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EQUIPMENT FOR CLEANING ENGINE COOLING SYSTEMS

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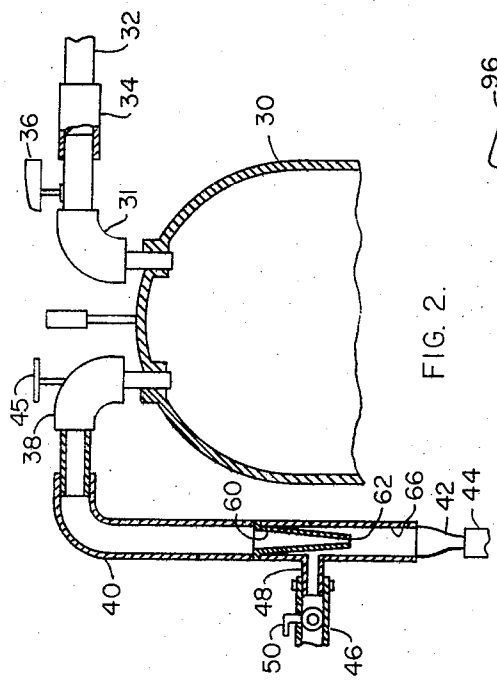


FIG. 2.

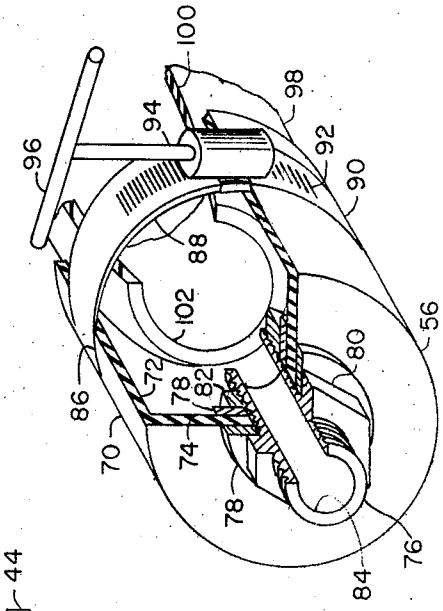


FIG. 3.

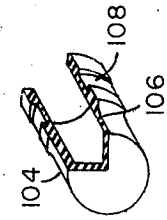


FIG. 4.

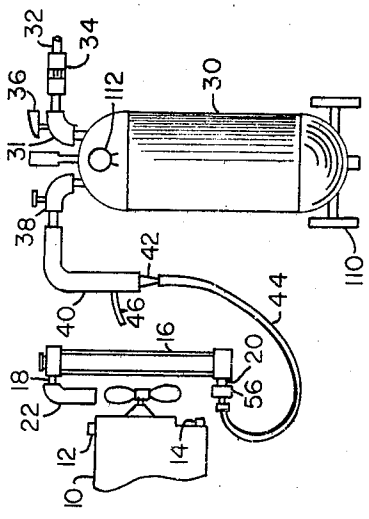


FIG. 1.

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EQUIPMENT FOR CLEANING ENGINE COOLING SYSTEMS

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This invention relates to cleaning equipment, and more particularly, to improved cleaning equipment suitable for commercial use to clean the water cooling systems of internal combustion engines.

Internal combustion engines, such as used in an automotive vehicle, have a cooling system, using either air or water as the cooling fluid, for maintaining a constant sufficiently cool operating engine temperature. A water cooling system includes water conveying passages formed in the engine block, a heat exchanger or radiator having water conveying passages, and separate hose means for permitting circulation of water through the passages in a closed loop between the engine block and radiator. Since the water only circulates in a single direction, impurities in the water and oxides from or decay of the water conveying passages tend to restrict the flow passages to reduce the effective water flow and thus cooling capacity of the system. To clean the passages, the hose means are removed from the engine block and radiator, and a fluid is forced through the passages in the direction opposite to the usual flow direction. Water alone can be used as the backflushing fluid, although a mixture of water and pressurized air is more effective because of the increased churning action thereof in the passages.

Present backflushing equipment has several common drawbacks, one such drawback being the requirement of separate hoses for conveying the water and air to the radiator or the engine block. This dual hose connection renders the backflushing equipment quite bulky and thus difficult to handle. A further common drawback is the pressure drop of air caused by conveying it through conventional air hoses from the pressure tank or compressor to the backflushing equipment. Since efficient backflushing requires a large volume of high pressure air to break down the collected deposits and since conventional air equipment is only of approximately 200 p.s.i. maximum pressure, the backflushing equipment commonly must be located near the air source to provide sufficient volume of air at the required pressure. This reduces the effectiveness of the backflushing equipment by limiting the working space available within which the equipment can be used.

