

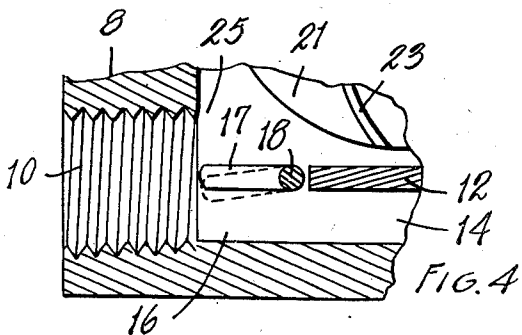
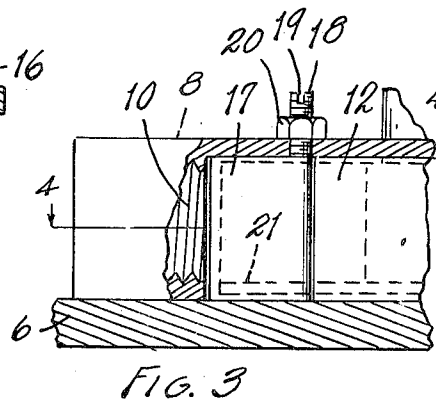
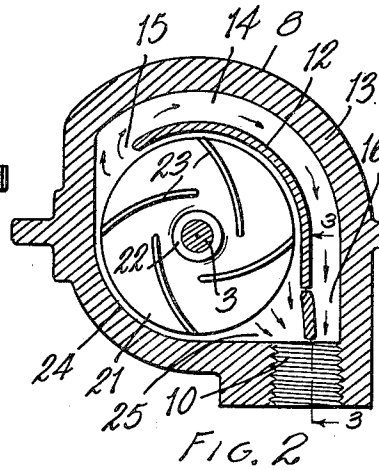
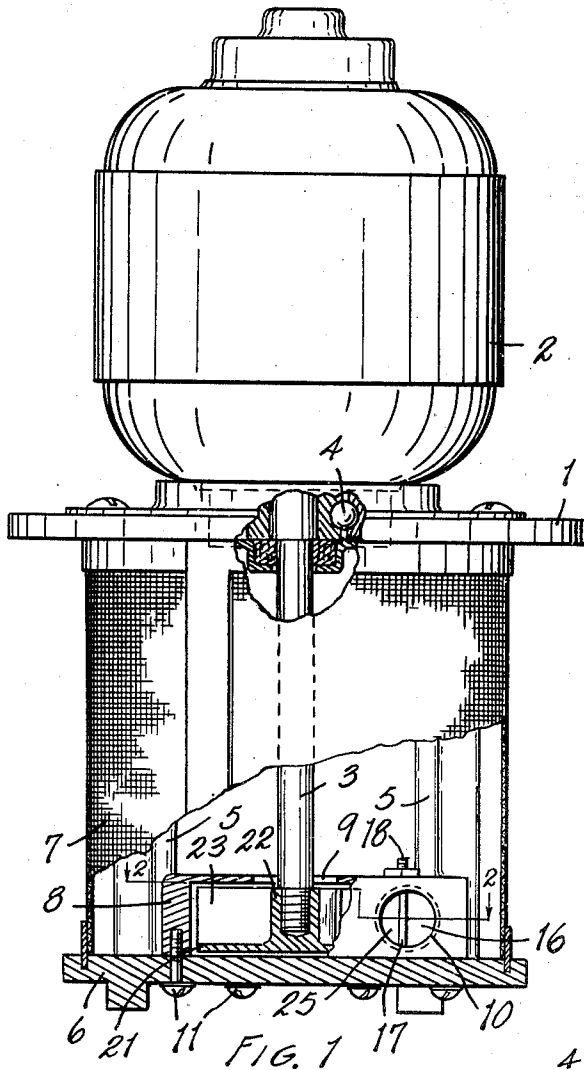
April 30, 1946.

H. H. INGERSOLL

2,399,548

CENTRIFUGAL PUMP

Filed May 5, 1944



INVENTOR.
HOMER H. INGERSOLL
BY
Earl T. Chappell

UNITED STATES PATENT OFFICE

2,399,548

CENTRIFUGAL PUMP

Homer H. Ingersoll, Kalamazoo, Mich., assignor
to Kalasign Company of America, Kalamazoo,
Mich.

Application May 5, 1944, Serial No. 534,258

6 Claims. (CL 103-103)

This invention relates to improvements in Centrifugal pumps.

The main objects of this invention are:

First, to provide a centrifugal pump which is well adapted for the pumping of coolant in machine tools and the like and one which is efficient and durable for such uses.

