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PUMPING MECHANISM

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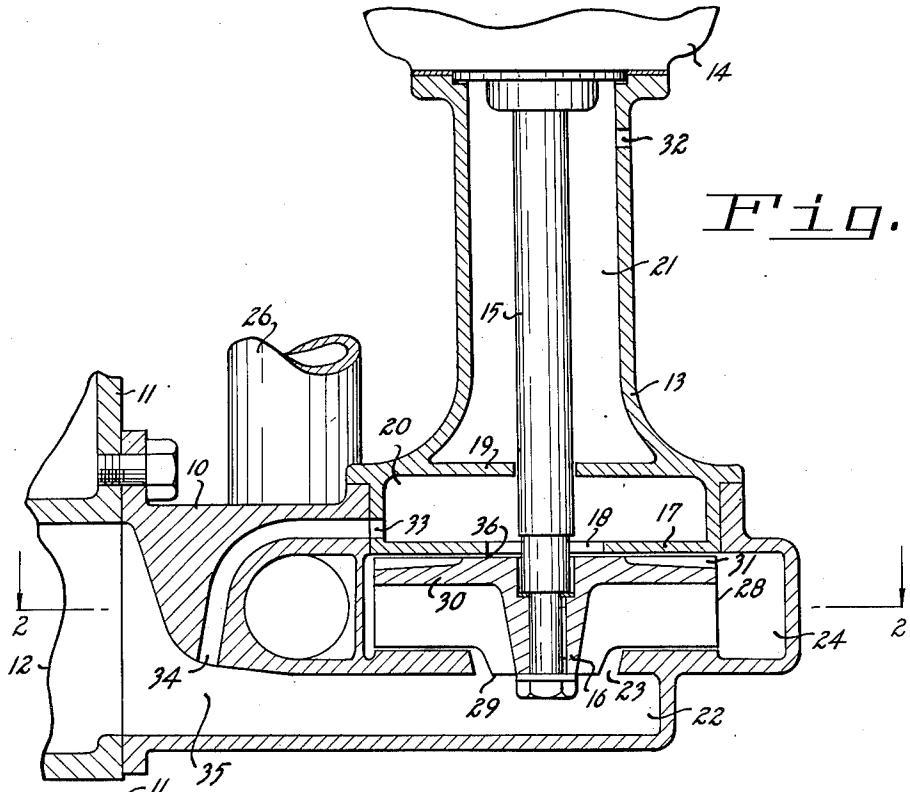


Fig. 1

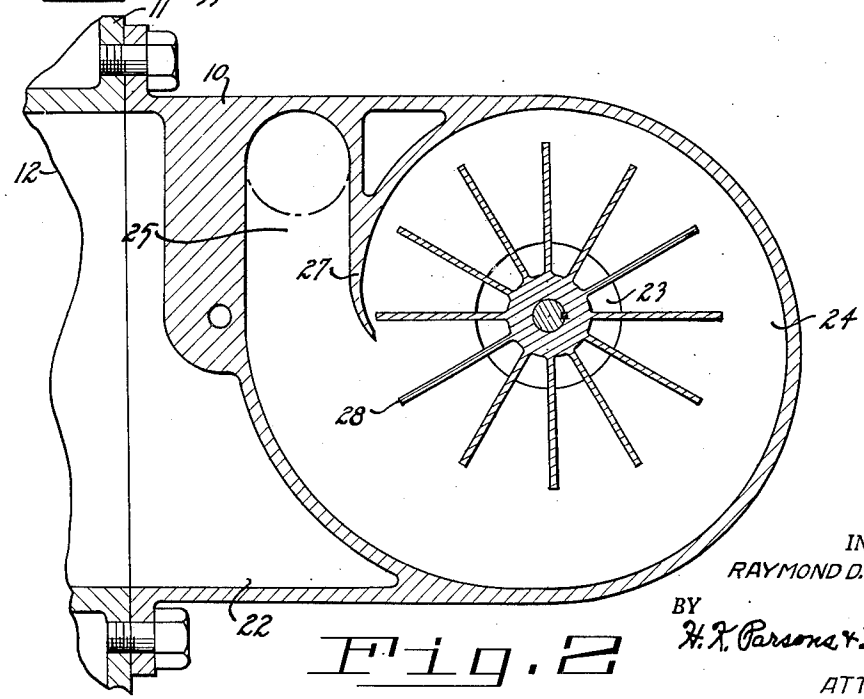


Fig. 2

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PUMPING MECHANISM

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2 Claims. (Cl. 103—87)

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This invention relates to improvements in pumping mechanisms and has particular reference to an improved structure particularly adapted for use in machine tool coolant circulation.

