

Aug. 9, 1960

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2,948,595

ENGINE STARTING FLUID PROPELLANT

Filed July 7, 1959

FIG. 1

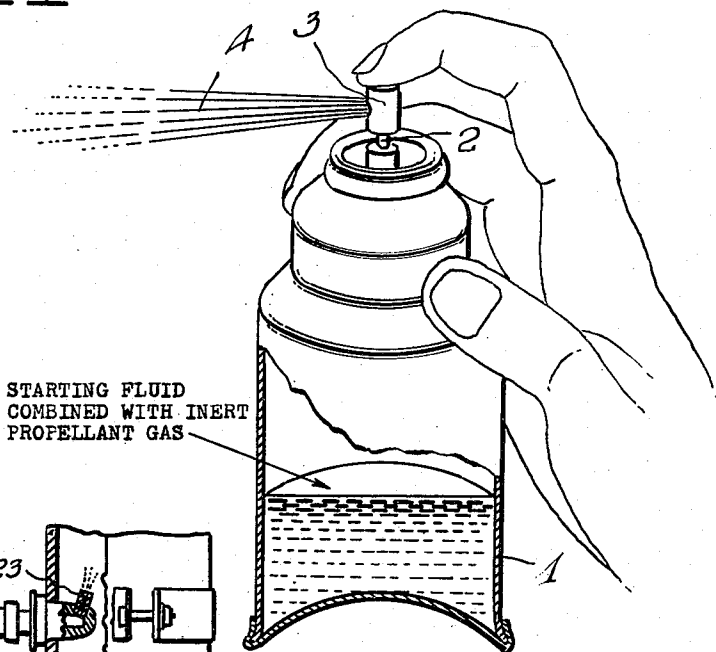


FIG. 2

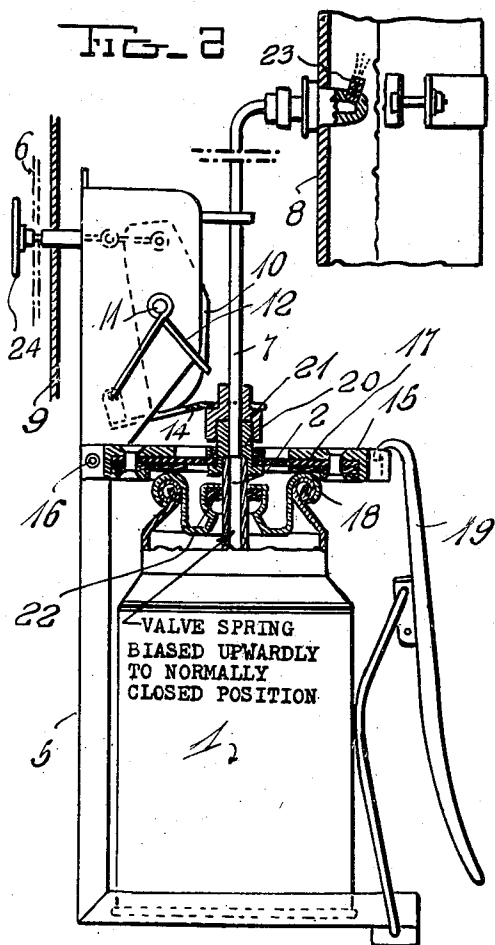
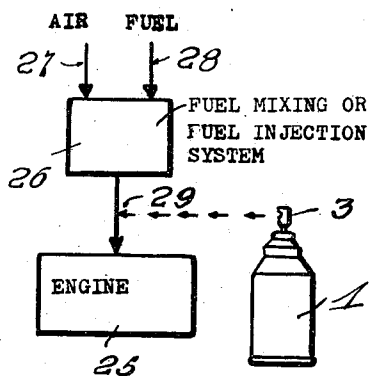


FIG. 3



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2,948,595

ENGINE STARTING FLUID PROPELLANT

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Filed July 7, 1959, Ser. No. 825,462

11 Claims. (Cl. 44-52)

This invention relates to the combination of a gaseous propellant and a priming or starting fuel for use in facilitating the starting of gasoline or diesel engines, generally referred to as internal combustion engines, and more particularly such a combination maintained under pressure in a package termed a "pressurized" container whereby the contents are expelled from the container to the desired extent by the opening of a normally closed spring biased valve, the valve being held open for the desired length of time to expel the desired amount of contents stored in the container under pressure.

