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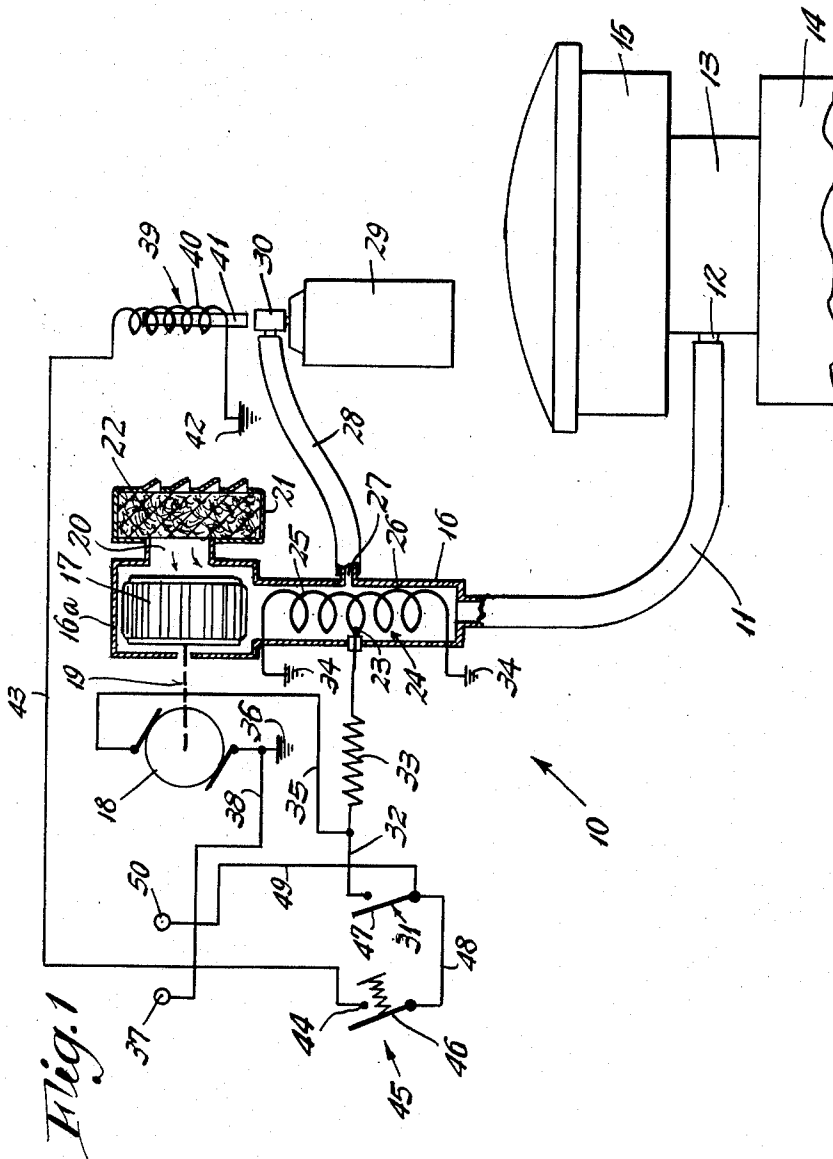
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STARTING UNIT FOR INTERNAL COMBUSTION UNITS

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2 Sheets-Sheet 1



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3,190,277 STARTING UNIT FOR INTERNAL COMBUSTION UNITS

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The present invention relates to a unit for aiding the starting of internal combustion engines either gasoline or diesel and particularly to a unit for injecting a readily combustible mixture into the engine intake for facilitating its starting during cold weather.

The starting of an internal combustion engine in cold weather has proved troublesome particularly as the engine depends upon the insertion of a combustible mixture of air and vaporized liquid fuel. During cold weather, such as sub-zero temperature not only is the fuel at that temperature exceedingly difficult to vaporize but also the coldness of the air impedes the forming of a mixture which is readily combustible.

An object of the present invention is to provide a starting unit for facilitating the starting of an internal combustion engine by introducing into the engine a readily combustible mixture of heated air and vaporized fuel.

Another object of the present invention is to provide in a starting unit of the above type for assuring vaporizing of the liquid fuel in a stream of forced air by initially heating the stream of air before introducing the fuel thereto and then subsequently heating the fuel and air mixture prior to entrance into the engine.