Accordingly, an object of this invention is to provide improved backflushing equipment of compact design consisting of only one hose for connection to the cooling system, the equipment being readily usable both in a stationery and/or portable installation.

Another object of this invention is to provide improved backflushing equipment that is both simple in construction and economical in cost, but yet is most efficient in operation.

In order that these and other objects can be more fully appreciated, reference is herein made to the accompanying drawing, wherein:

FIG. 1 is an elevational view of a preferred embodiment of the subject invention as used in typical working cooperation with a radiator and engine block of an internal combustion engine water cooling system;

FIG. 2 is an enlarged view of longitudinal center section of the air tank and water-air mixing housing in the embodiment of FIG. 1;

FIG. 3 is a perspective view, partly broken away and in section, of the terminal connection of the hose of FIG. 1; and

FIG. 4 is a perspective view, partly broken away and in section, of an end cap commonly used with the subject equipment.

FIG. 1 shows an internal combusion engine **10** having a cooling system including the engine **10** having internal passages (not shown) between tubular connections **12** and **14**, and a radiator **16** having internal passages (not shown) between tubular connections **18** and **20**. A hose **22** connects the upper connections **12** and **18** of the engine and radiator, respectively, and a second hose (removed and not shown) normally connects the lower connections **14** and **20** to complete a closed loop between the engine and radiator. Usually, water is circulated in the closed loop inside the internal passages (not shown) in the engine **10** and the radiator **16** in a clockwise direction (FIG. 1) from the lower connection **20** of the radiator **16** through the internal passages in the engine **10** and out upper connection **12** back to the radiator **16**. The air ambient the radiator **16** cools the water therein as required to maintain the operating engine temperature constant.

Normally, time and continued use of the cooling system typically cause deposits to collect in the water conveying passages to restrict effective water flow through them. To overcome this, water or a mixture of water and high pressure air is passed in a reverse direction through the passages to churn the deposits free and backflush them out. FIG. 1 shows the preferred embodiment of the subject invention backflushing the radiator **16**, the backflushing fluid being forced through the radiator from the lower connection **20** so as to drain from the disconnected hose **22**.

The preferred embodiment includes a portable air reservoir or tank **30** having inlet fitting **31** to which an airline **32** is connected through quick disconnect coupling **34**. Valve **36** in the inlet fitting permits uncoupling of the air line **32** without loss of pressure from the tank **30**. Housing **40** is connected through outlet valve **38** and forms a continuous passage from the tank **30** to connection **42** to which a hose **44** is connected. The valve **38** preferably one that is spring closed, so that it can be opened by manipulation of handle **45** but will close automatically upon releasing the handle. A water line **46** is connected at T **48** to housing **40** just above the outlet **42**, and operates to deliver water to the housing. Valve **50** permits adjustment of the water flow to the housing **40** or uncoupling of the water line **46** without water or air leakage from the housing. The hose **44** has an outlet in the form of a quick connection means **56** (FIG. 3) from which the cleaning fluid is discharged. The connection means **56** commonly is connected to the terminal connection of the engine or radiator, as shown in FIG. 1 connected to the connection **20** of the radiator **16**. A nozzle **60** is fixed within the housing **40** in the air stream from the tank **30**, and has its restricted end **62** located below the water inlet **48** to the housing **40** generally within a mixing chamber **66** defined below the nozzle between the inlet **48** and the outlet **42**.

The chamber **66** is connected by means of the hose **44** to the radiator or engine to communicate the cleaning fluid of an air and water mixture to the radiator or engine. FIG. 3 shows a preferred embodiment of the connection means **56** for the outlet hose **44** to the radiator or engine terminal. The connection **56** includes a conventional rubber cap or plug **70** (similar to that shown in FIG. 4) which has a cylindrical sidewall **72** closed at one end by endwall **74**. The plug **70** has an opening formed in the endwall **74** through which the threaded male projection of a connector **76** is inserted. Washers **78** are confined on opposite sides of the endwall **74** by a shoulder **80** on the connector **76** and a lock nut **82**. The connector **76** includes a through bore **84** communicating with the hose **44**, so that plug **70** is sealed to the outlet hose **44**.

The side wall **72** of the plug **70** is sufficiently large (approximately 3" I.D.) to receive any terminal connections of a standard engine or radiator. The outer periphery of the side wall has formed therein a groove **86** adapted to receive a band **88** of a tightening clamp **90**. The clamp **90** has spaced openings **92** for receiving in locking engagement an adjustment screw **94**. A transverse bar **96** welded to the end of the screw **94** increases the turning leverage on the screw for easily and quickly tightening the clamp **90** sufficiently to secure cup **70** to the terminal connection required with a minimum of effort.

