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7) Applicant: Matsushita Electric Industrial Co., Ltd. 1006, Oaza Kadoma Kadoma-shi Osaka-fu, 571(JP)

72 Inventor: HASHIMOTO, Akihiko 247-2, Higashikujyo-cho

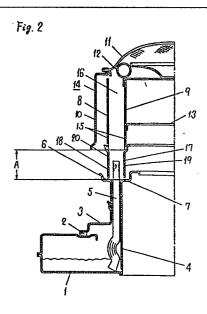
Nara-shi Nara-ken 630(JP)

(72) Inventor: SHIMIZU, Hideharu 109-14, Miyado-cho Yamatokoriyama-shi Nara-ken 639-11(JP)

(24) Representative: Crawford, Andrew Birkby et al,
A.A. THORNTON & CO. Northumberland House 303-306
High Holborn
London WC1V 7LE(GB)

#### **54) LIQUID FUEL BURNER WITH WICK.**

(57) A liquid fuel burner for absorbing and evaporating liquid fuel via a wick (5) and burning it in a combustion chamber (16) formed between an inner flame cylinder (9) and an outer flame cylinder (8), comprising inner and outer columns (17 and 18) detachably mounted at at least one lower part of the inner and outer flame cylinders (9 and 8) for varying the quantity of fuel evaporated from the wick (5), thereby varying the fuel quantity.



# ritle Modified see front page

### SPECIFICATION

TITLE: Liquid Fuel Burner

#### 5 TECHNICAL FIELD

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This invention relates to a liquid fuel burner adapted to make variable the rate of gasification of a liquid fuel, such as kerosene, sucked up by a wick, thereby facilitating the adjustment of the rate of combustion of fuel.

#### BACKGROUND ART

The wick type liquid fuel burner of conventional kerosene stove or the like is so arranged that the top of the wick is projected between inner and outer flame cylinders so that changing the projection height of the wick makes variable the rate of gasification of fuel from the wick, thereby adjusting the rate of combustion of fuel. As is known in the art, an excessive decrease in the projection height of the wick, however, accelerates the deposition of tar on the wick or increases the CO content of exhaust gases, so that actually it has been impossible to substantially adjust the combustion rate. Further, the recent worsening of the condition of oil supply has come up with kerosene containing heavier fractions, which means that the kerosene now available has a wide range of boiling

point and contains large amounts of high-boil 10064559 substances.

Long-term use of such wick type liquid fuel burner results in a large amount of tar deposited on the top of the wick. In this connection it is to be noted that if foreign oil(kerosene having diesel fuel or engine oil inclusions) or degarded oil (an oxidized form of kerosene) is burned by mistake, an excessive amount of tar forms on the combustion section of the wick, presenting a problem that it extremely lowers the combustion rate or interferes with the manipulation of the wick for vertical movement, making it impossible to extinguish the burner. For this reason, it has been common practice to perform the so-called dry burning, which is a continued burning without a supply of liquid fuel to the wick. However, the wick temperature can hardly be elevated during the dry burning because of the amount of air supply being limited by the decreased diameter of air holes formed in the inner and outer flame cylinders adjacent to the wick to reduce the amount of CO emission and odor while stable combustion is obtained from ignition. a result, there has been a drawback that evan if the dry burning is performed, the deposited tar cannot be eliminated.

#### DISCLOSURE OF THE INVENTION

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Accordingly, the present invention has for its object the provision of a liquid fuel burner wherein at least one of the inner and outer flame cylinders is provided at its lower end with a removable cylindrical body having a large number of air holes for facilitating the adjustment of the combustion rate.

An embodiment of the invention will now be described with reference to the accompanying drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

- Fig. 1 is a sectional view of half a liquid fuel burner according to an embodiment of the invention;
- Fig. 2 is a sectional view illustrating said burner in another burning state;
- Fig. 3 is a fragmentary perspective view of the inner flame cylindrical body of said burner;
- Fig. 4 is a fragmentary perspective view of the outer flame cylindrical body of said burner; and
- Figs. 5, 6 and 7 are half-sectioned views of liquid fuel burners according to other embodiments of the invention.

