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Hitchiner et al.

[11] **3,841,064**

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[54] **AFTERCOOLER**

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[52] **U.S. Cl.** **55/269,** 55/417, 55/432, 137/204

[51] **Int. Cl.** **B01d 53/26**

[58] **Field of Search** 55/267, 269, 428, 430, 55/431, 432, 309, 312, 313, 218, 417; 137/204

[56] **References Cited**

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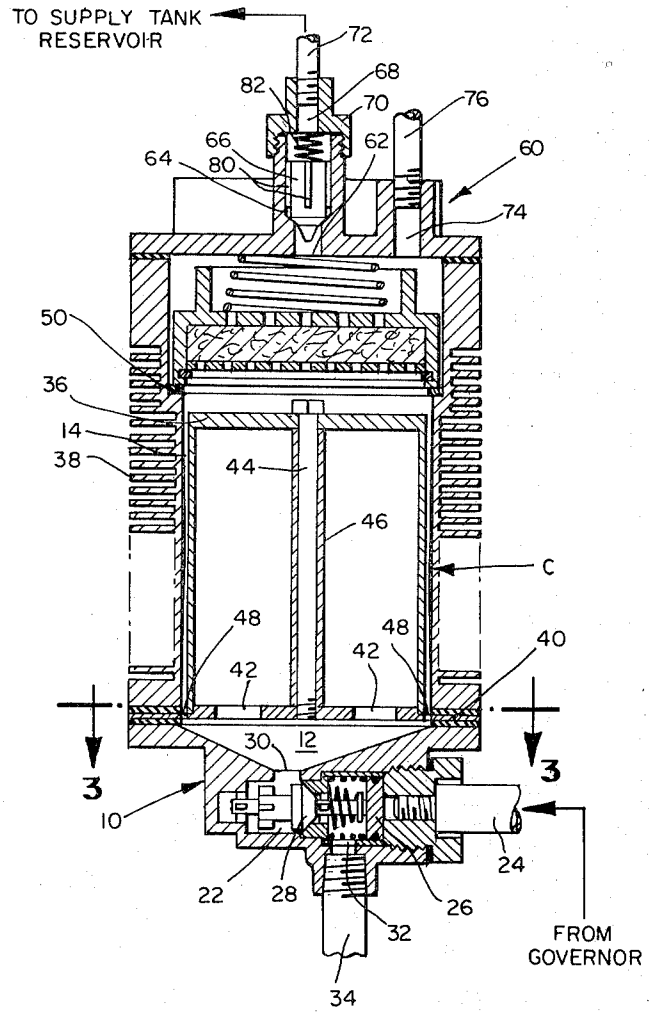
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[57] **ABSTRACT**

A compact aftercooler having a condensate discharge valve built into the bottom header so as to be heated by the air from the compressor, and a check valve built into the top header.

