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RADIATOR CLEANING DEVICE

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Fig. 1.

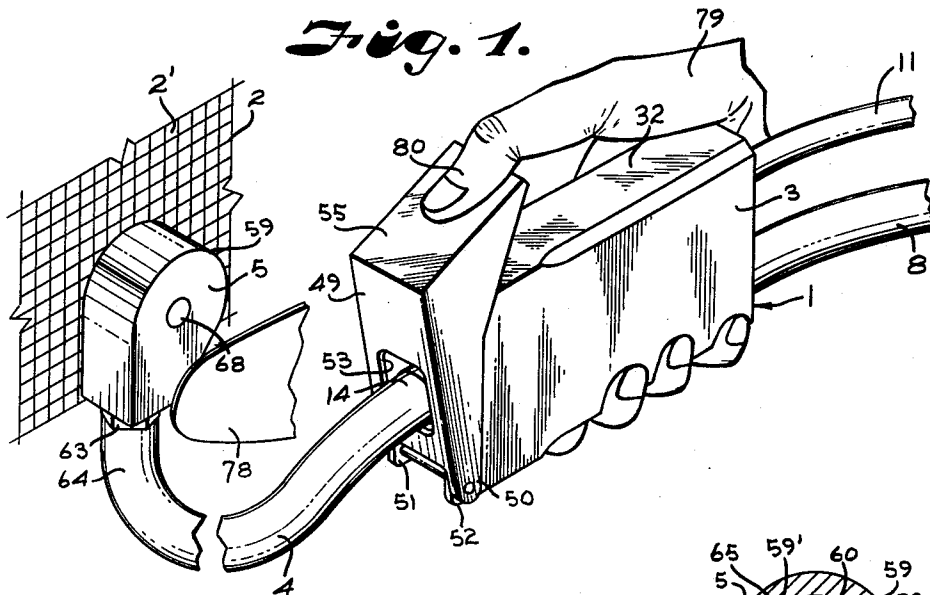


Fig. 2.

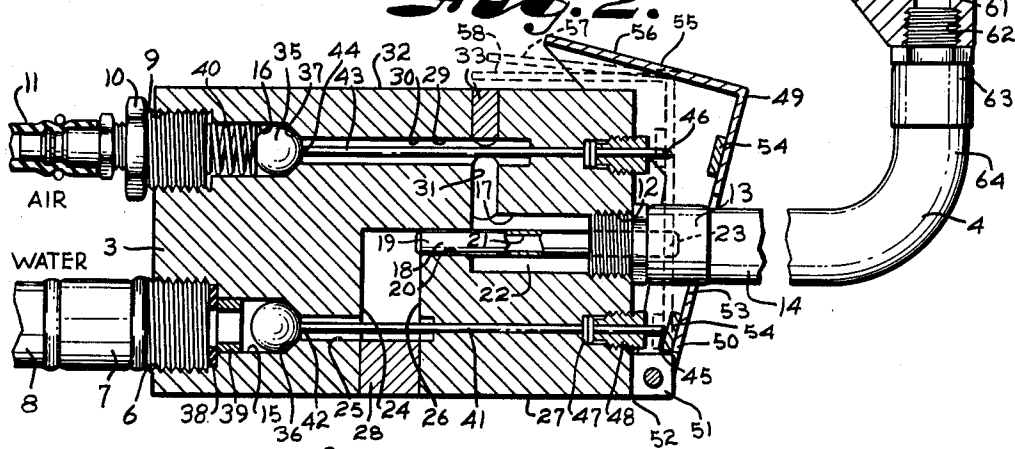
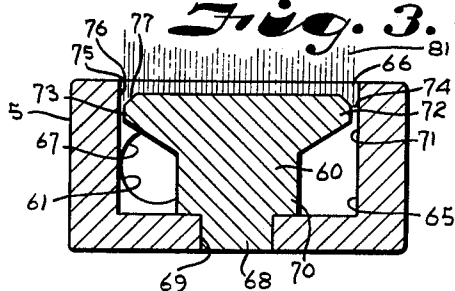


Fig. 3.



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RADIATOR CLEANING DEVICE
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This invention relates to fluid discharging cleaning devices, and more particularly to devices of this character for dislodging and expelling debris from radiators and the like.