This application is a continuation-in-part of my application Serial Number 551,729, filed December 8, 1955, for Engine Starting Fluid Propellant.

One of the objects of my invention is to provide a composition of a starting fluid composed of ether and a pressurized propellant which remains fluid at temperatures as low as 65° F. below zero while confined in a valve controlled reservoir or storage container capable of a large number of successive multiple starts or selected discharges to sustain combustion in an engine by actuating the valve of the reservoir or container and directing an atomized spray of the composition from the reservoir or container into a closed engine system.

Another object of my invention is to provide a packaged pressurized throw-away container enclosing a quantity of starting fluid combined with a pressurized propellant, with a spring biased valve associated with the discharge orifice of the container which may be operated successively to supply to a closed system in an internal combustion engine a charge of starting fluid which is readily miscible with the combustible charge supplied to the engine for increasing the combustible properties of the charge and facilitating starting of the engine over a wide range of temperatures, extending, for example, from 65° F. below zero to 180° F. above zero.

Still another object of my invention is to provide a gaseous propellant for a starting fluid for internal combustion engines which is capable of being loaded into pressurized containers at a pressure of the order of 100 lbs. per square inch at 70° F. for insuring the maintenance of adequate pressure in the containers as the temperature varies for insuring sufficient pressure within the containers at low temperatures of, for example, 65° F. below zero, for expelling all of the contents of the can into the combustible mixture in a closed system including the engine.

A further object of my invention is to provide a composition of a starting fluid and propellant having a boiling point below minus 65° F. and capable of being loaded in throw-away containers at a pressure of the order of 100 lbs. per square inch at 70° F., the composition comprising the propellant, lubricant, and an anti-oxidant miscible in the starting fluid for improving the starting of internal combustion engines over temperature ranges of the order of 65° F. below zero to 180° F. above zero.

Other and further objects of my invention reside in the proportions of the components in the starting fluid

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and the propellant of the order of 99.885 to 98.297 percent lower alkyl ether; 0.10 to 1.70 percent synthetic colloidal graphite lubricant; 0.015 to 0.003 percent of an anti-oxidant, the liquid being in volume proportion of about 60-90 percent combined in a container with 10-40% of a propellant gas consisting of 15% carbon dioxide and 85% nitrous oxide, as set forth more fully in the specification hereinafter following by reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a package pressurized throw-away container in which the starting fluid and propellant of my invention are loaded, the view being broken away to show the starting fluid and the propellant within the throw-away container and the manner in which the contents of the can are expelled in an atomized spray;

Fig. 2 illustrates a schematic cross-sectional view showing one method of delivering a controlled atomized spray of starting fluid and propellant from the pressurized throw-away container in which the starting fluid and the propellant of my invention are packed to a closed system of an engine; and

Fig. 3 is a block diagram showing the manner in which the starting fluid propelled by the propellant in the pressurized throw-away container is injected into a closed system for combination with the combustible charge supplied to the engine.

The suitability of use of gas pressurized throw-away containers for a combustible starting fluid over a wide range of temperature depends on the nature of the starting fluid and the characteristics of the gas or propellant associated with the starting fluid because, unless the starting fluid and propellant are properly selected and proportioned, the gas might objectionably enter into combination with the starting fluid composition which is to be dispensed and might otherwise objectionably react chemically to a dangerous extent. The combustible and explosive nature of the contents of such pressurized throw-away containers introduces a serious problem of public safety requiring the protection of motorists and vehicle operators against dangers of fire and explosion.

