April 4, 1950 B. WELTE 2,502,907

COOLING SYSTEM FOR VERTICAL BROACHING MACHINES

Filed June 18, 1947

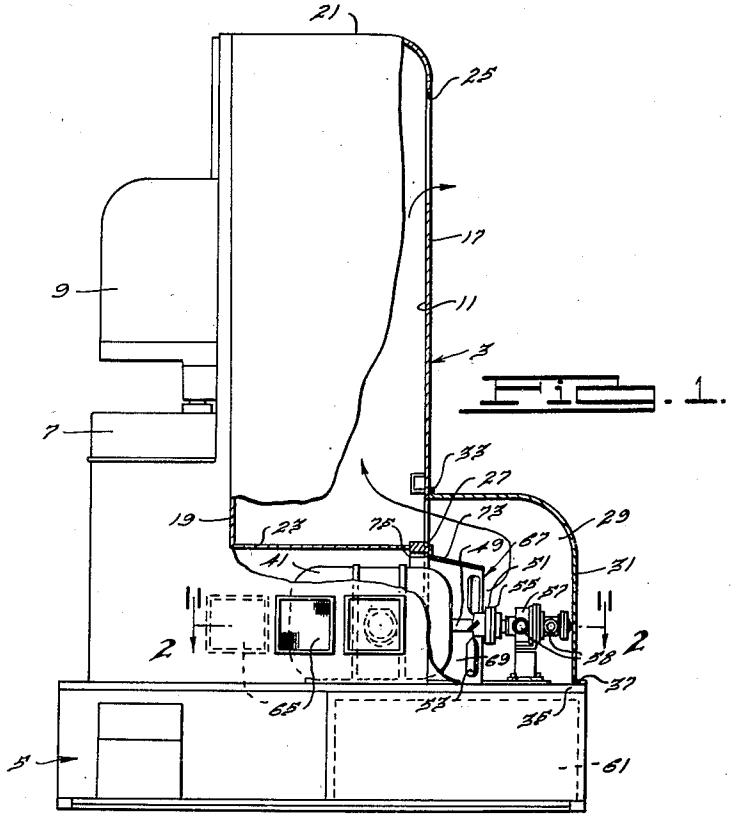


Fig. 1.

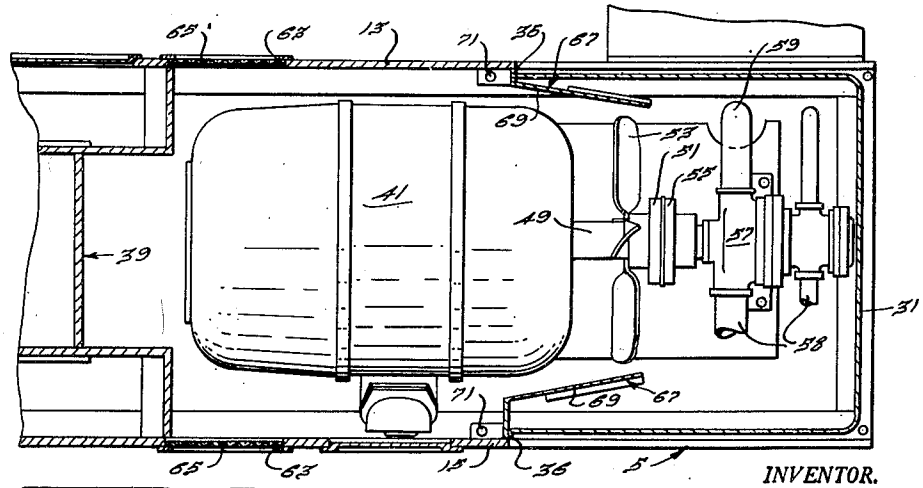


Fig. 2.

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Patented Apr. 4, 1950 2,502,907

UNITED STATES PATENT OFFICE

2,502,907

COOLING SYSTEM FOR VERTICAL BROACHING MACHINES

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Application June 18, 1947, Serial No. 755,291

3 Claims. (Cl. 90—33)

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This invention relates to vertical hydraulic broaching machines and more particularly to a cooling system for such machines.