Second, to provide a centrifugal pump in which the bearings for the impeller shaft are positioned above the level of the liquid pumped such as coolant solutions which commonly contain abrasive substances, fragments of metal and the like.

Third, to provide a centrifugal pump in which the impeller is so balanced by pressures of the liquid pumped that lateral stress on the impeller shaft is minimized.

Fourth, to provide a structure having these advantages which is very simple and economical in its parts and at the same time highly efficient for the purpose intended.

Objects pertaining to details and economies of the invention will definitely appear from the description to follow. The invention is defined in the claims.

A structure which embodies the features of the invention is clearly illustrated in the accompanying drawing, in which:

Fig. 1 is a fragmentary view partially in vertical section of a structure embodying the features of my invention, the pump being shown in operative relation to supporting parts and to a motor.

Fig. 2 is an enlarged fragmentary view in horizontal section on a line corresponding to broken line 2-2 of Fig. 1.

Fig. 3 is an enlarged fragmentary view partially in section on line 3-3 of Fig. 2.

Fig. 4 is an enlarged fragmentary view in section on line 4-4 of Fig. 3.

The embodiment of the invention illustrated in the accompanying drawing is designed for use in the sump of a machine tool grinder or the like in which coolant is to be pumped to the work or to the tools, cutters or grinders, as the case may be. It will be appreciated that there are wide adaptations and that some modifications, particularly in size of parts and the like, are necessary for particular installations.

The embodiment illustrated comprises a plate-like support 1 adapted to be mounted on the top of a sump and supporting the motor 2. The shaft 3 of the pump is provided with a bearing 4 carried by the support 1 and the shaft depending from the bearing. A skeleton frame 5 depends from the support and carries the bottom plate 6 which constitutes the bottom of the pump casing. The screen 7 surrounds the pump casing 8 which has an axial inlet 9 in the top thereof, the shaft 3 depending through this inlet. The pump casing is provided with a tangential discharge 10 which is internally threaded to receive the suitable

delivery conduit. The side walls of the casing member 8 are secured to the bottom plate 6 by means of screws 11.

Within the casing is a passage member 12 having the inner end portion thereof curved to embrace the impeller as shown in Fig. 2. The portion 13 of the side wall of the casing is conformed to coact with the discharge member 12 in providing a discharge passage 14 opening to the impeller through a port 15 which is substantially diametrically opposite the outlet 10. The outer end 16 of the passage member 12 terminates in spaced relation to the outlet and is complemented by the plate-like valve member 17, the stem 18 of which projects through the top of the casing and is provided with a kerf 19 to receive a screwdriver or the like. A lock nut 20 holds the member 17 in its adjusted position. The purpose of the adjustment is to regulate the relative discharge of the impeller through the passage 14 and directly from the impeller to the outlet.

In the embodiment illustrated the impeller comprises the web-like body member 21 having a hub 22 on its upper side which has threaded engagement with the lower end of the shaft. The curved vanes 23 are arranged in a somewhat spiraled relation on the upper side of the web 21 with their inner ends in uniformly spaced relation to the hub 22 and consequently to the inlet 9 of the pump. It will be noted that the curved portion of the passage member is opposed by a portion 24 of the casing side wall. With the parts thus arranged the discharge of the impeller is divided so that equal pressure is exerted at the port 15 and the port 25 communicating directly with the outlet; also, there is substantially uniform pressure between the opposed portions of the passage member and the side wall of the casing.

The adjustable flap or plate valve member 17 may be readily adjusted to secure a very effective balance; while this may be omitted and the passage member extended to the end of the valve member, this necessitates greater care in manufacture in order to secure the complete balance. This structure results in an effective balancing of the impeller and shaft, making it unnecessary to have bearings at the pump casing. It is a very undesirable feature to have bearings at the pump casing in pumps designed for the pumping of abrasive materials and liquids containing metal chips or abrasive materials, which is a condition commonly found in coolants. In effect I secure a liquid bearing which automatically steadies the impeller shaft and prevents it from whipping and vibrating, and prevents undue pressure on the motor or shaft bearings, inasmuch as lateral thrust is substantially eliminated. It will be appreciated that this thrust upon the remote bearing multiplies with the length of the impeller

shaft beyond the bearing and therefore the balancing of the impeller is of great advantage.