My invention provides a highly volatile priming or engine starting compound miscible with a propellant in a gas pressurized throw-away container wherein the pressurizing gas permeates the starting fluid but remains inert at all times; is not adversely affected by extreme ranges of temperature; is miscible with but remains inert with respect to and does not adversely affect the starting compound; is capable of storage under valve control for permitting multiple shots, charges or sprays for repeated or cyclic starts where occasion demands or for intermittent or continuous expelling of the contents of the container, the container providing an adequate supply of starting fluid for successive use as the engine requires it in order to sustain combustion; and does not in any manner adversely affect the engine with which the compound is used. It is important that the propellant shall not adversely affect the engine since a certain amount thereof will be drawn into the engine along with the starting fluid. I find that this small amount of propellant drawn into the engine along with the starting fluid has a highly helpful effect on starting the engine and in reducing smoke discharged from the engine. The composition of my invention has a highly beneficial effect in the starting of engines otherwise hesitant in starting after initial attempts at operating the automatic starter. In starting the engine quickly, the cranking period is shortened and the engine fuel allowed to take over sooner than it otherwise would so that earlier oil pressure and full operation of the engine is obtained and dilution of the engine fuel and incidental engine wear is reduced.

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I have discovered that an engine priming or starting compound comprised of lower alkyl ether, a synthetic colloidal graphite lubricant and an anti-oxidant, in the percentages of from 99.885 to 98.297 parts lower alkyl ether, 0.10 to 1.70 parts of the synthetic colloidal lubricant, and from 0.015 part to 0.003 part of the anti-oxidant can be readily packed or loaded at a pressure of 100 lbs. per square inch at a temperature of 70° F. in a gas pressurized type of dispensing throw-away container combined with a propellant comprised of nitrous oxide gas alone or nitrous oxide gas combined with carbon dioxide gas, which are harmless gases for the amounts used. Nitrous oxide gas is capable of improving the operation of the engine after starting as it supports flammability, is non-combustible, and has a catalytic effect augmenting combustion in the engine. The synthetic colloidal graphite lubricant I use in the composition of my invention is readily distinguishable from mined or commercial graphite. Mined or commercial graphite precipitates in a liquid, packs and blocks feed lines, and is abrasive, especially in the presence of moisture, whereas, the synthetic graphite I use remains in suspension in liquid, is floccular, does not pack and block feed lines, and is not abrasive at any time, and is so fine that it will go through filter paper.

The preferred anti-oxidant is 2,2'-methylene bis (4-methyl, 6-tertiary butyl phenol).

The anti-oxidant has the important function of preventing corrosion of the metal in the engine.

By volume, the proportions of the priming or starting compound in relation to the propellant gas, in a pressurized container, for example, is from 60 to 90 percent of the priming or starting compound and from 40 to 10 percent of the propellant gas. In case of use of a mixture of the nitrous oxide and carbon dioxide gases as the propellant, the preferred proportions are from 65 to 85 percent of nitrous oxide and 15 to 35 percent carbon dioxide.

In manufacturing the fluid, the components are mixed thoroughly and the lubricant is the last of the components to be added to the fluid, after which this is mixed thoroughly into the liquid product.

A summary of the preferred specifications governing the starting fluid propellant and container of the invention follows:

Propellant (does not liquefy at sub-zero temperatures)	Gas
Starting fluid	Diethyl ether
Specific gravity	0.7
Flash point, ° F.	-20
Ignition temperatures, ° F.	366
Auto ignition temperature, ° F.:	
Gasoline	495
Diesel #1 fuel	490
Diesel #2 fuel	494
Range of flammability in air, min. 2%—max. 48% by volume.	
Boiling point, ° F.	95
Vapor pressure:	
32° F., Absolute	3.5
60° F.	6.8
95° F.	14.7
104° F.	17.6
122° F.	24.7
Freezing point, ° F. below zero (does not slush in in feed line)	-88
Auxiliary lubricant	Effective
Corrosion inhibitor	Effective
Anti-freeze	Effective
Color	Gray
Dispenser throw-away pressurized can	12 oz. size
Height to shipping cap base	4 $\frac{1}{16}$ inch
Diameter of can	2 $\frac{3}{8}$ inch
Loading pressure	100 lbs. at 70° F.

