March 14, 1961 R. W. BLANCHARD 2,974,723

EVAPORATING NOZZLE FOR A LIQUID FUEL BURNING TORCH

Filed Dec. 27, 1955

FIG. 1

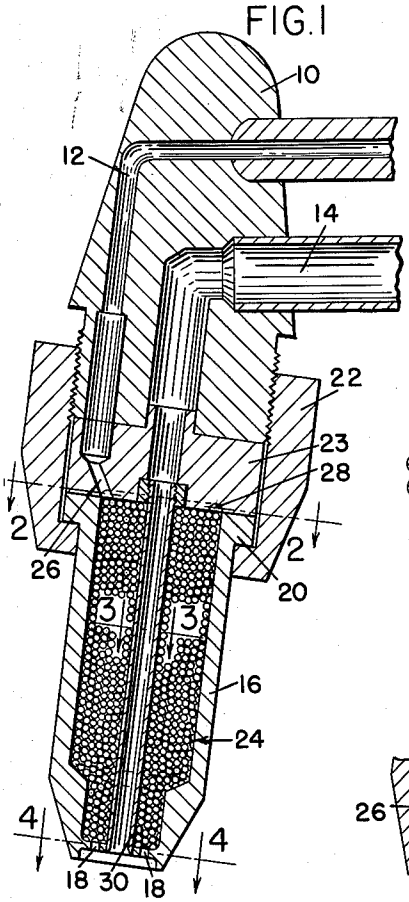


FIG. 2

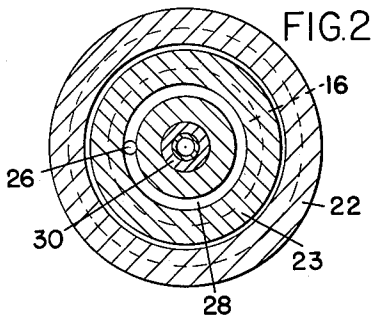


FIG. 3

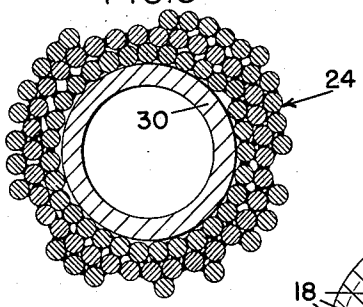


FIG. 4

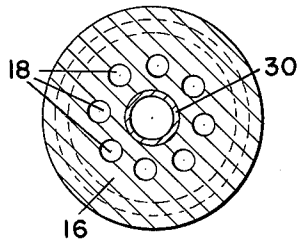


FIG. 6

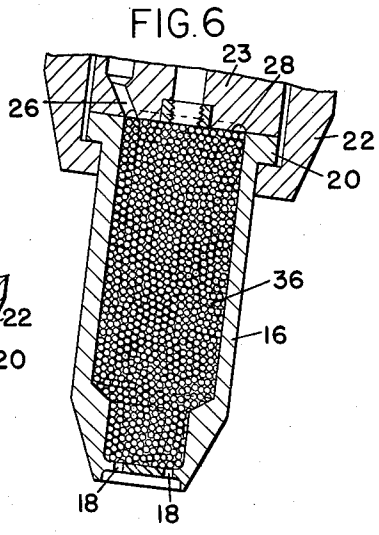
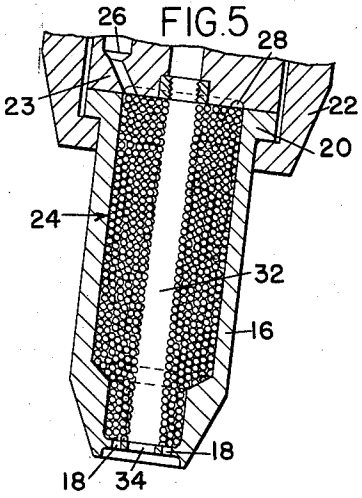


FIG. 5



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EVAPORATING NOZZLE FOR A LIQUID FUEL BURNING TORCH

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8 Claims. (Cl. 158—27.4)