## BEST MODE OF CARRYING OUT THE INVENTION

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In Fig. 1, an outer wick cylinder 3 is installed through a packing 2 above a top opening in a fixed tank 2 which stores XXXXXXXXX kerosene used as an example of liquid fuel. Welded to a bottom opening in the fixed tank 1 is a wick guide cylinder 4 which vertically movably carries on its XXXXX periphery a cylindrical

wick 5. The wick 5 serves to suck up xxxxxxxxxxxxxx kerosene in the fixed tank 1 and gasify it. The upper portions of the outer wick cylinder 3 and wick guide cylinder 4 terminate in fire tray portions 6 and 7, respectively, on which is mounted a combustion cylinder assembly 14 comprising an outer flame cylinder 8, an inner flame cylinder 9, an outer cylinder 10, a substantially hemisphere-like a coil 12 and a partition plate 13 in the form of a disk. The outer flame cylinder 8 and inner flame cylinder 9 are each formed with a number of air holes 15. The air which flows in through the air holes 15 and gasified xxxxxxxxxxxxxx kerosene from the top of the wick 5 are mixed together, and the mixture is burned in a combustion chamber 16 defined between the outer and inner flame cylinders 8 and 9.

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The inner and outer flame cylinders 9 and 8 of said combustion cylinder assembly 14 have inner and outer flame cylindrical bodies 17 and 18, respectively, removably fitted to their lower ends, as shown in Fig. 2. Further, the inner flame cylindrical body 17, as shown in Fig. 3, is formed with a number of air holes 19. The total area of these air holes 19 is larger than that of the air holes 15 in the lower portion of the inner flame cylinder 9 having the same height as the height A of the inner flame cylindrical body 17. Further, the outer flame cylindrical body 18 is also

formed with a number of air holes 20, as shown in Fig.

4. The total area of these air holes 20 is larger than that of the air holes 15 formed in the lower portion of the outer flame cylinder 8 having the same height as the height A of the outer flame cylindrical body 18. In addition, the inner and outer flame cylindrical body 17 and 18 have the lower ends of the inner and outer flame cylinders 9 and 8 force-fitted thereto, but such connections may be of thread or bayonent type. In any case, it is preferable that there be no protrusion in the interior of the combustion chamber 16, in order to prevent disturbance of combustion and degradation of material.

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With the above arrangement, this liquid fuel burner is used with the inner and outer flame cylindrical bodies 17 and 18 removed, as shown in Fig. 1 or with these inner and outer flame cylindrical bodies 17 and 18 mounted, as shown in Fig. 2. Thus, the overall height of the combustion cylinder assembly 14 changes and so does the draft in the combustion chamber 16; accordingly, the combustion rate increases or decreases. That is, it is possible to adjust the combustion rate. Furthermore, since the flow rate of air in the vicinity of the wick 5 can be changed by mounting or dismounting the outer and inner flame cylindrical bodies 18 and 17, various kinds of kerosene can be burned more completely. Various tests have shown that for kerosene which has

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large amounts of low-boiling components if the area of the air in-take opening adjacent to the wick 5 is decreased to decrease the flow rate of air and for kerosene which has large amounts of high-boiling components if the area of said opening is increased to increase the flow rate of air, then the formation of tar on the wick 5 decreases and complete combustion takes place. Thus, it is possible to provide for combustion of various kinds of kerosene by mounting and dismounting the inner and outer flame cylindrical bodies 17 and 18 to change the flow rate of air. If sets of said inner and outer flame cylindrical bodies 17 and 18 with the air holes 19 and 20 respectively having different total opening areas are prepared for exchange, the situation can be coped with more completely. By this arrangement, even if the tendency for kerosene to contain increasing amounts of heavier fractions becomes more and more pronounced in the future, it is only necessary to exchange the inner and outer flame cylindrical bodies 17 and 18 at the time when it would otherwise be necessary to discard the whole kerosene stove and buy a new one.

If the inner and outer flame cylindrical bodies 17 and 18 having air holes 19 and 20 of large total opening area are used as in this embodiment, mounting them increase the amount of inflow of air adjacent to the wick 5, accelerates combustion adjacent to the wick 5,

elevates the temperature of the wick 5, and makes it easier to eliminate the tar deposited on the wick 5. As a result, even if the deposition of tar has made it impossible to use the wick any further as in the past, it can be revived by performing the dry burning with a supply of xxxxxxxxxxxx kerosene cut off.

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If the inner and outer flame cylindrical bodies 17 and 18 are inexpensive, the merit will double. fore, the inner and outer flame cylinderical bodies 17 and 18 should be as inexpendisve as possible, and their height should be as small as possible. However, they should be tall enough to rise above the top of the wick 5 in its projected position so as not to substantially influence combustion. That is, if the inner and outer flame cylindrical bodies 17 and 18 are tall enough to rise above the top of the wick 5 in its projected position, there will be a merit that even if a clearance is created in the junction between the inner and outer flame cylindrical bodies 17 and 18 and the inner and outer flame cylinders 9 and 8 of the combustion cylinder assembly 14, this will not substantially influence combustion.