I have not attempted to illustrate and describe various adaptations and embodiments of the invention as it is believed the disclosure made will enable those skilled in the art to embody or adapt the same as may be desired.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a centrifugal pump, the combination of a horizontally disposed casing adapted to be submerged in the fluid to be pumped and having an axial inlet at the top and a tangentially disposed outlet, a horizontally disposed impeller comprising a disk-like web portion having an upwardly projecting hub and a plurality of curved spirally disposed vanes on its upper side, the vanes being arranged with their inner ends spaced from said hub and uniformly positioned relative to said inlet, a vertical shaft for said impeller disposed through said casing inlet and secured to said hub, said shaft being provided with a bearing substantially spaced from said impeller and above the fluid to be pumped, a passage member disposed within said casing in spaced relation to the adjacent wall thereof to provide an auxiliary discharge passage and an impeller discharge port opening thereto approximately opposite the outlet of the casing, the outer end of said passage member being aligned centrally relative to said outlet and terminating in substantially spaced relation thereto, and a plate-like valve member constituting an extension for said passage member and adjustable relative thereto and to said outlet whereby the discharge from said impeller directly to said outlet and through said port opening to said passage may be adjusted for balancing thrust stresses on said impeller, said casing and passage member having opposed curved impeller chamber wall portions whereby stresses on the impeller and its shaft are further balanced.

2. In a centrifugal pump, the combination of a horizontally disposed casing having an axial inlet at the top and a tangentially disposed outlet, a horizontally disposed impeller comprising a disk-like web portion having a plurality of vanes on its upper side, a vertical shaft for the impeller disposed through said casing inlet, a passage member disposed within said casing in spaced relation to the adjacent wall thereof to provide an auxiliary discharge passage and an impeller discharge port opening thereto approximately opposite the outlet of the casing, the outer end of said passage member being aligned centrally relative to said outlet and terminating in substantially spaced relation thereto, and a plate-like valve member constituting an extension for said passage member and adjustable relative thereto and to said outlet whereby the discharge from said impeller directly to said outlet and through said port opening to said passage may be adjusted for balancing thrust stresses on said impeller, said casing and said passage member having opposed curved impeller chamber wall portions whereby stresses on the impeller and its shaft are further balanced.

3. In a centrifugal pump, the combination of a casing having an axial inlet and a tangentially disposed outlet, an impeller having a plurality of vanes disposed in said casing, a shaft for said impeller disposed through said casing inlet, and a passage member disposed within said casing to provide an auxiliary discharge passage opening to said outlet and an impeller discharge port opening thereto approximately opposite the out-

let of the casing, the discharge from said impeller directly to said outlet and through said port opening to said passage acting to balance thrust stresses on said impeller, a plate-like valve member constituting an extension of one of the ends of said passage member and adjustable to vary the relative flow of fluid on opposite sides of said passage member, and means for fixedly retaining said valve member in different adjusted positions.

4. In a centrifugal pump, the combination of a casing having an axial inlet and a tangentially disposed outlet, an impeller comprising a web portion and a plurality of vanes, a shaft for said impeller provided with a bearing substantially spaced from said impeller and without the fluid to be pumped, a passage member disposed within said casing to provide an auxiliary discharge passage having an impeller discharge port opening thereto approximately opposite the outlet of the casing, the outer end of said passage member terminating in substantially spaced relation to the outlet, a plate-like valve member constituting an extension of said passage member and adjustable relative thereto and to said outlet whereby the discharge from said impeller directly to said outlet and through said port opening to said passage may be regulated, and means for fixedly retaining said valve member in different adjusted positions.

5. In a centrifugal pump, the combination of a casing having an axial inlet and a tangentially disposed outlet, an impeller, a shaft for said impeller, a passage member disposed within said casing to provide an auxiliary discharge passage having an impeller discharge port opening thereto approximately opposite the outlet of the casing, the outer end of said said passage member terminating in substantially spaced relation to the outlet, a plate-like valve member constituting an extension of said passage member and adjustable relative thereto and to said outlet whereby the discharge from said impeller directly to said outlet and through said port opening to said passage may be regulated, and means for fixedly retaining said valve member in different adjusted positions.

6. In a pump of the class described, the combination of a support provided with a depending skeleton frame, a bottom plate secured to said frame, a screen extending between said bottom plate and support, a pump casing comprising said bottom plate and a casing member disposed thereon, the top portion of said casing member having an axial inlet therein, a motor mounted on said support and provided with a shaft depending through said inlet opening, said support being provided with a bearing for said shaft, said casing having a tangentially disposed outlet, a horizontally disposed impeller having a disk-like web portion provided with an upwardly projecting hub secured on the lower end of said shaft, vanes on the upper side of said impeller web disposed with their inner ends in spaced relation to each other and to said hub, a passage member arranged to partially embrace said impeller and providing a discharge passage with a port opening to said impeller substantially opposite the said casing outlet, the outer end of said wall being arranged in intersecting relation to said outlet, a plate-like valve member constituting an extension of said passage member and tiltably adjustable relative thereto, and means for retaining said valve member in different adjusted positions.

HOMER H. INGERSOLL.