In hydraulic broaching machines, difficulty has been encountered as a result of the development of excessive heat in the fluid which is pumped from a fluid reservoir through conduits to actuate the movable elements of the machine, and accordingly it is an object of this invention to overcome this difficulty in vertical hydraulic broaching machines.

Other objects of this invention will become apparent from the following detailed description taken in conjunction with the accompanying drawing in which:

Figure 1 is a partially broken away side elevational view of a vertical broaching machine employing the features of this invention; and

Fig. 2 is an enlarged sectional view of the structure illustrated in Fig. 1 taken along the line 2—2 thereof.

In accordance with the present invention, the requisite degree of cooling is achieved by a circulation of air over the motor, pump and hydraulic pipes and valves, and the desired rate of air circulation is achieved in large degree by utilizing the relatively tall vertical frame of the machine as a chimney to induce air circulation.

The present invention is illustrated in conjunction with a pull-up vertical broaching machine of a more or less conventional type. The machine as illustrated comprises a vertical frame generally indicated at 3, which includes the usual supporting base 5 and a horizontally disposed table 7. A ram is mounted in suitable ways in the upper portion of the machine, and is adapted to reciprocate vertically under the influence of a hydraulic cylinder, or other conventional means (not shown), toward and away from a work supporting bracket 9. It will be understood, however, that the invention is equally applicable to pull-down vertical broaching machines.

A substantially hollow vertical column 11 is provided in the upper portion of the frame 3, rearwardly of the ram 9, and is defined by the frame side walls 13 and 15, a back wall 17, and front wall 19. The back wall 17 extends over the top of the side walls 13 and 15 and the front wall 19 to provide a top wall 21 for the column. The bottom wall of the vertical column 11 is formed by means of a plate 23, which is disposed between the vertical walls of the column, at the lower end thereof. An air outlet opening 25 is provided adjacent the upper end of the back wall 17. An air inlet opening 27 is provided

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adjacent the lower end of the back wall 17, immediately above the bottom wall 23, and this opening connects the interior of the column with a chamber 29 formed in the lower end of the frame 3.

The rear wall of the chamber 29 and a portion of the opposed side walls thereof is formed by a sheet metal hood 31 of a generally inverted L shape in vertical cross section. The upper horizontal wall portion of the hood 31 is connected to the back wall 17 of the vertical column at 33, immediately above the opening 27. The lower end of the end wall portion of the hood 31 is connected to a plate member 35, of the base 5, at 37, so that the plate 35 forms the bottom of the chamber 29. The side walls of the hood 31 abut, and are secured to the rear edges of the frame side walls 13 and 15, at 36, so as to enclose each side of the chamber 29. The plate 23, in the lower end of the vertical column 11, forms a portion of the top wall of the chamber. The forward end of the chamber is enclosed by means of a wall 39 which extends vertically between the base plate 35 and the lower wall 23 of the vertical column 11. It therefore can be seen that the chamber 29 is defined and enclosed by the various walls described, and communicates with the vertical column 11 through the opening 27.

Mounted on the plate 35 of the base 5, substantially directly below the bottom wall 23 of the vertical column, is a conventional electric motor 41.

The drive shaft 49, of the motor 41, extends rearwardly beyond the motor housing, and a coupling member 51 is drivingly secured to the rear end thereof. Radially spaced fan blades 53 are mounted on the forward end of the coupling member 51, and are adapted to be driven by the motor 41. The rear end of the coupling member 51 is connected to a second coupling member 55 which in turn is connected to a conventional fluid pump 57, so that both the fan blades 53 and the pump 57 are driven by the motor 41. The pump 57 has a conduit 59 extending downwardly therefrom into a fluid reservoir 61, which is disposed in the base 5, below the plate 35. The fluid is pumped from the reservoir 61 through the necessary conduits 58 to the hydraulic mechanism of the machine. The conduits 58 may extend upwardly, from the pump 57, through the vertical column 11, and through other parts of the machine, in order to be connected to the hydraulic mechanism (not shown).