Fig. 5 shows another embodiment of the invention XXXXXXXXXXXXXXX , wherein the inner and outer flame cylinders 9 and 8 are divided into upper and lower portions, the lower portions serving as the inner and outer flame cylindrical bodies 17 and 18, respectively.

In this embodiment, even if the inner and outer flame cylindrical bodies are used with the inner and outer flame cylinders 9 and 8, the addition of the inner and outer flame cylinders to the inner and outer flame cylindrical bodies 17 and 18 will cause no impression of incompatibility since the inner and outer flame extensions 17 and 18 are surrounded with the outer cylinder 10, and there is also a merit that combustion is not substantially influenced by the wind.

Figs. 6 and 7 show other embodiments of the invention, wherein only the outer flame cylinder 8 or the inner flame cylinder 9 is divided into upper and lower portions. The intended merit can be obtained by changing the lower air hole area in only one of the inner and outer flame cylinders 9 and 8.

In addition, if a paper-like thin sheet of fine ceramic fiber is used on the top of the wick 5, the merit further increases because of its high heat resistance and high oil holding capacity.

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### INDUSTRIAL APPLICABILITY

As has been described so far, according to the present invention, since the draft in the combustion chamber can be changed by mounting and dismounting the inner and outer flame cylindrical bodies, it is possible to adjust the rate of combustion by changing the rate of gasification of fuel without having to

change the projection height of the wick. The mounting and dismounting of the inner and outer flame cylindrical bodies changes the flow rate of air adjacent to the wick, so that at least two kinds of liquid fuels can be burned completely.

CLAIMS:

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- 1. A liquid fuel burner wherein in a combustion chamber defined between inner and outer flame cylinders each having a plurality of air holes, the top of a wick is projected and a cylindrical body having a plurality of air holes is removably installed under at least one of the inner and outer flame cylinders.
- 2. A liquid fuel burner as set forth in Claim 1, wherein the total area of the air holes in the cylindrica\_
- body is larger than that of the air holes formed in the
   lower portion of the inner or outer flame cylinder
   having the same height as that of the cylindrical body.
  - 3. A liquid fuel burner as set forth in Claim 1, wherein the height of the cylindrical body is larger than
    the projection height of the wick.

Fig. 1.

