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2,111,441

CIRCULATOR

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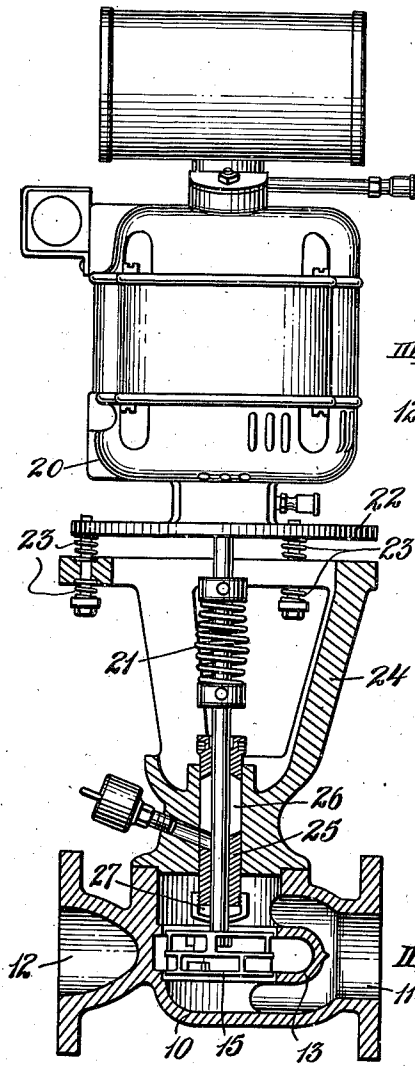


Fig. 1.

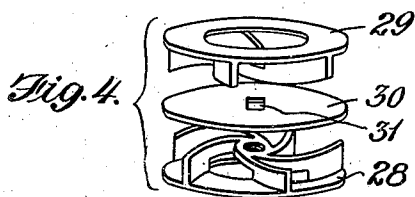


Fig. 4.

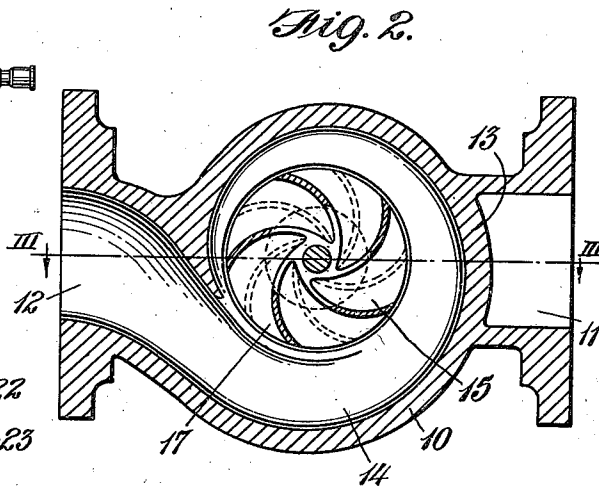


Fig. 2.

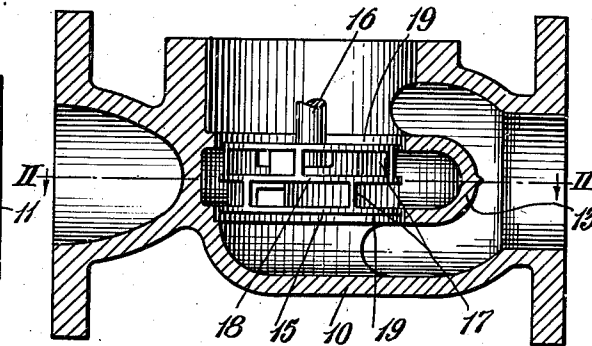


Fig. 3.

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CIRCULATOR

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3 Claims. (Cl. 103—104)

This invention relates to circulators or pumps for use in hot water heating systems or the like for circulating fluid through such systems. The invention relates particularly to circulators or pumps of the rotary-impeller type.

Circulators have been employed in hot water heating systems in order to effect improved operation and control of the system by producing a more rapid circulation of the water from the boiler to the radiators or heating appliances, such circulators being particularly advantageous where the boiler is heated by a fluid fuel such as oil or gas on account of the relatively large sudden heat input, the circulators producing a more rapid flow from the boiler to the radiators. Heating systems employing forced circulation have the further advantage that thermostatic control of the circulator provides a simple and effective means whereby accurate control of the heating system may be accomplished.

