

LIQUID-TYPE TRANSFORMERLESS THERMAL EVAPORATING DEVICE

The present invention relates to a liquid-type thermal evaporating device which evaporates a thermal evaporating agent by using a positive temperature coefficient thermistor in a heater to be heated and further, relates to a liquid-type thermal evaporating device which does not cause a difference in consuming time of the thermal evaporating agent even when it is heated within the range of voltage from 100 V to 240 V of commercial electric source.

As shown in Fig. 8, a liquid-type thermal evaporating device has such a constitution that a core 8 for sucking up a thermal evaporating agent is put into a tank 6 which is filled with the thermal evaporating agent; a heater unit 9 is provided on the circumference of the core 8 which projects on the tank 6; an electric power is applied to the heater unit 9 to be heated; the caused heat is transmitted to the core 8; and the thermal evaporating agent sucked up in the core 8 is evaporated and is evaporatingly discharged in a room.

Heater units used in the usual liquid-type thermal evaporating devices are incorporated with a positive temperature coefficient thermistor and the positive temperature coefficient thermistor changes its exothermic temperature in proportion to an applied voltage.

The liquid-type thermal evaporating device makes a heater unit heat by using a commercial electric source. The voltage of the commercial electric

This Sheet Has Been Replaced



REPLACED SHEETS	SG
☒ Description : paged ...1... to paged ...21...	
☒ Claim(s) : paged ...22... to paged ...-	
☒ Drawing(s) : paged ...4... to paged ...5...	
☒ Abstract : paged ...23... to paged ...-	
DATE OF RECEIPT	

source is unified at AC 100 V in Japan. Some countries in the world use 220 V or 240 V as the voltage of the commercial electric source. A part of the countries uses the both voltages of 100 V and 220 V or 100 V and 240 V of the voltage of the commercial electric source.

For example, it has been said that the exothermic temperature caused when the positive temperature coefficient thermistor for 100 V is applied with 220 V rises more than 7 °C in comparison with a case that the exothermic temperature coefficient thermistor is heated at 100 V of the applied voltage.

When the exothermic temperature rises more than 7°C from a preset temperature, the evaporating amount of the thermal evaporating agent is abnormally increased and thus, it can not satisfy the predetermined days of the consuming term of the thermal evaporating agent filled in a tank. For liquid-type thermal evaporating device for an export to countries in which the voltage of the commercial electric source is used at 220 V or 240 V, it can be dealt with by incorporating a heater unit exclusively used for 220 V or 240 V in such a device. On the other hand, for the devices for export to a part of the countries in the world in which the both voltages of 100 V and 220 V or 100 V and 240 V are used, it is actual circumstances, as shown in Fig. 8, to equip a transformer 15 on a bottom lid 1 to which a tank is provided and further, to provide a switch for changing over a voltage of a transformer (not shown) and use a transformer 15 according to the necessity.

However, the transformer used in the above-mentioned object has rather large volume (e.g., 40 x 26 x 30 mm). For this reason, the bottom lid 1 is required to have a size in which the both the tank 6 and the transformer 15 can be placed and as a result, it is obliged to increase the weight and the volume

This Sheet Has Been Replaced



of a device body of the thermal evaporating device.

In this connection, Japanese Utility Model Publication No. Hei 1-40617 discloses an electric soldering iron which is used in both Japan and U.S.A. by using a positive temperature coefficient thermistor. However, this iron is only intended not to cause the breakdown of Joule heat until high voltage by improving the withstand voltage of the positive temperature coefficient thermistor, but not to intend to reduce the difference of the temperatures at exothermic temperatures at 100 V of an applied voltage and at 220 V.

The object of the present invention is to provide a liquid-type transformerless thermal evaporating device which has small temperature difference of exothermic temperatures in spite of the degree of applied voltages and thus, does not cause the difference in consuming time of a thermal evaporating agent according to applied voltages.

In the liquid-type transformerless thermal evaporating device according to the present invention, a device body and a heater unit are combined and the heater unit is supplied an electricity to be heated so as to evaporate a thermal evalorating agent in a tank equipped in a device body of the liquid-type transformerless thermal evaporating device.

The device body holds the tank filled with the thermal evaporating agent at a predetermined position.

The heater unit is held on the tank and heat a core for sucking-up the thermal evaporating agent and which is pull out from the tank, said heater unit having a transformerless exothermic body.

This Sheet Has Been Replaced



The transformerless exothermic body is a positive temperature coefficient thermistor and the voltage-current characteristic thereof has a region, over the range of at least 100 V to 240 V of applied voltage, which satisfies the conditions of

$$V_x + I_y = a \text{ (a is constant)}$$

in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y .

As shown in Fig. 1, a positive temperature coefficient thermistor (manufactured by OHIZUMI MFG. CO., LTD. in Japan; product name: PG0D-202YP5, hereinafter referred to as "transformerless exothermic body") which is sintered at 1350°C for two hours by adding 0.1 % by weight of SiO_2 and 0.020 % by weight of Mn to $(\text{Ba}_{0.856}\text{Pb}_{0.10}\text{Sr}_{0.04}\text{Y}_{0.004})\text{Ti}_{1.000}\text{O}_3$ shows a sudden standing-up of temperature-resistance characteristic after the Curie point (T_c). This respect is exemplified by Fig. 2 in that when the positive temperature coefficient thermistor is caused to heat above T_c , the current value is suddenly decreased in inverted proportion to the voltage value even though the applied voltage is increased and thus, it can be considered that the increase of electric power is suppressed. The voltage-current characteristic thereof is damped in extreme proximity to a linear line of 45° at the region of containing 100 V to 240 V of applied voltage, as shown in Fig. 2. Namely, it has been found that damping characteristic which satisfies the relationship of

$$V_x + I_y = a \text{ (a is constant)}$$

in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y . In Figs. 1 and 2, characteristics of the conventional thermistor elements are shown as broken lines for the comparison.

This Sheet Has Been Replaced



According to the transformerless exothermic body according to the present invention, when applied voltages are 100 V and 240 V as shown in Fig. 2, the change of consumptions of electric power, $P = VI$, is small and therefore, there is not almost difference in the exothermic temperatures in the range of 100 V to 240 V of applied voltage. In other words, the heating temperature is constant and even when the heater unit is heated at 220 V or 240 V or heated at 100 V, the time of all consumption of the thermal evaporating agent filled in the tank does not vary by the difference of voltages applied to the heater unit.

Therefore, the use of a transformer becomes unnecessary and the device body can be made small in size and can be lightened in weight.

As described above, according to the present invention, the exothermic temperature of the heater unit can be kept almost constant in 100 V, 220 V or 240 V of the applied voltage and therefore, there becomes no necessity of incorporating a transformer for lowering a voltage in a device body unlike the conventional devices. Thus, the products for export and the products used in Japan can be manufactured by the same way and further, can be made in a small size and be lightened in its weight. When an existing device body for an export is used, a space in the cover from which the transformer is removed can be utilized as a space for housing a distribution of electric source.

Moreover, according to the present invention, since the incorporation of the transformer becomes unnecessary, distribution circuits themselves which are accompanied with the establishment of the transformer become unnecessary and therefore, the structure can be simplified and the manufacturing steps and assembling steps can be reduced.

This Sheet Has Been Replaced



Figure 1 is a view showing a temperature-resistance characteristic of the positive temperature coefficient thermistor.

Figure 2 is a view showing a voltage-current characteristic of the positive temperature coefficient thermistor.

Figure 3 is a front-longitudinal cross-sectional view showing one of the examples of the present invention.

Figure 4 is a partially sectional plan view showing a status of fixing a heater unit.

Figure 5 is a front-longitudinal cross-sectional view showing another example of the present invention.

Figure 6 is a front-longitudinal cross-sectional view further showing another example.

Figure 7 is a front-longitudinal cross-sectional view still further showing another example.

Figure 8 is a view showing a structure of the conventional liquid-type thermal evaporating device.

Now, the present invention is described in detail referring to the attached drawings. Fig. 3 shows a liquid-type transformerless thermal evaporating device according to the present invention. The liquid-type transformerless thermal evaporating device has a device body and a heater unit 3.

The body device houses a tank 6 filled with a thermal evaporating

This Sheet Has Been Replaced



agent 9 and keeps it at a predetermined position therein, and has a bottom lid 1, a supporting frame 2 and a cover 4. The bottom lid 1 constitutes a bottom of the device body of the thermal evaporating device and is provided with a power-supply switch 5. The supporting frame 2 is integrally formed on the center of the upper face of the bottom lid 1.

The supporting frame 2 is opened at its one face and receives a tank 6 in the inside thereof through said opened portion so as to support the tank 6 at the predetermined position in the device body. The cover 4 regulates an evaporatingly discharged amount of the thermal evaporating agent from the tank 6 and also takes a role of decoration. The cover 4 has no bottom at its lower face and has an opening 14 for evaporatingly discharging the thermal evaporating agent at a part of its upper face to cover the supporting frame 2. The no-bottom lower face of the cover 4 is covered by the bottom lid 1 so as to be freely put on a lid.

The tank 6 is a container in which the thermal evaporating agent 9 is filled and is inserted with a core 8 for sucking up the thermal evaporating agent through an upper lid 7. A part of the core 8 is pulled out on the upper lid 7.

The heater unit 3 is constituted in such a manner that a transformerless exothermic body 10 is incorporated inside of a cylindrical case 11. A through-hole 12 is provided at the center of the case 11 and as shown in Fig. 4, flanges 13 provided at two portion of the peripheral edge are screwed on the upper face of the supporting frame 2. The through-hole 12 is a hole through which the core 8 pulled out on the tank 6 passes.

In this example, according to the operation of an power-supply switch

This Sheet Has Been Replaced



5, the power-supply is turn on to generate the electricity of heater unit 3. Then, the transformerless exothermic body 10 in the heater unit 3 is heated and the thermal evaporating agent drawn up in the core 8 is evaporated and evaporatingly discharged outside of the device body through the opening 14 of the cover 4. In this case, the air taken from an air-intaking portion 16 of the cover 14 rises up towards the opening 14 of the cover 4 which is warmed, so that the evaporating discharge of the thermal evaporating agent can be effectitively conducted.

Table 1 shows a comparison of time of consuming the whole amount of a thermal evaporating agent in cases that the heater unit 3 is heat-generated by 100 V of applied voltage and that the heater unit 3 is heat-generated by 220 V of applied voltage. Liquid-type transformerless thermal evaporating device which were used in the tests are listed below.

1) Transformerless exothermic body:

positive temperature coefficient thermistor manufactured by

OHIZUMI MFG. CO., LTD. in Japan

Product name: "PGOD-202YP5"

The product is manufactured by forming patterns of arc-segments each having 1.34 cm in major diameter, 0.78 cm in inside diameter, 0.36 cm in thickness and 100 ° at central angle and sintering the patterns at more than 1330 °C for 2 hours. The both faces of the pattern are provided with electrodes and a pair of thermistor elements which is sandwiched between terminal fittings, which is housed in a case of the heater unit 3. Ten pieces were optionally selected among the products which were manufactured in mass production as the positive temperature coefficient thermistors (product name:

This Sheet Has Been Replaced



PGOD-202YP5). These ten pieces are named as specimens A to J.

2) Thermal evaporating agent:

liquid-type electric mosquito-fuge liquid (product name: Earth NO MAT (registered trademark) for 30 days (30 days in use of 12 hours per day)

45 ml of the liquid were filled in a tank.

Table 1 shows evaporating and diffusing time (hour) of thermal evaporating agent at the time of 100 V being applied and at the time of 220 V being applied with respect to the specimens A to J. The difference is an evaporating time difference of thermal evaporating agents at 100 V-applied voltage and 200 V-applied voltage.