The throw-away container of the 12 oz. size, shown at 1, is approximately 4 $\frac{1}{16}$ " high and 2 $\frac{3}{8}$ " in diameter, having a reinforcing concave bottom, $\frac{1}{2}$ " deep, and a

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rolled top neck which receives the inserted pressure valve assembly 4. A 12 oz. container will provide approximately from 3 to 50 starts for the average engine and by increasing the size of the container this number can be correspondingly increased. Three starts for a 600 H.P. engine can generally be obtained from a 12 oz. container. The throw-away container is loaded with the starting fluid and propellant mixture at a pressure of the order of 100 lbs. per square inch at 70° F. which insures, after completion of packaging, an average pressure below loading pressure but adequate to effect continuous potency of the discharge over a wide temperature range from 180° F. above zero to 65° F. below zero, either under finger control as shown in Fig. 1, or by remote control as shown in Fig. 2.

The propellant is loaded or packed in with the priming or starting fluid compound in seamless sheet metal throw-away cans or containers 1 having a normally closed spring biased valve 2 in the top of the throw-away container controlled by a depressible button 3 readily manipulatable by the finger of the user, as shown in Fig. 1, for releasing the atomized spray of starting fluid 4, or the pressurized throw-away can or container 1 may be mounted in a bracket assembly 5 as shown in Fig. 2 adjacent the engine, and the valve 2 thereof actuated successively from time to time remotely from the driver's position 6 of the vehicle to discharge the starting fluid from the storage condition in the pressurized throw-away container and the atomized spray from the orifice of the valve directed in a closed system through flexible tube 7 into the intake manifold or ducting 8 of the engine where it combines with the engine fuel for starting the engine. The loading of the throw-away containers is accomplished at a pressure of 100 lbs. per square inch at 70° F. to afford adequate reserve for the dropping of pressure within the container as the temperature decreases and yet maintain sufficient pressure within the container at low temperatures to expel all of the contents of the throw-away container at low temperatures when the spring biased valve is open.

By sufficient pressure for expelling the contents of the can at 65° F. below zero, I mean in the range of 1 $\frac{1}{2}$ lbs. per square inch. That is to say, the pressure within the can originally loaded at 100 lbs. per square inch at 70° F. may vary by a downward decrease with decrease in temperature, but at 65° F. below zero, does not fall below the range of 1 $\frac{1}{2}$ lbs. per square inch which is adequate to expel the contents of the can.

The bracket 5 is conveniently mounted adjacent the engine and is separated by wall 9 from the driver's position 6 so that, even though the ether from the starting fluid might tend to escape from the closed system, such fumes would be unlikely to enter the driver or passenger compartment of the vehicle. The bracket 5 carries a pivotally mounted cam 10 journaled at 11 in bracket 5 and assembled with respect to the spring 12 adapted to normally elevate the lever 14 out of valve actuating position with respect to throw-away container 1. The throw-away container 1 is removably or replaceably clamped in bracket 5 by means of the hinged frame 15 pivoted at 16 on bracket 5. The frame 15 carries a sealing diaphragm 17 adapted to engage the annular bead 18 of throw-away container 1 while allowing the valve 2 to project upwardly through the diaphragm 17. The frame 15 is clamped by means of the engaging lever assembly 19 for maintaining the throw-away can 1 in position with respect to bracket 5. The diaphragm 17 carries a nipple 20 secured in vertical position with respect to opposite sides of the diaphragm 17 for receiving the upper end of valve 2. The exterior of the nipple 20 is seated in the socket 21 which couples with the flexible tube 7. The socket 21 is engaged by the lever 14 which may be moved downwardly by the angular displacement of cam 10 for depressing the valve 2 which is movable through the seal 22 to open the valve associated with the interior of can 1,