7 Claims, 3 Drawing Figures



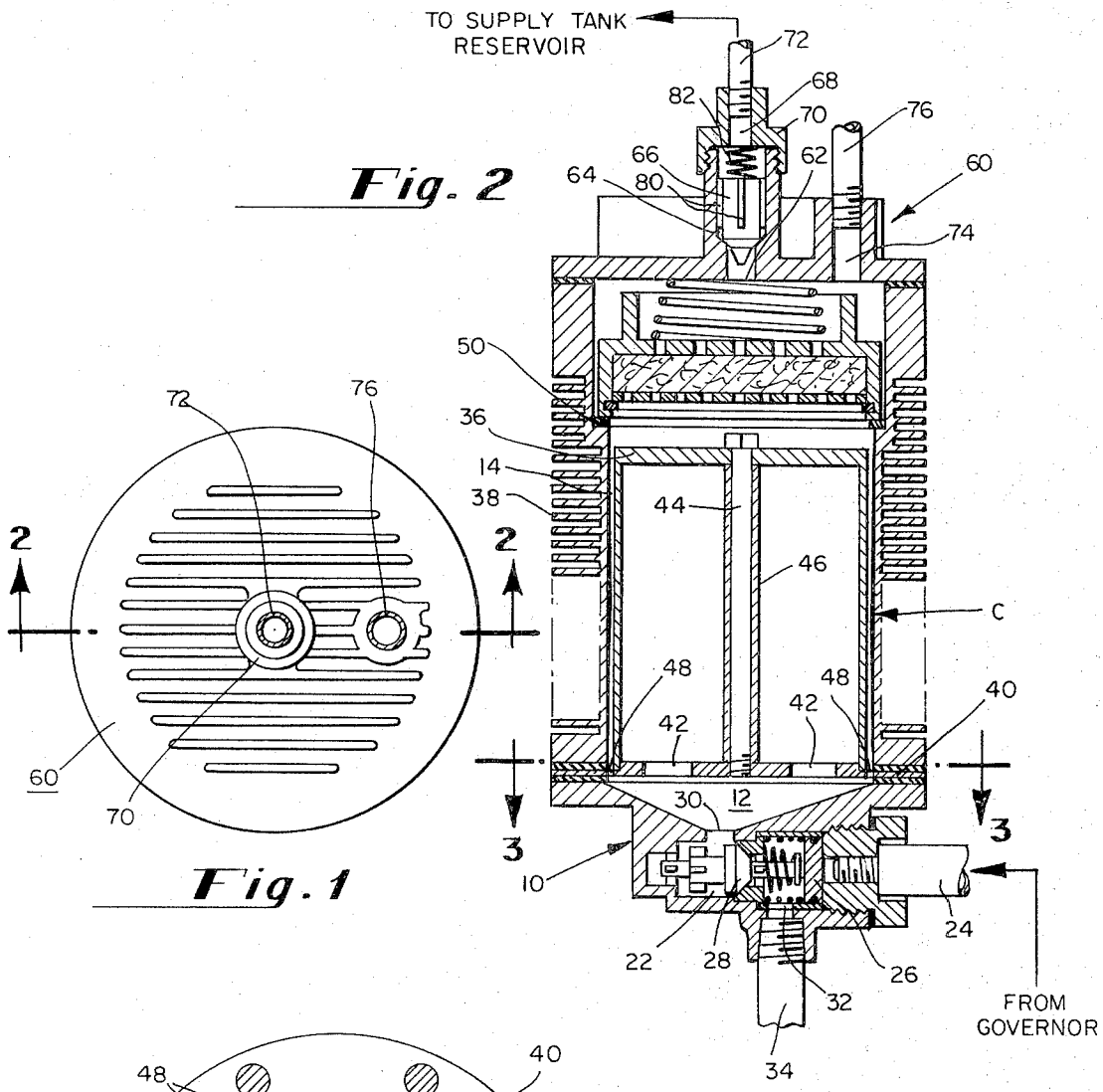


Fig. 2

Fig. 1

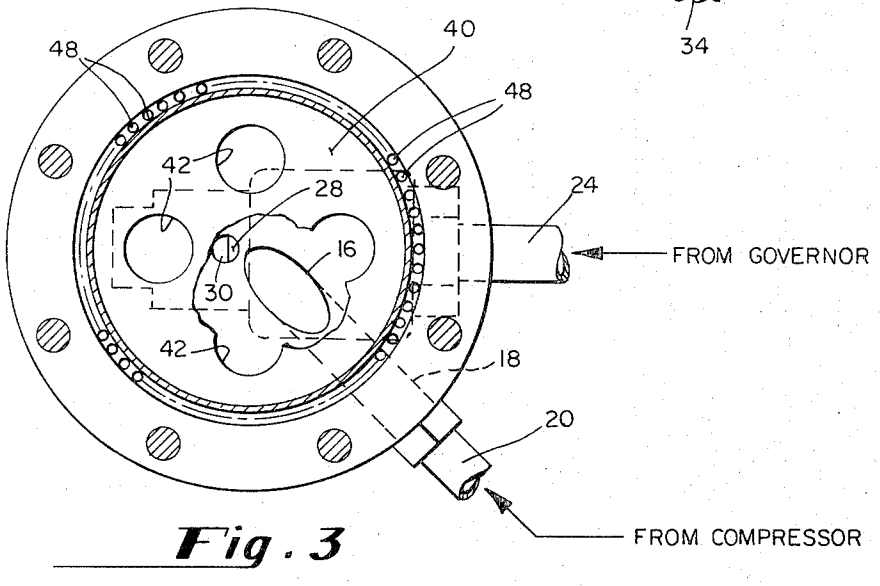


Fig. 3

AFTERCOOLER

BACKGROUND OF THE INVENTION

This invention relates to aftercoolers for use between the compressor and the reservoir in an air supply line; which aftercooler cools the air from the compressor and filters out the water and other contaminats, which it then automatically ejects.

The prior art aftercooler to which this invention particularly relates is shown in U.S. Pat. No. 3,516,231. In accordance with that patent, external valving was provided for both exhausting contaminants and checking the reverse flow of air from the reservoir. Several disadvantages are present when providing such valving. For one thing, the condensate exhaust valve, while connected to the bottom header, was nevertheless suspended in mid-air. When used in outdoor systems, such as those used on trucks, it tended to freeze up in cold weather. Further, since both valves were spaced from the main body of the aftercooler, inexperienced persons could reorient the valves, so that they did not function properly.