This Sheet Has Been Replaced

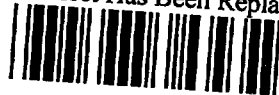


Table 1

		Evaporating and diffusing time of thermal evaporating agent (hr.)		
specimen	R_{25} (K Ω)	applied voltage of 100 V	applied voltage of 220 V	difference
A	0.51	337	311	26
B	0.52	332	308	24
C	0.58	345	318	27
D	0.68	343	315	28
E	0.74	362	330	32
F	0.80	373	340	33
G	0.88	376	342	34
H	0.94	393	357	36
I	1.10	396	360	36
J	1.41	418	381	37
average	—	367	336	31

According to the result of the Table 1, the time for consuming the thermal evaporating agent in every specimens was short in the case of the applied voltage of 220 V in comparison with the case of the applied voltage of 100 V. However, the difference of time was only 31 hours at the longest. As the evaporating times of the thermal evaporating agent were varied by the influences of the kinds of the evaporating agents, room temperature, the distance between a core for sucking up the thermal evaporating agent and an

This Sheet Has Been Replaced



exothermic body, the measurements were conducted in the same conditions as much as possible. Therefrom, it was recognized that there caused the difference of 12 hours for consuming time of the whole liquid of 45 ml of the thermal evaporating agent 9 if there is a difference of 1 °C at the exothermic temperatures of the applied voltages 220 V and 100 V. Therefore, if the temperature difference is 7 °C, the difference of the consuming time is 84 hours.

Although Table 1 shows the comparisons in the applied voltage 100 V and the applied voltage 220 V, the time of consuming the whole liquid was not greatly varied in the case of 240 V of the applied voltage in comparison with the case of 100 V of the applied voltage.

Examples of the thermal evaporating agent used in the present invention are various kinds of agents which are used for deodorization, fragrance emittance, fungicide, repellence, prevention of mold, regulation of plant growth, herbicide, insecticide, acaricide, anticide, borericide, and are listed up below.

Insecticidal and acaricidal agent:

- * 3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl dl-cis/trans-chrysanthemate
(common name: allethrins, commercial name: Pinamin, manufactured by Sumitomo Chemical Industries, Ltd. in Japan (hereinafter referred to as "AA"))
- * 3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl d-cis/trans-chrysanthemate
(commercial name: Pinaminforte, manufactured by Sumitomo Chemical Industries, Ltd. in Japan (hereinafter referred to as "AB"))
- * d-3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl d-trans-chrysanthemate
(commercial name: Exylin manufactured by Sumitomo Chemical Industries,

This Sheet Has Been Replaced



Ltd. in Japan (hereinafter referred to as "AC")

* 3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl d-trans-chrysanthemate

(common name: bioarethrins, hereinafter referred to as "AD")

* N-(3,4,5,6-tetrahydrophthalimide)-methyl dl-cis/trans-chrysanthemate

(common name: phthalthrin, commercial name: Neopinamin, manufactured

by Sumitomo Chemical Industries, Ltd. in Japan (hereinafter referred to as "AE")

* 5-benzyl-3-furylmethyl d-cis/trans-chrysanthemate

(common name: rethmetrin, commercial name: Crislonforte, manufactured by Sumitomo Chemical Industries, Ltd. (hereinafter referred to as "AF")

* 5-(2-propargyl)-3-furylmethyl chrysanthemate

(common name: flasmetrin, hereinafter referred to as "AG")

* 3-phenoxybenzyl 2,2-dimethyl-3-(2',2'-dichloro)vinylcyclopropane carboxylate

(common name: permeterin, commercial name: Exmin, manufactured by

Sumitomo Chemical Industries, Ltd., hereinafter referred to as "AH")

* 3-phenoxybenzyl d-cis/trans-chrysanthemate

(common name: phenothrin, commercial name: Sumithrin, manufactured by

Sumitomo Chemical Industries, Ltd., hereinafter referred to as "AI")

* α -cyanophenoxybenzyl isopropyl-4-chlorophenylacetate

(common name: phenvalelate, commercial name: Sumisaijin, manufactured

by Sumitomo Chemical Industries, Ltd., hereinafter referred to as "AJ")

* (S)- α -cyano-3-phenoxybenzyl (1R, cis)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (hereinafter referred to as "AL")

* (R,S)- α -cyano-3-phenoxybenzyl (1R,1S)-cis/trans-3-(2,2-dichlorovinyl)-2,2-

This Sheet Has Been Replaced



- dimethylcyclopropanecarboxylate (hereinafter referred to as "AM")
- * α -cyano-3-phenoxybenzyl d-cis/trans-chrysanthemate (hereinafter referred to as "AN")
 - * 1-ethynyl-2-methyl-pentenyl cis/trans-chrysanthemate (hereinafter referred to as "AO")
 - * 1-ethynyl-2-methyl-2-pentenyl 2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropane-1-carboxylate (hereinafter referred to as "AP")
 - * 1-ethynyl-2-methyl-2-pentenyl 2,2,3,3-tetramethylcyclopropanecarboxylate (hereinafter referred to as "AQ")
 - * 1-ethynyl-2-methyl-2-pentenyl 2,2-dimethyl-3-(2,2-dichlorovinyl)cyclopropane-1-carboxylate (hereinafter referred to as "AR")
 - * Benfluslinplarestrin and isomers, analogues and derivatives thereof
 - * 0,0-dimethyl 0-(2,2-dichloro)vinylphosphate (hereinafter referred to as "AS")
 - * 0-isopropoxyphenyl methylcarbamate (hereinafter referred to as "AT")
 - * 0,0-dimethyl 0-(3-methyl-4-nitrophenyl)thionophosphate (hereinafter referred to as "AU code")
 - * 0,0-diethyl 0-2-isopropyl-4-methyl-pyrimidine-(6)-thiophosphate
 - * 0,0-dimethyl S-(1,2-dichloroethoxyethyl)-diotiphosphate

Vermin-repellent:

- * dimethylphthalate, 2,3,4,5-bis-(Δ_2 -butylane)-tetrahydrofuran, 2,3,4,5-bis-(Δ_2 -butylene)-tetrahydrofurfuryl alcohol, N,N-diethyl-m-triamide(DET), diethylamide caprylate, 2,3,4,5-bis-(Δ_2 -butylene)-tetrahydrofurfural, di-m-propyl-isocinchomeronate, secondary butylstyrylketone,

This Sheet Has Been Replaced



nonylstyrylketone, N-propylacetoanilide, 2-ethyl-1,3-hexandione,
 di-n-butylsuccinite, 2-butoxyethyl-2-furfuridenacetate,
 dibutylphthalate, tetrahydrothiophene, β -naphthol,
 diaryldisulfide, bis(dimethylthiocarbamoyl)disulfide, etc.

Rodent-repellent:

- * tetramethylthiuramdisulfite, guanidine, naphthalene cresol,
 cycloheximide, zinc dimethyldithiocarbamate, cyclohexylamine,
 N,N-dimethylsulphenyldithiocarbamate, etc.

Dog and cat-repellent:

- * 2,6-dimethyl-octadiene-(2,6)-al(8) (citral),
 0,0-diethyl S-2-ethylthioethyldithiophosphate (ETP),
 0,0-dimethyl S-2-isopropylthioethyldiophosphate (MIP), etc.

Bird-repellent:

- * γ -chlorarose, 4-(methylthio)-3,5-xylyl-N-methylcarbamate,
 4-aminopyridineanthraxinon, tetramethylthiuramdisulfide,
 diallyldisulfide, etc.

Rodent-exterminator

- * ANTU, monofluoro acetate soda, warfarin, coumachlor, fumarin,
 coumatetrallylsilylocido, norvomite, N-3-pyridylmethyl-N'-nitrophenylurea,
 endoside, α -naphthylthio urea, thiosemicarbazide, diphenacm, pival,
 chlorophasinon, scillatorene, calciferol, etc.

Agent for preventing ant

- * Belmetrin, Chlordane, etc.

Agent for preventing mold

- * α -promocinnamic aldehyde, N,N-dimethyl-N-phenyl-N'-(fluorodichloro-



methylthio)-sulfonamide, etc.

Plant growth regulator

- * 4-chlorophenoxy acetate, gibberellin, N-(dimethylamino)succinamide, α -naphthylamido, etc.

Deodorator

- * laurylic acid methacrylate (LMA), etc.

Perfume

- * citral, citronellal, etc.

The above-described thermal evaporating agents are formulated in a solution. Solvent for formulating the solution of the thermal evaporating agent is water and/or various kinds of organic solvents (inclusive of surfactant), typically, hydrocarbon solvents. Especially, it is preferable to use fatty hydrocarbon having the boiling range of 150 to 350 °C (paraffin hydrocarbon and unsaturated fatty hydrocarbon). Among them, n-paraffin and isoparaffine are most suitable since they have no toxicity in use, no odor and very less in risk of fire. The organic solvents other than the above-mentioned hydrocarbon are glycerine, propylene glycol, methanol, acetone, xylene, chlorocene, iso-propanol, chloroform, etc.

As the above-mentioned solvent solution may be used according to the kinds of thermal evaporating agents to be used, there is no special limitation. However, it is desirable to be adjusted to be normally about 0.2 to 10 % by weight in the concentration of a thermal evaporating agent, preferably, 0.3 to 8 % by weight.

The above-mentioned thermal evaporating agents can be arbitrarily added with various kinds of additives such as an agent for preventing clogging,

This Sheet Has Been Replaced



an effect-increasing agent, an agent for improving evaporatingly discharging ratio, a deodoring agent, perfume, etc. Examples of the agent for preventing clogging are BHT and BHA. Examples of the effect-increasing agent are piperonyl butoxide, N-propyl izol, MGK-264, Sinepirin 222, Sinepirin 500, Recen 384, IBTA, S-421, etc. Examples of the agent for improving evaporatingly discharging ratio are phenethylisothiocyanate, dimethyl himix acid.

Examples of the core for sucking up the thermal evaporating agent used in the thermal evaporating device according to the present invention are felt, cotton, pulp, nonwoven textile, asbestos, inorganic molded substances, organic molded substances, preferably, felt-made core, unglazed core, pulp-made core and core made of inorganic molded substance. The core made of the inorganic molded substance is, for example, prepared by solidifying a porcelian-porous inorganic fiber, glass-fiber inorganic fiber or asbesto inorganic fiber with a binding agent such as gypsum or bentonite, etc. Moreover, the core made of the inorganic molded substance may be prepared by simply using kaolin, active china clay, talc, diatomaceous earth, gypsum, clay, magnesium carbonate, perlite, bentonite, alumina, silica, alumina silica, titanium, vitreous volcanic stone-sintered powder, vitreous volcanic ashe-sintered powder, etc. or using them together with wood powder, charcoal powder, active charcoal, etc. which are hardened by textile size such as dextrin, starch, gum arabic, synthetic paste CMC, etc. Especially preferable core for sucking up the thermal evaporating agent is prepared by compounding 100 weigth part of the mineral powder and 10 to 300 weight parts of the wood power or the mixture of the wood powder and the equivalent weight of charcoal powder and/or active charcoal with the textile size to be 5 to 25 % by weight with respect to the total amount of the core for

This Sheet Has Been Replaced



sucking up the thermal evaporating agent, and further, by adding water thereto to be kneaded and being extrusion-molded and dried. The intaking speed of the core for sucking up the thermal evaporating agent is desirable to be 1 to 40 hours, preferably, 8 to 21 hours. The intaking speed means a value calculated by measuring a time taken from the immersion of a core for sucking up the thermal evaporating agent having 7 mm in diameter and 70 mm in length in an n-paraffin liquid having 25 °C of liquid temperature to the position of 15 mm from the lower part of the core to a time that the n-paraffin reaches to the top of the core. On top of the above-mentioned mineral powder, wood powder and textile size, coloring material such as Marakite green, etc., sorbic acid and salts thereof, fungicidal agent such as dehydroacetic acid, etc. may be combined in the core for sucking up the thermal evaporating agent, according to the necessity.

The method of conducting the evaporating discharge (of insecticidal agent) by applying the composition of the present invention to the present device can be similarly utilized in this type of the conventional devices. The thermal temperature is suitably decided according to the kinds of the thermal evaporatingly discharging agent and is not especially limited, but it is normal to be a surface temperature of the exothermic body within the range of about 40 to 150°C, preferably, 85 to 145 °C which correspond to about 30 to 135°C, preferably, about 70 to 130 °C of the surface temperature of the core for sucking up the thermal evaporating agent.

