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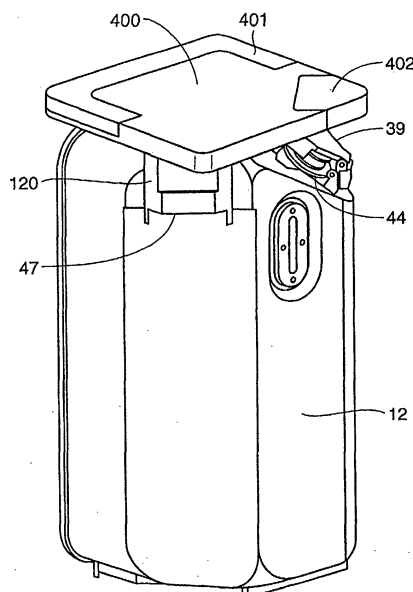
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(54) **LIQUID FEEDER AND LIQUID FUEL COMBUSTION DEVICE WITH THE LIQUID FEEDER**

(57) A liquid supply device, contained within the body of an apparatus having a top surface, for supplying liquid to the body of the apparatus in accordance with the operation of the body of the apparatus is provided so as to be freely removable/attachable from/to a pre-determined attachment position inside of the body of the apparatus and has a top panel (400) of the container part that covers the opening provided in the top surface

of the body of the apparatus in order to contain container part (12) when container part (12), which can store the liquid, is attached at the attachment position. Further, it is preferable for the liquid supply device to have a structure that a handle (401) is attached to top panel (400) of the container part and that handle (401) is raised from top panel (400) of the container part only at the time of utilization.

FIG.1



Description

Technical Field

[0001] The present invention relates to a liquid fuel combustion apparatus such as a kerosene fan heater or a kerosene heater. Further, the present invention relates to a liquid supply device, mounted within the apparatus, including a tank or the like for storing liquid.

Background Art

[0002] Conventionally, kerosene fan heaters are in wide use in individual homes as heating apparatuses that utilize liquid fuel. A conventional kerosene fan heater will be described below with reference to Fig. 8, which shows an overall view thereof. A combustion part and a liquid supply device are contained in a housing 1 in such kerosene fan heater. Here, the concept of a liquid supply device includes a so-called "fuel tank", which can be utilized as an independent apparatus.

[0003] Housing 1 is configured by mounting a box-type member, formed of a front panel 6 for covering the front of the heater, a side and rear panel 7 for covering the sides and rear of the heater and a top panel 8 for covering the top of the heater, on a base 5. An air outlet 2 through which heated air is blown into a room is formed in the lower portion of front panel 6. An operation part 3 including switches and the like for switching the operating condition is placed in the upper portion of front panel 6. An opening for insertion and removal of a kerosene supply tank is provided in top panel 8 and a lid 4 that covers the opening is connected to the body so as to freely openable and closeable.

[0004] The inside of the first kerosene fan heater according to prior art will be described below with reference to Fig. 9. A container part 12 for storing fuel, such as kerosene, a vaporizer 15 for heating and vaporizing fuel, a combustion part 16 for mixing the gas gained by vaporization of fuel with air and, then, carrying out combustion, and the like, are contained inside of the housing. Container part 12 has a supply opening 24, which is the only opening in container part 12, and is connected to a kerosene reception part 500 in a form this supply opening 24 faces downward. Fuel flows into kerosene reception part 500 from container part 12 and is temporarily stored therein. Furthermore, the fuel stored in kerosene reception part 500 is drawn upward by an electromagnetic pump 14 and is led to vaporizer 15.

[0005] In the case of such a structure, a handle attached to the top of container part 12 is grasped and raised, as shown in Fig. 10, at the time when container part 12 is removed from the housing in order to refill container part 12 with fuel. Then, it is necessary to place the container part 12 upside down so that fuel can be poured into the container part through supply opening 24. This operation of turning the container part upside down is inconvenient. In addition, a kerosene refill cap

19 for supply opening 24 is a screw-type cap. Therefore, a problem arises in the case that the cap is not screwed on tightly enough wherein kerosene refill cap 19 may come off or wherein fuel may leak when the supply opening is again faced downward. Such a problem becomes particularly significant in a society in which a large proportion of the population is aged because the grasping force tends to be decreased in the aged.

[0006] Thus, the second kerosene fan heater according to a prior art has been proposed that has a structure, as shown in Fig. 11, wherein fuel can be directly removed from the upper side of container part 12 via a pipe by means of electromagnetic pump 14 while eliminating supply opening 24, which faces downward. In this structure a supply opening 44 facing diagonally upward is provided on the upper side of the container part, as shown in Fig. 12. Accordingly, when container part 12 is refilled with fuel it is raised upwards and is carried, as shown in Fig. 12, and, then, a kerosene refill cap 39 is opened. That is to say, it is not necessary to turn the container part upside down, unlike in the case of the first kerosene fan heater according to the prior art.

[0007] In the case of the second kerosene fan heater according to the prior art it is necessary for the user to manually open lid 4 connected to the body in top panel 8 of housing 1, which is a lid that covers the opening as shown in Fig. 13, and to find the handle of container part 12 inside of the heater as well as to grasp the handle and lift up the container part in order to remove container part 12 from housing 1 for fuel refill. In addition, it is necessary to manually close lid 4 connected to the body after container part 12 has been set inside of housing 1 in order to complete the replacement of container part 12 after container part 12 has been refilled with fuel. These opening and closing operations of lid 4 connected to the body are felt to be inconvenient to the user.

[0008] On the other hand, a joint part 47 for connecting a pipe for fuel transfer to the container part and a cushioned cover 120 for protecting joint part 47 at the time that the heater falls down are attached to the upper portion of container part 12. Therefore, joint part 47 and cushioned cover 120 are exposed from the top of the heater at the time when container part 12 is removed and they can easily be seen by the user, giving a negative impression to the user.

[0009] Even when the above described problem is solved there is a risk concerning such a liquid supply device wherein the temperature of container part 12 may rise in the case when an abnormality occurs inside of housing 1 leading to overheating in the worst case scenario. In such a case the heat is transferred to a member above container part 12 (hereinafter, referred to as "member above the container part") and this causes a risk to the user. In particular, in the case that the member above the container part is made of resin, there is a risk wherein the member above the container part may melt due to effects from heat from the inside of housing 1.

[0010] In addition, in the case that the member above the container part is made of resin, the member above the container part may melt and hang down onto container part 12 and prevent the normal operation of the liquid supply device itself from continuing when, for example, a large amount of heat is conveyed to lid 4 connected to the body due to a problem outside of housing 1 causing the member above the container part to become melted and deformed. In addition, there is a risk of fuel ignition within container part 12 when the member above the container part that has melted and hung down due to excessive heat drops onto container part 12.

[0011] An object of a first invention is to provide a liquid supply device and a liquid fuel combustion apparatus wherein inconvenience to the user is reduced and which has a simple appearance.

[0012] An object of a second invention is to provide a liquid supply device and a liquid fuel combustion apparatus wherein overheating of the container part does not affect the lid connected to the body of the liquid fuel combustion apparatus. Alternately, an object of the second invention is to provide a liquid supply device and a liquid fuel combustion apparatus wherein the container part is not negatively affected even in the case where the lid connected to the body becomes thermally deformed or melts.