Heat transferring devices such as radiators are commonly formed with a great number of small air receiving passageways to provide large areas of heat transfer surface in a relatively small space. Such passageways, and particularly those found in automobile radiators, tend to clog with air and water carried debris after more or less extended periods of operation resulting in reduced effectiveness. Cleaning the radiators has presented serious problems. It is usually necessary to direct cleaning fluid streams in the reverse direction to normal air flow and adjacent fan blades or other equipment render access difficult to the inner side of the radiator. In addition, high velocity liquid streams are usually required for dislodging caked particles deep within the radiator and the required fluid pressure is generally not available without the use of complex auxiliary pumping or pressurizing equipment. Compressed air, though commonly available under relatively high pressures, tends to maintain the debris in a dry, caked condition which severely limits the usefulness thereof for cleaning. Attempts to overcome these difficulties have taken at least two major forms. It has been the practice to soak the radiator by directing a stream of water therethrough and then using high pressure air to dislodge the debris softened by the liquid. This has often been unsatisfactory because the air, when reduced to atmospheric pressure, becomes extremely dry and quickly dries out the debris which is not immediately dislodged. The other major procedure has been to use wet steam directed from a nozzle secured to an elongated pipe or the like. This generally produces good results; however, the high heat involved is often harmful to the radiator or adjacent equipment and is dangerous to personnel, besides requiring boilers and associated pressure-regulating equipment.

The principal objects of the present invention are: to provide a radiator cleaning device which mixes compressed air at commonly available high pressure with water under common tap pressure for increasing the velocity and, therefore, cleaning power of the water; to provide such a device which directs a combined air-water stream into a radiator with high cleaning force; to provide such cleaning apparatus wherein turbulence or energy loss is maintained at a minimum therewithin for obtaining the maximum force or velocity from the cleaning stream; to provide such a device having a nozzle member which is easily inserted between the rear side of a radiator and adjacent equipment such as fan blades in order that a reverse flow may be maintained through the radiator passageways; to provide such apparatus wherein relatively wide cleaning paths are produced for fast efficient cleaning; to provide a radiator cleaning device having a single control lever whereby a pre-soaking with water only may be obtained immediately prior to producing the high velocity cleaning stream; to provide such a device wherein high pressure air is so directed against flowing water that high velocity water particles are produced for efficient cleaning rather than an ineffective foam; and to provide such apparatus which is simple and rugged in construction, reliable in use and well adapted for its intended purpose.

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Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a fragmentary perspective view illustrating a cleaning device for radiators embodying this invention and showing a nozzle member thereof in position for directing a cleaning stream through a schematically represented radiator.

FIG. 2 is a cross-sectional fragmentary view on an enlarged scale through the cleaning device of FIG. 1 showing the internal construction and parts thereof.

FIG. 3 is a cross-sectional view on an enlarged scale taken on the line 3-3, FIG. 2, showing the internal configuration of the nozzle member.

Referring to the drawings in more detail:

The reference numeral 1 generally indicates a device for cleaning radiators and the like, a radiator being depicted schematically at 2 having air passageways 2' therethrough. The device 1, in the illustrated example, includes a body member 3 connected by means of a flexible hose 4 to a nozzle member 5.

Referring particularly to FIG. 2, the body member 3 is preferably composed of a corrosion-resistant material such as aluminum or stainless steel and has formed therein a first threaded inlet bore 6 receiving the threaded connector 7 of a water supply hose 8 connected to any suitable source of water under common commercial tap pressure. The body member 3 also has formed therein a second threaded inlet bore 9 receiving the threaded connector 10 of an air supply hose 11 connected to any suitable source of compressed air such as those commonly available in automobile service stations having pressures of between approximately 100 to 300 pounds per square inch. The body member 3 also has formed therein a threaded outlet bore 12 receiving a threaded connector 13 secured to one end 14 of the flexible hose 4.

The body member 3 includes a first check valve chamber 15 communicating with the first inlet bore 6 and a second check valve chamber 16 communicating with the second inlet bore 9. An elongated cylindrical outlet chamber 17 communicates coaxially with the outlet bore 12. An elongated tube 18 smaller in diameter than the outlet chamber 17 and extending coaxially therewithin is mounted, in the illustrated example, by press fitting adjacent an open inner end 19 thereof in a bore 20 extending coaxially of the outlet chamber 17 within the body member 3. The sole support of the elongated tube 18 is by contact with the body member 3 in the bore 20 and the tube 18 forms with the outlet chamber 17 coaxial elongated inner and outer ducts 21 and 22 respectively. The tube 18 extends in cantilever fashion past the outlet bore 12 and opens at the other or outer end 23 thereof into the flexible hose 4. This configuration reduces turbulence in flow through the hose 4 and also inhibits the tendency for the higher pressure air to cause the water to "back up" or reverse flow toward its source.