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whereupon the starting fluid is delivered through flexible tube 7 and through the atomizing nozzle 23 into the intake ducting 8 of the engine where it is selectively delivered in a closed system to the engine. The discharge of the starting fluid activated by the propellant from can 1 continues so long as the actuating knob 24, at the driver's position 6, is pulled to move the cam 10 to a position for depressing lever 14 and the valve 2. Upon release of the actuating knob 24, spring 12 moves cam 10 out of engagement with lever 14, allowing valve 2 on can 1 to close by spring pressure within the can.

In Fig. 3 I have shown a theoretical diagram where the closed system characteristics of the starting fluid propellant of my engine have been emphasized. An internal combustion or a diesel engine 25 is connected through ducting with either a carburetor or fuel injecting system indicated at 26 supplied with an air-intake system 27 and a fuel system 28. Under conditions of cold weather engine 25 may fail to start, whereupon the atomized spray of starting fluid of container 1 is supplied to the ducting between engine 25 and the carburetor or fuel injecting system 26, at position 29.

Inasmuch as the propellant, the starting fluid, and the lubricant are all miscible and are confined to a closed system, this composition moves into the engine, increasing the combustibility of the fuel or combustible mixture, thereby starting the engine even under the most adverse temperature conditions.

The mechanism for controlling the release of the atomized spray of starting fluid from the can 1 may be intermittently operated under control of knob 24, in Fig. 2, to effect the intermittent discharge of successive selected quantities of the liquid starting fluid from the pressurized container 1 into the closed system at 29, in Fig. 3, in a manner completely sealed to the outside atmosphere, activated wholly from the pressure stored in the pressurized throw-away container or can 1.

This priming or starting fluid compound, such as I have herein described, is most generally used in starting engines in extremely cold weather and hence one of the problems is not only to load or package the compound on a practical mass production line basis, but to insure that the packaged compound be in usable condition in the throw-away container after exposure of the container for long periods of time to extreme cold. The starting compound is delivered into the intake manifold of the engine or the carburetor by spraying it thereinto. Furthermore, in event of fluctuation of temperature range, the compound must not be adversely affected by the propellant gas, while at the same time the gas must retain its functional characteristics unimpaired for this particular use. To illustrate, the packaged compound, together with its propellant gas, must be able to withstand temperatures ranging from 65° F. below zero to 180° above zero F. Nitrous oxide gas alone, or nitrous oxide combined with carbon dioxide, ideally meets these requirements. The nitrous oxide gas or the combination thereof with carbon dioxide gas remains absolutely inert and in no manner affects or chemically reacts with the priming or starting fluid compound.

Other inert gases such as nitrogen can be used with the nitrous oxide in association with the starting fluid in the same proportions hereinbefore stated for the preferred propellant.

As represented in Fig. 3 there is a sealed connection extending from the valve 2 of the starting fluid container through a tubular conductor 7 to an atomizer nozzle 23 projecting into the intake manifold of the engine. This tubular connection 7 insures a closed system into which the starting fluid and propellant are injected so that only the confined hydrocarbons of the fuel and oxygen existent in the intake manifold of the engine are subject to combination with the starting fluid and propellant. That is to say, the starting fluid and propellant are introduced into a confined area in which only the combustible mixture

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which is being supplied for the engine exists. The actuation of the valve 2 on the pressurized container does not disrupt the airtight connection between the container and the tubing 7, as a tight connection is carefully maintained, and, hence, a truly closed system is insured. The advantage of the closed system is that all of the starting fluid released is effective for starting the engine and the operator is not affected by ether fumes and no dust or dirt can get into the cylinder by entrainment with the starting fluid. The valve 2 of the container mounted in the bracket assembly of Fig. 2 is readily controlled from a remote position convenient to the driver.