SUMMARY OF THE INVENTION

We have discovered a means for eliminating these problems by providing a unified package comprising a basic aftercooler body and heat dissipation unit with a top header having an integral vertically mounted check valve in the air line to the reservoir, and a bottom header having an integral horizontally mounted condensate discharge valve exposed through thin walls to the heated intake chamber from the compressor.

We have also provided a new hot air circulating means comprising a plate having a plurality of holes communicating with the space between the bore of the body and the baffle. Further, the bore has been redesigned and tapered inwardly from its upstream end toward its center and then outwardly from the center toward the downstream end, so as to create a Venturi effect on the air flowing in the space between the bore and the baffle.

Accordingly, it is an object of this invention to provide an improved aftercooler having greater efficiency and less susceptibility to breakdown than those known in the prior art.

It is another object of this invention to prevent freeze-up of the condensate discharge valve in an aftercooler.

These and other objects of our invention will become apparent from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of an aftercooler in accordance with the preferred embodiment of our invention;

FIG. 2 is a section taken as indicated by lines and arrows 2—2 in FIG. 1; and

FIG. 3 is a slightly enlarged section partially broken away of a portion of the aftercooler taken as indicated by the lines and arrows 3—3 in FIG 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although specific forms of the invention have been selected for illustration in the drawings, and the following description is drawn in specific terms for the purpose of describing these forms of the invention, this description is not intended to limit the scope of the invention which is defined in the appended claims.

The basic structure and functioning of our device is similar to that shown in U.S. Pat. No. 3,516,231 and for the sake of simplicity in understanding the prior art and the present invention, the disclosure of that patent is incorporated herein by reference. Accordingly, we shall describe our structure only to the extent necessary to understand the improvement over the structure disclosed in that patent. In that patent a typical aftercooler is shown for cooling and cleaning compressed air; which aftercooler comprises a housing having an inlet and an outlet and means therebetween for cooling air passing from the inlet through the outlet. The housing has juxtaposed to the inlet and the outlet a bottom header and top header, respectively.

We have redesigned the bottom header designated generally **10** (FIG. **2**) to provide a funnel shaped unobstructed cavity **12** for accumulating the hot condensate and contaminants. Air enters this funnel shaped portion **12** through the oval shaped entrance port **16** shown in the cut-away view FIG. **3.** This oval shaped port defines the entrance of the passage **18** which is in fluid flow communication with the conduit **20,** connected by any suitable means to the compressor (not shown).

A second passage **22** is provided passing horizontally through the header **10** and having a plurality of shoulders and threaded portions therein. This passage houses the condensate discharge valve mechanism which is clearly illustrated and which corresponds to the valve mechanism shown in FIGS. **2** and **3** of U.S. Pat. No. 3,516,231. This passage **22** is connected by any suitable means to a conduit **24** which is connected to a governor (not shown) and transmits air input signals to the piston **26** to thereby regulate the opening and closing of the valve **28.** The passage **22** also communicates with the apex of the cone shaped chamber **12** by means of the opening **30** shown in FIGS. **2** and **3.** Thus the condensate and contaminants flow by gravity down the sloping sides of the chamber **12** and through the hole **30** into the passage **22** from which they are exhausted periodically upon opening of the valve **28** and are ejected through the hole **32** and out through the discharge pipe **34.**

Positioning the valve mechanism in the header provides for through heat communication between the incoming hot compressed air and the valve, through a wall integrally formed in the header in direct heat transfer relation to the cavity **12** and the passage **18.** Only the thin wall separates the chamber **12** from the passage **22** and this wall conducts and distributes the heat to prevent the valve from freezing. Furthermore, the valve is always positioned correctly as is the discharge pipe **34,** thereby eliminating mistakes in maintenance due to unfamiliarity with the equipment.

The hot air coming into the chamber **12** passes upwardly about the cylindrical baffle **36** as is well known in the art and dissipates its heat through the surface forming the bore **14** and the outer fins **38.** To aid in this process we have provided a plate **40** which is annular and which has a plurality of holes **42** therein communicated with the inner chamber of the baffle **36.** A bolt **44** is attached through the baffle and is threaded into a hole in the center of the plate **40.** A spacer **46** on bolt **44** inside the baffle holds the baffle and the plate at a

controlled distance. This arrangement eliminates the need for the boss shown in the prior U.S. Pat. No. 3,516,231.

