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(54) KEROSENE VAPOUR STOVE WITH AUTOMATIC FUEL FEEDING SYSTEM

(71) I, BESHING HOU, a citizen of Taiwan, of No. 33–1 Alley 9, Lane 390, Tun Hua S. Road, Taipei, Taiwan, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a kerosene vapour stove with an automatic fuel feeding system.

The importance of fuel in our daily life cannot be over emphasized. In rural areas of developing countries, wood and coal are used to produce heat for cooking or warming purposes. In urban areas or in developed countries, coal gas, water gas or liquified natural gas are often used. In the former case, pollution is a certain result. In the latter, the convenience is over shadowed by the potential hazard of gas poisoning or fire breakout due to leakage of gas. Accidents from this source claim a high toll of lives in any country. Further, in some countries, the availability of various types of fuels are not always in the proportion they are needed. In Taiwan, there is often a shortage of gas and a surplus of kerosene.

Because kerosene has a high ignition point and because its leakage can be more easily detected and there is no problem of gas poisoning, the adoption of kerosene as a fuel can contribute considerably toward the promotion of safety. Unbalance in the supply of various types of fuels, such as in the case of Taiwan, can also be alleviated. This invention provides a stove which utilizes kerosene vapour as fuel to produce a strong blue flame without smoke as in the case of burning wood or coal. The automatic feeding of kerosene as well as the automation of the vapourization process and ignition process by means of a timepiece and an electromagnetic valve, enable the operation of this kerosene vapour stove to be no less convenient than any other gas stove, and more convenient than conventional kerosene stoves.

In the accompanying drawings: —

Figure 1 is a plan view of an embodiment of the invention;

Figure 2 shows the preliminary path of vapourization at the start-up stage of the stove;

Figure 3 shows the normal path of vapourization when the stove is being used;

Figure 4 is a circuit diagram showing a two step automatic timer for use with the stove;

Figure 5 shows an igniter for use with the stove;

Figure 6 shows a sectional side view and plan view of the two step automatic timer;

Figure 7 is a side view of the stove; and

Figure 8 is a sectional front view of the steel container.

Referring to Figure 1, 1 is an inlet for kerosene through which kerosene is passed into the stove. A pipe delivers the kerosene to an electromagnetic valve 2 which comprises an electromagnet 3, a soft iron block 4 with a "T" shaped passage therein and a spring 5 connecting the soft iron block 4 to a fastening point in the upper part of the electromagntic valve 2. When the electromagnet 3 is activated, the soft iron block will be pulled down such that the left arm of the "T" shaped passage will communicate with a pipe 6. When the electromagnet 3 is off, the spring 5 will pull the soft iron block up such that the right arm of the "T" shaped passage will communicate with a pipe 7. The electromagnet 3 of the electromagnetic valve 2 is operated by a two step automatic timer 8A. A wire connects the output terminal of the two step automatic timer 8 to a pilot lamp 9 and then to a heating element 10 inside a preliminary preheating tube 11 which communicates with tube 6 at one of its ends. Connected to the other end of preliminary preheating tube 11 is a transverse tube 12 having one of its ends in communication with a needle valve 13 and another of its ends in communication with another needle valve. Opposite the needle valve 13 is a vapourizing tube 14 which leads into a large mixing tube 15. After the process of mixing in the mixing tube 15, the mixture then emerges from the burner 16 where it burns. The ignition of the burner is effected

by an electromagnetic igniter 17 controlled by the two step automatic timer 8 whose operation will be described later.

The left end of the transverse tube 12 is in communication with a needle valve 18. A vapourizing tube is spaced by an air gap from needle valve 18 which permits an inflow of air into the vapourizing tube and mixing tube and leads to an auxiliary burner 19 (see Figure 7, details not shown) which has a far less supply of fuel than the main burner. The function of the auxiliary burner is to keep a part of the preheating tube 11 and the whole transverse tube 12 at a high temperature. During the process of cooking when the fire is desired to be turned off temporarily, control of the knob 13A will put out the flame at the main burner 16 while the auxiliary burner 19 is kept burning. When the main burner is desired to be lit again, it is now not necessary to go through the preliminary preheating procedure once more because the transverse tube 12 is kept heated by the auxiliary burner 19.

Tube 7 extending from the electromagnetic valve 2 toward the burner 16 bends into a loop 20 encircling the burner 16. The other end of the loop 20 is connected to the transverse tube 12.

Referring to Figure 8, the kerosene fuel for the stove is stored in a steel container 21 which has a central tube 22 to drain the kerosene. Compressed air is introduced into the upper part of the container 21 so that a pressure will be exerted on the liquid surface to force the kerosene up the central tube 22 when a valve 23 on the top of the steel container 21 is opened.

Figure 6 shows the structure of the two step automatic timer 8. Gear train 24 is identical with the gear train in a conventional clock, with gears and spring connected together such that the shaft 25 will have a fixed speed of turning. Control disc 26 with a recess 27 is mounted rigidly on the shaft 25. Another control disc 28 with a recess 29 is also rigidly mounted of the shaft 25 outside the control disc 26. A follower 30 slides over the edge of the control disc 26 when the disc is rotating. A flexible spring 31 carrying a contact terminal 32 is kept in a bent position by the follower 30 so that the contact terminal 33 is touching an opposite contact terminal 32. When the follower 30 falls into the recess 27, pressure on the spring 31 is released and contact terminal 32 will part with the contact terminal 33. This step of control discs, follower and contact terminals is used to break the circuit of the electromagnetic valve 2 and that of the heating coil 10. The elements of the other step, namely follower 34, spring 35, contact terminals 36 and 37 are in identical relationship with one another except that this set is to be used to break the circuit of the electromagnet 37 of the igniter 17.