Disclosure of the Invention

[0013] In order to achieve the above described objects, according to one aspect of the first invention, a liquid supply device, contained inside of the body of an apparatus having a top surface, for supplying liquid to the body of the apparatus in accordance with the operation of the body of the apparatus, includes: a container part that is freely removable/attachable from/to the predetermined attachment position inside of the body of the apparatus and that can store the liquid; and a top panel of the container part formed on the top surface of the container part, wherein the top panel of the container part covers the opening provided in the top surface of the body of the apparatus in order to contain the container part inside of the body of the apparatus when the container part is attached to the attachment position. With this configuration employed, the body of the apparatus that contains this liquid supply device has a form without any openings and has a simple appearance when this liquid supply device is attached at the attachment position.

[0014] In addition, in order to achieve the above described objects, according to another aspect of the first invention, a liquid supply device, contained inside of the body of an apparatus having a top surface, for supplying liquid to the body of the apparatus in accordance with the operation of the body of the apparatus, includes: a container part that is freely removable/attachable from/to the predetermined attachment position inside of the body of the apparatus

and that can store the liquid; and a top panel of the container part formed on the top surface of the container part, wherein the top panel of the container part is located approximately at the same height as the top surface of the body of the apparatus when the container part is attached to the attachment position. With this configuration employed, the body of the apparatus that contains this liquid supply device has a form wherein the top of this liquid supply device appears unified with the top of the body of the apparatus and has a simple appearance when this liquid supply device is attached at the attachment position.

[0015] Preferably in the above-described invention, the top panel of the container part is formed integrally with the container part. The container part and the upper panel of the container part are integrated and a lid connected to the body, which is separately provided in the prior art, becomes unnecessary according to this configuration in the body of the apparatus containing this liquid supply device. As a result, it becomes unnecessary for the user to open and close the lid connected to the body and, thus, labor is reduced.

[0016] Preferably in the above-described invention, the top panel of the container part is provided with a handle to be held at the time that the container part is carried. The user can grasp the handle and can lift the liquid supply device, which includes the container part and, therefore, the utility is increased.

[0017] Preferably in the above-described invention, the container part is provided with an opening for liquid through which the liquid enters the container part and the opening for liquid can be opened only under the condition that the container part is removed from the body of the apparatus. The situation wherein the refilling task is carried out while the container part is left inside the body of the apparatus can be avoided with this liquid supply device in order to ensure safety according to the configuration.

[0018] In order to achieve the objects, according to one aspect of the present invention, a liquid fuel combustion apparatus includes: a body of an apparatus having a top surface; and a liquid supply device, contained inside of the body of the apparatus having a top surface, for supplying liquid to the body of the apparatus in accordance with the operation of the body of the apparatus, wherein the liquid supply device includes: a container part that is freely removable/attachable from/to the predetermined attachment position inside of the body of the apparatus and that can store the liquid; and a top panel of the container part formed on the top surface of the container part, and the top panel of the container part covers the opening provided in the top surface of the body of the apparatus in order to contain the container part inside of the body of the apparatus when the container part is attached to the attachment position. With this configuration employed, the body of the apparatus that contains this liquid supply device has a form without any openings and has a simple appearance con-

figuration when this liquid supply device is attached at the attachment position.

[0019] In addition, in order to achieve the objects, according to another aspect of the first invention, a liquid fuel combustion apparatus includes: a body of an apparatus having a top surface; and a liquid supply device, contained inside of the body of the apparatus having a top surface, for supplying liquid to the body of the apparatus in accordance with the operation of the body of the apparatus, wherein the liquid supply device includes: a container part that is freely removable/attachable from/to the predetermined attachment position inside of the body of the apparatus and that can store the liquid; and a top panel of the container part formed on the top surface of the container part, and the top panel of the container part is located approximately at the same height as the top surface of the body of the apparatus when the container part is attached to the attachment position. With this configuration employed, the body of the apparatus that contains this liquid supply device has a form wherein the top of this liquid supply device appears unified with the top of the body of the apparatus and has a simple appearance when this liquid supply device is attached at the attachment position.

[0020] Preferably in the above-described invention, the top panel of the container part is formed integrally with the container part. The container part and the upper panel of the container part are integrated and a lid connected to the body, which is separately provided in the prior art, becomes unnecessary according to this configuration in the body of the apparatus containing this liquid supply device. As a result, it becomes unnecessary for the user to open and close the lid connected to the body and, thus, labor is reduced.

[0021] Preferably in the above-described invention, the top panel of the container part is provided with a handle to be held at the time that the container part is carried. The user can grasp the handle and can lift the liquid supply device, which includes the container part and, therefore, the utility is increased.

[0022] Preferably in the above-described invention, the container part is provided with an opening for liquid through which the liquid enters the container part and the opening for liquid can be opened only under the condition that the container part is removed from the body of the apparatus. The situation wherein the refilling task is carried out while the container part is left inside the body of the apparatus can be avoided with this liquid supply device in order to ensure safety according to the configuration.

[0023] In order to achieve the objects, according to the second invention, a liquid supply device, contained inside of the body of an apparatus having a top surface, for supplying liquid to the body of the apparatus in accordance with the operation of the body of the apparatus, includes: a container part that is freely removable/attachable from/to the predetermined attachment position inside of the body of the apparatus and that can

store the liquid; a top panel of the container part formed on the top surface of the container part; and a shielding body interposed between the container part and the top panel of the container part. With this configuration employed, thermal interaction between the container part and the top panel of the container part can be prevented from melting and hanging or dropping down through the selection of appropriate material for the shielding body.

[0024] Preferably in the above-described invention, the shielding body separates the container part from the entire surface of the top panel of the container part. With this configuration employed, thermal interaction between the container part and the top panel of the container part can more surely be prevented and the top panel of the container part can more surely be prevented from melting and hanging or dropping down.

[0025] Preferably in the above-described invention, the shielding body is made of heat insulating material.

With this configuration employed, mutual transfer of heat between the container part and the top panel of the container part can be prevented and the top panel of the container part can be prevented from receiving negative effects from the container part when the container part is heated to a high temperature or the container part can be prevented from receiving negative effects from the top panel of the container part when the top panel of the container part is heated to a high temperature.

[0026] In addition, in order to achieve the objects, a liquid fuel combustion apparatus includes: a body of an apparatus having a top surface; and a liquid supply device, contained inside of the body of the apparatus having a top surface, for supplying liquid to the body of the apparatus in accordance with the operation of the body of the apparatus, wherein the liquid supply device includes: a fuel container part that is freely removable/attachable from/to the predetermined attachment position inside of the body of the apparatus and that can store the liquid; a top panel of the fuel container part formed on the top surface of the fuel container part; and a shielding body interposed between the fuel container part and the top panel of the fuel container part. With this configuration employed, thermal interaction between the fuel container part and the top panel of the fuel container part as well as ignition of fuel inside of the fuel container part due to external heat can be prevented, and heat transfer to the top panel of the fuel container part due to excessive heat from the fuel container part can be prevented from causing the top panel of the fuel container part to melt and hang down or drop down through the selection of appropriate material for the shielding body according to this configuration.

[0027] Preferably in the above-described invention, the shielding body separates the fuel container part from the entire surface of the top panel of the fuel container part. With this configuration employed, the top panel of the fuel container part can more surely be prevented from hanging down onto, or dropping down onto, the fuel

container part in the case where the top panel of the fuel container part melts due to heat.

[0028] Preferably in the above-described invention, the shielding body is made of heat insulating material. With this configuration employed, mutual transfer of heat between the fuel container part and the top panel of the fuel container part can be prevented, and the top panel of the fuel container part can be prevented from receiving negative effects from the fuel container part when the fuel container part is heated to a high temperature or the fuel container part can be prevented from receiving negative effects from the top panel of the fuel container part when the top panel of the fuel container part is heated to a high temperature.

