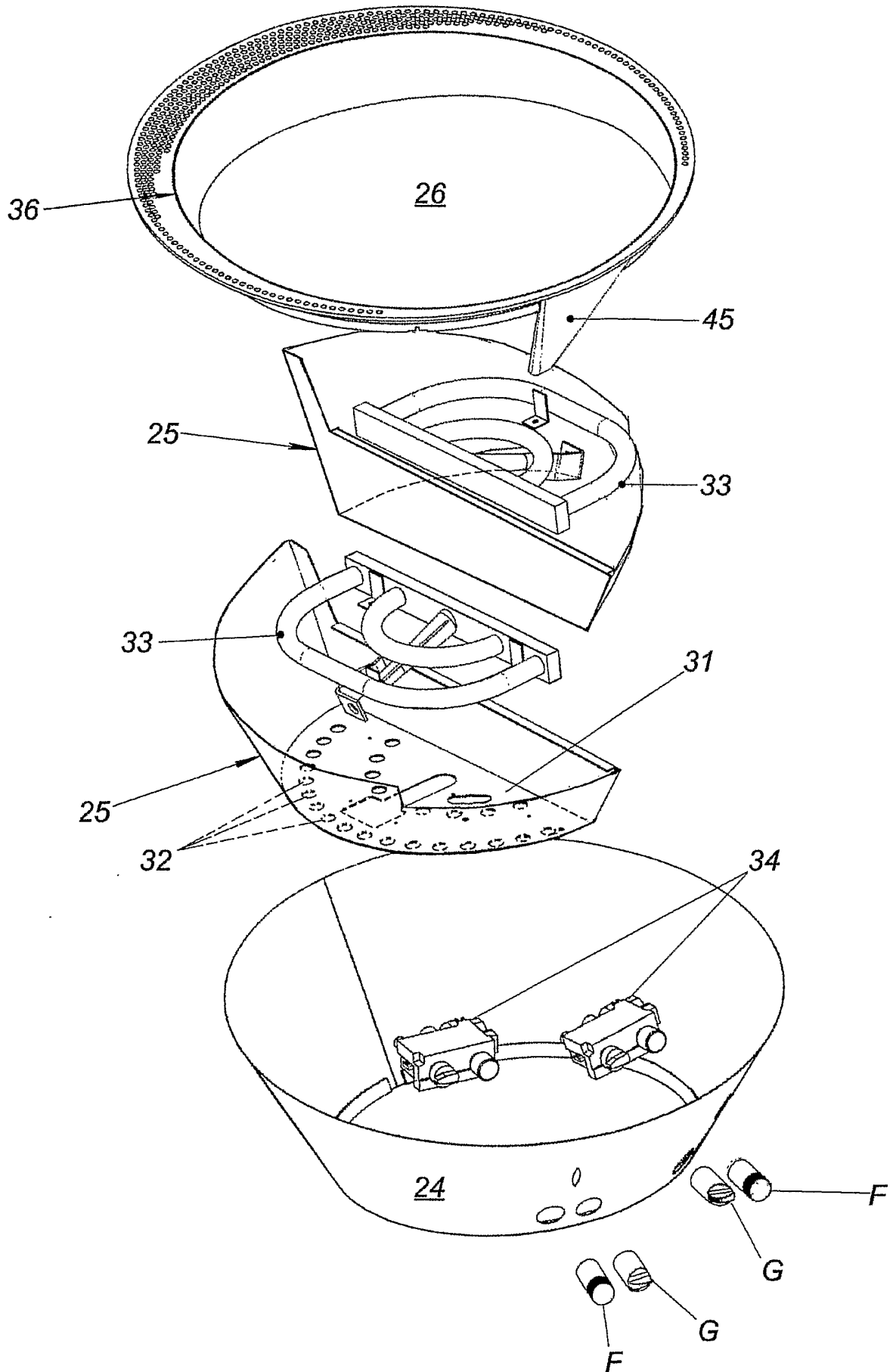


Fig. 8

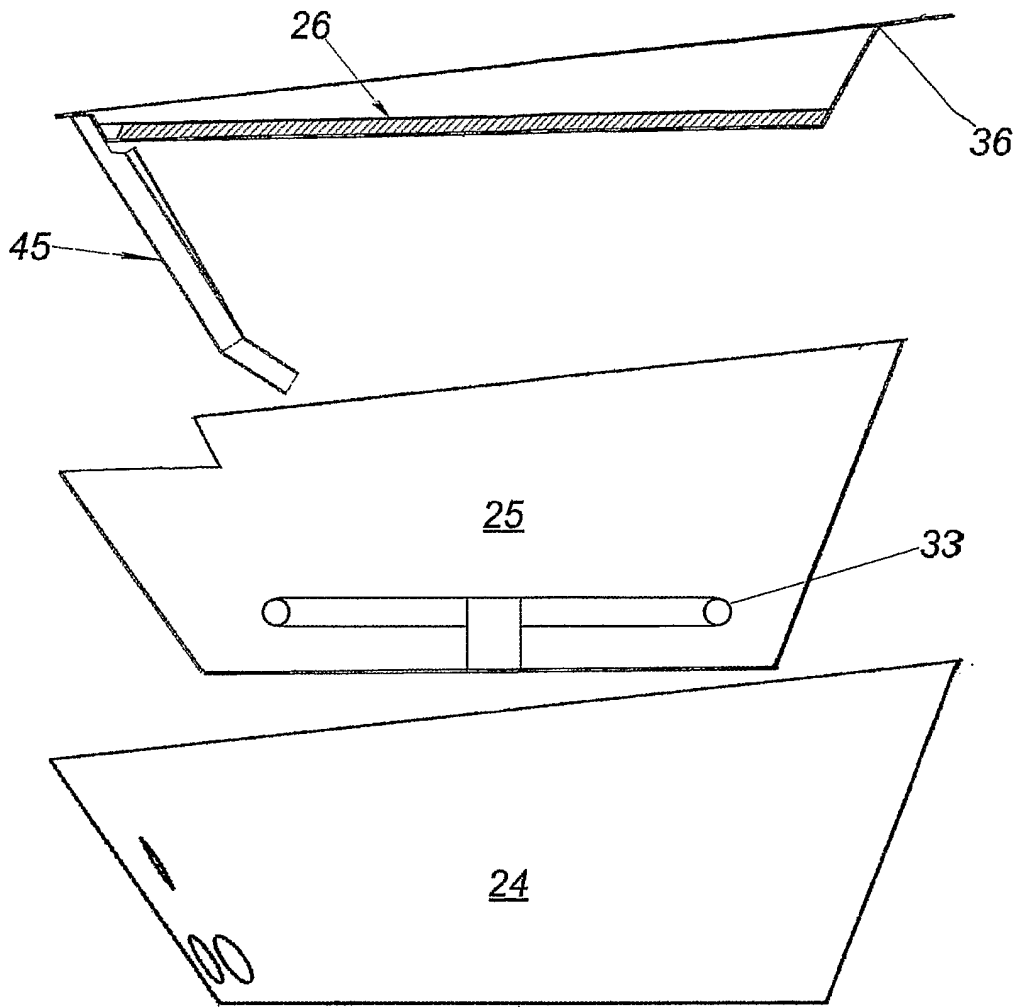


Fig. 9

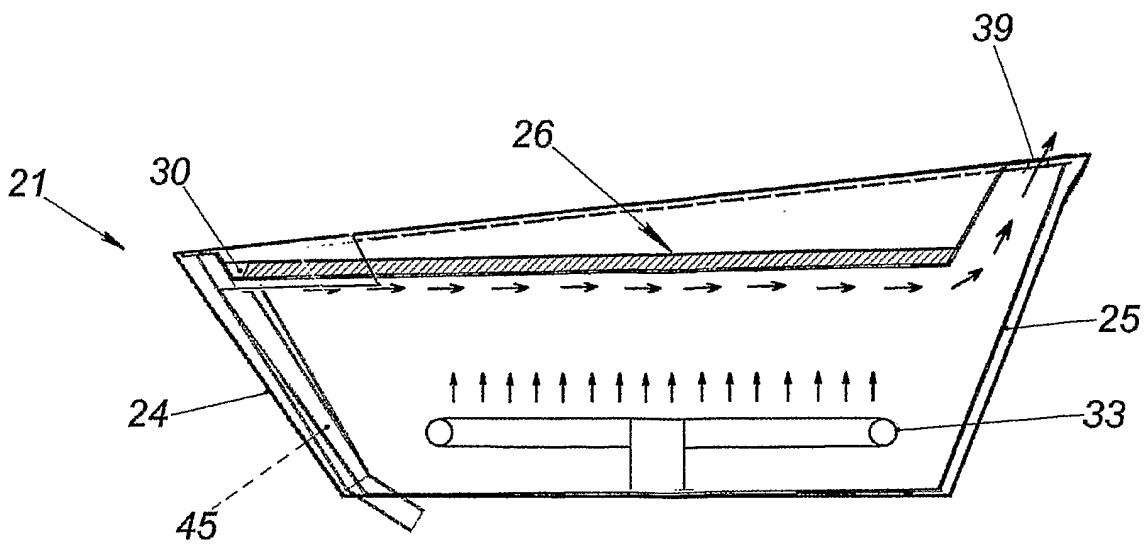


Fig. 10

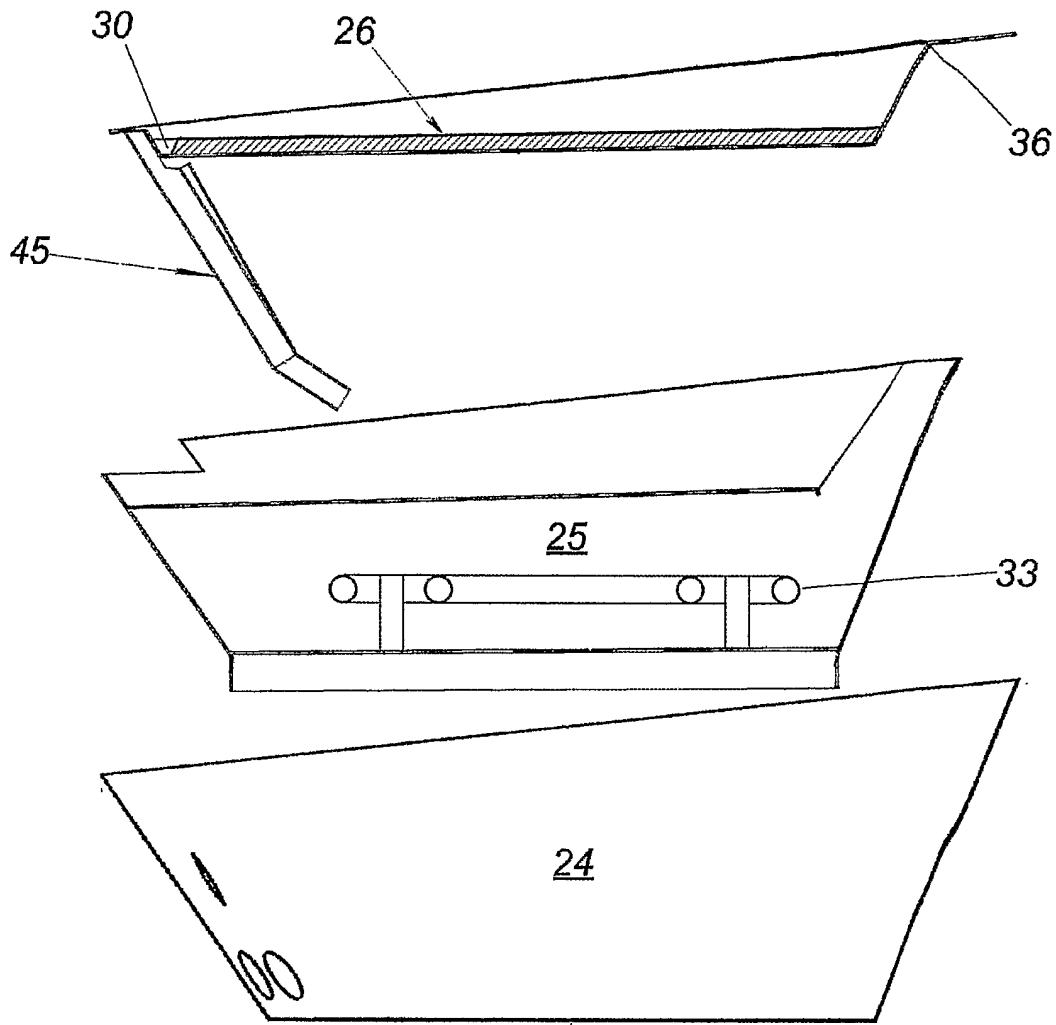


Fig. 11

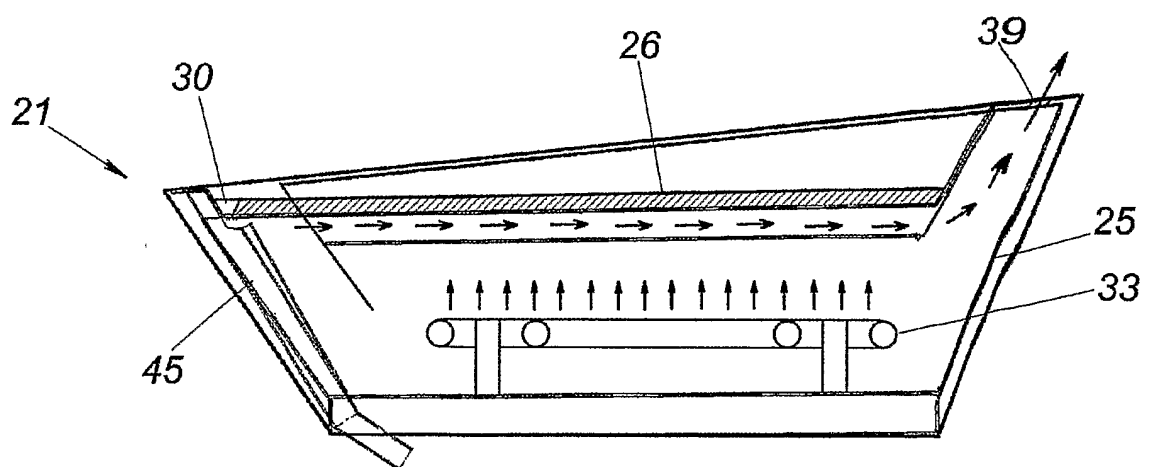


Fig. 12

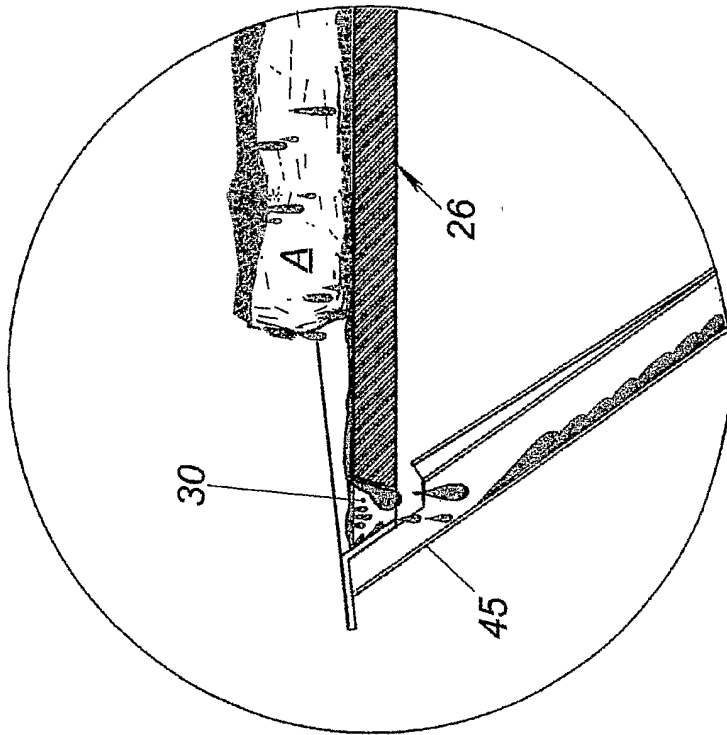


Fig. 14