A first passageway 24 is composed of a section 25 coaxial with the first check valve chamber 15 and a second section 26 extending at right angles to the section 25 but communicating therewith. The second section 26 is preferably formed in the body member 3 by transverse boring through a side wall 27 thereof and then inserting a plug 28 to a depth adjacent the first section 25 to avoid leakage from the body member 3. The second section 26 communicates with the open end 19 of the elongated tube 18.

A second passageway 29 is composed of a first section 30 extending coaxially with the second check valve chamber 16 and a second section 31 communicating with the

section 30 but extending transversely thereto and opening into the outlet chamber 17. In the illustrated example, the second section 31 is formed by boring into the body side wall 32 opposite to the side wall 27 and a suitable plug 33 is inserted into the side wall 32 to prevent leakage from the body member 3. It is noted that the first passageway 24 communicates with the inner duct 21 and the second passageway 29 communicates with the outer duct 22.

Suitable check balls 34 and 35 are respectively contained in the check valve chambers 15 and 16 and are adapted to seat against shoulders 36 and 37 adjacent the passageways 24 and 29 for normally blocking flow thereinto from the hoses 8 and 11. Conventional sealing washers 38, check ball spacers 39 and/or check ball closure springs 40 may be provided in the check valve chambers, if desired, for improving or altering the check ball seating characteristics. A first elongated rod 41 is longitudinally slidable in the body member 3, extends coaxially within the passageway section 25 and normally abuts the check ball 34 adjacent one end 42 thereof. A second elongated rod 43 is longitudinally slidable in the body 3, extends coaxially within the passageway section 30 and terminates at one end 44 thereof in normally abutting relationship with the check ball 35. The respective other ends 45 and 46 extend externally of the body member 3 and suitable glands or seals 47 maintained in place by packing nuts 48 prevent leakage therearound but permit longitudinal sliding.

An elongated lever arm 49 is pivotally mounted at one end 50 thereof to outwardly extending ears 51 integral with the body member 3 adjacent a corner 52 thereof. The lever arm 49 has a central opening 53 therethrough through which the flexible hose 4 extends. The elongated rod external ends 45 and 46 are located on opposite sides of the flexible hose connector 13 and the elongated lever arm 49 is aligned whereby it covers the two rod ends. Suitable push pads 54 are connected to the underside of the lever arm 49 to provide protruding contacting surfaces for the rod ends. The lever arm 49 bends at right angles to itself, forming a finger or thumb-contacting portion 55 which, when urged toward the side wall 32, causes an opening displacement of the check balls 34 and 35 in a sequence now described. When the portion 55 is in the position indicated at 56, both check balls are in the closed position. When the contacting portion 55 moves to the position indicated by the broken lines 57, the check ball 34 is urged away from the seat 36, causing a flow of water into the passageway 24. When the portion 55 is moved further to the position indicated by the broken lines 58, the check ball 35 is moved away from the shoulder 37 and air flows through the passageway 29. Note that in the illustrated structure water must be flowing before and during the flow of air.

The nozzle member 5 comprises a jacket 59 and a core 60. The jacket 59 has a passageway 61 threaded at one end 62 thereof for receiving a threaded connector 63 secured to the other end 64 of the flexible hose 4. The jacket 59 has an internal wall 59' forming a cylindrical chamber 65 open only at one end 66 thereof and communicating tangentially with the other end 67 of the jacket passageway 61.

The core 60 is fixed with respect to the jacket 59 by means of a protrusion 68 press fitted into a coaxial bore 69 in the jacket 59 and has a cylindrical stem portion 70 of substantially smaller diameter than the cylindrical chamber 65. The stem portion 70 extends coaxially within the chamber 65 and forms with the wall 59' a circular passageway 71. The core 60 terminates in a cantilever supported expanding conical portion 72 having a lip 73 of slightly smaller diameter than the cylindrical chamber forming wall 59' producing a circular slot 74 therebetween. The chamber wall 59' extends past the lip 73 at 75 and terminates in a square edge or shoulder 76 spaced therefrom. The conical portion 72

terminates in a bevel edge 77 facing the square edge 76. This configuration has been found to direct a smooth flow with little spreading. The overall width of the nozzle member 5 is such that it is easily inserted in the small space provided between a fan blade 78 and the rear face of the radiator with the slot 74 facing in the direction of the radiator. The flexible hose 4 may be of a convenient length, for example two to three feet.