Fig. 5 is a longitudinally sectional view showing another example of the present invention. In Fig. 5, a heater unit 3 is supported by a supporting portion 2a and a lower-face no-bottom portion of a cover 4 is covered by a

This Sheet Has Been Replaced



bottom lid 1. The upper face of the bottom lid 1 is formed with a position-determining protrusion 15, and the side-face portion of the cover 4 is opened with an air-intake portion, and a gap 17 is formed between an outer peripheral face of a core 8 for sucking up the thermal evaporating agent and an inner peripheral face of the heater unit 3.

According to this example, the following advantages can be obtained that as the gap 17 and the air-intaking portion 16 are communicated to the open air, the diffusion efficiency of the effective components can be improved; and moreover, as the position of the tank 6 can be decided by the protrusion 15 on the upper face of the bottom lid 1, the centering of the core 8 for sucking up the thermal evaporating agent can be smoothly made and the function of the transformerless exothermic body can be extremely efficiently exerted.

Fig. 6 is a longitudinally sectional view showing still another example of the present invention. In Fig. 6, a supporting portion 2a has, at its almost center, a socket 18 and the inner periphery of the socket 18 is provided with an internal thread 17a. An external thread 6a of the tank 6 is screwed in an internal thread 18a of the socket 18. A core for sucking up the thermal evaporating agent of the tank 6 is inserted in the heater unit 3 so that the core 8 can vertically move. The bottom face of the cover 4 has no bottom and a leg-portion 19 is provided at an opening edge at the bottom-face portion of the cover 4. The bottom face of the tank 6 is raised up upwardly from the established face by the leg portion 19 for the support and accordingly, the air-intaking portion 16 is secured at the bottom face of the cover 4. Moreover, at the bottom face of the supporting portion 2a is provided air-intaking portions 16a which positions at the inner and outer peripheries of the

This Sheet Has Been Replaced



heater unit 3.

According to this example, as the socket 18 is provided at almost center of the supporting portion 2a, the project of the center of the core 8 for intaking a liquid can be easily carried out and therefore, excellent function of the transformerless exothermic body can be extremely effectively exerted. Furthermore, by rotating the tank 6 to vertically move the core 8 for sucking up the thermal evaporating agent with respect to the heater unit 3, the amount of evaporating discharge can be adjusted with a pitch of the external thread 6a.

Fig. 7 is a longitudinally sectional view showing a still another example of the present invention. The examples shown in Figs. 1 to 6 show the constitution that the device body houses the tank 6 in its inside to be stationarily held. In the example of Fig. 7, an external thread 6a of a tank 6 is screwed into an internal thread 18a provided at a socket 18 of a supporting portion 2a, and the tank 6 is exposed to the lower face of the device body and suspended therefrom to be held in the stationary position. Moreover, in this example, a power-source plug 20 which supplies an electric force to a transformerless exotherm body of the heater unit 3 is freely inserted in the device body. By directly inserting the power-source plug 20 into a power-source consent, it can be made to be codeless.

According to this example, a very compact-sized codeless device can be obtained as well as the similar advantages of the socket 18 in Fig. 6 can be obtained. Further, the socket 18 may be provided with supporting pieces having flexibility in place of the internal thread 18a so as to clamp the external thread 6a of the tank 6 by these supporting pieces.

This Sheet Has Been Replaced



In the examples shown in Figs. 3 and 6, such a mechanism can be provided that a code electrically connected between the heater unit and the power-supply consent is wound. This code-winding mechanism can employ either method of manually or automatically winding the code. In each example shown in Figs. 3 to 6, a type of hanging from a wall can be employed instead of the type of being placed on a floor. Furthermore, in each example shown in Figs. 3 to 6, as the thermal evaporating device, a timer can be provided to the device so as to arbitrarily set the evaporatingly discharging-time of the thermal evaporating agent. Further, a means to recognize a remaining amount of the thermal evaporating agent in the tank can be constituted by providing an optical sensor, a weight sensor, etc.

In the examples shown in Figs. 3 to 7, moreover, it is shown that the transformerless exothermic body is in an annular form, but the present invention is not limited thereto. U-letter form and a cylindrical form can be employed for the transformerless exothermic body. In a case that a U-letter shaped transformerless exothermic body is used, there is an advantage that the core for sucking up a thermal evaporating agent in the tank can be inserted from the side face of the transformerless exothermic body. In a case that a cylindrical transformerless exothermic body is used, an evaporatingly discharging amount of the thermal evaporating amount can be adjusted by changing the length of the core for sucking up the thermal evaporating agent to be inserted into the cylindrical transformerless exothermic body so that the heating area of the core for sucking up the thermal evaporating agent is changed.

As described above, the liquid-type transformerless thermal evaporating device according to the present invention can be used for the

This Sheet Has Been Replaced



evaporating discharge of deodorization, fragrance emittance, fungicide, repellence, prevention of mold and regulation of plant growth and other medicaments for household use and for business use.

This Sheet Has Been Replaced



CLAIMS:

1. A liquid-type transformerless thermal evaporating device having a combination of a device body and a heater unit (3) for evaporating a thermal evaporating agent (9) in a tank (6) provided in the device body by electrically heating the heater unit, characterized in that

the device body holds a tank (6) filled with a thermal evaporating agent (9) at a stationary position,

the heater unit (3) is held on the tank, for heating a core (8) for sucking up a thermal evaporating agent pulled out of the inside of the tank and has a transformerless exothermic body (10),

the transformerless exothermic body (10) is a positive temperature coefficient thermistor and the voltage-current characteristic thereof has a region, over the range of at least 100 V to 240 V of applied voltage, which satisfies the conditions of

$$V_x + I_y = a \text{ (a is constant)}$$

in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y .

This Sheet Has Been Replaced



ABSTRACTLIQUID-TYPE TRANSFORMERLESS THERMAL
EVAPORATING DEVICE

A device body is equipped with a heater unit (3) and a thermal evaporating agent (9) is filled in a tank (6), and a leading end of a core (8) for sucking up the thermal evaporating agent which is inserted in the tank (6) is inserted into the heater unit (3). The heater unit (3) is in an annular shape and is incorporated with a transformerless exothermic body (10). The transformerless exothermic body (10) is a positive temperature thermistor and the voltage-current characteristic thereof has a region, over the range of at least 100V to 240V of applied voltage, which satisfies the conditions of

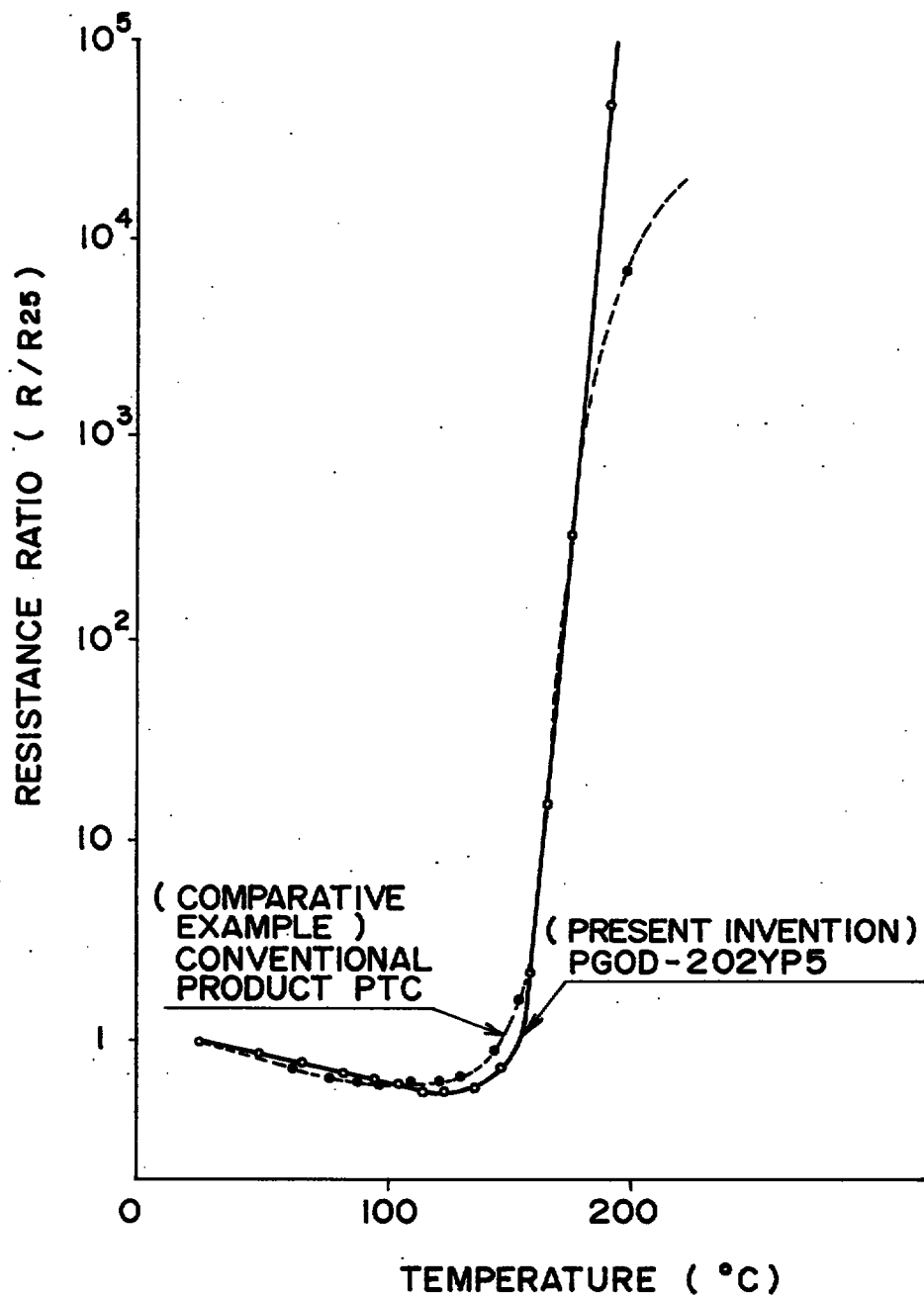
$$V_x + I_y = a \text{ (a is constant)}$$

in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y . Therefore, even though the applied voltages are 100 V and 240 V, the change of consumed current, $P=VI$ is small and there causes no difference in their exothermic temperatures in the range of the applied voltages of 100 V to 240 V. Thus, even though the applied voltage is 100 V or 240 V, there causes no difference in consuming time of the thermal evaporating agent. (Figure 3).

