Nov. 12, 1963 E. J. BECK, JR 3,110,422

ENGINE STARTING DEVICE

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FIG. 1.

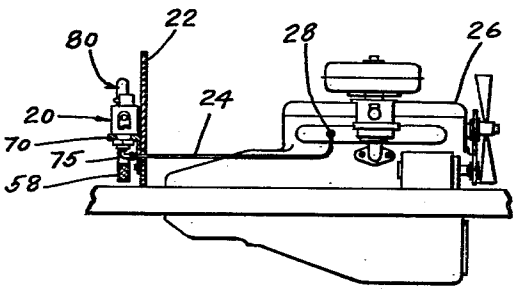


FIG. 11.

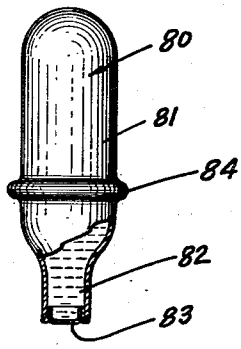


FIG. 2.

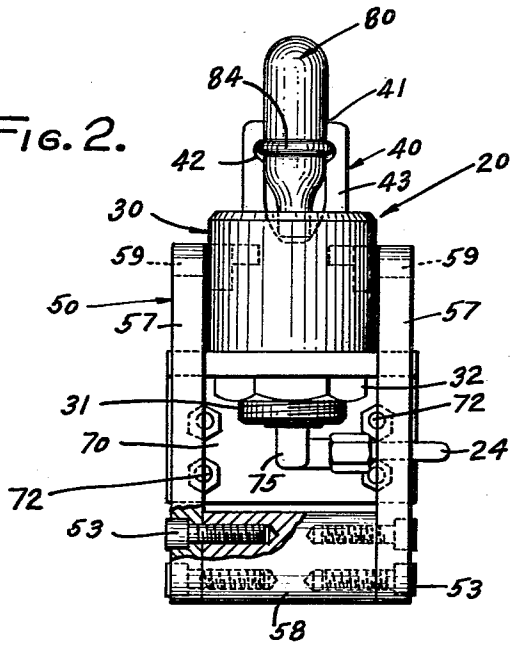
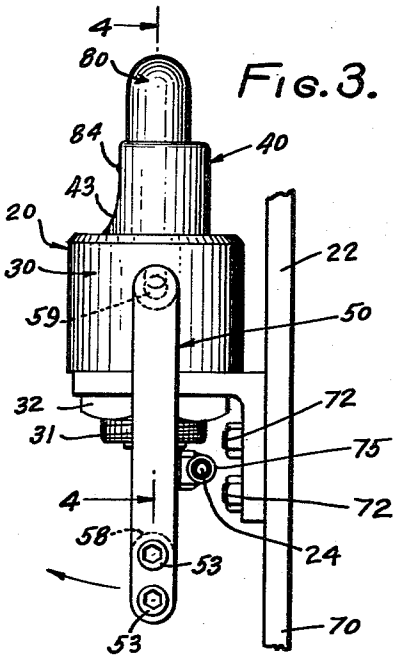


FIG. 3.



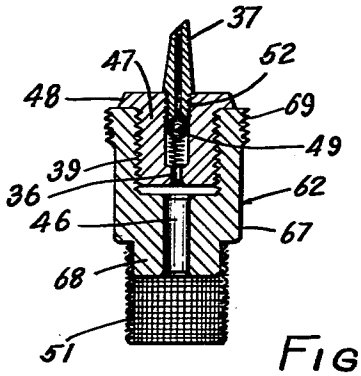


FIG. 9.

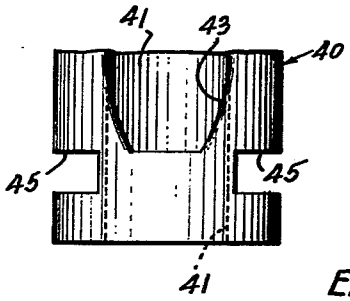


FIG. 8.