Figure 5 is a diagram of the igniter 17. When current passes through the coil of the electromagnet 38, the resultant magnetic force will pull down a soft iron rod 39. When current is cut off, the soft iron rod will be released and pulled back by a spring, activating a striker on its way back. The striker will emit sparks that will ignite the kerosene vapour.

Having described the structure of the kerosene vapour stove with an automatic fuel feeding system, the operation of the stove will now be described. Before using the stove, the control knobs 13A and 18A are set in position so that the passages of the needle valves 13 and 18 are closed. Control knob 8A of the two step automatic timer is turned in the clockwise direction. This action causes followers 30 and 34 to come out of the recesses 27 and 19, pressing the contact terminal 32 against 33 and 36 against 37 and closing the circuit of the heating coil 10 and the electromagnetic coil 3 which are in series connection. The electromagnet then pulls down the soft iron block 4, causing tube 6 to come into communication with inlet 1 through the "T" shaped passage in the soft iron block 4. Valve 23 at the top of the steel container 21 is opened immediately after to allow kerosene to flow into the preliminary preheating tube 11 before the heating coil 10 becomes too hot. The stove is allowed to stand under these conditions for thirty five seconds, then control knobs 13A and 18A are adjusted to allow a small amount of kerosene to pass through the needle valves 13 and 18. The emitted kerosene will vaporize and the vapour mixture will emerge at the main burner and auxiliary burner, see Figure 2. Forty seconds after the activation of the two step automatic timer 8, the rotating shaft 25 is at such a position that the follower 34 will now fall into the recess 29 and the contact terminals 36 and 37 will be separated from each other. At this point, the circuit of the electromagnet 38 of the igniter 17 being open, the soft iron rod is released to activate the striker which then emits sparks to ignite the main burner. The auxiliary burner is also ignited at the same time by a separate igniter (not shown in the Figures) connected in parallel with igniter 17. Control knob 13A is now adjusted to allow a higher flame at the burner. Loop 20 is now being gradually heated up by the main burner. About two minutes after the activation of the two step automatic timer 8 the rotating shaft will be in such a position that the follower 30 will be separated from recess 27. At this point, the circuit of the heating coil 10 and the electromagnet 3 in series is open. The heating coil will stop heating and the electromagnet 3 will release the soft iron

block which is then pulled up by the spring 5. The passage of kerosene into tube 6 is now disconnected. Kerosene is channelled into tube 7 instead. After being heated during its passage through loop 20, the hot kerosene then delivered into the transverse tube 12 and then emitted through the needle valves 13 and 18, see Figure 3. After using the stove, valve 23 and the control knobs 13A and 18A are turned to block the passage of the valve 23 and the needle valves 13 and 18.

WHAT I CLAIM IS:—

1. A kerosene vapour stove with an automatic fuel feeding system comprising a vaporization system with a preliminary fuel preheating path and a normal fuel preheating path the selection of which is controlled by an electromagnetic change over valve which, in turn, is controlled by a two step automatic timer, the preliminary preheating path utilizing a heating coil also controlled by the two step automatic timer and the normal preheating path utilizing a loop encircling a burner to absorb heat for preheating purposes, a needle valve to regulate the flow of the kerosene, a kerosene container made of steel and utilizing compressed air to exert a pressure to drive the flow of kerosene through the stove, an igniter which is also controlled by the two step automatic timer and which will emit sparks when its circuit is broken by the two step automatic timer, the said two step automatic timer when it is activated, making the circuit of the preheating coil and electromagnetic valve and the circuit of the igniter breaking the circuit of the igniter to activate its striker and breaking the circuit of the preheating coil and electromagnetic valve to switch over the vaporization path from the preliminary preheating path to the normal preheating path; and a burner fed by said system.

2. A stove as claimed in Claim 1, in which the preliminary preheating system comprises a preheating system comprises a preheating tube with the preheating coil in it, there also being provided a vapourizing tube, a mixing tube leading to and feeding the main burner, another needle valve for an auxiliary burner, a vapourizing and mixing tube leading to and feeding the auxiliary burner.

3. A stove as claimed in Claim 2, in which said normal preheating system is connected to the electromagnetic valve at one end and connected to a transverse tube at the other.

4. A stove as claimed in Claims 2 and 3, in which an air gap between the needle valve and the vapourizing tube permits an inflow of air into the vapourizing tube and mixing tube.

5. A stove as claimed in Claim 1, in which the two step automatic timer comprises a train of gears and a spring to limit the turning of a main shaft to a specific speed, two control discs rigidly attached to the main shaft, each control disc having a recess and each being provided with a follower, a flexible spring and a pair of contact terminals.

6. A stove as claimed in any one of the preceding claims, in which the kerosene container has a central tube and an outlet valve.

7. A kerosene vapour stove with an automatic fuel feeding system substantially as herein described with reference to the accompanying drawings.

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