This invention relates to a new and improved liquid fuel burning torch, and the principal object of the invention resides in the provision of a greatly simplified and much more efficient evaporation means for liquid fuel such as gasoline, kerosene, etc. in the nozzle of the torch. It has been proposed in the prior art to provide various mechanical means in an attempt to increase the degree of evaporization of liquid fuels by providing sinuous and tortuous passages in the nozzle in order to increase the evaporating surface therein. The present invention relates to the provision of a solid but porous sintered metallic mass of extremely small finely divided metallic elements, such as bronze balls, through which the fuel must pass, for creating optimum conditions of evaporation by providing the greatest possible number of irregular and elongated passages and the largest possible evaporation surface in any torch of the class described.

A further object of the invention resides in the provision of a new and improved nozzle for a liquid fuel burning torch as above described, said nozzle comprising a solid body of porous sintered metallic finely divided material forcing a combined gas such as oxygen and a liquid fuel such as gasoline or kerosene to traverse the solid porous nozzle in order to arrive at the burning orifices, whereby the liquid fuel is completely evaporated and provides the best possible burning flame whether the torch is to be used for cutting or welding.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a section through the hand and nozzle of a torch according to the present invention;

Fig. 2 is a section on line 2—2 of Fig. 1;

Figs. 3 and 4 are enlarged sections on the respective lines in Fig. 1; and

Figs. 5 and 6 are sectional views illustrating modifications.

Only so much of the torch is illustrated herein as is necessary for an understanding of the present invention. As is well known in this art, there are many examples of liquid fuel burning torches, of which examples are Browning Patent No. 1,879,789 and Miller et al. No. 2,362,213.

Referring now to Fig. 1, the reference numeral 10 indicates the head of the torch in which is arranged a passage 12 for the combined liquid fuel and a low-pressure gas such as for instance oxygen. There is also a passage as at 14 for a high-pressure gas such as oxygen. It will be at once apparent that the high-pressure oxygen flows through the center of the device in substantially undisturbed form and that the low-pressure oxygen and liquid fuel in passage 12 flow into the tip indicated at 16, in which tip the liquid fuel must be evaporated prior to escape thereof through orifices as at 18 where the evaporated now gaseous fuel is burned, mixed with the low-pressure gas, all as is well known in the art.

The tip 16 is in the form of a cylinder or bullet-shaped hollow member which is provided with corresponding passages aligning with that at 12 and 14. The nozzle 16 has a flange 20 by which it is secured to head 10 by a cooperating flanged nut 22. Interposed between the head and nozzle tip is a block 23 which may be separate or integral with the base of the nozzle.

In order to provide the greatest possible evaporating surfaces for the liquid fuel within the nozzle, this invention contemplates the provision of a solid porous member completely filling the evaporation chamber which comprises the hollow within the nozzle or tip 16. This solid material is indicated generally at 24 in Fig. 1, and it comprises a sintered metallic core or body, individual particles of which are extremely fine and are preferably made of bronze or the like to prevent rust. Any other metal would be advantageous also in the evaporation of the liquid fuel. This core is represented in the drawings on an exaggerated scale since the metallic particles are so small that the core 24 upon examination by the unaided eye appears almost to be non-porous as well as solid; but by reason of the fact that the small metallic particles are spherical, it will be seen that upon sintering they become brazed to each other as is best illustrated in Fig. 3. Wherever the metallic balls or like elements touch each other, they become brazed together, and this leaves an enormous number of small minute passages which extend tortuously from end-to-end, and also of course laterally, of the solid body 24.

In turn, this means that the largest possible evaporation surface is provided for receiving the flow of the liquid fuel as at the entrance passage 26 in block 23, and this in turn means that at the orifices 18, the liquid fuel will be very highly evaporated or gasified and will be in such an extremely finely divided state as to burn with a maximum of efficiency, so that there is substantially no unburned fuel. The nozzle in the block 23 may be provided with an annular passage 28 surrounding the base of the solid core 24 and thus equalizing the entrance pressure of the liquid fuel and low-pressure gas evenly about the entire base of the solid core 24.