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ENGINE STARTING DEVICE

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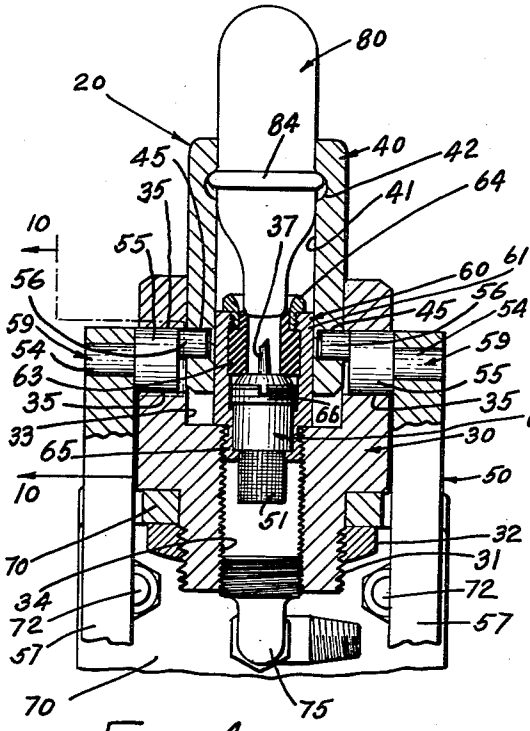


FIG. 4.

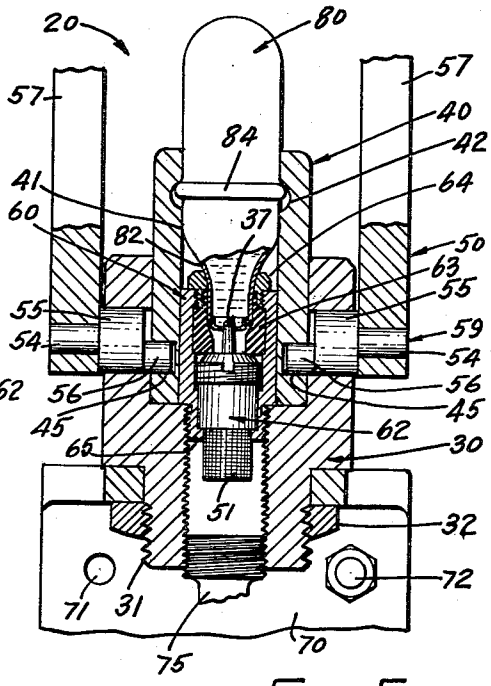


FIG. 5.

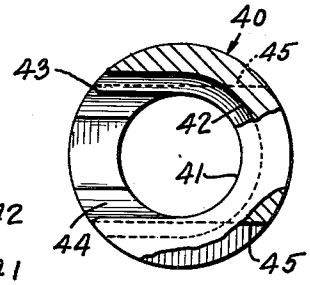


FIG. 7.

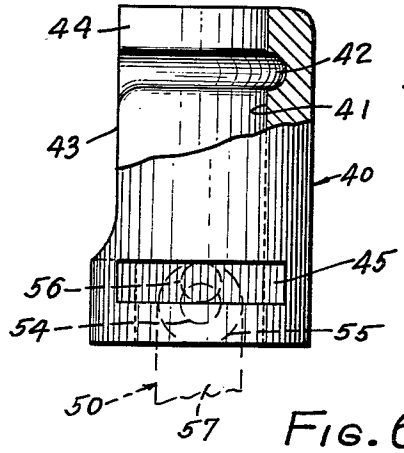


FIG. 6.

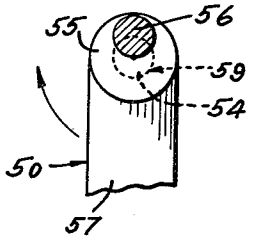


FIG. 10.

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3,110,422

ENGINE STARTING DEVICE

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Filed June 27, 1960, Ser. No. 39,197
1 Claim. (Cl. 222—83.5)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates generally to the starting of internal combustion engines in cold weather and is particularly related to new and advantageous means for discharging special starting fluids into the engine.