This Sheet Has Been Replaced



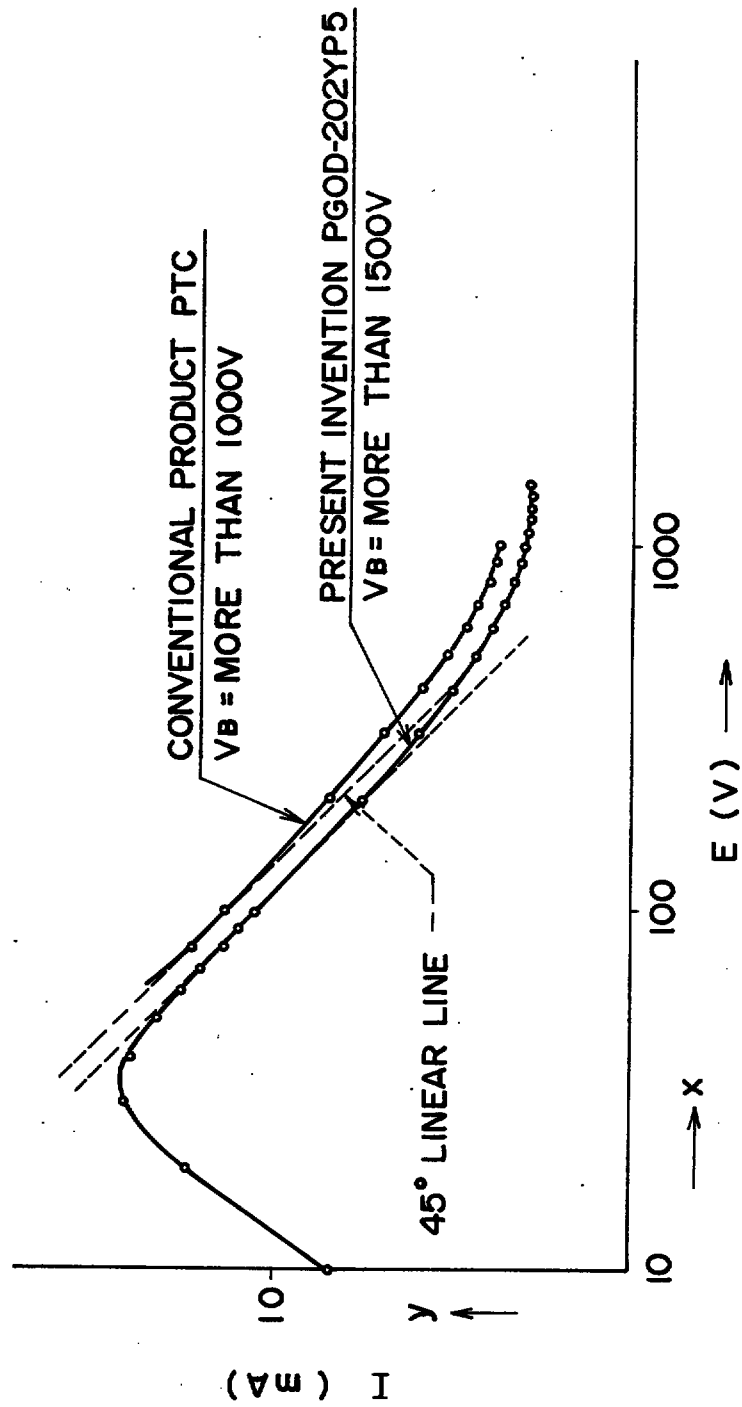
FIG. 1



This Sheet Has Been Replaced



FIG. 2



This Sheet Has Been Replaced

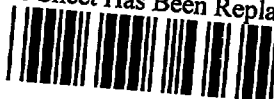


FIG. 3

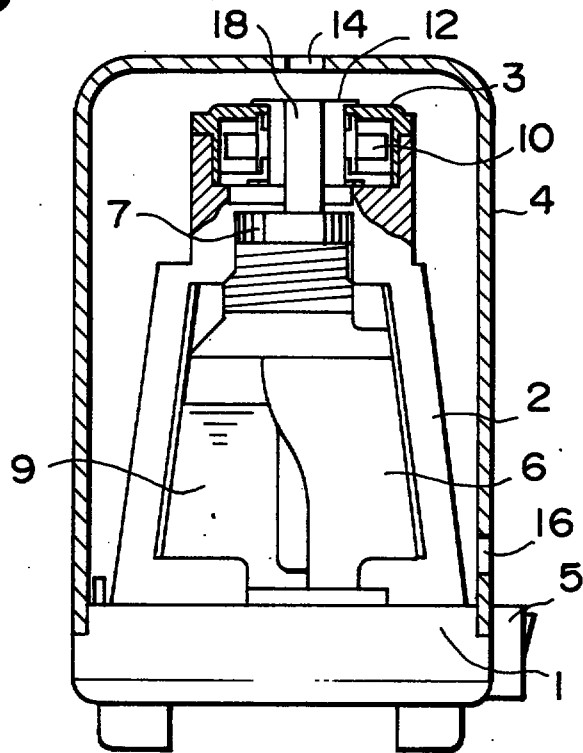
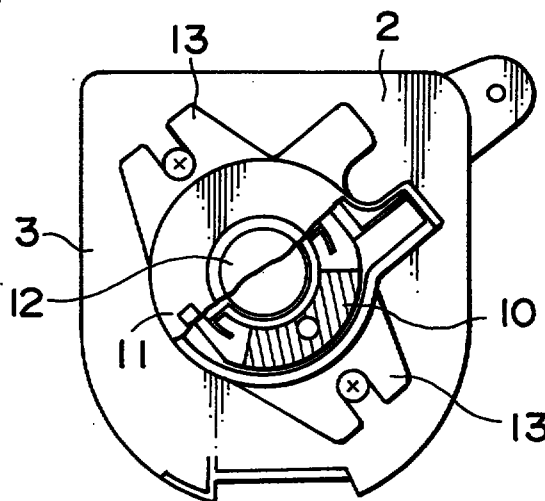
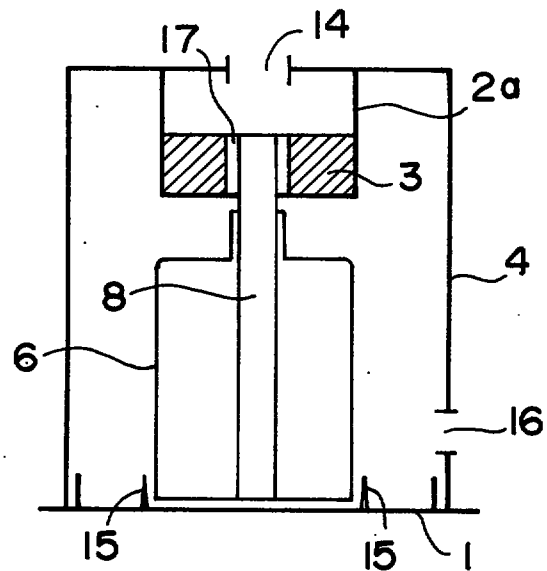
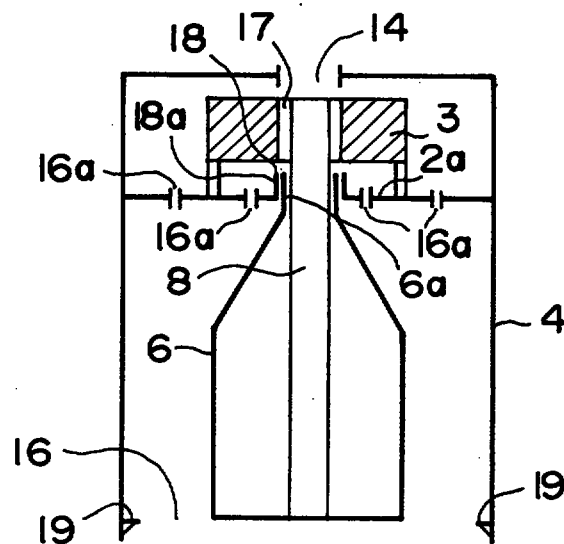


FIG. 4



This Sheet Has Been Replaced



FIG. 5**FIG. 6**

This Sheet Has Been Replaced



FIG. 7

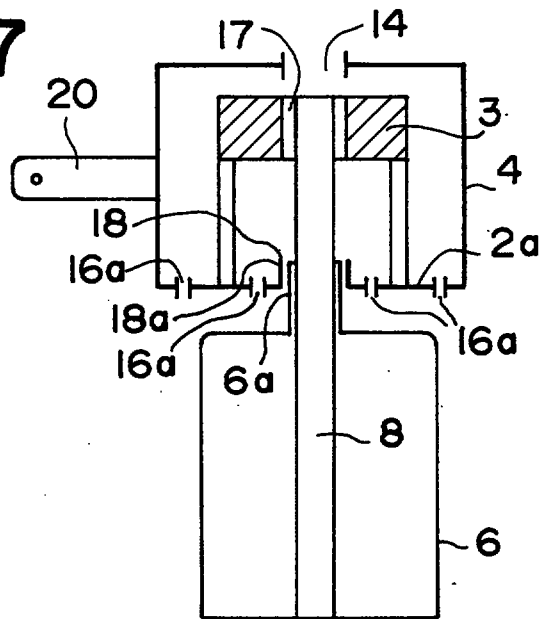
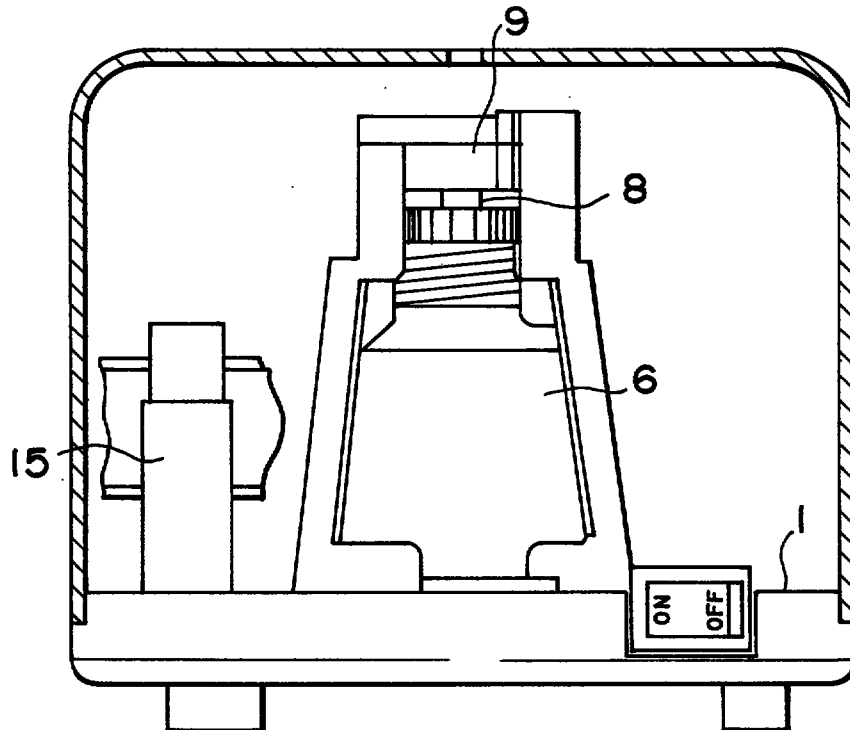
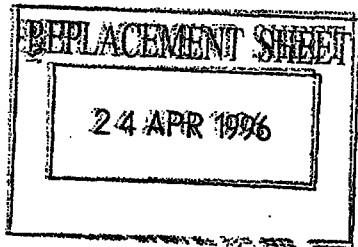


FIG. 8



This Sheet Has Been Replaced





1

REPLACEMENT SHEETS 50

☒ Description : paged 1. to paged 21.

☒ Claim(s) : paged 22. to paged 23.

☒ Drawing(s) : paged 24. to paged 25.

☒ Abstract : paged 26. to paged 27.

DATE OF RECEIPT 24/2/96

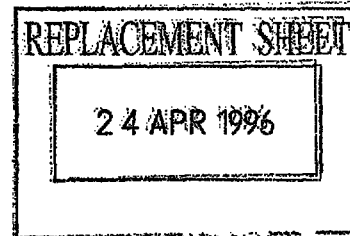
LIQUID-TYPE TRANSFORMERLESS THERMAL EVAPORATING DEVICE

The present invention relates to a liquid-type thermal evaporating device which evaporates a thermal evaporating agent by using a positive temperature coefficient thermistor in a heater to be heated and further, relates to a liquid-type thermal evaporating device which does not cause a difference in consuming time of the thermal evaporating agent even when it is heated within the range of voltage from 100 V to 240 V of commercial electric source.

As shown in Fig. 8, a liquid-type thermal evaporating device has such a constitution that a core 8 for sucking up a thermal evaporating agent is put into a tank 6 which is filled with the thermal evaporating agent; a heater unit 9 is provided on the circumference of the core 8 which projects on the tank 6; an electric power is applied to the heater unit 9 to be heated; the caused heat is transmitted to the core 8; and the thermal evaporating agent sucked up in the core 8 is evaporated and is evaporatingly discharged in a room.

Heater units used in the usual liquid-type thermal evaporating devices are incorporated with a positive temperature coefficient thermistor and the positive temperature coefficient thermistor changes its exothermic temperature in proportion to an applied voltage.

The liquid-type thermal evaporating device makes a heater unit heat by using a commercial electric source. The voltage of the commercial electric

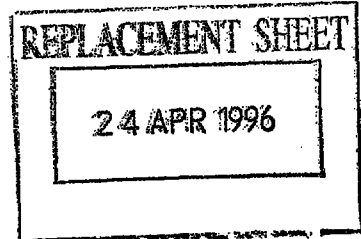


source is unified at AC 100 V in Japan. Some countries in the world use 220 V or 240 V as the voltage of the commercial electric source. A part of the countries uses the both voltages of 100 V and 220 V or 100 V and 240 V of the voltage of the commercial electric source.

For example, it has been said that the exothermic temperature caused when the positive temperature coefficient thermistor for 100 V is applied with 220 V rises more than 7 °C in comparison with a case that the exothermic temperature coefficient thermistor is heated at 100 V of the applied voltage.