[0029] Preferably in the above-described invention, the shielding body is made of metal. With this configuration employed, the shielding body remains unchanged, without melting, and the melted top panel of the fuel container part can be prevented from hanging down onto, or dropping down onto, the fuel container part even in the case where the top panel of the fuel container part is made of resin and where the top panel of the fuel container part melts due to heat.

[0030] Preferably in the above-described invention, the body of the apparatus includes a shielding wall on a side of a recess for containing the liquid supply device and the shielding body and the shielding wall contact each other so as to provide a structure that surrounds the fuel container part in a continuous manner when the liquid supply device is attached at the attachment position. With this configuration, the fuel container part of the liquid supply device is surrounded by the shielding wall on the side in addition to the shielding body on the top, wherein the shielding body and the shielding wall make contact with each other so as to surround the fuel container part in a continuous manner according to the configuration and, therefore, negative thermal effects can more surely be prevented and the top panel of the fuel container part can be prevented from hanging down onto, or dropping down onto, the fuel container part.

Brief Description of the Drawings

[0031]

Fig. 1 is a perspective of a liquid supply device according to Embodiment 1 of the present invention. Fig. 2 is a first cross sectional view of the condition wherein the liquid supply device according to Embodiment 1 of the present invention is contained in the housing.

Fig. 3 is a second cross sectional view of the condition wherein the liquid supply device according to Embodiment 1 of the present invention is contained in the housing.

Fig. 4 is a perspective view of the condition before the top panel of the container part is attached to the liquid supply device according to Embodiment 1 of

the present invention.

Fig. 5 is a perspective view of a liquid supply device according to Embodiment 2 of the present invention.

Fig. 6 is a first cross sectional view of the condition wherein the liquid supply device according to Embodiment 2 of the present invention is contained in the housing.

Fig. 7 is a second cross sectional view of the condition wherein the liquid supply device according to Embodiment 2 of the present invention is contained in the housing.

Fig. 8 is a perspective view of a kerosene fan heater according to prior art.

Fig. 9 is a conceptual view of the internal structure of a first kerosene fan heater according to the prior art.

Fig. 10 is a view of the condition wherein a first liquid supply device according to the prior art is lifted up by hand.

Fig. 11 is a conceptual view of the internal structure of a second kerosene fan heater according to the prior art.

Fig. 12 is a view of the condition wherein a second liquid supply device according to the prior art is lifted up by hand.

Fig. 13 is a view for describing the fuel refilling task in the second kerosene fan heater according to the prior art.

Best Mode for Carrying Out the Invention

(Embodiment 1)

(Configuration)

[0032] An example of a kerosene fan heater, which is a liquid fuel combustion apparatus that uses the liquid supply device of the present invention, is described below with reference to Fig. 1 according to Embodiment 1 of the first invention. Here, the same symbols are attached in the present embodiment to the same parts of the configuration as in the kerosene fan heater described in the prior art.

[0033] A top panel 400 of the container part is secured to the top of container part 12 for integration with this liquid supply device. A handle 401 is provided to top panel 400 of the container part for the easy carrying of container part 12. Handle 401 folds into top panel 400 of the container part in the same plane at the time when not in utilization while handle 401 is lifted up from top panel 400 of the container part only at the time of utilization in this structure. In addition, top panel 400 of the container part is provided with a lid 402 above the kerosene refill opening that can be displaced so that top panel 400 of the container part is not a hindrance at the time of the refilling of fuel through supply opening 44. Lid 402 above the kerosene refill opening is also folded

into top panel 400 of the container part in the same plane in the condition wherein the lid is closed in the structure.

[0034] In addition, a joint part 47 and a cushioned cover 120 are placed in the upper portion of container part 12 in the same manner as in the prior art. A portion of the top surface of container part 12 is inclined and this inclined surface is provided with supply opening 44, through which liquid enters, and supply opening 44 is covered with a kerosene refill cap 39, also in the same manner as in the prior art.

[0035] Fig. 2 shows a cross sectional view of the condition wherein this liquid supply device is contained inside of housing 1. Top panel 400 of the container part is located at approximately the same height of the plane of top panel 8 of housing 1 and they form a continuous surface. In addition, top panel 400 of the container part has a structure so as to cover the opening in top panel 8.

[0036] Fig. 3 shows a cross sectional view of the vicinity of supply opening 44 viewed from an angle different from that of Fig. 2. Supply opening 44 is provided with kerosene refill cap 39 in a structure wherein kerosene refill cap 39 cannot be opened when container part 12 is contained within housing 1 because supply opening 44 is provided in an inclined surface. Kerosene refill cap 39 can be opened only in the condition wherein container part 12 has been removed from housing 1.

[0037] The liquid fuel combustion apparatus according to the present embodiment is a liquid fuel combustion apparatus provided with the above described liquid supply device and the appearance thereof is the same as that shown in Fig. 8.

(Operation and Effects)

[0038] Top panel 400 of the container part is secured to container part 12 so as to be integrated with the above liquid supply device wherein top panel 400 of the container part has approximately the same height as the top surface of top panel 8 of housing 1 at the time when the liquid supply device is contained within housing 1 and, therefore, the top of this liquid supply device appears unified with the top of the fuel combustion apparatus and has a simple appearance. In addition, top panel 400 of the container part has a structure that covers the opening in top panel 8, wherein lid 4 connected to the body of the apparatus for the opening in top panel 8 becomes unnecessary, unlike in the prior art, and, therefore, it becomes unnecessary for the user to open and close lid 4 connected to the body of the apparatus.

[0039] Handle 401, which becomes necessary at the time that the liquid supply device is removed from and reinserted into the apparatus, is provided so as to be folded, in the same plane, into top panel 400 of the container part and so as to be raised up from top panel 400 of the container part only at the time of utilization and, therefore, handle 401 is not a hindrance at the time when the handle is not being utilized and it can easily be raised up and grasped for the convenience of the user.

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[0040] Supply opening 44 is provided in the inclined surface of container part 12 in this structure wherein kerosene refill cap 39 cannot be opened when container part 12 is contained inside of housing 1 and, therefore, the situation wherein the refilling task is carried out while container part 12 is left inside of housing 1 due to laziness or ignorance of the user can be avoided in order to ensure safety.

[0041] In addition, joint part 47 and cushioned part 120 are hidden behind top panel 400 of the container part and, therefore, a negative impression in regard to the appearance can be avoided.

[0042] The same effects as described above can also be gained in a liquid fuel combustion apparatus provided with such a liquid supply device.

(Assembly)

[0043] Assembly of such a liquid supply device is schematically described below. Fig. 4 shows the condition of the structure before top panel 400 of the container part has been attached for ease of understanding. as shown in Fig. 4 container part 12 is formed in approximately an approximately rectangular parallelepiped form wherein left member 12a, in approximately a plate form, of the kerosene supply tank and right member 12b, which is formed, by means of a press, into a container form having U-shaped cross section with the open end of the U shape facing to the left, of the kerosene supply tank are joined by means of an Adrian process. Container part 12 has an approximately rectangular form as viewed from above (in Fig. 4 above) and the right front corner, wherein joint part 47 is attached, is rounded. The shape of container part 12 does not match the shape of the opening in top panel 8 due to the above described corner rounding and container part 12 cannot be inserted into housing 1 in the case where the user attempts to insert container part 12 into the housing while holding container part 12 in the wrong direction. As a result of this, incorrect insertion can be prevented. On the other hand, the upper right rear portion of container part 12, in which supply opening 44 is provided, has a form wherein the corner is cut off. The respective sides thereof are in R-shaped forms. Top panel 400 of the container part is secured with screws, or the like, to an attachment plate 403 for the top panel of the container part.