A further object of the present invention is to provide a starting unit which maintains a continuous stream of heated air under some pressure to the engine and only intermittently introduces a combustible fuel thereto.

An additional object of the present invention is to provide a starting unit that achieves the above objects, which is simple in construction, durable in use, quickly attachable to a present existing engine and easily operated during the starting of the engine.

A feature of the present invention is the provision of means for heating and forcing under pressure, when the engine is turning over, a large quantity of warmed air to the air intake of the engine to aid in the volatilizing of the usual fuel supplied to the engine, and to supply, if and when the engine fails to fire, a quantity of highly volatile auxiliary fuel such as ether, naphtha or the like, to the heating means whereby the heated auxiliary fuel and air are forced into the engine air intake. Preferably, the auxiliary fuel is supplied under the control of the operator in intermittent spurts of measured quantities until the engine fires.

Other features and advantages will hereinafter appear. In the drawing:

FIGURE 1 is a diagrammatic representation of the starting unit of the present invention.

FIG. 2 is an elevation of the starting unit shown mounted in a casing with the cover removed.

FIG. 3 is a section taken on the line 3-3 of FIG. 2.

Referring to the drawing, the starting unit is generally referred to by the reference numeral 10 and referring to FIG. 1 it has an outlet conduit 11 terminating in a nozzle 12 that enters the air intake 13 of an internal combustion engine 14 below the conventional air filter 15. The conduit 11 at its other end is connected to casing 16 which in turn is connected to a housing 16a for a forced air impeller type blower 17 that is rotated by a motor 18 through a shaft 19 indicated by the dotted line. The side of the blower housing 16a has an opening 20 that communicates with a housing 21 having blowers opened to the atmosphere and contain an air filter 22. The cas-

ing 16 forms a heating chamber and has mounted within it electric heating means 24 having coils 25 and 26 connected end to end at 23. Adjacent the connection 23 the casing 16 has an inlet fitting 27 connected to a tube 28 that connects with the outlet of a push button valve 30 on a container 29. The container 29 is adapted to hold a highly volatile fuel, such as ether, naphtha or gasoline under pressure. Actuation of the push button valve 30 will cause ejection of the fuel. Moreover, as will be hereinafter set forth, the valve 30 is preferably of the well-known type wherein upon each actuation only a predetermined measured quantity of fuel is ejected and hence is referred to as a measuring valve.

With the structure heretofore recited the blower motor 18 and heating coils 25 and 26 are energized by operation of a switch 31, connects by a lead 32 including in the form shown a resistor 33 to the midpoint of the heating coil 23 while the two ends of the coil are electrically grounded as at 34, a lead 35 connecting the motor 18 to the lead 32 while the other side of the motor is grounded as at 36. An input terminal 37 which is adapted to be connected to a source of electrical energy is connected by a lead 38 to the ground 36.

Located adjacent the push button 30 in alignment therewith is a push type solenoid 39 having a winding 40 and an armature 41. One end of the winding is grounded as at 42 while a lead 43 connects the other end to a contact 44 of a switch 45 whose contact arm 46 is spring urged to open position. The contact arm 46 is connected to the switch arm 47 of the switch 31 by a lead 48 which in turn by lead 49 is connected to the other input terminal 50.

In the operation of the starting unit of the present invention after operating the engine starter and the engine is turning over, the operator closes switch 31 so that contact is made between contact arm 47 and lead 32 which energizes the motor 18 causing the blower 17 to rotate and force a stream of air continuously through the casing 16 and conduit 11. Also, this energizes the heating means 24 and causes it to become hot with its temperature being limited by the current limiting resistor 33 connected in series therewith. If the engine does not start, while the forced air is passing over the energized heating coils 25 and 26, the operator depresses the switch arm 46 of switch 45, the latter being of the type which only remains closed upon manual operation. This energizes the solenoid winding 40 causing the plunger 41 to be moved downwardly into engagement with the push button valve 30 opening the valve. The valve, as heretofore recited, is of the measuring or metering type and hence only a limited quantity of the fuel in container 29 passes into the tube 28 and through the inlet 27 to be introduced into the casing 11, until the switch 46 is released, the valve returned and again operated by repeated operations of the switch 46.