When the exothermic temperature rises more than 7°C from a preset temperature, the evaporating amount of the thermal evaporating agent is abnormally increased and thus, it can not satisfy the predetermined days of the consuming term of the thermal evaporating agent filled in a tank. For liquid-type thermal evaporating device for an export to countries in which the voltage of the commercial electric source is used at 220 V or 240 V, it can be dealt with by incorporating a heater unit exclusively used for 220 V or 240 V in such a device. On the other hand, for the devices for export to a part of the countries in the world in which the both voltages of 100 V and 220 V or 100 V and 240 V are used, it is actual circumstances, as shown in Fig. 8, to equip a transformer 15 on a bottom lid 1 to which a tank is provided and further, to provide a switch for changing over a voltage of a transformer (not shown) and use a transformer 15 according to the necessity.

However, the transformer used in the above-mentioned object has rather large volume (e.g., 40 x 26 x 30 mm). For this reason, the bottom lid 1 is required to have a size in which the both the tank 6 and the transformer 15 can be placed and as a result, it is obliged to increase the weight and the volume



of a device body of the thermal evaporating device.

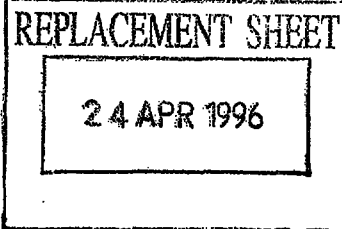
In this connection, Japanese Utility Model Publication No. Hei 1-40617 discloses an electric soldering iron which is used in both Japan and U.S.A. by using a positive temperature coefficient thermistor. However, this iron is only intended not to cause the breakdown of Joule heat until high voltage by improving the withstand voltage of the positive temperature coefficient thermistor, but not to intend to reduce the difference of the temperatures at exothermic temperatures at 100 V of an applied voltage and at 220 V.

The object of the present invention is to provide a liquid-type transformerless thermal evaporating device which has small temperature difference of exothermic temperatures in spite of the degree of applied voltages and thus, does not cause the difference in consuming time of a thermal evaporating agent according to applied voltages.

In the liquid-type transformerless thermal evaporating device according to the present invention, a device body and a heater unit are combined and the heater unit is supplied an electricity to be heated so as to evaporate a thermal evaporating agent in a tank equipped in a device body of the liquid-type transformerless thermal evaporating device.

The device body holds the tank filled with the thermal evaporating agent at a predetermined position.

The heater unit is held on the tank and heat a core for sucking-up the thermal evaporating agent and which is pull out from the tank, said heater unit having a transformerless exothermic body.



The transformerless exothermic body is a positive temperature coefficient thermistor and the voltage-current characteristic thereof has a region, over the range of at least 100 V to 240 V of applied voltage, which satisfies the conditions of

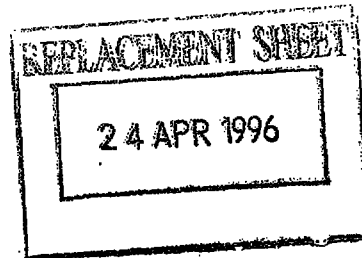
$$V_x + I_y = a \text{ (a is constant)}$$

in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y .

As shown in Fig. 1, a positive temperature coefficient thermistor (manufactured by OHIZUMI MFG. CO., LTD. in Japan; product name: PG0D-202YP5, hereinafter referred to as "transformerless exothermic body") which is sintered at 1350°C for two hours by adding 0.1 % by weight of SiO_2 and 0.020 % by weight of Mn to $(\text{Ba}_{0.85}\text{Pb}_{0.10}\text{Sr}_{0.04}\text{Y}_{0.004})\text{Ti}_{1.000}\text{O}_3$ shows a sudden standing-up of temperature-resistance characteristic after the Curie point (T_c). This respect is exemplified by Fig. 2 in that when the positive temperature coefficient thermistor is caused to heat above T_c , the current value is suddenly decreased in inverted proportion to the voltage value even though the applied voltage is increased and thus, it can be considered that the increase of electric power is suppressed. The voltage-current characteristic thereof is damped in extreme proximity to a linear line of 45° at the region of containing 100 V to 240 V of applied voltage, as shown in Fig. 2. Namely, it has been found that damping characteristic which satisfies the relationship of

$$V_x + I_y = a \text{ (a is constant)}$$

in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y . In Figs. 1 and 2, characteristics of the conventional thermistor elements are shown as broken lines for the comparison.



According to the transformerless exothermic body according to the present invention, when applied voltages are 100 V and 240 V as shown in Fig. 2, the change of consumptions of electric power, $P = VI$, is small and therefore, there is not almost difference in the exothermic temperatures in the range of 100 V to 240 V of applied voltage. In other words, the heating temperature is constant and even when the heater unit is heated at 220 V or 240 V or heated at 100 V, the time of all consumption of the thermal evaporating agent filled in the tank does not vary by the difference of voltages applied to the heater unit.

Therefore, the use of a transformer becomes unnecessary and the device body can be made small in size and can be lightened in weight.

As described above, according to the present invention, the exothermic temperature of the heater unit can be kept almost constant in 100 V, 220 V or 240 V of the applied voltage and therefore, there becomes no necessity of incorporating a transformer for lowering a voltage in a device body unlike the conventional devices. Thus, the products for export and the products used in Japan can be manufactured by the same way and further, can be made in a small size and be lightened in its weight. When an existing device body for an export is used, a space in the cover from which the transformer is removed can be utilized as a space for housing a distribution of electric source.

Moreover, according to the present invention, since the incorporation of the transformer becomes unnecessary, distribution circuits themselves which are accompanied with the establishment of the transformer become unnecessary and therefore, the structure can be simplified and the manufacturing steps and assembling steps can be reduced.

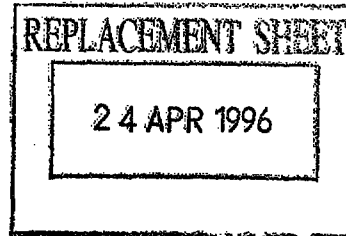


Figure 1 is a view showing a temperature-resistance characteristic of the positive temperature coefficient thermistor.

Figure 2 is a view showing a voltage-current characteristic of the positive temperature coefficient thermistor.

Figure 3 is a front-longitudinal cross-sectional view showing one of the examples of the present invention.

Figure 4 is a partially sectional plan view showing a status of fixing a heater unit.

Figure 5 is a front-longitudinal cross-sectional view showing another example of the present invention.

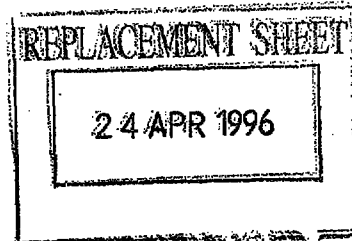
Figure 6 is a front-longitudinal cross-sectional view further showing another example.

Figure 7 is a front-longitudinal cross-sectional view still further showing another example.

Figure 8 is a view showing a structure of the conventional liquid-type thermal evaporating device.

Now, the present invention is described in detail referring to the attached drawings. Fig. 3 shows a liquid-type transformerless thermal evaporating device according to the present invention. The liquid-type transformerless thermal evaporating device has a device body and a heater unit 3.

The body device houses a tank 6 filled with a thermal evaporating



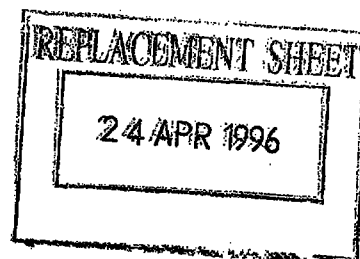
agent 9 and keeps it at a predetermined position therein, and has a bottom lid 1, a supporting frame 2 and a cover 4. The bottom lid 1 constitutes a bottom of the device body of the thermal evaporating device and is provided with a power-supply switch 5. The supporting frame 2 is integrally formed on the center of the upper face of the bottom lid 1.

The supporting frame 2 is opened at its one face and receives a tank 6 in the inside thereof through said opened portion so as to support the tank 6 at the predetermined position in the device body. The cover 4 regulates an evaporatingly discharged amount of the thermal evaporating agent from the tank 6 and also takes a role of decoration. The cover 4 has no bottom at its lower face and has an opening 14 for evaporatingly discharging the thermal evaporating agent at a part of its upper face to cover the supporting frame 2. The no-bottom lower face of the cover 4 is covered by the bottom lid 1 so as to be freely put on a lid.

The tank 6 is a container in which the thermal evaporating agent 9 is filled and is inserted with a core 8 for sucking up the thermal evaporating agent through an upper lid 7. A part of the core 8 is pulled out on the upper lid 7.

The heater unit 3 is constituted in such a manner that a transformerless exothermic body 10 is incorporated inside of a cylindrical case 11. A through-hole 12 is provided at the center of the case 11 and as shown in Fig. 4, flanges 13 provided at two portion of the peripheral edge are screwed on the upper face of the supporting frame 2. The through-hole 12 is a hole through which the core 8 pulled out on the tank 6 passes.

In this example, according to the operation of an power-supply switch



5, the power-supply is turn on to generate the electricity of heater unit 3. Then, the transformerless exothermic body 10 in the heater unit 3 is heated and the thermal evaporating agent drawn up in the core 8 is evaporated and evaporatingly discharged outside of the device body through the opening 14 of the cover 4. In this case, the air taken from an air-intaking portion 16 of the cover 14 rises up towards the opening 14 of the cover 4 which is warmed, so that the evaporating discharge of the thermal evaporating agent can be effectitively conducted.

Table 1 shows a comparison of time of consuming the whole amount of a thermal evaporating agent in cases that the heater unit 3 is heat-generated by 100 V of applied voltage and that the heater unit 3 is heat-generated by 220 V of applied voltage. Liquid-type transformerless thermal evaporating device which were used in the tests are listed below.

1) Transformerless exothermic body:

positive temperature coefficient thermistor manufactured by

OHIZUMI MFG. CO., LTD. in Japan

Product name: "PGOD-202YP5"

The product is manufactured by forming patterns of arc-segments each having 1.34 cm in major diameter, 0.78 cm in inside diameter, 0.36 cm in thickness and 100 ° at central angle and sintering the patterns at more than 1330 °C for 2 hours. The both faces of the pattern are provided with electrodes and a pair of thermistor elements which is sandwiched between terminal fittings, which is housed in a case of the heater unit 3. Ten pieces were optionally selected among the products which were manufactured in mass production as the positive temperature coefficient thermistors (product name:

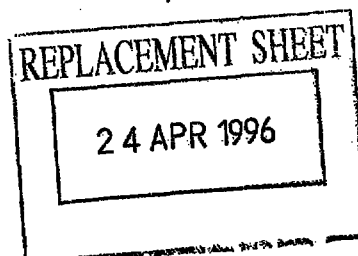
PGOD-202YP5). These ten pieces are named as specimens A to J.

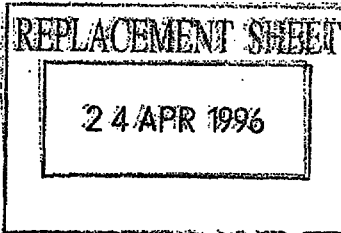
2) Thermal evaporating agent:

liquid-type electric mosquito-fuge liquid (product name: Earth NO MAT (registered trademark) for 30 days (30 days in use of 12 hours per day)

45 ml of the liquid were filled in a tank.

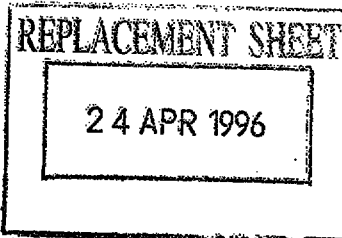
Table 1 shows evaporating and diffusing time (hour) of thermal evaporating agent at the time of 100 V being applied and at the time of 220 V being applied with respect to the specimens A to J. The difference is an evaporating time difference of thermal evaporating agents at 100 V-applied voltage and 200 V-applied voltage.