One of the principal objects of the present invention is the provision of an improved construction of coolant circulating pump permitting of close fitting of the parts without frictional engagement to increase the potential output or discharge of the pump and minimize internal leakage under operating conditions.

A further object of the present invention is the provision of an improved structure for reducing tendency of rise of the coolant or medium being pumped within the supporting portion of the pump to prevent possible damage to the drive motor therefor.

A further object of the invention is the provision of an improved construction for positively exhausting excess coolant from the supporting pedestal portion of the pump structure.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification, considered in conjunction with the accompanying drawings forming a part thereof, and it is to be understood that any modifications may be made in the exact structural details there shown and described, within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

Figure 1 is a vertical section through a coolant pump embodying the present invention, and

Figure 2 is a horizontal section on the line 2—2 of Figure 1.

In the operation of coolant pumps for machine tools, such as grinding machines, for example, it is necessary that a large volume of coolant be continuously circulated to the grinding wheel at a low pressure during the operation of the machine and desirable that this be effected with a minimum consumption of power. To minimize power requirements it is, therefore, desirable that close fitting seals and bearings be eliminated so far as possible and that the structure be such that it will have long wearing capabilities in spite of the presence of abrasive particles or the like in suspension in the coolant, which necessitates provision of clearance spaces between the moving

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parts to a greater extent than is customary in connection with ordinary pressure circulation pumping mechanisms. Additionally, it is desirable that the structure be of simplified form operable at a constant and uniform rate with the possibility of throttling the outflow or discharge to determine the percentage of potential volumetric discharge actually utilized. Such later action creates a back pressure condition in the pumping mechanism and a tendency to increase the overall leakage conditions.

The present pump is designed to overcome difficulties which have been expressed with coolant pumps in the past and primarily comprises a housing unit 10 adapted to be secured to a flange 11 of a coolant tank element 12. Rising from the housing 10 is a hollow pedestal 13 supporting at its upper end the drive motor 14 having a long dependent shaft 15 on the lower end of which is secured the pump impeller 16. The pedestal sleeve 13 is preferably provided with a closure 17 at its lower end interfitting with the housing having a central aperture 18 through which the shaft 15 extends, the aperture 18 being of sufficient size to permit free rotation of the shaft 15 without contact therewith. If desired, the lower portion of the pedestal may be divided by the transverse rib or plate portion 19 to provide a lower chamber 20 and upper chamber 21 within the pedestal.

The housing 10 is cored or formed in its lower portion with the chamber or passage 22 communicating with the coolant tank 12 to provide an inlet passage communicating through the port or aperture 23 with the upper impeller space 24.

This space, as shown in Figure 2, has the generally volute chamber 24 terminating in the discharge passage 25 communicating with the output pipe or conduit 26, the portion 25 being separated from the intake area of chamber 24 by a cut-off flange or shoulder 27 which extends into proximity with the outer edges of the rotating vanes 28 on the impeller.

It will be understood that these vanes have the downwardly tapering center portions 29 extending through the aperture 23, and may, if desired, have a somewhat spiral corkscrew form, but in any event serve to create an intake suction action effecting movement of the coolant from the passage 22 upwardly into the chamber

24 where centrifugal action of the impeller rotating in a clockwise direction as viewed in Figure 2 forces the coolant or medium to be circulated out through passage 25 and discharge conduit 26.

These vanes are carried on the underside of the impeller body 30, which is provided on its upper face with the relatively thin scavenger blades or vanes 31 which are slightly spaced from the pedestal base 17, that is to say by an amount of .005'' to .010''. It will be appreciated that when the pump is in operation and particularly if discharge through conduit 26 is somewhat restricted that a pressure will be built up in the chamber 24 and that fluid under pressure will tend to creep over the top of the impeller and into the chamber 20—21 in the interior of the pedestal member 13 and may rise in this pedestal above the general liquid level of coolant in tank 12 to an extent to reach and damage the bearings or other parts of motor 14, even though vents such as 32 are placed in the pedestal or column.

To eliminate this undesirable feature I have provided the conduit or passage 33 which extends from the chamber portion 20 at the base of the motor supporting sleeve or pedestal to a discharge port or orifice 34 within the narrowing throat 35 of the fluid intake passage 22. So situated, when the pump is not in operation there will be free communication between the interior of the pedestal and the tank area, causing any liquid in the pedestal to drop by gravity to the height of the liquid in the tank, while during operation of the pump the intake suction through the throat 35 will react at the port 34 supplementing the gravity action of the weight of any column of liquid in the pedestal 13. This suction action tends to create a sub-atmospheric condition in the conduit 33, drawing out any excess liquid which has crept through the space 36 between the impeller body 30 inwardly of the scavenger blades 31 and the bottom flange 17 of the pedestal.