The side walls 13 and 15, of the frame 3, are provided with openings 63, immediately to the

rear of the vertical front wall **39** of the chamber **29**, and adjacent the forward end of the electric motor **41**. Screens **65** are secured to the walls **13** and **15**, over the openings **63**, to filter out foreign particles and the like. These apertures **63** permit air to be drawn into the chamber **29**, in which the motor, fan and pump are mounted, and when the motor **41** is operating it will draw air through its housing. Likewise the fan blades **53** will draw air, from the openings **63**, through the chamber toward the rear end thereof.

An inverted U-shaped housing, generally indicated at **67**, is positioned over the rear portion of the motor **41** and fan blades **53** and has its side walls **69** secured at their forward end to the base plate **35** adjacent the frame side walls **13** and **15**, at **71**. The housing side walls **69** converge inwardly toward the rear end of the chamber **29**. The top wall **73** of the housing **67** has its forward end secured to the rear edge of the lower wall **23** of the vertical column, at **75**, immediately below the opening **27**. The housing **67** is opened at its front and rear ends and acts as a shroud for the fan **53**. The housing **67** also directs the air into the rear end of the chamber **29**, where the arcuate back wall **31** directs it through the opening **27** and into the vertical column **11**.

As the vertical column **11** is closed except for the opening **27**, at its lower end, and the opening **25**, adjacet its upper end, a chimney-like effect is obtained, so that the air in the chamber **29** is drawn into the vertical column, and flows out the upper opening **25**, into the surrounding atmosphere. Therefore, a constant flow of fresh, cool air is constantly passing over the pump **57** and up through the vertical column **11**, so as to cool the pump and at least a portion of the conduits leading therefrom. This in turn will cool the fluid which is pumped through the conduits and so eliminate the difficulties previously encountered.

Due to the chimney effect of the vertical column and the usual air circulating fan conventionally incorporated within electric motors, it is not necessary to employ the fan **53** to obtain an adequate degree of cooling effect. The cooling effect, however, is further enhanced by the fan **53**.

I claim:

1. In a vertical hydraulic broaching machine a main frame defining a hollow vertical column, means defining and enclosing a chamber in the lower portion of said frame which is in communication with the interior of said column, said means having an inlet opening therein to permit the entrance of air into said chamber, said vertical column having an opening adjacent the upper end thereof communicating with the atmosphere, a fluid pump and motive means therefor mounted in said chamber in the path of flow of air from said inlet opening into said column, and a fan disposed between said fluid pump and motive means and operatively connected with said motive means for enhancing the flow of air over said fluid pump through said chamber and into said column.

2. In a vertical hydraulic broaching machine,

a main frame defining a hollow substantially closed vertical column, a fluid operated tool-supporting element movably supported on said frame adjacent to and exteriorly of said column, a supporting base for said frame, means providing a fluid reservoir in said base, means defining a substantially closed chamber in the lower portion of said frame above said base, means providing communication between the lower portion of said vertical column and said chamber, said chamber-defining means having an inlet opening therein to permit the entrance of air, said vertical column having an air outlet opening therein adjacent the upper end thereof through which air can flow from said column, a motor mounted in said chamber, a fluid pump mounted in said chamber and operatively connected with said motor, fluid conduit means connected with said pump and reservoir and extending through said chamber and column toward said tool-supporting element, said pump, motor and at least a portion of said conduit means being disposed in the path of flow of said air from said inlet opening to said outlet opening.

3. In a vertical hydraulic broaching machine, a main frame defining a hollow substantially closed vertical column, a fluid operated tool-supporting element movably supported on said frame adjacent to and exteriorly of said column, a supporting base for said frame, means providing a fluid reservoir in said base, means defining a substantially closed chamber in the lower portion of said frame above said base, means providing communication between the lower portion of said vertical column and said chamber, said chamber-defining means having an inlet opening therein to permit the entrance of air, said vertical column having an air outlet opening therein adjacent the upper end thereof through which air can flow from said column, a motor mounted in said chamber, a fluid pump mounted in said chamber and operatively connected with said motor, fan means disposed between said fluid pump and motor and operatively connected with said motor, fluid conduits connected with said pump and reservoir and extending through said chamber and at least a portion of said column toward said tool-supporting element, said pump, motor and at least a portion of said conduits being disposed in the path of flow of said air flowing from said inlet opening to said air outlet opening and enhanced by the operation of said fan means.

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