Table 1

		Evaporating and diffusing time of thermal evaporating agent (hr.)		
specimen	R_{25} (K Ω)	applied voltage of 100 V	applied voltage of 220 V	difference
A	0.51	337	311	26
B	0.52	332	308	24
C	0.58	345	318	27
D	0.68	343	315	28
E	0.74	362	330	32
F	0.80	373	340	33
G	0.88	376	342	34
H	0.94	393	357	36
I	1.10	396	360	36
J	1.41	418	381	37
average	—	367	336	31

According to the result of the Table 1, the time for consuming the thermal evaporating agent in every specimens was short in the case of the applied voltage of 220 V in comparison with the case of the applied voltage of 100 V. However, the difference of time was only 31 hours at the longest. As the evaporating times of the thermal evaporating agent were varied by the influences of the kinds of the evaporating agents, room temperature, the distance between a core for sucking up the thermal evaporating agent and an



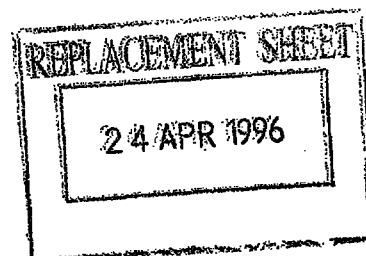
exothermic body, the measurements were conducted in the same conditions as much as possible. Therefrom, it was recognized that there caused the difference of 12 hours for consuming time of the whole liquid of 45 ml of the thermal evaporating agent 9 if there is a difference of 1 °C at the exothermic temperatures of the applied voltages 220 V and 100 V. Therefore, if the temperature difference is 7 °C, the difference of the consuming time is 84 hours.

Although Table 1 shows the comparisons in the applied voltage 100 V and the applied voltage 220 V, the time of consuming the whole liquid was not greatly varied in the case of 240 V of the applied voltage in comparison with the case of 100 V of the applied voltage.

Examples of the thermal evaporating agent used in the present invention are various kinds of agents which are used for deodorization, fragrance emittance, fungicide, repellence, prevention of mold, regulation of plant growth, herbicide, insecticide, acaricide, anticide, borericide, and are listed up below.

Insecticidal and acaricidal agent:

- * 3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl dl-cis/trans-chrysanthemate
(common name: allethrins, commercial name: Pinamin, manufactured by Sumitomo Chemical Industries, Ltd. in Japan (hereinafter referred to as "AA"))
- * 3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl d-cis/trans-chrysanthemate
(commercial name: Pinaminforte, manufactured by Sumitomo Chemical Industries, Ltd. in Japan (hereinafter referred to as "AB"))
- * d-3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl d-trans-chrysanthemate
(commercial name: Exylin manufactured by Sumitomo Chemical Industries,



Ltd. in Japan (hereinafter referred to as "AC")

- * 3-aryl-2-methylcyclopenta-2-ene-4-one-1-yl d-trans-chrysanthemate

(common name: bioarethrins, hereinafter referred to as "AD")

- * N-(3,4,5,6-tetrahydrophthalimide)-methyl dl-cis/trans-chrysanthemate

(common name: phthalthrin, commercial name: Neopinamin, manufactured by Sumitomo Chemical Industries, Ltd. in Japan (hereinafter referred to as "AE"))

- * 5-benzyl-3-furylmethyl d-cis/trans-chrysanthemate

(common name: rethmetrin, commercial name: Crislonforte, manufactured by Sumitomo Chemical Industries, Ltd. (hereinafter referred to as "AF"))

- * 5-(2-propargyl)-3-furylmethyl chrysanthemate

(common name: flasmetrin, hereinafter referred to as "AG")

- * 3-phenoxybenzyl 2,2-dimethyl-3-(2',2'-dichloro)vinylcyclopropane carboxylate

(common name: permeterin, commercial name: Exmin, manufactured by Sumitomo Chemical Industries, Ltd., hereinafter referred to as "AH")

- * 3-phenoxybenzyl d-cis/trans-chrysanthemate

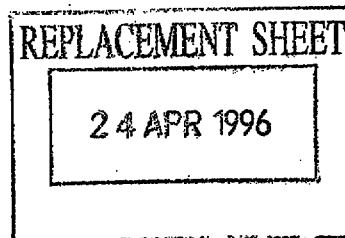
(common name: phenothrin, commercial name: Sumithrin, manufactured by Sumitomo Chemical Industries, Ltd., hereinafter referred to as "AI")

- * α -cyanophenoxybenzyl isopropyl-4-chlorophenylacetate

(common name: phenvalelate, commercial name: Sumisaijin, manufactured by Sumitomo Chemical Industries, Ltd., hereinafter referred to as "AJ")

- * (S)- α -cyano-3-phenoxybenzyl (1R, cis)-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (hereinafter referred to as "AL")

- * (R,S)- α -cyano-3-phenoxybenzyl (1R,1S)-cis/trans-3-(2,2-dichlorovinyl)-2,2-



dimethylcyclopropanecarboxylate (hereinafter referred to as "AM")

* α -cyano-3-phenoxybenzyl d-cis/trans-chrysanthemate (hereinafter referred to as "AN")

* 1-ethynyl-2-methyl-pentenyl cis/trans-chrysanthemate (hereinafter referred to as "AO")

* 1-ethynyl-2-methyl-2-pentenyl 2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropane-1-carboxylate (hereinafter referred to as "AP")

* 1-ethynyl-2-methyl-2-pentenyl 2,2,3,3-tetramethylcyclopropanecarboxylate (hereinafter referred to as "AQ")

* 1-ethynyl-2-methyl-2-pentenyl 2,2-dimethyl-3-(2,2-dichlorovinyl)cyclopropane-1-carboxylate (hereinafter referred to as "AR")

* Benfluslinplarestrin and isomers, analogues and derivatives thereof

* 0,0-dimethyl 0-(2,2-dichloro)vinylphosphate (hereinafter referred to as "AS")

* 0-isopropoxyphenyl methylcarbamate (hereinafter referred to as "AT")

* 0,0-dimethyl 0-(3-methyl-4-nitrophenyl)thionophosphate (hereinafter referred to as "AU code")

* 0,0-diethyl 0-2-isopropyl-4-methyl-pyrimidine-(6)-thiophosphate

* 0,0-dimethyl S-(1,2-dichloroethoxyethyl)-diotiphosphate

Vermin-repellent:

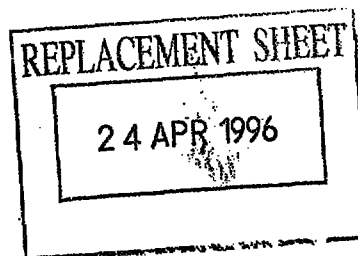
* dimethylphthalate, 2,3,4,5-bis-(Δ_2 -butylane)-tetrahydrofuran,

2,3,4,5-bis-(Δ_2 -butylene)-tetrahydrofurfuryl alcohol,

N,N-diethyl-m-triamide(DET), diethylamide caprylate,

2,3,4,5-bis-(Δ_2 -butylene)-tetrahydrofurfural,

di-m-propyl-isocinchomeronate, secondary butylstyrylketone,



nonylstyrylketone, N-propylacetoanilide, 2-ethyl-1,3-hexandione,
 di-n-butylsuccinate, 2-butoxyethyl-2-furfuridenacetate,
 dibutylphthalate, tetrahydrothiophene, β -naphthol,
 diaryldisulfide, bis(dimethylthiocarbamoyl)disulfide, etc.

Rodent-repellent:

- * tetramethylthiuramdisulfite, guanidine, naphthalene cresol,
 cycloheximide, zinc dimethyldithiocarbamate, cyclohexylamine,
 N,N-dimethylsulphenyldithiocarbamate, etc.

Dog and cat-repellent:

- * 2,6-dimethyl-octadiene-(2,6)-al(8) (citral),
 0,0-diethyl S-2-ethylthioethyldithiophosphate (ETP),
 0,0-dimethyl S-2-isopropylthioethyldiophosphate (MIP), etc.

Bird-repellent:

- * γ -chlorarose, 4-(methylthio)-3,5-xylyl-N-methylcarbamate,
 4-aminopyridineanthraxinon, tetramethylthiuramdisulfide,
 diallyldisulfide, etc.

Rodent-exterminator

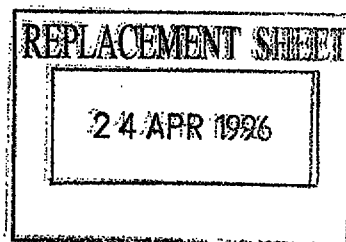
- * ANTU, monofluoro acetate soda, warfarin, coumachlor, fumarin,
 coumatetralylsilylocido, norvomide, N-3-pyridylmethyl-N'-nitrophenylurea,
 endoside, α -naphthylthio urea, thiosemicarbazide, diphenacm, pival,
 chlorophasinon, scillatoren, calciferol, etc.

Agent for preventing ant

- * Belmetrin, Chlordane, etc.

Agent for preventing mold

- * α -promocinnamic aldehyde, N,N-dimethyl-N-phenyl-N'-(fluorodichloro-



methylthio)-sulfonamide, etc.

Plant growth regulator

- * 4-chlorophenoxy acetate, gibberellin, N-(dimethylamino)succinamide, α -naphthylamido, etc.

Deodorator

- * laurylic acid methacrylate (LMA), etc.

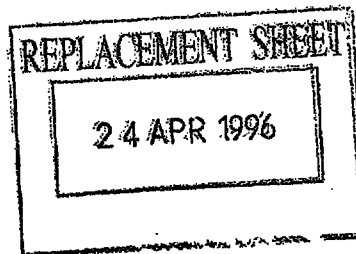
Perfume

- * citral, citronellal, etc.

The above-described thermal evaporating agents are formulated in a solution. Solvent for formulating the solution of the thermal evaporating agent is water and/or various kinds of organic solvents (inclusive of surfactant), typically, hydrocarbon solvents. Especially, it is preferable to use fatty hydrocarbon having the boiling range of 150 to 350 °C (paraffin hydrocarbon and unsaturated fatty hydrocarbon). Among them, n-paraffin and isoparaffine are most suitable since they have no toxicity in use, no odor and very less in risk of fire. The organic solvents other than the above-mentioned hydrocarbon are glycerine, propylene glycol, methanol, acetone, xylene, chlorocene, iso-propanol, chloroform, etc.

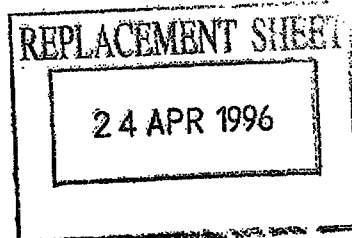
As the above-mentioned solvent solution may be used according to the kinds of thermal evaporating agents to be used, there is no special limitation. However, it is desirable to be adjusted to be normally about 0.2 to 10 % by weight in the concentration of a thermal evaporating agent, preferably, 0.3 to 8 % by weight.

The above-mentioned thermal evaporating agents can be arbitrarily added with various kinds of additives such as an agent for preventing clogging.



an effect-increasing agent, an agent for improving evaporatingly discharging ratio, a deodoring agent, perfume, etc. Examples of the agent for preventing clogging are BHT and BHA. Examples of the effect-increasing agent are piperonyl butoxide, N-propyl izol, MGK-264, Sinepirin 222, Sinepirin 500, Recen 384, IBTA, S-421, etc. Examples of the agent for improving evaporatingly discharging ratio are phenethylisothiocyanate, dimethyl himix acid.