It will be appreciated that cold air drawn through the baffle plate 21 and air filter 22 is preheated by the coil 25 of the heater 24 to a temperature which facilitates the mixing of the fuel from the inlet 27. After the fuel has been combined with the air, this mixture is further passed over the heating coil 26 which causes vaporization of the fuel in the hot air stream by the heating of the mixture in addition to subsequent heating of the air stream and the fuel. Thus this mixture of volatilized fuel and air mixture constituting a readily combustible mixture is introduced into the air intake 13 by the conduit 11 and readily facilitates the starting of the engine 14 during cold weather.

While the operation has been disclosed with respect to just one closing of the switch 45, it will be appreciated that if the engine does not start that the operator may again close switch 45 causing subsequent injections of fuel into the forced air stream. Moreover, by the present invention only intermittently is auxiliary fuel introduced

into the forced heated air stream and thus obviating the problem of having a readily combustible mixture throughout the entire length of the passage-way 11 which might create hazardous operating conditions.

Referring to FIGS. 2 and 3, wherein the parts of the present invention shown diagrammatically in FIG. 1 are shown structurally these parts have generally been given the same reference characters. The parts are mounted within a closed box or container 51 having a removable cover 52 to provide access to the interior of the casing. A clip 53 secured in the casing holds an "Aerosol" container 29 having an operating valve button 30. Positioned just above the button 30 is the solenoid 39 and it is held in place as by the screws 55 cooperating with the back panel 57 of the box. The switch 46 is mounted on the left-hand side panel 58 of the box in any convenient manner and has an operating arm 59 located outside the casing. In addition the switch 31 is mounted adjacent thereto and is provided with an operating arm 60. The inlet fitting 27 of the casing 16 is shown in FIGS. 2 and 3 as a compression fitting threaded in the casing 16. The casing has a reduced end 61 which connects to the delivery opening 62 of the housing 16a of the blower 17. A motor housing 63 containing the motor 18 is mounted on one side of the blower housing 16a. The other side of the housing 16a communicates through a hole in the box 51 with the air filter housing 21, the cover of which has louvers 64 through which air passes to the filtering elements 22 which preferably is non-combustible so that the filter may serve to prevent back-flashing from the heater casing from reaching the atmosphere.

While the present invention contemplates that the starting unit will be mounted adjacent the engine with the conduit 11 connected thereto in any convenient manner for convenience purposes a handle 65 is secured onto the top 66 of the box 51 so that the device may be transported from place to place. In addition the input terminals 37 and 50 are shown mounted on a terminal board 67 with portions 68 extending to the exterior of the box 51 in order that connections to a source of electrical energy may be made, such as typified by leads 69. Though the present invention has been shown mounted in a box, it is within the scope of the present invention to mount the two switches 46 and 31 remote from the box, as for example in the cab of a motor vehicle while the other components of the starting unit including the box may be mounted adjacent the engine.

It will accordingly be appreciated that there has been disclosed a novel and advantageous starting unit for facilitating the starting of an internal combustion engine particularly during cold weather, such as sub-zero temperatures. The present invention provides for introducing into the intake of the engine a continuous stream of heated warm air under pressure at all times that the unit is being operated. Further at times selected by the operator upon operation of a switch a selected quantity of fuel is ejected from an "Aerosol" can into the forced air stream. However, in order to assure the proper vaporization and mixture of the fuel and air, the introduction of the fuel is made to the air stream after the latter has been initially preheated and yet in which there is subsequent heating of both the fuel and air stream prior to injection into the intake manifold of the engine.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A unit for aiding in the starting of an internal combustion engine having a carburetor and air intake means, comprising a casing remote from the air intake means and provided with a conduit communicating with the engine between the carburetor and the intake means; an air blower communicating with the atmosphere for forcing a stream of air into said casing and through said conduit

into said engine intake means; a pressurized source of readily combustible fuel; means connecting said source of fuel to the casing including a normally closed valve; heating means for heating the air stream passing through said casing to the conduit and the engine intake means, and also heating the fuel entering the casing when said valve is open; and manually operable means for controlling operations of said blower, said valve and said heating means, said air stream propelling the fuel entering the casing through the latter and the conduit to the air intake of the engine.

2. A unit as defined in claim 5, in which the manually operable means comprises means for controlling the operation of the blower and the heating means and separately operable means for selectively and intermittently controlling the operation of said normally closed valve.