(Application to Other Apparatuses)

[0044] Though the liquid supply device according to the present embodiment is described herein with reference to an example wherein liquid fuel is supplied to a heating apparatus, the liquid supply device according to the present invention is not limited to this application. The present invention is applicable in other apparatuses that hold some type of liquid. For example, the invention is applicable to a humidifier, which is an apparatus that

utilizes water as the liquid.

(Embodiment 2)

(Configuration)

[0045] A liquid supply device according to Embodiment 2 of the present invention is described below with reference to Fig. 5. Though the appearance of the liquid supply device is similar to that shown in Fig. 1, the bottom and the lower portions of the sides of top panel 400 of the container part are covered with a shielding plate 405a. On the other hand, the bottom and the lower portions of the sides of lid 402 above the kerosene refill opening are covered with a shielding plate 405b. Top panel 400 of the container part, handle 401 and lid 402 above the kerosene refill opening are all made of resin and shielding plates 405a and 405b are made of heat insulating material.

[0046] The structure of this liquid supply device in the vicinity of top panel 400 of the container part at the time when this liquid supply device is within housing 1 is described with reference to Figs. 6 and 7. The inner side-walls of the apparatus body that surrounding the space in which is placed the above described liquid supply device are covered with shielding walls 406 made of heat insulating material, as shown in Figs. 6 and 7, and shielding plates 405a and 405b and shielding walls 406 make contact with each other so as to surround container part 12 of the liquid supply device, which is contained in the apparatus body, in the condition wherein the liquid supply device is set within housing 1. Glass fiber, and the like, can be utilized as the heat insulating material that is formed into shielding plates 405a and 405b and shielding walls 406.

(Operation and Effects)

[0047] The bottoms and lower portions of the sides of top panel 400 of the container part and lid 402 above the kerosene refill opening are covered with shielding plates 405a and 405b and, therefore, heat that may be generated according to various reasons in container part 12 will not be transferred to top panel 400 of the container part or to lid 402 above the kerosene refill opening so that top panel 400 of the container part and lid 402 above the kerosene refill opening can be prevented from receiving thermal effects and prevented from melting or becoming thermally deformed even in the case where top panel 400 of the container part and lid 402 above the kerosene refill opening made of a resin that is susceptible to heat. Furthermore, container part 12, which is in the state of containment, is surrounded by shielding plates 405a and 405b and shielding walls 406 in the condition wherein the liquid supply device is within housing 1 and, therefore, effects from heat transfer can more surely be prevented. In particular a structure wherein shielding plates 405a and 405b and shield-

ing walls 406 make contact with each other so that container part 12 is surrounded in a continuous manner is preferable because this more surely prevents thermal effects.

5 **[0048]** Alternately, shielding plates 405a and 405b and shielding walls 406 are not limited to being made of heat insulating material but, rather, may be metal plates in the case where top panel 400 of the container part and lid 402 above the kerosene refill opening can be prevented from thermal deformation due to external heat and from hanging down onto, or dropping down onto, container part 12 as a result of becoming melted. Other fire retarding material may be used in place of metal plates.

10 **[0049]** Though it is not necessary for shielding plates 405a and 405b to completely separate container part 12 from top panel 400 of the container part of the container part, the above described complete separation is preferable.

20 (Application to Other Apparatuses)

[0050] Though the liquid supply device according to the present embodiment is described herein with reference to an example of a liquid supply device for supplying liquid fuel to a heating apparatus, the liquid supply device according to the present invention is not limited to this application. The present invention is applicable in other apparatuses that hold some type of liquid. The invention is applicable to an apparatus that utilizes water as the liquid. For example, a liquid supply device that stores water according to the invention is applicable to a humidifier.

25 **[0051]** Though such a liquid supply device may be provided as a part in any apparatus that holds a liquid, the application of the present invention to a liquid fuel combustion apparatus provided with an internal heat source wherein ignition of the internal fuel is not desired is advantageous because thermal interaction between the inside and the outside of the apparatus can be prevented.

30 (Effects of the Invention)

35 **[0052]** According to the first invention the top panel of the container part, which also serves as a lid that is connected to the body of the apparatus according to a prior art, is secured to the container part for integration with the container part and, therefore, the container part and the top panel of the container part can be handled as a single unit, and the lid separately provided to the body of the apparatus according to the prior art becomes unnecessary. As a result, it becomes unnecessary for the user to open and close the lid connected to the body of the apparatus at the time of refill or exchange of the liquid and, thus, labor is reduced.

40 **[0053]** The second invention provides a shielding body interposed between the container part and the top

panel of the container part and, therefore, thermal interaction between the container part and the top panel of the container part can be prevented and the top panel of the container part can be prevented from melting and hanging down or dropping down through the selection of appropriate material for the shielding body. As a result the ignition of fuel in the container part due to melting of the top panel of the container part caused by external heat can be prevented and the top panel of the container part can be prevented from becoming damaged due to abnormal heat emission from inside the container part.

[0054] In addition, the above described embodiments disclosed herein are illustrative from all points of view and are not limitative. The scope of the present invention is not defined by the above description but, rather, is defined by the claims and is intended to include meanings equivalent to the claims and all modifications within the scope.

Industrial Applicability

[0055] Both the first and second inventions are applicable to a liquid fuel combustion apparatus, such as a kerosene fan heater or a kerosene heater. Furthermore, the inventions are applicable to a liquid supply device, including a tank for storage of liquid, mounted in such an apparatus. In addition, the inventions are applicable to a liquid supply device provided in a humidifier, or the like.

Claims

1. A liquid supply device, contained inside of the body of an apparatus having a top surface, for supplying liquid to said body of the apparatus in accordance with the operation of said body of the apparatus, said device comprising:

a container part (12) that is freely removable/attachable from/to the predetermined attachment position inside of said body of the apparatus and that can store said liquid; and a top panel (400) of the container part formed on the top surface of said container part (12), wherein said top panel (400) of the container part covers the opening provided in the top surface of said body of the apparatus in order to contain said container part (12) inside of said body of the apparatus when said container part (12) is attached to said attachment position.

2. A liquid supply device, contained inside of the body of an apparatus having a top surface, for supplying liquid to said body of the apparatus in accordance with the operation of said body of the apparatus, said device comprising:

a container part (12) that is freely removable/attachable from/to the predetermined attachment position inside of said body of the apparatus and that can store said liquid; and a top panel (400) of the container part formed on the top surface of said container part (12), wherein

said top panel (400) of the container part is located approximately at the same height as the top surface of said body of the apparatus when said container part (12) is attached to said attachment position.

3. The liquid supply device according to claim 1, wherein

said top panel (400) of the container part is formed integrally with said container part (12).

4. The liquid supply device according to claim 1, wherein

said top panel (400) of the container part is provided with a handle to be held at the time that said container part (12) is carried.

5. The liquid supply device according to claim 1, wherein

said container part (12) is provided with an opening for liquid through which said liquid enters said container part (12), and said opening for liquid can be opened only under the condition that said container part (12) is removed from said body of the apparatus.