The high-pressure gas in passage 14 passes directly through the core by reason of the provision of a centrally elongated tube 30 which provides the central passage therefor. However, this central passage could be a cored hole without the sleeve 30 as is indicated at 32 in Fig. 5 without departing from the invention, and the high-pressure gas will still exit through its own orifice 34 in the tip of the nozzle.

In the event that it is desired to cut by means of the flame, the high-pressure oxygen is used, but where welding or brazing is to be done, the high-pressure oxygen is cut off as by means of the conventional valve provided therefor and not herein shown. However, if it is desired to provide a special nozzle tip merely for welding or brazing, the sintered solid porous core may emit the central passage provided by sleeve 30 and cored hole 32, and thus it may be solid from side-to-side thereof as shown at 36 in Fig. 6. In this case, the low-pressure gas and liquid fuel enter as before at passage 26 but the high-pressure fuel is completely cut off and is not utilized at all.

This invention provides the maximum evaporation surface that is possible for a torch of the class described and thereby the liquid fuel is extremely efficiently vaporized and issues from the orifices 18 in a gaseous state, providing for complete burning of the fuel with no unburned particles or soot being formed. The liquid fuel and low-pressure gas are of course intimately mixed by reason of the extremely great number and irregularities of the passages from end-to-end of the core as de-

scribed above, and this together with the maximum vaporization surface created by the large number of individual metal balls provides the optimum in burning efficiency of the liquid fuel, and eliminates flash-back.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. Apparatus for spraying a liquid in substantially gaseous form comprising a shell-like nozzle tip having separated entrance and exit orifices, a source of liquid and gas under pressure, means conducting the liquid and gas to the nozzle tip through the entrance orifice, and a finely divided porous material substantially filling the nozzle tip, the porous material being composed of a plurality of relatively small metallic sintered ball-like elements.

2. Apparatus for vaporizing a liquid comprising a hollow nozzle tip, a source of gas under pressure, a source of liquid, means conducting the gas and liquid to the nozzle tip, and a relatively finely divided porous solid material substantially filling the nozzle tip, the latter having an exit orifice, and the liquid and gas entrance to the nozzle tip being located at a point remote from the orifice so that the liquid and gas traverse the material to reach the orifice, said material comprising a relatively large number of small ball-like sintered metallic elements fixed together and providing many small sinuous passages therethrough.

3. Apparatus for vaporizing a liquid comprising a nozzle tip, a source of gas under pressure, a source of liquid, means conducting the gas and liquid to the nozzle tip, and a relatively finely divided porous solid material substantially filling the nozzle tip, the latter having an exit orifice, and the liquid and gas entrance to the nozzle tip being located at a point remote from the orifice so that the liquid and gas traverse the material to reach the orifice, said material comprising a relatively large number of small ball-like elements fused together into a fixed mass.

4. The apparatus of claim 3 including an unimpeded passage through the porous material leading to the exit orifice for additional fluid at the orifice.

5. Apparatus of the class described comprising an elongated hollow nozzle tip, a source of gas under pressure, a source of fluid, means conducting the gas and fluid to the nozzle tip at one end thereof, a relatively finely divided porous solid material substantially filling the nozzle tip, the latter having an exit orifice, and the fluid and gas entrance to the nozzle tip being located at a point remote from the orifice so that the fluid and gas traverse the material to reach the orifice, said material comprising a number of small metallic elements sintered into a solid mass.

6. The apparatus of claim 5 including an unimpeded central gas passage through the porous solid mass, and a separate gas entrance and orifice for said gas passage.

7. The apparatus of claim 5 including an unimpeded central gas passage through the porous solid mass, and a separate gas entrance and orifice for said gas passage, said fluid and gas entrance including an annular groove about the gas entrance end of the tip.

8. Apparatus for vaporizing a liquid for a liquid burning torch comprising a hollow tip, sources of gas and liquid, means conducting the same to the nozzle, a vaporizing member in the nozzle, said vaporizing member comprising a body of solid material, said body being provided with a plurality of tortuous relatively small irregular passages extending continuously from end to end thereof, said passages being adapted to conduct combined gas and fluid the length of the nozzle, said body of solid material comprising sintered metal powder.

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