Circulators in use heretofore have had certain objectionable characteristics. For example, they were noisy in operation and this noise was transmitted throughout the building in which the system was located. Also the circulators have not been of sufficiently reliable and durable construction.

It is an object of the present invention to overcome the difficulties enumerated and provide a circulator that will operate quietly and withstand long service.

A further object of the invention is to provide a pump of the above-mentioned character having a balanced impeller whereby the vibration and wear are reduced to a minimum and the volumetric efficiency of the pump is increased.

A still further object of the invention is to provide in a pump of this character a simple casing that may be cast in one piece and that may be readily machined and assembled.

Other objects and advantages of my invention will be apparent from the following description of the embodiment thereof shown in the accompanying drawing wherein,

Fig. 1 is a side elevation of a pump or hot water circulator embodying the invention, the pump casing and motor supporting bracket being shown in section;

Fig. 2, a sectional view through the pump casing on the line II—II of Fig. 3;

Fig. 3, a similar view on the line III—III of Fig. 2, and

Fig. 4, an exploded view of a modified form of impeller.

Referring to the drawing, the circulator shown

comprises a hollow casing 10 having inlet and outlet openings 11 and 12 respectively. The hollow casing 10 contains a wall 13 preferably formed integrally with the body of the casing, which wall 13 divides the inlet from the discharge opening and defines in effect a hollow impeller housing with opposed spaced axial inlets 19. The wall portion 13 further defines a single spiral tangential discharge passage 14 which communicates with the outlet passage 12 of the casing. The inner edges of the wall 13 are closely spaced from the outer edges of the impeller or movable member 15 of the circulator.

The form and arrangement of the parts of the casing are such that the same may be readily cast and it will be apparent that no machining is required inside of the casing except at the edges adjacent the impeller housing, and these edges or surfaces are easily machined.

The impeller 15 is fixed on the end of a rotatable shaft 16 and comprises impeller blades 17 symmetrically disposed, preferably in a staggered relationship, on opposite sides of a central disc or plate 18. The narrow blades 17 are much more efficient than the conventional wide blades of the same capacity, and the frictional resistance and load on the motor are greatly reduced by the use of these blades. As shown in Fig. 3, the edges of the wall portion 13 of the casing define axial inlet openings 19 to the sets of impeller blades 17, said inlet openings 19 communicating with the inlet opening 11 of the pump casing. By the described construction a balanced impeller is provided adapted to receive the fluid to be pumped through the opposed inlet openings 19 and discharge the same tangentially through the discharge passage 14 and outlet opening 12.

The impeller 15 is rotated by means of a motor 20 which is connected to the shaft 16 through a flexible coupling 21. The flexible coupling 21 as well as the motor mounting may be similar to the coupling and motor mounting disclosed in my prior application, Serial No. 756,557, filed December 7, 1934. As shown the motor 20 is provided with a base plate 22 carried by coil springs 23 engaging the supporting bracket 24. The bracket 24 is provided with a suitable bearing 25 for the impeller shaft 16, packing means 26 and 27 being arranged to seal the bracket and shaft against leakage.

The flexible coupling 21 as shown comprises end collars adapted to be secured to the motor shaft and impeller shaft respectively and a barrel shaped coiled spring having its ends clamped in 55

recesses in the collars or secured in any desired manner thereto. As shown in said prior application, the collars may be provided with annular recesses to receive the ends of the spring, said ends being secured to said collars by swaging the lips of said recess over the end portions of the spring. The barrel shaped spring, preferably of flattened wire, is lighter for a given drive capacity and is flexible and yields readily to transverse bending stresses imposed upon the coupling when the motor shaft and impeller shaft are held out of alignment.

The provision of a balanced impeller, such as that shown for purposes of illustration in the drawing, reduces the vibration to a minimum and thereby reduces the noise and the wear to which the bearing 25 is subjected. Obviously the impeller may be modified in construction while retaining the balanced weight distribution. The flexible coupling 21 for rotating the impeller and the resilient support of the driving motor 20 further contribute to the reduction of noise and of wear in the bearing 25 so that a long operating life is insured and the noise and vibration are reduced to a minimum whereby the pump or circulator may be employed in connection with a system of piping such as a hot water heating system in residences where even a slight noise is objectionable.