6. A liquid fuel combustion apparatus comprising:

a body of an apparatus having a top surface; and a liquid supply device, contained inside of said body of the apparatus having a top surface, for supplying liquid to said body of the apparatus in accordance with the operation of said body of the apparatus, wherein said liquid supply device includes:

a container part (12) that is freely removable/attachable from/to the predetermined attachment position inside of said body of the apparatus and that can store said liquid; and a top panel (400) of the container part formed on the top surface of said container part (12), and said top panel (400) of the container part covers the opening provided in the top surface of said body of the apparatus in order

- to contain said container part (12) inside of said body of the apparatus when said container part (12) is attached to said attachment position.
7. A liquid fuel combustion apparatus comprising:
- a body of an apparatus having a top surface; and
 - a liquid supply device, contained inside of said body of the apparatus having a top surface, for supplying liquid to said body of the apparatus in accordance with the operation of said body of the apparatus, wherein said liquid supply device includes:
 - a container part (12) that is freely removable/attachable from/to the predetermined attachment position inside of said body of the apparatus and that can store said liquid; and
 - a top panel (400) of the container part formed on the top surface of said container part (12), and
 - said top panel (400) of the container part is located approximately at the same height as the top surface of said body of the apparatus when said container part (12) is attached to said attachment position.
8. The liquid fuel combustion apparatus according to claim 6, wherein
- said top panel (400) of the container part is formed integrally with said container part (12).
9. The liquid fuel combustion apparatus according to claim 6, wherein
- said top panel (400) of the container part is provided with a handle to be held at the time that said container part (12) is carried.
10. The liquid fuel combustion apparatus according to claim 6, wherein
- said container part (12) is provided with an opening for liquid through which said liquid enters said container part (12) and, said opening for liquid can be opened only under the condition wherein said container part (12) is removed from said body of the apparatus.
11. A liquid supply device, contained inside of the body of an apparatus having a top surface, for supplying liquid to said body of the apparatus in accordance with the operation of said body of the apparatus, said device comprising:
- a container part (12) that is freely removable/attachable from/to the predetermined attachment position inside of said body of the apparatus and that can store said liquid;
 - a top panel (400) of the container part formed on the top surface of said container part (12); and
 - a shielding body (405a, 405b) interposed between said container part (12) and said top panel (400) of the container part.
12. The liquid supply device according to claim 11, wherein
- said shielding body (405a, 405b) separates said container part (12) from the entire surface of said top panel (400) of the container part.
13. The liquid supply device according to claim 11, wherein
- said shielding body (405a, 405b) is made of heat insulating material.
14. A liquid fuel combustion apparatus comprising:
- a body of an apparatus having a top surface; and
 - a liquid supply device, contained inside of said body of the apparatus having a top surface, for supplying liquid to said body of the apparatus in accordance with the operation of said body of the apparatus, wherein said liquid supply device includes:
 - a fuel container part that is freely removable/attachable from/to the predetermined attachment position inside of said body of the apparatus and that can store said liquid;
 - a top panel of the fuel container part formed on the top surface of said fuel container part; and
 - a shielding body (405a, 405b) interposed between said fuel container part and said top panel of the fuel container part.
15. The liquid fuel combustion apparatus according to claim 14, wherein
- said shielding body (405a, 405b) separates said fuel container part from the entire surface of said top panel of the fuel container part.
16. The liquid fuel combustion apparatus according to claim 14, wherein
- said shielding body (405a, 405b) is made of

heat insulating material.

17. The liquid fuel combustion apparatus according to claim 14, wherein

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said shielding body (405a, 405b) is made of metal.

18. The liquid fuel combustion apparatus according to claim 14, wherein

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said body of the apparatus includes a shielding wall (406) on a side of a recess for containing said liquid supply device, and said shielding body (405a, 405b) and said shielding wall (406) contact each other so as to provide a structure that surrounds said fuel container part in a continuous manner when said liquid supply device is attached at said attachment position.