Commonly, the different radiator or engine terminal connections vary in size in which case a sleeve or spacer **98** can be used to firm up the connection with connection means **56**. The sleeve **98** is generally cyilndrical at **100** and converges to a lesser diameter **102** on one end. The sleeve **98** is sized to readily slip over the end of the terminal connection of the engine block or radiator with the tapered end **102** facing away from the engine or radiator toward the advance of the connection means **56**. The sidewall **82** thus can slip over the nose end **102** onto the sleeve **98** and the terminal connection **20**. More than one sleeve can be used if required, the sleeves being of different sizes and stacked on one another. Also in many installations the engine or radiator has a dual terminal connection (two of connections **20**, for example) so that to avoid a short circuit across them a cap **104** (FIG. 4) is put on one connection and the connection means **56** is put on the other. The side wall **106** similarly has a groove **108** to receive a locking clamp **90** as described above to hold the cap on the terminal connection.

In operation, air is confined in the tank **30** under the conventional pressure of the order of 100 to 200 p.s.i. Upon opening the outlet air valve **38** from the tank **30** the short length of large area passage through the housing to the nozzle outlet **62** causes air at a tremendous velocity to pass through the nozzle. This high veolcity air acting against the water confined within the chamber **66** forces both the air and water to the point of least resistance through the connection **42** and outlet hose **44** to the connection means **56**. The outlet hose **44** is approximately a garden size hose of ⅝ to ¾" diameter so as to accommodate readily the passage of the air and water with a minimum of back pressure or resistance which could choke the flow. The discharge from the outlet connection means **56** is a mixture of atomized water forced by the expanding air as a highly turbulent high velocity flow. Since the discharge end **62** of the nozzle **60** is located below the inlet **48** of the water line **46** there is little tendency with the large size outlet hose **44** and its minimum back pressure to cause back flow of the air or water into the water line **46**. The action above described of the air from nozzle **60** on the water within chamber **66** of the housing **40** is similar to a jet pump which operates upon the rapid expansion of a gaseous fluid to pump and/or mix with a second fluid.

It is thus seen that the subject equipment provides a ready means for cleaning or backflushing the water cooling system of an automotive engine. The equipment also can be used to clean the exterior of the radiator by holding the connection means **56** close to the radiator to spray it with the discharging high velocity air and water mixture. The tank **30** preferably is between 1 to 2 cubic feet capacity and is mounted on wheels **110** to make it portable in use. A pressure gauge **112** can be connected to the tank, if desired, to advise the operator of the tank pressure.

Although only a single embodiment of the invention has been disclosed, it will be obvious to those skilled in the art that modifications can be made therein without departing from the inventive concept. Accordingly, it is desired to limit the scope of the invention only by the claims hereinafter following.

What is claimed is:

1. Cleaning equipment, comprising a housing having a through bore, air inlet means for the housing communicating with the through bore at one end, water inlet means for the housing communicating with the through bore downstream of the air inlet means, a restrictor positioned across the through bore within the housing at a location upstream of the water inlet means and having its outlet open to the through bore at a location therein downstream of the water inlet means, outlet means for the housing communicating with the other end of the through bore, said outlet means including a hose and connection means suitable to connect in a fluid tight manner to an exterior terminable connection on a conventional automotive water cooling system, adjustable valve means connected, respectively, in the air inlet means and the water inlet means to regulate as desired the respective flow rates, and an air tank supporting the housing and communicating directly with the air inlet means to deliver thereto a large quantity of air under high pressure from the tank with a minimum of pressure drop.

2. Cleaning equipment according to claim **1**, wherein wheels support the air tank operable to offer mobility to the equipment for portable use thereof.

3. Cleaning equipment for a water cooling system on an automotive engine, comprising a housing having a through bore therein, an air source connected to one end of the housing, control means for regulating flow of air to the housing, a water source connected to the housing downstream of the air inlet, control means for regulating the flow rate of water to the housing, a nozzle across the air flow path upstream of the water inlet and having its outlet of restricted area as compared to the normal area of the through bore located downstream of the water inlet, a fluid conveying hose connected to the downstream end of the through bore suitable for connection to an exterior terminal connection of the water cooling system, an air tank supporting the housing and communicating directly with the air inlet means to deliver thereto a large quantity of air under high pressure from the tank with a minimum of pressure drop, and wheels supporting the air tank operable to offer mobility to the equipment for portable use thereof.

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