Pressure in the container must not exceed 185 lbs. per square inch absolute at 130° F. When using these containers in automatic starting as depicted in Fig. 2, longer periods of injection of the starting fluid have no adverse effect on the engine as prolonged periods of injection are often required to start the engine at low ambient temperatures. The ability of the pressurized can to provide a multiplicity of successive charges of starting fluid to the engine greatly facilitates the starting of the engine. At sub-zero temperatures, the propellant does not liquefy and freeze, but remains gaseous with inherent force to expel the contents of the container.

While I have described my invention as particularly applicable to throw-away containers, I desire that it be understood that the composition of my invention as applied to pressurized containers is equally applicable to refillable cans, particularly in the larger portable sizes.

By lower alkyl ether I intend to include dimethyl ether, ethyl or diethyl ether, diisopropyl ether, dibutyl ether, methyl ethyl ether and dipropyl ether, methyl propyl ether, and methyl isopropyl ether; methyl butyl ether and ethyl isopropyl ether.

Although I have described my invention herein in one of its preferred forms, I realize that modifications may be made and I desire that it be understood that no limitations upon my invention are intended other than may be imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A priming fluid for an internal combustion engine consisting essentially of a lower alkyl ether confined in a container under pressure with a relatively smaller quantity of a propellant gas comprising nitrous oxide, the quantity of the said propellant gas being sufficient to atomize said combustible liquid under a positive atomizing pressure at temperatures substantially below 0° F.

2. A priming fluid for an internal combustion engine consisting essentially of a lower alkyl ether confined in a container under pressure with a relatively smaller quantity of a propellant gas comprising nitrous oxide, the quantity of the said propellant gas being sufficient to impart about 100 pounds pressure at ambient temperatures and at least a positive pressure to said composition at temperatures down to about -65° F.

3. A priming fluid for an internal combustion engine consisting essentially of a lower alkyl ether confined in a container under pressure with a relatively smaller quantity of a propellant gas, said propellant gas comprising a mixture of a major proportion of nitrous oxide and a minor proportion of an inert gas the composition being in proportion of from about 60 to 90 percent of the priming fluid to about 10 to 40 percent of the propellant gas.

4. The priming fluid of claim 3 wherein the propellant gas comprises about 65 to 85 percent of nitrous oxide and about 15 to 35 percent of the inert gas mixed therewith.

5. The priming fluid of claim 3 wherein the propellant gas comprises a mixture of about 65 to 85 percent nitrous oxide and the balance, about 15 to 35 percent, carbon dioxide.

6. The priming fluid of claim 2 further containing as a top cylinder lubricant small quantity of synthetic colloidal graphite.

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7. The priming fluid of claim 1 containing a small quantity of an antioxidant.

8. A priming fluid for an internal combustion engine consisting essentially of a lower alkyl ether combined under pressure in a dispensing container with a small quantity of a propellant gas consisting essentially of a mixture of nitrous oxide having substantially solubility in said combustible liquid in major proportion with a minor proportion of carbon dioxide, the quantity of the said propellant being sufficient to atomize said alkyl ether under a positive atomizing pressure at temperatures down to about -65° F.

9. The priming fluid as of claim 8 wherein the lower alkyl ether is selected from the group consisting of dimethyl ether, diethyl ether, di-isopropyl ether, dibutyl ether, methyl ethyl ether, dipropyl ether, methyl propyl ether and methyl isopropyl ether, methyl butyl ether and ethyl isopropyl ether.

10. A priming fluid for internal combustion engines consisting essentially of a lower alkyl ether combined under pressure in a container with a propellant gas in quantity sufficient to impart about 100 pounds pressure at ambient temperatures and a positive atomizing pres-

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sure at temperatures down to about -65° F., said propellant gas comprising a mixture 15-35 percent carbon dioxide and 65-85 percent nitrous oxide.

11. The priming fluid of claim 10 further containing a small quantity of synthetic colloidal graphite as a lubricant and a small quantity of an anti-oxidant.

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