It is commonly known that the starting of internal combustion engines becomes more difficult to accomplish as the temperature of the engine and the surrounding atmosphere becomes lower and that eventually a temperature is reached at which the engine will refuse to start unless auxiliary starting aids are employed.

It has been proposed heretofore to start a cold engine with a priming fuel which would also be used to keep it running until the engine warmed up sufficiently so that it would operate on its ordinary fuel. Such priming fuels, which may comprise combinations of ether or ether derivatives and low viscosity lubricants, are by nature very volatile and readily inflammable at ordinary temperatures. The vapors from such priming fuels will form explosive mixtures when they reach a certain concentration in air. This explosive concentration may be accomplished rapidly and accidentally especially when the fluid is handled in an open container or is poured from a container into an auxiliary apparatus situated on or near the engine being started.

In order to obviate the dangers associated with the handling of such priming fuels from open containers, it has been the practice to furnish the same in small sealed bulbs or cartridges which may be inserted into another auxiliary type of apparatus mounted on or near the engine. Such prior auxiliary apparatus, however, has had various disadvantages in that they were either difficult, or impossible, to manipulate with heavy gloves in extremely cold atmospheres as found in Arctic and Antarctic locations and had no positive means of ejecting the spent bulb or cartridge. This last disadvantage was found particularly trying where it was necessary to use a number of bulbs in quick succession to start and maintain the engine in a running condition until it had reached a more normal operating temperature. Manifolding a number of similar dischargers did not adequately solve the problem as the difficulty of manipulation remained and the complexity and expense of the installation rapidly increased beyond its expected return.

The object of this invention, therefore, is to provide a single engine starting device or priming fuel bulb discharger which is capable of effective and rapid manipulation in extremely cold weather.

Another object of this invention is to provide such a device or discharger as will be adapted to readily receive and rapidly eject priming fuel bulbs or cartridges whereby a rapid succession of such bulbs may be inserted, discharged, and removed as may be necessary to start and maintain the running of the engine for any desired period of time.

Other objects and advantages of the invention will be

appreciated in view of the following detailed description and the appended drawings wherein:

FIGURE 1 is a side elevation schematically showing the use of the invention;

FIG. 2 is a front elevation, partly in cross-section, of the invention;

FIG. 3 is a side elevation;

FIG. 4 is a front elevation in cross section taken on the line 4—4 of FIG. 3, illustrating one mode of operation of the invention;

FIG. 5 is a similar view showing another mode of operation; and

FIGS. 6–11, inclusive, illustrate various details of the invention.

With reference to FIG. 1, the engine starter device or bulb discharger 20 is shown as being attached to the operator's side of a firewall or instrument panel 22. A tube or conduit 24 leads to the manifold section of an internal combustion engine 26. A nozzle 28 projecting into the manifold section is usually provided for introducing the priming fuel into the engine, usually in the form of a spray. This nozzle may be of any standard configuration to fit the tube employed and forms no part of the invention.

With reference to the other figures, the engine starting device or bulb discharger comprises a body 30, a bulb or cartridge holder 40, an arm assembly 50, a bulb or cartridge discharger assembly 60, a supporting bracket 70, a tube connector fitting 75, and a priming fuel bulb or cartridge 80.

The fuel bulb or cartridge 80 is of a standard form which may be obtained commercially. It comprises a drawn steel bulb similar to those employed to package charges of CO_2 gas under pressure. Such bulbs comprise a generally cylindrical body portion 81 closed in a unitary manner at one end and necked down at the other end to form an opening 82 of reduced size. When the bulb is filled with its contents of pressurized priming fuels, the opening is effectively sealed against leakage by a perforable closure 83. A protruding rim or circlet 84 is usually formed in the cylindrical body portion 81 in order to easily distinguish these priming fuel cartridges from the CO_2 cartridges previously mentioned. While these bulbs, per se, form no part of the invention, the rim or circlet 84 is of importance to the further working of the invention. To this extent, it may be said that the invention, in its present embodiment, is limited to the use of this type of bulb.