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FIG.1

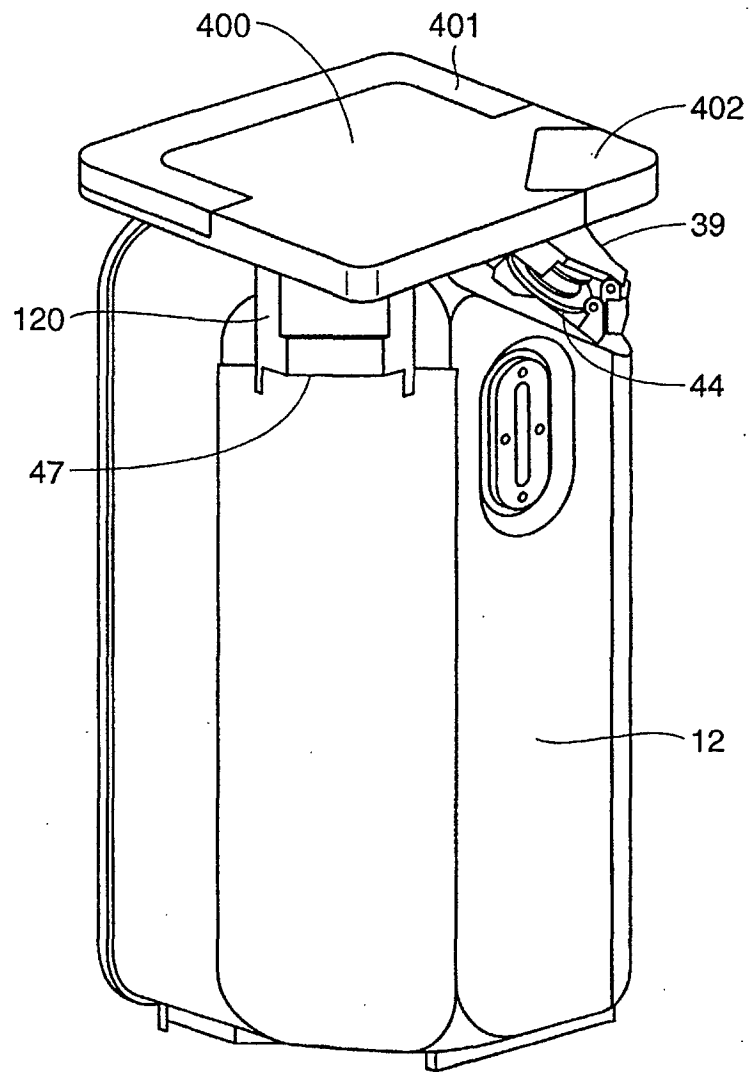


FIG.2

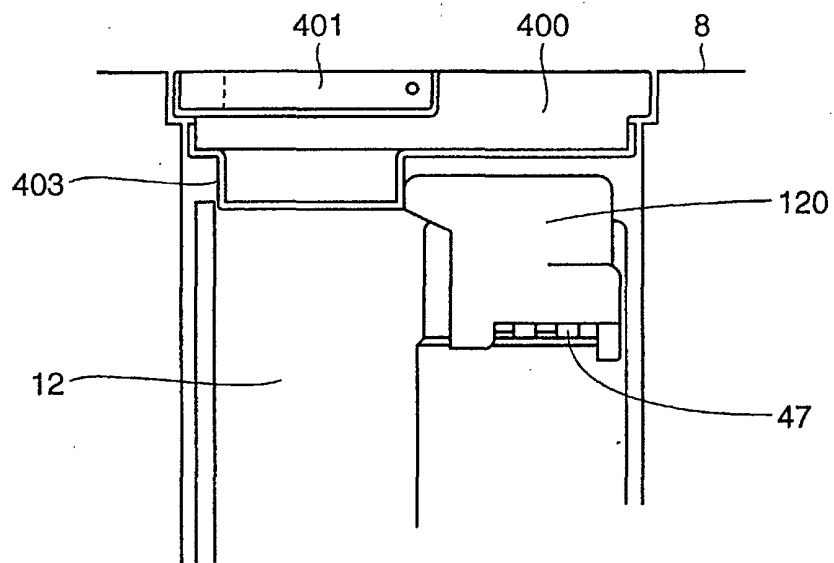


FIG.3

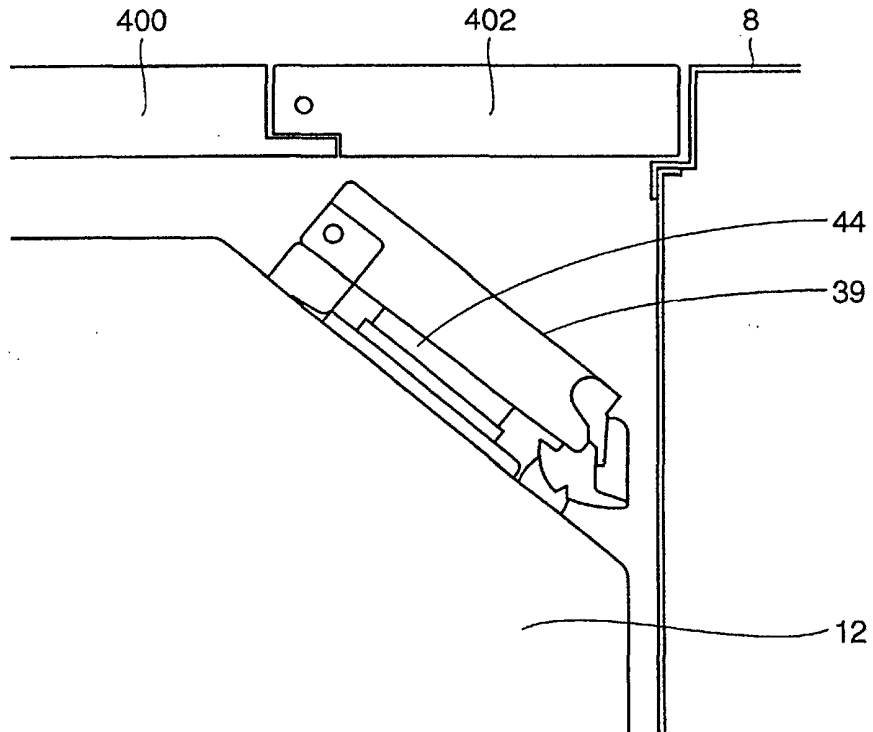


FIG.4

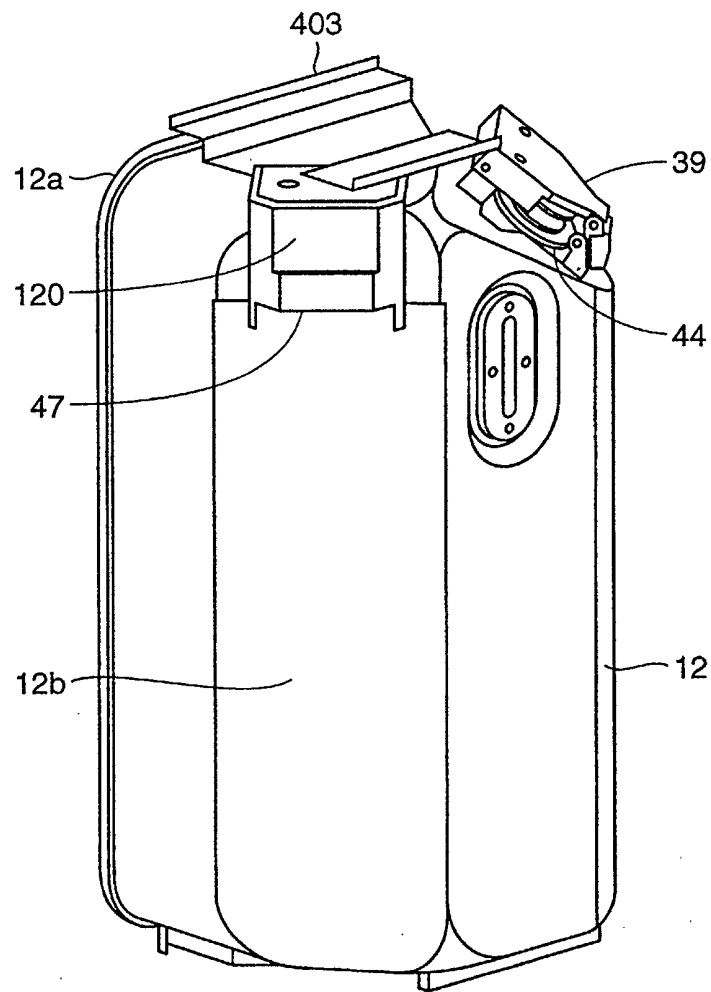


FIG.5

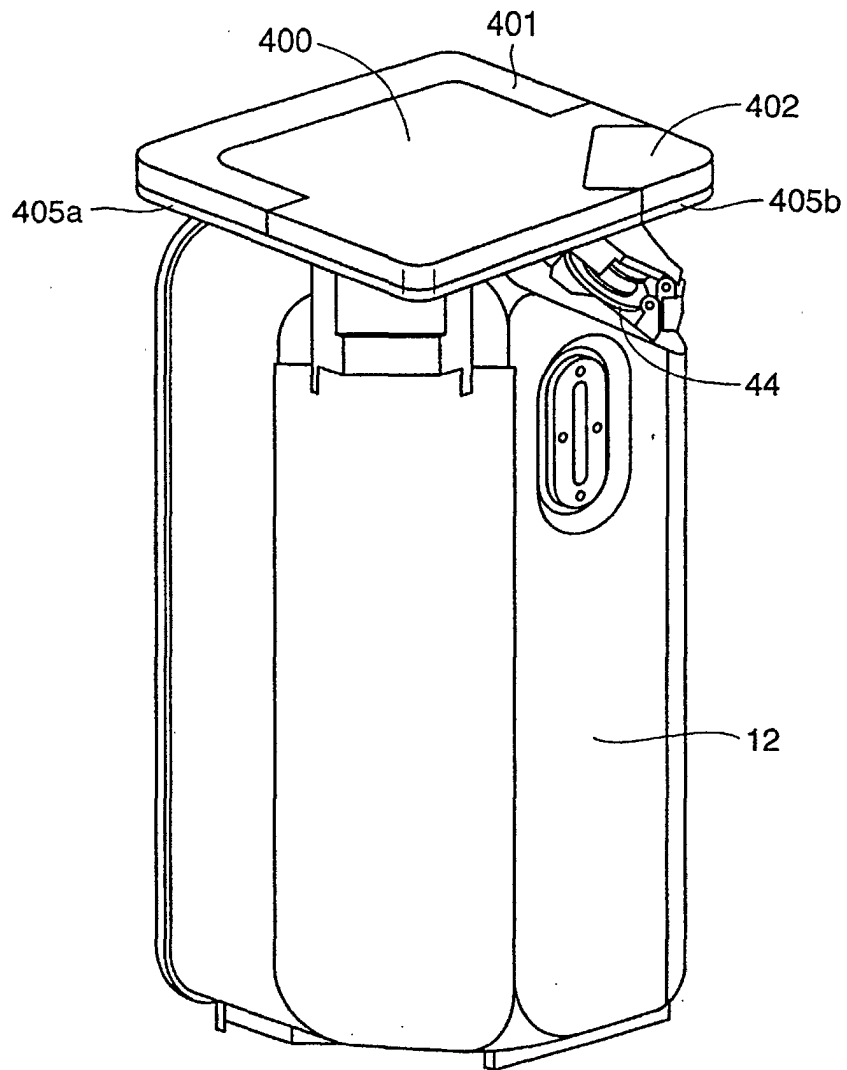


FIG.6

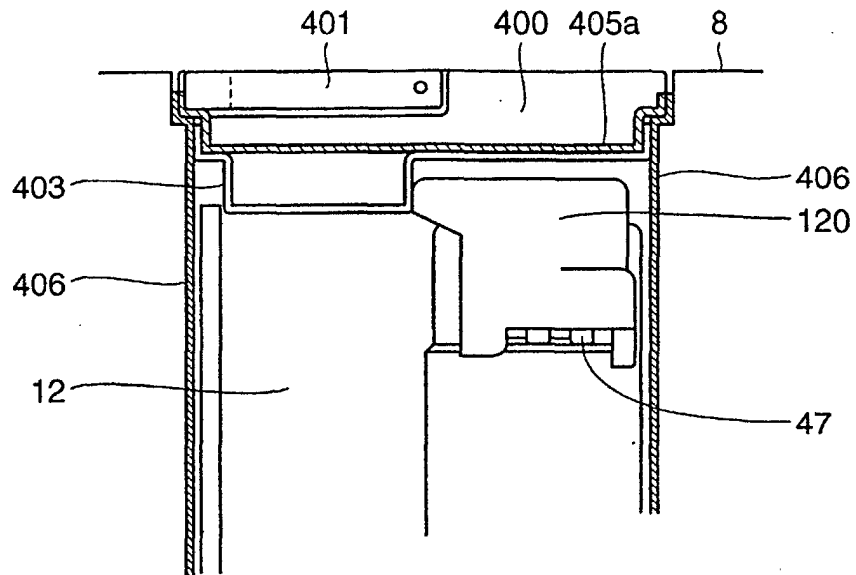


FIG.7

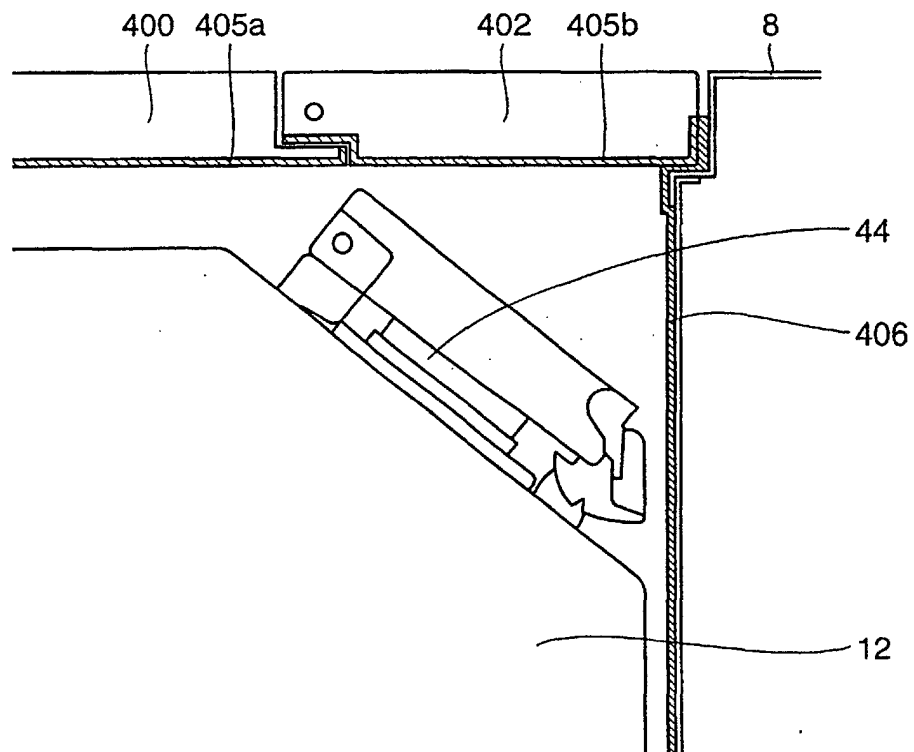


FIG.8

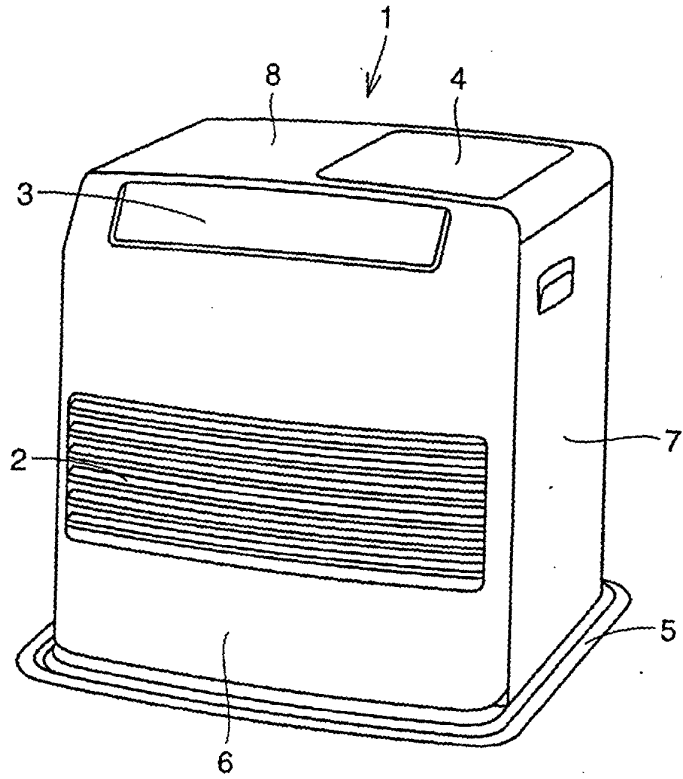


FIG.9

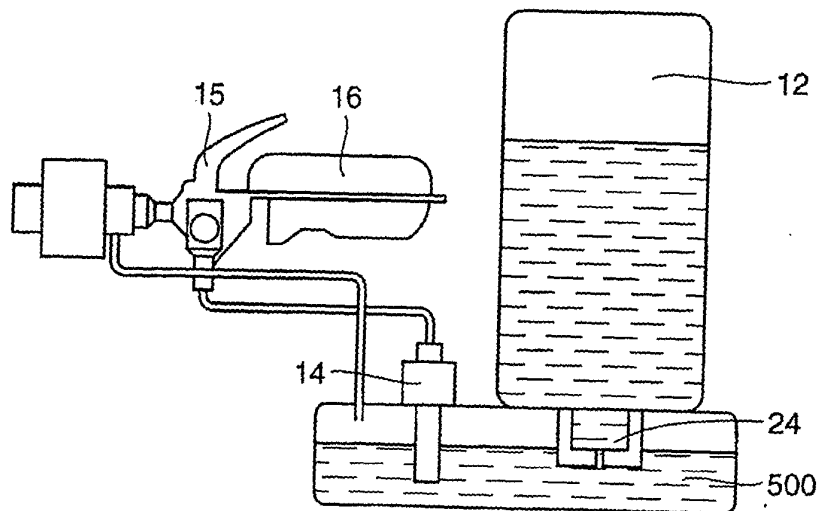


FIG.10

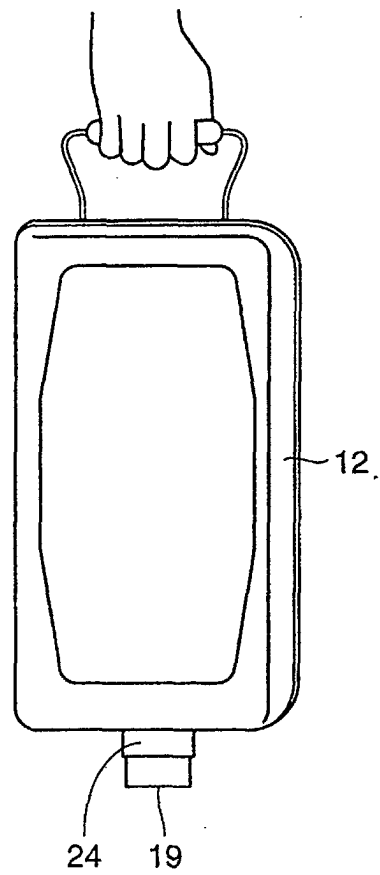


FIG.11

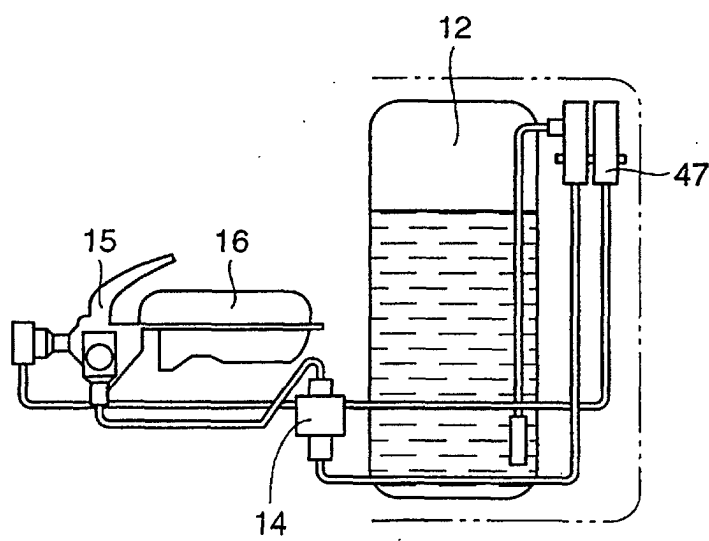


FIG.12

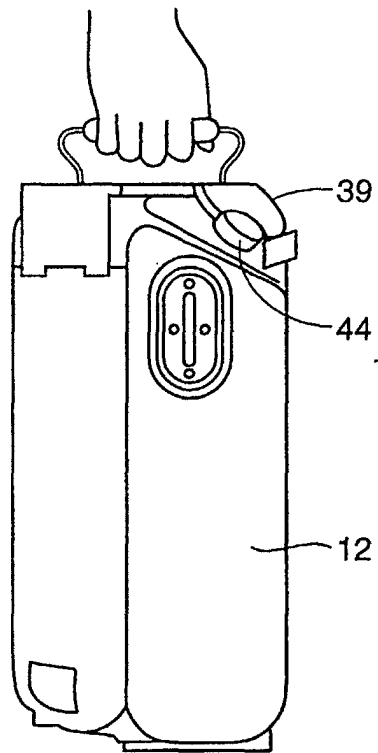
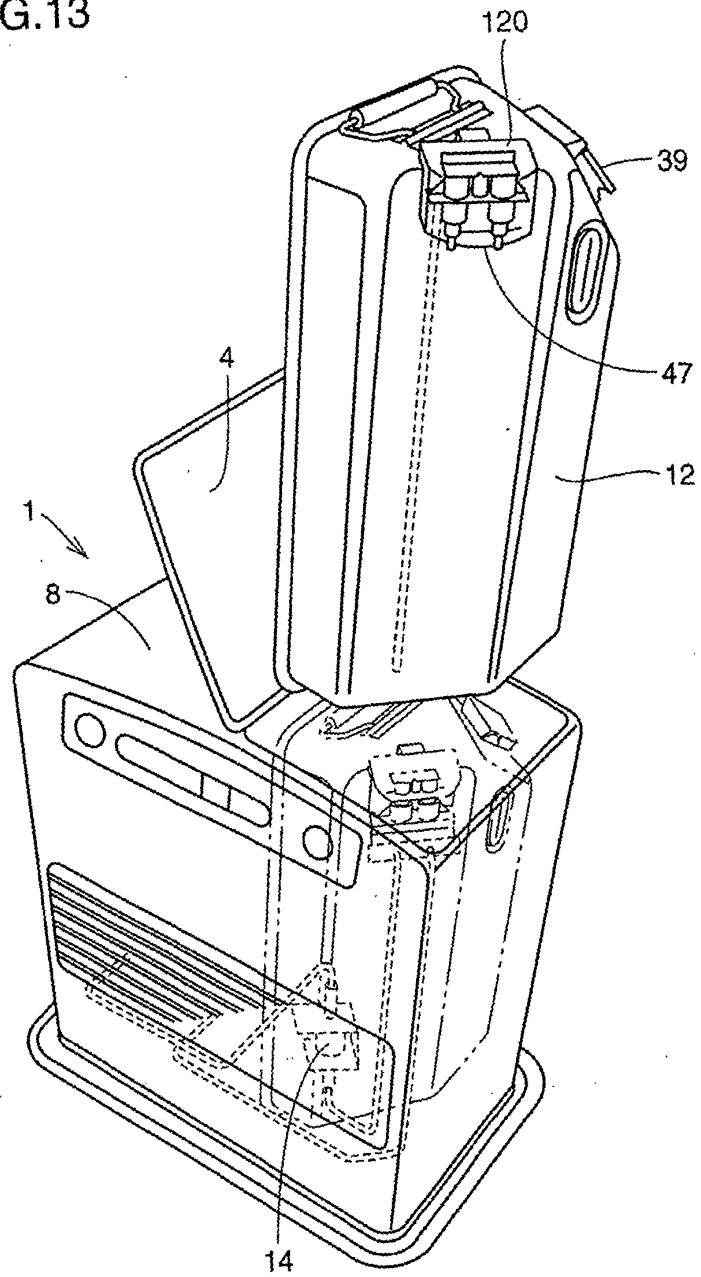


FIG.13



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/11220

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁷ F23K 5/14 F24F 6/00		
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) Int.Cl ⁷ F23K 5/14 F24F 6/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2002 Kokai Jitsuyo Shinan Koho 1971-2002 Jitsuyo Shinan Toroku Koho 1996-2002		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2000-337625 A (Matsushita Electric Ind. Co., Ltd.), 08 December, 2000 (08.12.2000), (Family: none)	1-10
Y		11-17
A		18
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.65384/1979 (Laid-open No.167042/1980) (Mitsubishi Electric Corporation), 01 December, 1980 (01.12.1980), description, page 2, lines 14 to 20, (Family: none)	11-17
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No.123322/1981 (Laid-open No.28221/1983) (Tokyo Shibaura Denki K.K.), 23 February, 1983 (23.02.1983), (Family: none)	13,16
☒ Further documents are listed in the continuation of Box C. ☐ See patent family 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 17 January, 2002 (17.01.02)		Date of mailing of the international search report 29 January, 2002 (29.01.02)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/11220

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-39137 A (Sharp Corporation), 08 February, 2000 (08.02.2000), (Family: none)	1-18
A	JP 64-41716 A (Matsushita Electric Ind. Co., Ltd.), 14 February, 1989 (14.02.1989), (Family: none)	1-18

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