Spaced inwardly from the margin of the plate are a plurality of small holes **48** (FIG. 3) in an annular pattern which open into the space between the outer walls of the cylindrical baffle **36** and the bore **14.** This arrangement serves to add to the filtration effect of the device.

ABove the plate **40,** the walls of the bore **14** are tapered inwardly from the plate toward the longitudinal center of the bore designated generally C in FIG. **2.** From this center the walls taper outwardly to the upper end **50.** This tapering effect provides a function similar to that of the Venturi and aids in heat dissipation and fluid movement.

All of the improvements described so far have individually and collectively resulted in improved efficiency in operation of the device.

This device has been further modified from that shown in the prior art patent by the provision of the new top header designated generally **60** which has a centrally located outlet port **62** communicating with an enlarged chamber **64** wherein there is mounted a check valve **66.** The chamber **64** communicates with a passage **68** in a cap **70.** The cap **70** has a conduit **72** threaded therein in fluid communication with the passage **68,** which conduit leads to the supply tank reservoir of the fluid system. The positioning of the check valve in this manner eliminates guesswork as to its installation, considerably reduces the size of the unit in terms of its overall width from that known in the prior art, and, most importantly, eliminates wear and assuers proper functioning because of the precise vertical action of the valve. The movable valve member **66** closes on the usual conical valve seat shown, which is formed in the walls of the cavity **64.** Cocking of the valve is eliminated by the vertical mounting and the guide ribs **80** which are in contact with the walls of the cavity, and consequently, the valve wears and seats uniformly. The spring **82** urges the movable chamber toward the seat, so that the valve functions to permit the discharge of air from the housing, but prevent its return.

The header **60** also has a pasage **74** therein communicating with a conduit **76** which in turn communicates with a safety valve (not shown, but well known in the art).

It will be understood that various changes in the details, materials and arrangement of parts which have been herein described and illustrated in order to explain the nature of this invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the following claims.

It will further be understood that the Abstract of the Disclosure set forth above is intended to provide a nonlegal technical statement of the contents of the disclosure in compliance with the Rules of Practice of the United States Patent Office, and is not intended to limit the scope of the invention described and claimed herein.

What is claimed is:

1. An aftercooler for cooling and cleaning compressed air, comprising: a housing having an inlet and an outlet and means therebetween for cooling air passing from the inlet through the outlet; and a header juxtaposed to the inlet comprising a body defining a cavity therein communicating with the inlet having a port therein communicating with a passage through said header to permit fluid flow communication with a source of compressed air; said header having a second passage therein containing discharge valve means to permit the discharge of fluid from said second passage; said header having a port communicating with said second passage from said cavity to permit the flow of liquid from said cavity into said second passage through said port; said valve means being completely disposed within the body of said header and being separated from said first mentioned passage by a wall integrally formed in said header in direct heat transfer relation to said first passage and said cavity in sufficient proximity to said first mentioned passage to prevent freezing of said fluid on the surfaces of said valve means.

2. The invention of claim **1** wherein a perforated plate is disposed between said header and said housing.

3. The invention of claim **2** wherein said housing contains a cylindrical baffle disposed in spaced relation to the inner walls of said housing which form a bore; and said perforations in said plate are annularly disposed to permit fluid flow communication between said cavity and the space between said baffle and the walls forming said bore.

4. The invention of claim **3** wherein said baffle is fixedly connected to said plate.

5. The invention of claim **1** wherein a second header is juxtaposed to the outlet of said housing; said second header having a chamber therein and a check valve means within said chamber for permitting air to pass from said outlet and preventing its return.

6. The invention of claim **5** wherein said check valve means comprises a seat formed in said cavity and a movable member having a plurality of guide means thereon engaging the walls forming said cavity, to guide said movable member toward and away from said seat.

7. An aftercooler for cooling and cleaning compressed air, comprising: a housing having an inlet and an outlet and means therebetween for cooling air passing from the inlet through the outlet; and a header juxtaposed to the inlet comprising a body defining a cavity therein communicating with the inlet having a port therein communicating with a passage through said header to permit fluid flow communication with a source of compressed air; said header having a second passage therein containing discharge valve means to permit the discharge of fluid from said second passage; said header having a port communicating with said second passage from said cavity to permit the flow of liquid from said cavity into said second passage through said port; said valve means being completely disposed within the body of said header and being separated from said first mentioned passage by a wall integrally formed in said header in direct heat transfer relation to said first passage and said cavity; said housing having a cylindrical baffle disposed within said housing in spaced relation to the walls of said housing which form a bore; and said walls are sloped inwardly from the inlet toward the longitudinal center of said bore and then outwardly toward the outlet of said housing.

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