The body 30 may be generally cylindrical in shape and is provided with a reduced diameter, threaded portion 31 on which is threaded a large nut 32. As will be more fully explained later, this reduced portion 31 and nut 32 are used to secure the invention to its support bracket 70. The body 31 is further provided with a large central longitudinal bore 33 and a concentric smaller diameter threaded bore 34. Bore 33 is of a sufficient size to snugly receive bulb holder 40 and the use of threaded bore 34 will be explained later. The body 30 is also provided with two diametrically aligned transverse bores 35 which are adapted to receive the axle components 55 of the arm assembly 50.

Bulb holder 40 is generally cylindrical in shape and is provided with a central bore 41 of a size sufficient to snugly accept the bulb 80. Just below the upper extremity of bulb holder 40, a radial groove 42 is turned or formed in the upper portion of bore 41. This groove is furnished for the reception of bulb rim 84 and, as will be explained later, furnishes the means to force the bulb 80 downwardly in the fuel discharging operation and then to force it upwardly into position for removal.

As shown best in FIGS. 6, 7, and 8, holder 40 is cut away at one side as at 43 and bore 41 is opened outwardly at at 44, thus making possible and facilitating the insertion of the bulb 80 into the holder 40. Holder 40 is further provided with transverse external slots 45 which cooperate with the eccentric portions 56 of the arm assembly 50 to move bulb holder 40 in the vertical direction as the eccentric portion 56 is caused to rotate about the axis of the axle components 55.

Arm assembly 50 comprises two arms 57, a handle 58, and two crank portions 59. This latter part consists of a short shank 54, an axle component 55 concentric with shank 54, and an eccentric portion 56. Shank 54 is forced or otherwise secured as by silver-soldering into the hole provided in the upper end of arm 57. As shown, the two cranks are assembled with their respective arms in alignment, particularly with respect to the eccentric portions. The lower ends of arms 57 are provided with transverse bores to accept the screws 53 which secure the handle 58 between the two arms. Thus, using the transverse bores 35 in the body 30 as a fulcrum, as the crank portions are rotated by the arms, the holder 40 is lowered and raised.

The bulb discharger assembly 60 comprises a cylindrical support section 61, a needle holder assembly 62 a cylindrical gasket 63, and a collar 64.

Cylindrical support section 61 is of a size to slidably fit within bore 41 of the bulb holder 40. It has a reduced-diameter threaded lower portion 65 which threads into the upper portion of threaded bore 34 in body 30. Being secured in bore 34, it will be observed that this cylindrical section 61 serves as a guide for the up and down movement of bulb holder 40. Support section 61 is provided with a stepped and threaded bore 66 for receiving the threaded needle holder assembly 62, gasket 63, and threaded collar 64, as shown in FIGS. 4 and 5. Needle holder assembly 62 is threadedly held in place in the bore 66 while hollow cylindrical gasket 63 is pressed down on top of the needle holder by the threaded collar 64.

As shown in FIG. 9, needle holder 62 comprises a cup shaped cylindrical threaded section 67, a threaded needle-holding insert 47, a ball check valve and spring 49 and a cup shaped screening member 51. Threaded section 67 has a reduced diameter lower portion 68 and external threads 69. Threads 69 are used for securing the needle holder assembly 62 into the lower threaded bore 66 of cylindrical support section 61. The screening member 51 may be force-fitted to the reduced diameter portion 68. Threaded section 67 is further provided with a stepped bore having an upper threaded portion 39 and a lower reduced diameter smooth bore 46.

The threaded needle holding insert 47 screws into the threaded bore 45 until its enlarged head 48 engages the upper surface of the cup shaped section 67. Insert 47 is provided with a central bore having an upper threaded section 52 and a lower reduced diameter smooth bore 36. Hollow needle 37 is threadedly inserted in upper threaded bore 52 as shown. The ball check valve and spring 49 are held in bore 52 under the needle 37. The bore or orifice of the needle is provided with a chamfer at its lower end for the reception of the ball. The spring is of a sufficient size and tension to maintain the ball in this chamfer and effectively closing the needle orifice for the backward escape of the vapors from the priming fuel being forced therethrough.

As shown in FIG. 4, tube connector fitting 75 is threadedly inserted in the lower portion of threaded bore 34 of the body 30. This fitting may be of the usual standard banjo type and serves to connect bore 34 with tubing 24.

