May 28, 1963 T. CURZON 3,091,282

MEANS FOR FACILITATING THE STARTING OF AN INTERNAL COMBUSTION ENGINE

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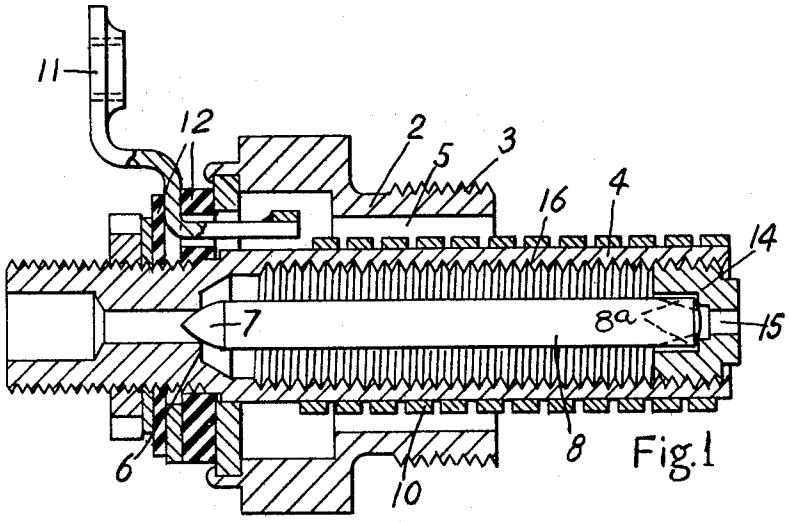


Fig. 1

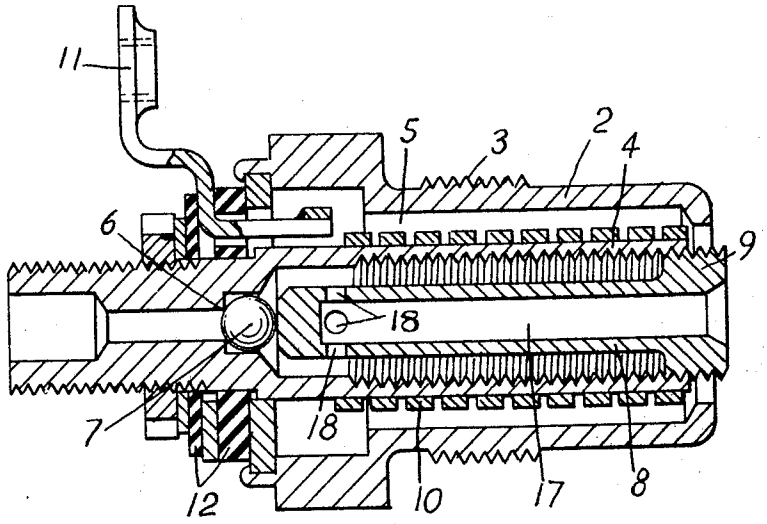


Fig. 2.

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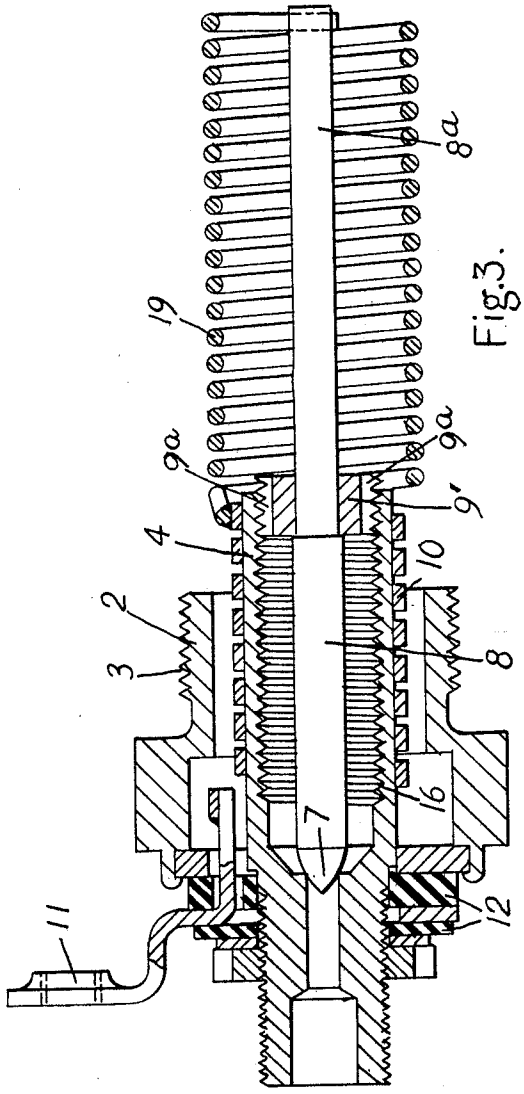


Fig.3.

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MEANS FOR FACILITATING THE STARTING OF AN INTERNAL COMBUSTION ENGINE

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2 Claims. (Cl. 158—28)

This invention relates to means for facilitating the starting of an internal combustion engine at low temperatures, and is a continuation in part of Patent No. 2,965,164 which was filed on October 10, 1958.

The objects of the invention are to enable liquid fuel to be admitted under the control of a valve to the interior of a gasifying tube through an inlet portion thereof only after the tube has been heated to a predetermined temperature by an electrically heatable coil mounted on and surrounding the tube, and also to enable the fuel admitted to the interior of the tube to be effectively superheated and gasified before flowing from the interior of the tube through the end thereof remote from the said inlet portion.