With the construction as described, it is therefore possible to set up the parts with the necessary loose running fit to eliminate friction or cutting away of adjacent relatively movable parts by contained grit or the like in the coolant being circulated, and at the same time to utilize the suction action of the pump impeller itself to prevent undesired rise or spilling over of the coolant by way of the motor pedestal support.

What is claimed is:

1. A coolant pump for use in connection with a grinding machine or the like comprising a housing having a lower inlet chamber formed with an outwardly flaring intake throat, said housing being formed with a pair of superimposed chambers disposed above the inlet chamber and an upwardly extending hollow pedestal above the uppermost chamber, said intermediate chamber being formed of spiral shape providing an impeller receiving portion and a lateral discharge portion, a discharge conduit extending in continuation of said discharge portion, a motor mounted on the pedestal having a shaft portion extending downwardly through the pedestal and the upper and intermediate chambers of the housing, the upper chamber having a top closure wall formed with an aperture of larger diameter than that of the shaft to provide a clearance between said parts and said upper chamber having a lower wall providing a division between the upper and intermediate chambers, said lower wall having an aperture formed therein with its bounding wall disposed in spaced circumscribing relation to the depending shaft, an impeller member carried by the shaft and disposed within the intermediate chamber, said impeller member having a lower series of vane portions effective on rotation of the impeller to draw fluid through the inlet passage of the chamber and discharge such fluid into the outlet conduit, the impeller being further formed on its upper surface with a series of scavenger blades underlying the lower wall of the upper chamber and with a solid central portion circumscribing the supporting shaft and of greater diameter than the aperture in said intermediate wall whereby said solid portion will form a substantial closure for the aperture and the scavenger blades will exert a centrifugal force resisting flow of fluid from the central space to the upper chamber by way of said aperture, said housing having a passage formed therein with its upper end opening into the upper chamber adjacent the lower wall thereof and its lower end opening into the flaring portion of the inlet passage of the chamber whereby said passage provides a normal gravity drain for the upper chamber and a suction evacuator of the upper chamber when the pump is in operation due to the created suction in the inwardly tapering portion of the flared intake throat when the impeller is drawing fluid therethrough.

2. A coolant pump for use in connection with a grinding machine or the like comprising a housing having a lower inlet chamber formed with an outwardly flaring intake throat, said housing being formed with a pair of superimposed chambers disposed above the inlet chamber and an upwardly extending hollow pedestal above the uppermost chamber, said intermediate chamber being formed of spiral shape providing an impeller receiving portion and a lateral discharge portion, a discharge conduit extending in continuation of said discharge portion, a motor mounted on the pedestal having a shaft portion extending downwardly through the pedestal and the upper and intermediate chambers of the housing, the upper chamber having a top closure wall formed with an aperture of larger diameter than that of the shaft to provide a clearance between said parts and said upper chamber having a lower wall providing a division between the upper and intermediate chambers, said lower wall having an aperture formed therein with its bounding wall disposed in spaced circumscribing relation to the depending shaft, an impeller member carried by the shaft and disposed within the intermediate chamber, said impeller member having a lower series of vane portions effective on rotation of the impeller to draw fluid through the inlet passage of the chamber and discharge such fluid into the outlet conduit, the impeller being further formed on its upper surface with a series of scavenger blades underlying the lower wall of the upper chamber and with a solid central portion circumscribing the supporting shaft and of greater diameter than the aperture in said intermediate wall whereby said solid portion will form a substantial closure for the aperture and the scavenger blades will exert a centrifugal force resisting flow of fluid from the central space to the upper chamber by way of said aperture, said housing having a passage formed therein with its upper end opening into the upper chamber adjacent the lower wall thereof and its lower end opening into the flaring portion of

the inlet passage of the chamber whereby said passage provides a normal gravity drain for the upper chamber and a suction evacuator of the upper chamber when the pump is in operation due to the created suction in the inwardly tapering portion of the flared intake throat when the impeller is drawing fluid therethrough, said pedestal having an aperture formed therethrough at a point intermediate the motor and the upper wall of the upper chamber insuring maintenance of atmospheric pressure within the pedestal to assist clearance of fluid from the upper chamber under both static and dynamic operating conditions.

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