Support bracket 70 may be made from angle material and has vertical and horizontal legs. The vertical leg is provided with holes 71 for the reception of cap screws 72 which are used to fix the bracket to the firewall or instrument panel 22. The horizontal leg is provided with a large hole of sufficient diameter to accept the threaded

portion 31 of the body 30. Nut 32 may then be used to hold body 30 securely on the support bracket 70.

FIG. 10, which is taken on the line 10—10 of FIG. 4, more clearly illustrates the configuration of the crank portions 59 which are secured to the upper ends of arms 57.

The operation of the invention may now be described with reference to FIGS. 2 to 5, inclusive. With the arm assembly 50 in the lower vertical positon as shown in FIGS. 2, 3, and 4, the bulb holder 40 is in its raised vertical position and the bulb or cartridge 80 may be easily inserted therein. The neck of the bulb is centered with respect to the gasket 63 and collar 64 and the bulb is pushed downwardly by hand until the rim 84 is aligned with and in the groove 42. Arms 57 are then raised forwardly and upwardly by means of handle 58 until they are disposed vertically as shown in FIG. 5. During this movement of the arms, the cranks 59 have turned 180° and the eccentrics 56, working in the bulb holder slots 45, have forced the bulb and bulb holder downwardly, first forcing the neck of the bulb 80 into the gasket 63 whereby the chamber adjacent to the needle is sealed and then secondly, impaling the bulb on the needle 37. The contents of the pressurized priming fuel bulb are then forcibly ejected down through the needle holder assembly, past the check valve, into the tubing 24 and through the nozzle 28 into the manifold of the engine 26.

In the event a fresh charge of priming fuel is immediately necessary, the arms 57 are moved forwardly and downwardly and due to the eccentric action of the cranks 59 in slots 45, the bulb holder is forced upwardly, forcibly and positively removing the spent bulb 80 from the needle 37. If the contents of the engine manifold and tubing 24 have not been fully discharged and these parts contain vaporized fuel, the ball check valve 49 acts to prevent their outflow from the improved discharger into the engine or other operating compartments. With the spent bulb extended upwardly off the needle, it can be easily and quickly removed and replaced with a fresh bulb.

While a preferred embodiment of the invention has thus been described and illustrated, I do not intend to be limited thereby. Many modifications may suggest themselves to those skilled in the art. If the form of the priming fuel bulb should be changed, for instance, such changes would necessitate certain modifications to the bulb holder for gripping the bulb, transferring its contents to the working cylinders, and then forcibly and positively ejecting the bulb to a position from where it may easily be removed by the mittened hand of the operator.

Having thus described and illustrated my improved engine starting device or priming fuel cartridge discharger, I claim:

Apparatus for discharging pressurized priming fuel into an internal combustion engine comprising, in combination:

a cylindrical priming fuel cartridge having a generally cylindrical major body portion, a first rounded unitary end, a second necked down cylindrical portion closed with a perforable seal at the other end, and an external circular rim substantially centrally disposed on said major body portion with respect to said first and second ends;

a stationary supporting body;

a reciprocable holder means supported in said stationary body for laterally receiving and retaining a substantial portion of said fuel cartridge including said circular rim;

means for locking said fuel cartridge in said holder means with respect to the axis of the reciprocating motion of said holder means and with the first rounded unitary end of said fuel cartridge exposed to view and manual manipulation of said fuel cartridge;

means in said holder means for facilitating the lateral insertion and removal of said fuel cartridge with respect to said holder means;

a conduited hollow needle supported by said stationary body for perforating the perforable seal at the said second end of said fuel cartridge and conducting said priming fuel from said cartridge to a point of use; and

means for reciprocating said holder means and said holder means retained fuel cartridge with respect to said stationary body and said hollow needle comprising a pair of cranks diametrically journalled in the sides of said body, said cranks having eccentric members cooperating with transverse slots in the sides of said holder whereby as said cranks are moved 180° said holder will reciprocate in said body from a limiting position in one direction to another limiting position in the other direction.

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