Examples of the core for sucking up the thermal evaporating agent used in the thermal evaporating device according to the present invention are felt, cotton, pulp, nonwoven textile, asbestos, inorganic molded substances, organic molded substances, preferably, felt-made core, unglazed core, pulp-made core and core made of inorganic molded substance. The core made of the inorganic molded substance is, for example, prepared by solidifying a porcelian-porous inorganic fiber, glass-fiber inorganic fiber or asbesto inorganic fiber with a binding agent such as gypsum or bentonite, etc. Moreover, the core made of the inorganic molded substance may be prepared by simply using kaolin, active china clay, talc, diatomaceous earth, gypsum, clay, magnesium carbonate, perlite, bentonite, alumina, silica, alumina silica, titanium, vitreous volcanic stone-sintered powder, vitreous volcanic ashe-sintered powder, etc. or using them together with wood powder, charcoal powder, active charcoal, etc. which are hardened by textile size such as dextrin, starch, gum arabic, synthetic paste CMC, etc. Especially preferable core for sucking up the thermal evaporating agent is prepared by compounding 100 weight part of the mineral powder and 10 to 300 weight parts of the wood power or the mixture of the wood powder and the equivalent weight of charcoal powder and/or active charcoal with the textile size to be 5 to 25 % by weight with respect to the total amount of the core for



sucking up the thermal evaporating agent, and further, by adding water thereto to be kneaded and being extrusion-molded and dried. The intaking speed of the core for sucking up the thermal evaporating agent is desirable to be 1 to 40 hours, preferably, 8 to 21 hours. The intaking speed means a value calculated by measuring a time taken from the immersion of a core for sucking up the thermal evaporating agent having 7 mm in diameter and 70 mm in length in an n-paraffin liquid having 25 °C of liquid temperature to the position of 15 mm from the lower part of the core to a time that the n-paraffin reaches to the top of the core. On top of the above-mentioned mineral powder, wood powder and textile size, coloring material such as Marakite green, etc., sorbic acid and salts thereof, fungicidal agent such as dehydroacetic acid, etc. may be combined in the core for sucking up the thermal evaporating agent, according to the necessity.

The method of conducting the evaporating discharge (of insecticidal agent) by applying the composition of the present invention to the present device can be similarly utilized in this type of the conventional devices. The thermal temperature is suitably decided according to the kinds of the thermal evaporatingly discharging agent and is not especially limited, but it is normal to be a surface temperature of the exothermic body within the range of about 40 to 150°C, preferably, 85 to 145 °C which correspond to about 30 to 135°C, preferably, about 70 to 130 °C of the surface temperature of the core for sucking up the thermal evaporating agent.

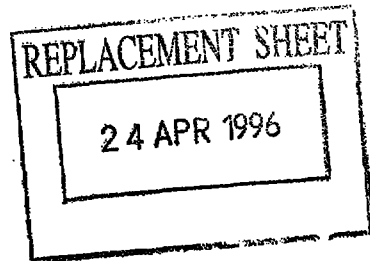
Fig. 5 is a longitudinally sectional view showing another example of the present invention. In Fig. 5, a heater unit 3 is supported by a supporting portion 2a and a lower-face no-bottom portion of a cover 4 is covered by a

24 APR 1996

bottom lid 1. The upper face of the bottom lid 1 is formed with a position-determining protrusion 15, and the side-face portion of the cover 4 is opened with an air-intake portion, and a gap 17 is formed between an outer peripheral face of a core 8 for sucking up the thermal evaporating agent and an inner peripheral face of the heater unit 3.

According to this example, the following advantages can be obtained that as the gap 17 and the air-intaking portion 16 are communicated to the open air, the diffusion efficiency of the effective components can be improved; and moreover, as the position of the tank 6 can be decided by the protrusion 15 on the upper face of the bottom lid 1, the centering of the core 8 for sucking up the thermal evaporating agent can be smoothly made and the function of the transformerless exothermic body can be extremely efficiently exerted.

Fig. 6 is a longitudinally sectional view showing still another example of the present invention. In Fig. 6, a supporting portion 2a has, at its almost center, a socket 18 and the inner periphery of the socket 18 is provided with an internal thread 17a. An external thread 6a of the tank 6 is screwed in an internal thread 18a of the socket 18. A core for sucking up the thermal evaporating agent of the tank 6 is inserted in the heater unit 3 so that the core 8 can vertically move. The bottom face of the cover 4 has no bottom and a leg-portion 19 is provided at an opening edge at the bottom-face portion of the cover 4. The bottom face of the tank 6 is raised up upwardly from the established face by the leg portion 19 for the support and accordingly, the air-intaking portion 16 is secured at the bottom face of the cover 4. Moreover, at the bottom face of the supporting portion 2a is provided air-intaking portions 16a which positions at the inner and outer peripheries of the

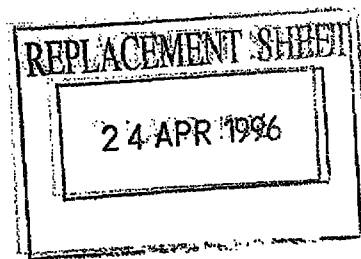


heater unit 3.

According to this example, as the socket 18 is provided at almost center of the supporting portion 2a, the project of the center of the core 8 for intaking a liquid can be easily carried out and therefore, excellent function of the transformerless exothermic body can be extremely effectively exerted. Furthermore, by rotating the tank 6 to vertically move the core 8 for sucking up the thermal evaporating agent with respect to the heater unit 3, the amount of evaporating discharge can be adjusted with a pitch of the external thread 6a.

Fig. 7 is a longitudinally sectional view showing a still another example of the present invention. The examples shown in Figs. 1 to 6 show the constitution that the device body houses the tank 6 in its inside to be stationarily held. In the example of Fig. 7, an external thread 6a of a tank 6 is screwed into an internal thread 18a provided at a socket 18 of a supporting portion 2a, and the tank 6 is exposed to the lower face of the device body and suspended therefrom to be held in the stationary position. Moreover, in this example, a power-source plug 20 which supplies an electric force to a transformerless exotherm body of the heater unit 3 is freely inserted in the device body. By directly inserting the power-source plug 20 into a power-source consent, it can be made to be codeless.

According to this example, a very compact-sized codeless device can be obtained as well as the similar advantages of the socket 18 in Fig. 6 can be obtained. Further, the socket 18 may be provided with supporting pieces having flexibility in place of the internal thread 18a so as to clamp the external thread 6a of the tank 6 by these supporting pieces.

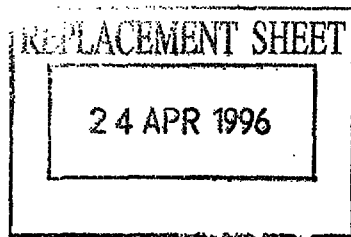


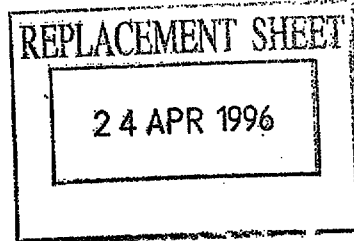
In the examples shown in Figs. 3 and 6, such a mechanism can be provided that a code electrically connected between the heater unit and the power-supply consent is wound. This code-winding mechanism can employ either method of manually or automatically winding the code. In each example shown in Figs. 3 to 6, a type of hanging from a wall can be employed instead of the type of being placed on a floor. Furthermore, in each example shown in Figs. 3 to 6, as the thermal evaporating device, a timer can be provided to the device so as to arbitrarily set the evaporatingly discharging-time of the thermal evaporating agent. Further, a means to recognize a remaining amount of the thermal evaporating agent in the tank can be constituted by providing an optical sensor, a weight sensor, etc.

In the examples shown in Figs. 3 to 7, moreover, it is shown that the transformerless exothermic body is in an annular form, but the present invention is not limited thereto. U-letter form and a cylindrical form can be employed for the transformerless exothermic body. In a case that a U-letter shaped transformerless exothermic body is used, there is an advantage that the core for sucking up a thermal evaporating agent in the tank can be inserted from the side face of the transformerless exothermic body. In a case that a cylindrical transformerless exothermic body is used, an evaporatingly discharging amount of the thermal evaporating amount can be adjusted by changing the length of the core for sucking up the thermal evaporating agent to be inserted into the cylindrical transformerless exothermic body so that the heating area of the core for sucking up the thermal evaporating agent is changed.

As described above, the liquid-type transformerless thermal evaporating device according to the present invention can be used for the

evaporating discharge of deodorization, fragrance emittance, fungicide, repellence, prevention of mold and regulation of plant growth and other medicaments for household use and for business use.



CLAIMS:

1. A liquid-type transformerless thermal evaporating device having a combination of a device body and a heater unit (3) for evaporating a thermal evaporating agent (9) in a tank (6) provided in the device body by electrically heating the heater unit, characterized in that

the device body holds a tank (6) filled with a thermal evaporating agent (9) at a stationary position,

the heater unit (3) is held on the tank, for heating a core (8) for sucking up a thermal evaporating agent pulled out of the inside of the tank and has a transformerless exothermic body (10),

the transformerless exothermic body (10) is a positive temperature coefficient thermistor and the voltage-current characteristic thereof has a region, over the range of at least 100 V to 240 V of applied voltage, which satisfies the conditions of

$$V_x + I_y = a \text{ (a is constant)}$$

in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y .