3. A unit for aiding in the starting of an internal combustion engine having a carburetor and air intake means, comprising a casing remote from the air intake means and provided with a conduit communicating with the engine between the carburetor and the intake means; an air blower communicating with the atmosphere for forcing a stream of air into said casing and through said conduit into said engine intake means; a pressurized source of readily combustible fuel; means connecting said source of fuel to the casing including a normally closed valve; electrical heating means contained within said casing in the path of said air stream for heating the air passing therethrough, and also heating the fuel entering the casing when said valve is open; and manually operable means for controlling the operation of said blower, said valve and said electric heating means, said air stream propelling the fuel entering the casing through the latter and the conduit to the air intake of the engine.

4. A unit as defined in claim 3, in which said manually operable means comprises a manually operable switch for controlling the operation of the blower and the energization of the electrical heating means; and electrical means including a separate and independently manually operable spring returned switch for operating said normally closed valve to open the same.

5. A unit for aiding in the starting of an internal combustion engine having a carburetor and air intake means, comprising a casing remote from the air intake means and provided with a conduit communicating with the engine between the carburetor and the intake means; an air blower communicating with the atmosphere for forcing a stream of air into said casing and through said conduit into said engine intake means; a pressurized source of readily combustible fuel; means connecting said source of fuel to the casing including a normally closed measured quantity valve; electrical heating means contained in said casing in the path of said air stream for heating the air passing therethrough, and also heating the fuel entering the casing when the valve is open; manually operable means for controlling said blower and said electric heating means to cause the warmed air stream to pass through said conduit to the engine intake means; and separately manually operable means for opening said normally closed valve to cause at each operation a measured quantity of fuel to enter said casing and mix with and be volatilized by said warmed air stream and pass to the engine intake means, said air stream propelling the fuel entering the casing through the latter and the conduit to the air intake of the engine.

6. A unit for aiding in the starting of an internal combustion engine having a carburetor and air intake means, comprising a casing remote from the air intake means and provided with a conduit communicating with the engine between the carburetor and the intake means; an electric motor-operated blower communicating with the atmosphere for forcing a stream of air into said casing and through said conduit means into said engine intake means; a pressurized source of readily combustible fuel; means connecting said fuel source to said casing includ-

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ing a normally closed valve for delivering a measured quantity of said fuel to said casing upon each operation thereof; electric heating coil means in said casing in the path of said air stream for heating the air passing there-through, and also heating the fuel entering the casing when the valve is open; an electromagnet having an armature to engage and open said valve; an energizing circuit for said electromagnet including a manually operable switch biased to open-circuit position; and an energizing circuit for energizing the blower motor and the electric heating coils and including a switch operable independently of said first-named switch, said air stream propelling the fuel entering the casing through the latter and the conduit to the air intake of the engine.

7. A unit as defined in claim 1, in which the blower communicates with the atmosphere through a combined air cleaner and backfire preventing device.

8. A unit as defined in claim 9, in which the pressurized source of readily combustible fuel comprises an "Aerosol" can detachably mounted in said box-like container and having an outlet nozzle, and the means connecting the source of fuel to the casing comprises a flexible tube removably attachable to said nozzle.

9. A portable unit for aiding in the starting of an internal combustion engine having a carburetor and air intake means, comprising a box-like container remote from the air intake means and a casing in the container provided with a flexible conduit adapted to be connected to the engine between the carburetor and the intake means; an electric motor-operated blower in the container communicating with the atmosphere for forcing a stream of air into said casing and through said conduit means into said engine intake means; means in the

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container for mounting a can of pressurized readily combustible fuel for removal and replacement; means connecting said can to said casing including a flexible tube detachably connected to the outlet of a normally closed valve for delivering a measured quantity of said fuel to said casing upon each operation thereof; electric heating coil means in said casing in the path of said air stream for heating the air passing therethrough, and also heating the fuel entering the casing when the valve is open; an electromagnet mounted in said container having an armature to engage and open said valve; an energizing circuit for said electromagnet including current supply terminals; a manually operable switch biased to open-circuit position mounted on said container; and an energizing circuit for energizing the blower motor and the electric heating coils and including a switch mounted on said container operable independently of said first-named switch.

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