Instead of forming the impeller blades 17 and disc member 18 integral as shown in Figs. 1 to 3, the elements of the impeller may be formed separately as shown in Fig. 4. In this modification, the impeller elements 28 and 29 and the separate disc member 30 are keyed or threaded on the end of the impeller shaft. As shown the disc member 30 is provided with a square opening 31 to prevent relative rotation between the shaft and impeller. If desired the end of the impeller shaft may be threaded and one or more of the elements 28, 29 and 30 likewise threaded, and these elements may be securely clamped to the end of the shaft by means of a threaded nut.

The circulator or pump described is susceptible of many uses in various fields other than the heating industry. Further it will be obvious to those skilled in the art that various changes may be made in my device without departing from the spirit of the invention and therefore I do not limit myself to what is shown in the drawing and described in the specification but only as indicated in the appended claims.

I claim:

1. A rotary pump comprising a hollow walled casing having inlet and outlet passages, dividing walls within the casing defining an impeller housing with spaced opposed axial openings and branch passageways from said openings to one of said casing passages, said impeller housing having a spiral chamber connecting with and forming a continuous communicating conduit with the other passage, an impeller mounted in said housing and comprising a central plate having curved impeller blades symmetrically disposed on opposite sides thereof, the blades on one side of said plate being arranged in offset relation to the blades on the opposite side of the plate, peripheral discs connected to the outer edge portions of said blades on opposite sides of the impeller and cooperating with said central plate to direct the flow of fluid from the impeller, each of said blades being partly cut away around the axis of the impeller with their inner extremities forming

central hub members on opposite sides of the central plate, said impeller including the central plate and outer discs being of a diameter slightly less than the diameter of the opposed axial openings in the impeller housing, and means for supporting said impeller for bodily rotation in said axial openings clear of the impeller housing.

2. A rotary pump comprising a hollow walled casing having inlet and outlet passages, dividing walls within the casing defining an impeller housing, said housing having spaced opposed axial openings and branch passageways from said openings to one of said casing passages, said housing having a spiral chamber connecting with and forming a continuous communicating conduit with the other passage, an impeller mounted in said housing and comprising a central plate having curved impeller blades symmetrically disposed on opposite sides thereof, the blades on one side of said plate being arranged in offset relation to the blades on the opposite side of the plate, peripheral discs connected to the outer edge portions of said blades on opposite sides of the central plate and cooperating with the latter to direct the flow of fluid from the impeller, each of said blades being cut away around the axis of the impeller with the inner extremities forming central hub members on opposite sides of the central plate, said impeller including the central plate and outer disc and being of a diameter slightly less than the diameter of the opposed axial openings in the impeller housing, said casing also having an opening in its outer wall coaxial with said impeller housing openings but of greater diameter than the latter whereby the edges of the impeller housing openings are accessible for machining, and means for supporting said impeller for bodily rotation in said impeller housing.

3. A rotary pump comprising a hollow walled casing having inlet and outlet passages, dividing walls within the casing defining an impeller housing with spaced opposed axial openings and branch passageways from said openings to one of said casing passages, said impeller housing having a spiral chamber connecting with and forming a continuous communicating conduit with the other passage, a rotatable impeller slidably positioned in said impeller housing operable to produce a forced flow of fluid through said casing comprising a central plate and blades symmetrically disposed on opposite sides of said plate, the blades on one side of said plate being offset with relation to the blades on the other side of said plate, each of said sets of blades having an outer peripheral annular disc connected thereto and cooperating with said central plate to direct the flow of fluid from the impeller, each of said blades being partly cut away around the axis of the impeller with their inner ends forming central hub members on opposite sides of the central plate, said outer discs and central plate being coextensive with the outer ends of the blades and of a diameter slightly less than the diameter of the openings into the impeller housing, said casing also having an opening through one of its outer walls coaxial with said impeller housing openings and of slightly greater diameter, a closure for said casing opening having a concentric bearing member, and an impeller shaft journaled in said bearing member and carrying said impeller on its inner end.

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