FIG. 1

REPLACEMENT SHEET
24 APR 1996

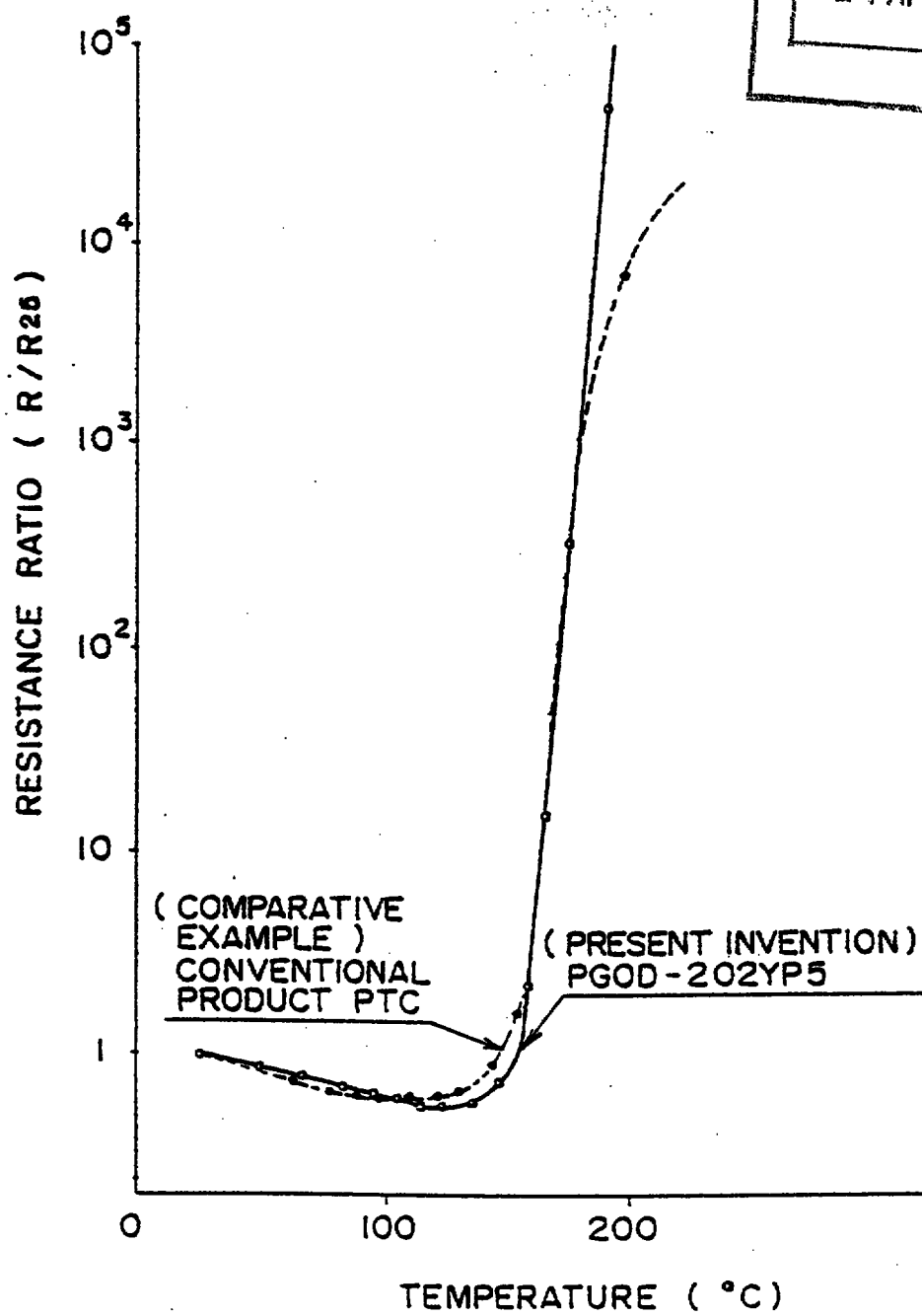


FIG. 2

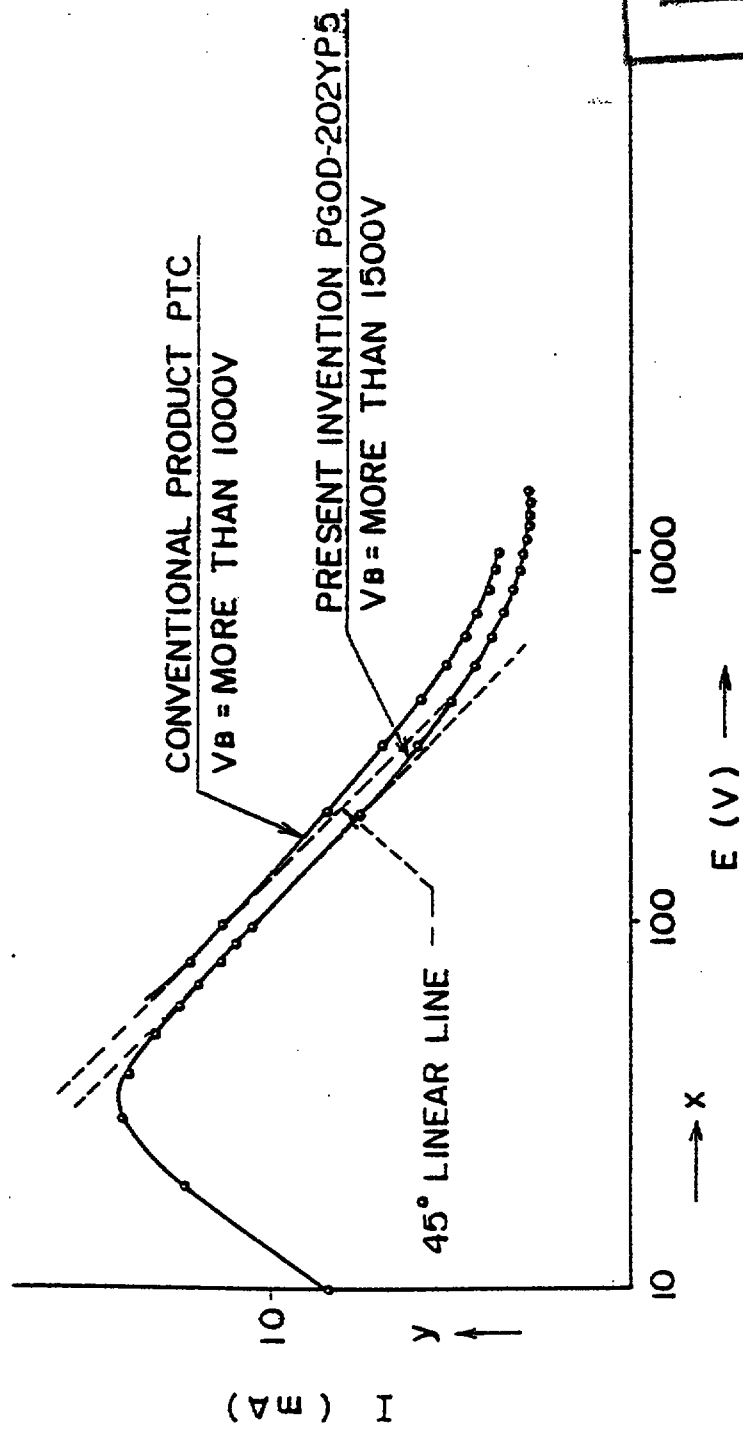


FIG. 3

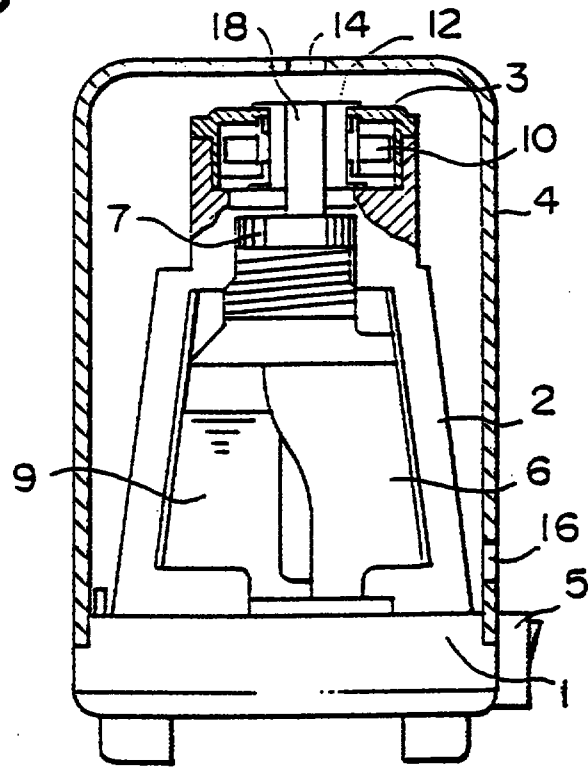
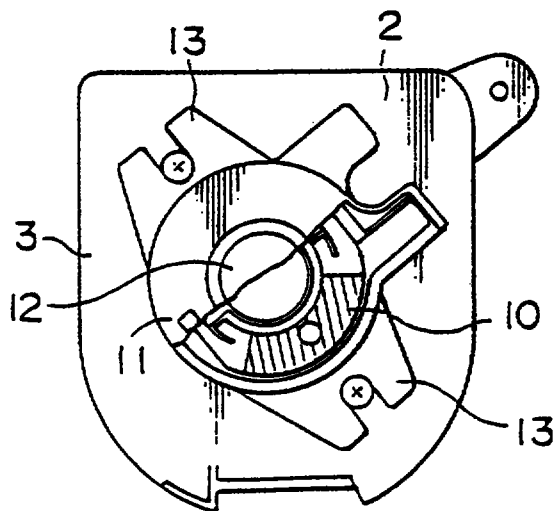


FIG. 4



24 APR 1996

FIG. 5

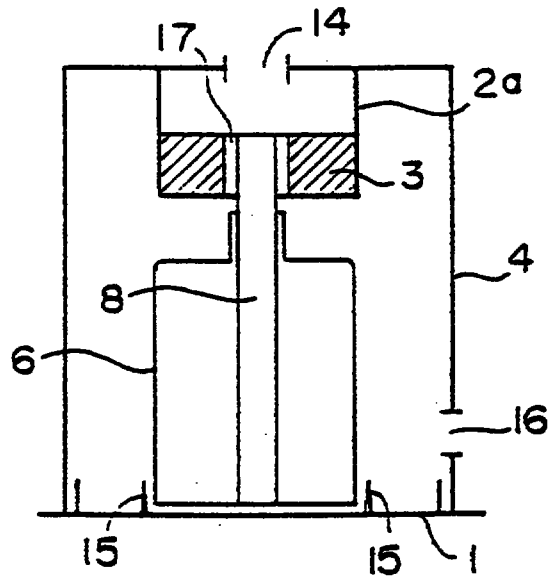
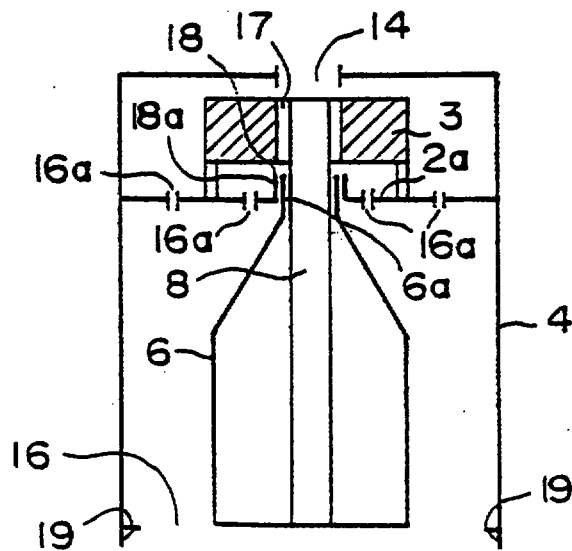


FIG. 6



24 APR 1996

5

FIG. 7

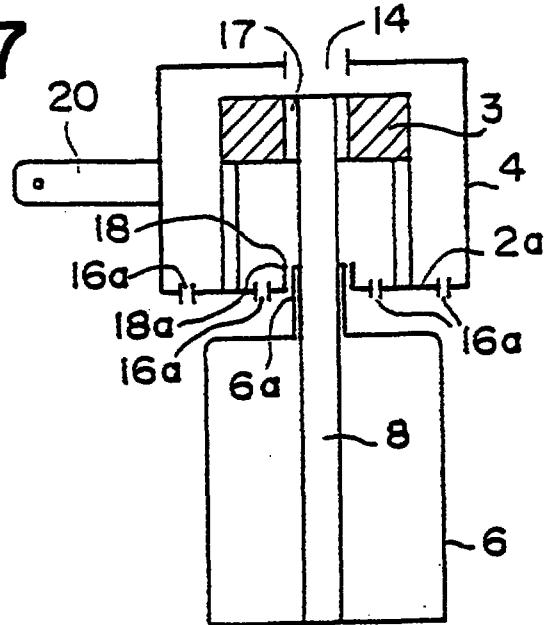
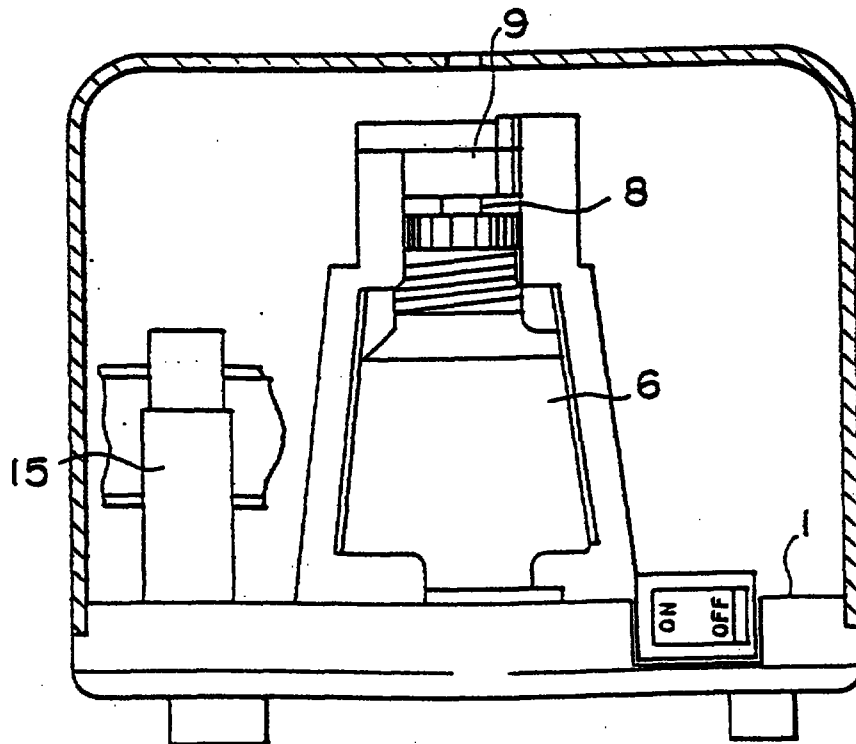


FIG. 8



ABSTRACT

LIQUID-TYPE TRANSFORMERLESS THERMAL EVAPORATING DEVICE

A device body is equipped with a heater unit (3) and a thermal evaporating agent (9) is filled in a tank (6), and a leading end of a core (8) for sucking up the thermal evaporating agent which is inserted in the tank (6) is inserted into the heater unit (3). The heater unit (3) is in an annular shape and is incorporated with a transformerless exothermic body (10). The transformerless exothermic body (10) is a positive temperature thermistor and the voltage-current characteristic thereof has a region, over the range of at least 100V to 240V of applied voltage, which satisfies the conditions of $V_x + I_y = a$ (a is constant) in orthogonal coordinates in which a longitudinal axis is a voltage V_x and a lateral axis is a current I_y .

Figure 3

1-1785028

REPLACEMENT SHEET

24 APR 1996