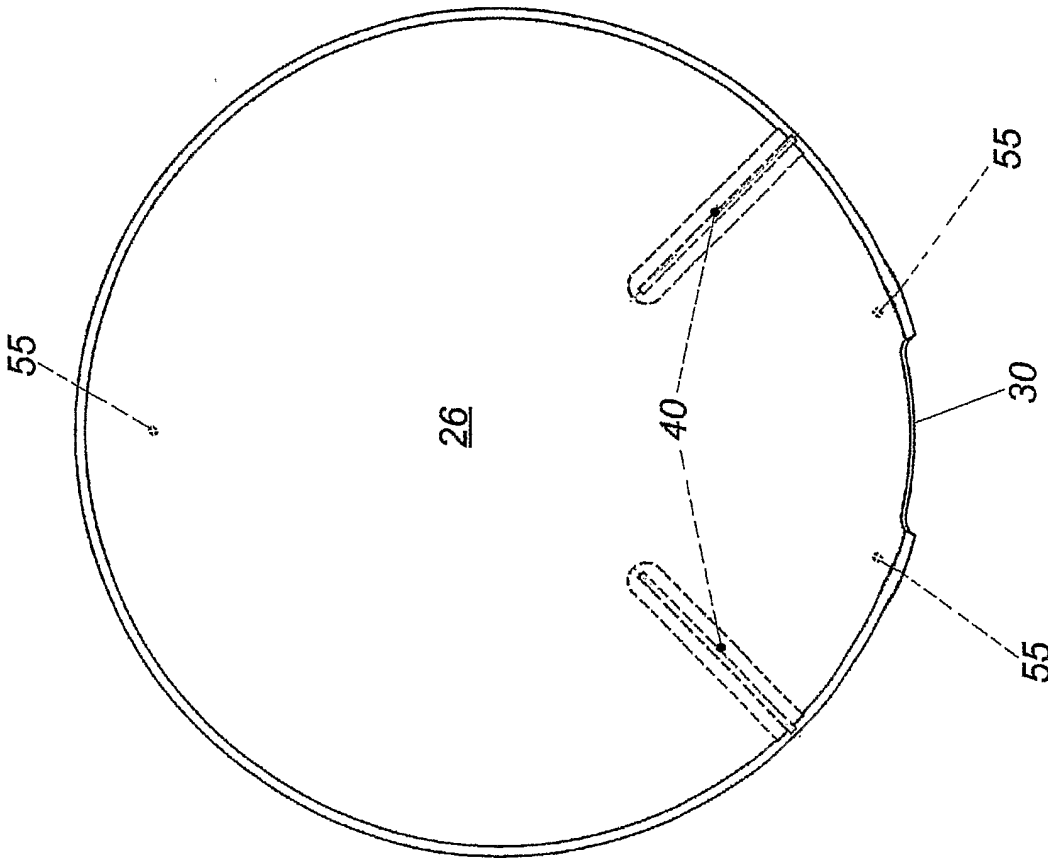


Fig. 13

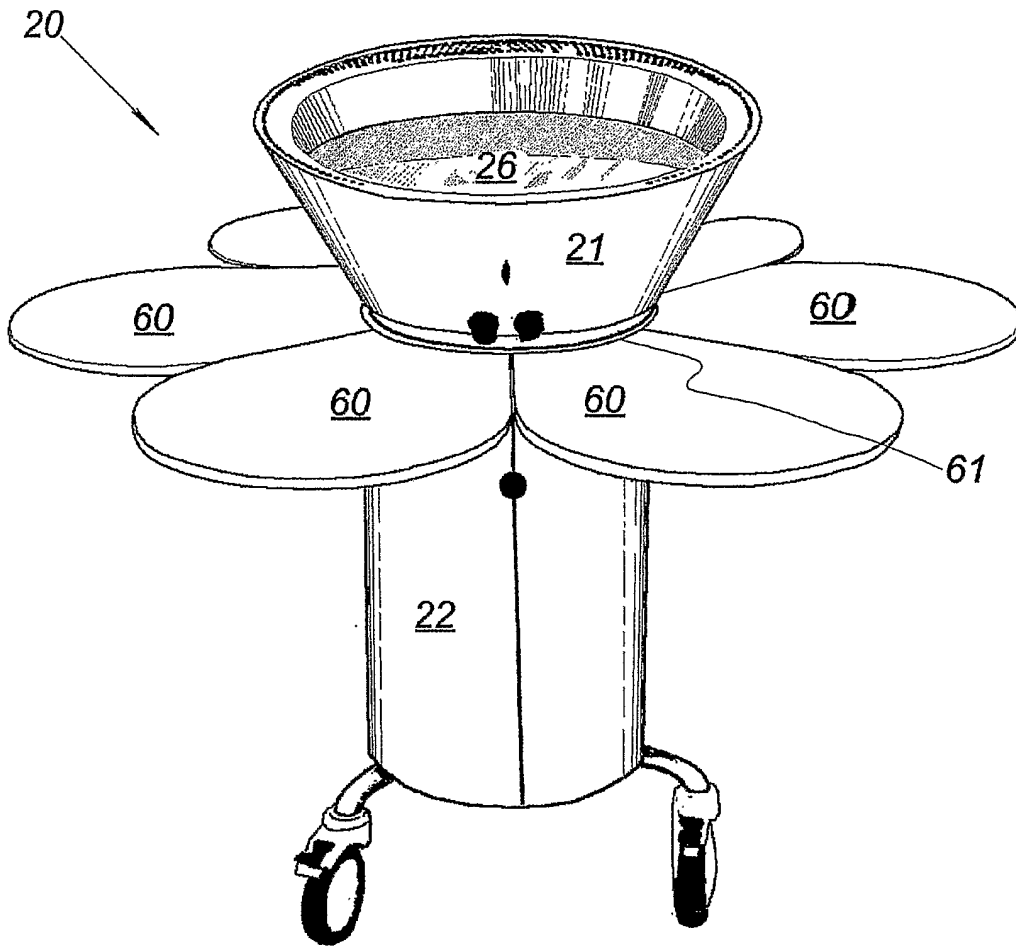


Fig. 15

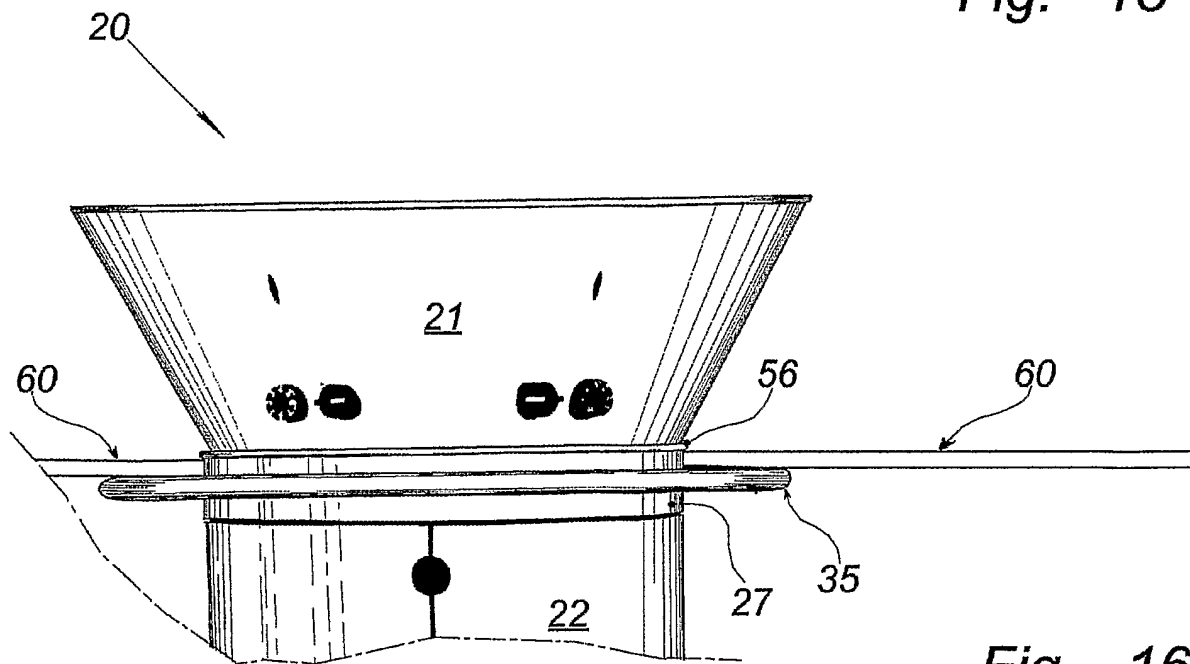


Fig. 16

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB2005/000725

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 A47J37/07		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC 7 A47J		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/106546 A1 (WU TSAN-KUEN) 12 June 2003 (2003-06-12)	1-3
Y	abstract figures 1-4 paragraph '0018!	5
Y	US 2 304 140 A (BERGHOLM JOHN) 8 December 1942 (1942-12-08) the whole document	5
X	US 4 108 142 A (BARSON ET AL) 22 August 1978 (1978-08-22)	1-3
A	the whole document	5,6
A	US 5 163 358 A (HANAGAN ET AL) 17 November 1992 (1992-11-17) abstract figures 1-3 column 5, lines 29-33	3,5
<input type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
° Special categories of cited documents :		
A document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed		*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family
Date of the actual completion of the international search 18 July 2005		Date of mailing of the international search report 26/07/2005
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Sainz Martínez, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IB2005/000725

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
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US 2304140	A	08-12-1942	NONE	
US 4108142	A	22-08-1978	AU 475074 B2 GB 1505614 A AU 5936273 A	20-02-1975 30-03-1978 20-02-1975
US 5163358	A	17-11-1992	NONE	