In operation, the nozzle member 5 is placed against the radiator 2 with one hand (not shown) as the other hand 79 holds the body member 3, as illustrated in FIG. 1. A finger or thumb 80 is rested on the lever portion 55 and the lever is urged to the position 57. This causes a water flow through the passageway 24, through the inner duct 21 and into the flexible hose 4 in a solid stream which, it is believed, substantially maintains its integrity into the chamber 65. The water flows smoothly in a circular path within the chamber 65 and is urged from the slot 74 in a smooth cylindrical pattern 81 which covers a reasonably large path with a small quantity of liquid. If desired, several passes may be made over the radiator to completely soak the debris contained therein.

The portion 55 is then urged to the position indicated at 58 which causes air to flow through the passageway 29, through the outer duct 22 and into the hose 4, it is believed, without substantially disturbing the flow of liquid therethrough from the elongated tube 18. The air mixes with the water in the chamber 65 in such a manner that the water is accelerated and forced from the slot 74 in the form of high velocity water particles which forcefully dislodge the debris in the radiator.

Turbulence within the device 1 is maintained at a minimum so that a maximum amount of the energy contained in the water and air is transferred to velocity in the expelled water particles. Thus, sufficient energy is generally available for efficient cleaning without the need for specialized high pressure equipment.

It is to be understood that while one form of this invention has been illustrated and described, it is not to be limited to the specific form or arrangement of parts herein described and shown except insofar as such limitations are included in the claims.

What I claim and desire to secure by Letters Patent is:

1. A device for cleaning radiators and the like comprising:

- (a) a body and a nozzle member,
- (b) said body having a first receiving means for connecting a pressured water supply hose and a second receiving means for connecting a high pressure air supply hose,
- (c) said body forming an elongated cylindrical outlet chamber, a length of flexible hose secured to said body and communicating between said outlet chamber and said nozzle member, said hose forming a coaxial extension to said outlet chamber adjacent said body,
- (d) an elongated straight tube smaller in width than said outlet chamber and having oppositely directed first and second open ends, means supporting said tube at said second end extending coaxially within said outlet chamber and forming therewith elongated coaxial inner and outer ducts,
- (e) said tube first end extending coaxially beyond said outlet chamber into said hose, a first passageway in said body communicating between said first means and said tube second end, and a second passageway in said body communicating between said second means and said outlet chamber adjacent said first end,
- (f) whereby inner water flow and outer air flow are coaxially separated when entering said hose for reducing turbulence loss to said nozzle member.

2. A nozzle member for discharging an air and water mixture comprising:

- (a) a jacket and a core,

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- (b) said jacket having a passageway with opposite open ends, means at one of said passageway ends for connection to a source of air and water under pressure,
- (c) said jacket having an internal cylindrical wall forming a cylindrical chamber open at only one end thereof and communicating tangentially through said wall with the other of said passageway ends, 5
- (d) said core being fixed with respect to said jacket and having a central stem portion of substantially smaller width than said chamber and extending longitudinally therewithin forming a circular passageway in said chamber, 10
- (e) said core terminating in a portion expanding in width from said stem portion, said expanding portion having a lip of slightly smaller size than said cylindrical chamber forming wall forming a circular slot therewith near said cylindrical chamber open end, 15
- (f) whereby air and water entering said means are discharged from said slot with little friction lost. 20
3. A nozzle member for discharging air and water mixture comprising:
- (a) a jacket and a core,
- (b) said jacket having a passageway with opposite open ends, means at one of said passageway open ends for connection to a source of air and water under pressure, 25
- (c) said jacket having an internal cylindrical wall forming a cylindrical chamber open at only one end thereof and communicating tangentially through said wall with the other of said passageway ends, said core being fixed with respect to said jacket and having a cylindrical stem portion of substantially smaller diameter than said cylindrical chamber and extending coaxially therewithin forming a circular passageway in said cylindrical chamber, 30 35

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- (d) said core terminating in a conical portion expanding from said stem portion, said conical portion having a lip of slightly smaller diameter than said cylindrical chamber forming wall forming a circular slot therewith near said cylindrical chamber open end, said cylindrical chamber wall extending past said lip and terminating in a square inner edge, said conical portion terminating in a bevel edge facing said chamber wall square edge,
- (e) whereby air and water entering said means are discharged from said slot with little spread and friction loss.

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