In the accompanying drawings:

FIGURE 1 is a longitudinal section illustrating one form of nozzle embodying the invention.

FIGURES 2 and 3 are similar views to FIGURE 1 illustrating alternative forms of nozzles embodying the invention.

The example of a nozzle in accordance with the invention as shown in FIGURE 1, comprises a hollow cylindrical body part **2** adapted to be inserted in a hole in one side of the air intake manifold, and secured thereto by a screw thread connection **3**. Extending coaxially through the body part **2** is a gasifying tube **4** which at its outer end is supported in and extends beyond the outer end of the body part.

The inner end portion of the tube **4** extends beyond the inner end of the body part **2**, the latter being shaped to form an annular chamber **5** which surrounds a portion of the tube intermediate the ends thereof.

Within and adjacent to the outer end of the tube **4** is formed a valve seating **6** for a valve closure member **7** of any convenient form. The closure member **7** is formed on one end of a stem **8** which is mounted coaxially within the tube **4**, and which is supported at its opposite end by a plug **14** in screw-thread engagement with the inner end of the tube **4** so that the closure member **7** is normally held in contact with the seating **6**. In the plug **14**, is formed a gas discharge orifice **15**, and the contiguous end of the stem **8** has formed thereon a narrow groove or grooves **8***a* through which gas can flow from the interior of the tube **4** to the discharge orifice **15**. The internal surface of the tube **4** has formed on it a helical groove **16** to increase the area over which the said internal surface is exposed to the fuel admitted to the interior of the tube. The tube **4** and stem **8** are made of metals having different temperature co-efficients of thermal expansion, such that when heated between 200–300° C. the closure member **7** is separated from the seating **6** and permits the liquid fuel to pass into the tube from a supply pipe attached to the outer end of the tube.

To gasify the liquid fuel admitted to the tube **4**, heating of the fuel is effected by an electrically conductive wire or tape **10** coiled helically around the exterior of the tube. One end of the wire or tape is secured to the inner end of the tube and the other end of the wire or tape is connected to a current supply terminal **11**. Electrical insulation of the tape or wire is effected by discs **12** of insulating material secured to the outer end of the body part.

The nozzle above described is such that it can gasify the liquid fuel admitted to the tube **4** and cause a superheated gaseous jet to emerge from the tube at a temperature of for example about 300° C. By superheated is meant a temperature higher than the vaporisation temperature of the fuel.

The mode of use in a diesel type or like engine, is to provide a nozzle or nozzles as above described in the air intake manifold of the engine at a position or positions as closely adjacent as possible to the air inlet valve of each engine cylinder, or pair of adjacent engine cylinders. When starting a cold engine the nozzle or each nozzle is heated to effect the required gasification of the fuel supplied to the nozzle, the gasified jet being discharged into the air in the manifold and carried thereby to the associated cylinder or cylinders.

It will be understood, that the normal supply of fuel to each engine cylinder is effected in the usual manner by a fuel injection nozzle or nozzles supplied by a pump. The amount of gasified fuel supplied by the nozzle or nozzles above described is such that it can convey sufficient heat to facilitate the normal ignition of a cold fuel and air mixture to the engine.

The example shown in FIGURE 2 differs from the example illustrated by FIGURE 1 in that the valve closure member **7** has the form of a ball in contact with the adjacent end of the stem **8**, the opposite end of the stem **8** has formed on it a head **9** in screw-thread engagement with the inner end of the gasifying tube **4**, and the stem **8** has formed in it an axial bore **17** which at the end nearest to the valve closure member **7** communicates with the interior of the tube **4** through ports **18** in the stem, and which at the opposite end is open so that gasified fuel can flow from the interior of the tube through the axial bore in the stem.

In the example shown in FIGURE 3, the stem **8** has formed on or secured to it a collar **9'** in screw thread engagement with the gasifying tube **4**. To the heating wire or tape **10** is secured one end of a supplementary heating coil **19** which at its other end is secured to the inner end of an extension **8***a* of the stem **8**. The gasified fuel emerges from the tube **4** through passages **9***a* in the collar and enters the interior of the coil **19**. Here the fuel mixes with the combustion air in the air intake manifold of the engine, and the mixture is heated by heat derived from the coil **19**.

The invention is not, however, restricted to the examples above described, as constructional details may be varied to suit different requirements. Further the invention is applicable in essentially the same manner to petrol or other engines in which the normal fuel is supplied through a carburettor or vaporiser.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. Means for facilitating the starting of an internal combustion engine, comprising in combination a hollow cylindrical body part having at least one of its ends closed, a liquid fuel gasifier in the form of a tube which has an inlet portion secured to the closed end of said body part, and which extends through said body part in coaxial relationship thereto, a fuel inlet valve mounted within the inlet portion of said tube at a position adjacent the closed end of said body part, and provided with a controlling stem which is contained in said tube, and which is supported by the end of said tube remote from said valve, an electrically heatable coil mounted on and surrounding said tube, and at least one outlet whereby gasified and superheated fuel can flow from the interior of said tube through the last mentioned end of the latter, said

tube and stem being made respectively of metals having different coefficients of expansion such as will enable said valve to open when said tube and stem are heated by said coil, and the internal surface of said tube being helically grooved to increase the area over which said surface is exposed to fuel admitted to the interior of said tube by said valve.

2. Means according to claim 1, in which said steam is provided with an axial bore open at the end remote from said valve, and with ports establishing communication between the interior of said tube and the other end of said bore, said ports and bore forming the outlet through which gasified and superheated fuel can flow from the interior of said tube.

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