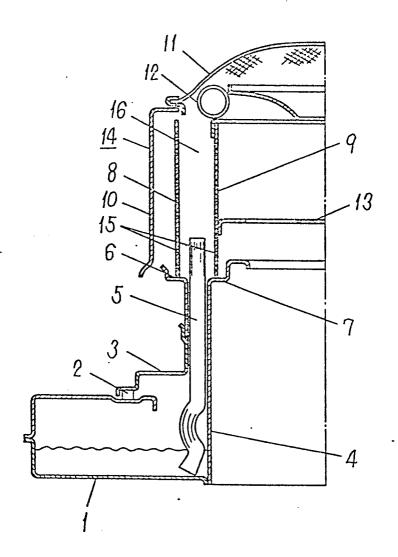


Fig. 2

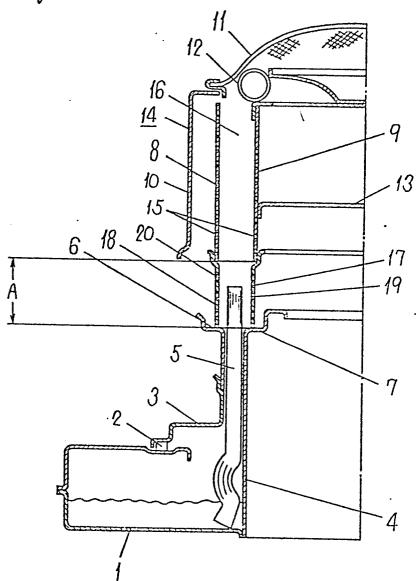


Fig. 3

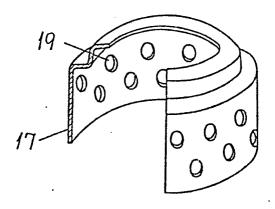


Fig. 4

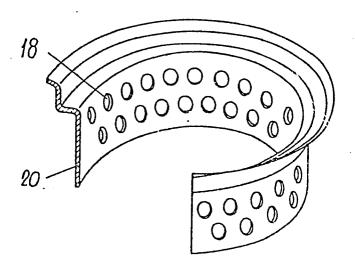


Fig. 5

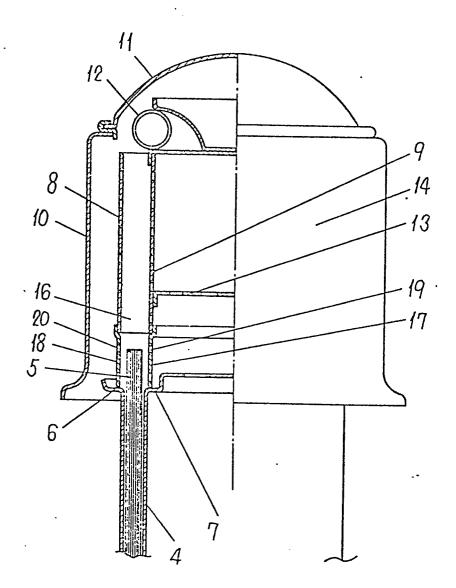


Fig. 6

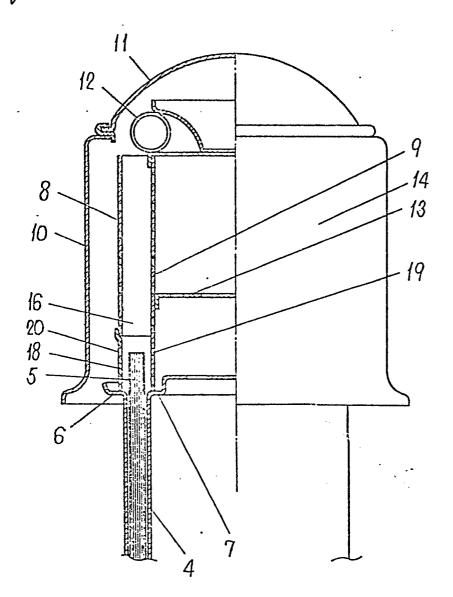
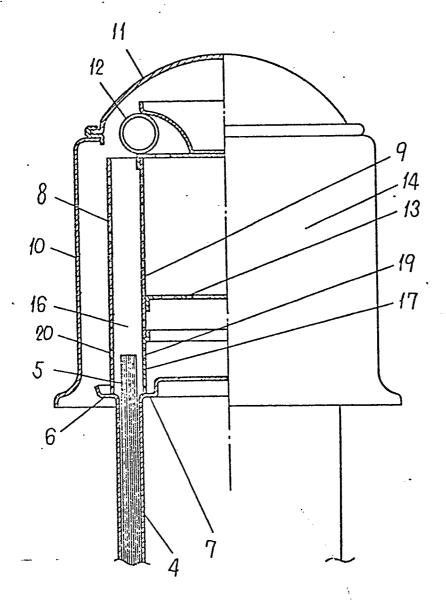


Fig. 7



## LIST OF REFERENCE NUMBER IN THE DRAWINGS

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- 2.....Packing
- 3.....Outer wick cylinder
- 4.....Wick guide cylinder
- 5.....Wick
- 6.....Fire tray portion
- 7.....Fire tray portion
- 8.....Outer flame cylinder
- 9.....Inner flame cylinder
- 10....Outer cylinder
- 11....Net
- 12.....Coil
- 13.....Partition plate
- 14.....Combustion cylinder assembly
- 15....Air holes
- 16.....Combustion chamber
- 17.....Inner flame cylindrical body
- 18....Outer flame cylindrical body
- 19....Air holes
- 20....Air holes

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Jits	uyo Shinan Koho	1920 - 1981				
Koka	i Jitsuyo Shinan Koho	1971 - 1981 '				
	MENTS CONSIDERED TO BE RELEVANT 14					
Category *	Citation of Document, 18 with indication, where appr	opriate, of the relevant passages 17	Relevant to Claim No. 18			
Y	JP,B1, 44-22584 (Matsushit Industrial Co., Ltd.) 26, (26. 09. 1969), Column 2, column 2, line 33 to colum	September, 1969 lines 9 to 14,	1, 3			
Y	JP,Y1, 47-31696 (Sharp Corporation) 25, 1 September, 1972 (25.09.1972), Column 2, line 34 to column 3, line 7					
Y	JP,U, 51-132637 (Matsushita Electric 1 Industrial Co., Ltd.) 25, October, 1976 (25.10.1976)					
Y	JP,U, 52-69037 (Sharp Corp 1977 (23.05.1977)	oration) 23, May,	1 - 3			
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