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M. O. THRUSH

2,356,482

WATER CIRCULATOR

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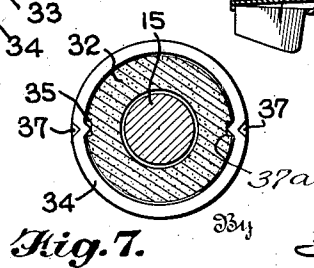
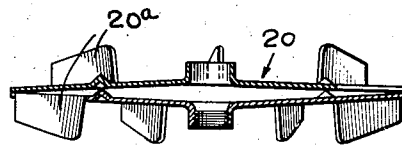
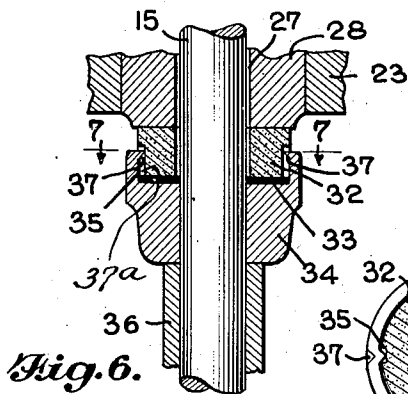
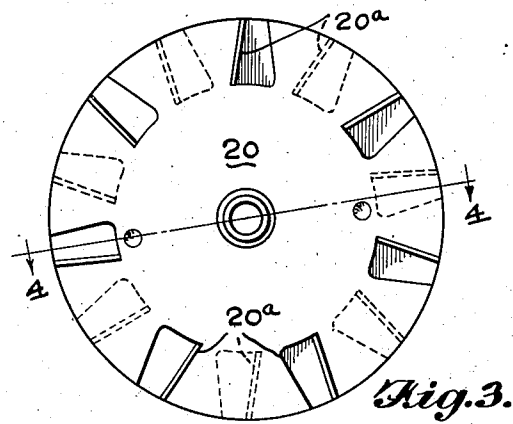
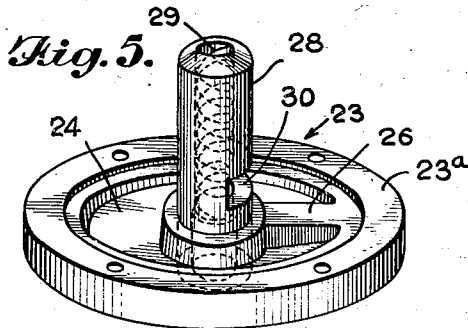
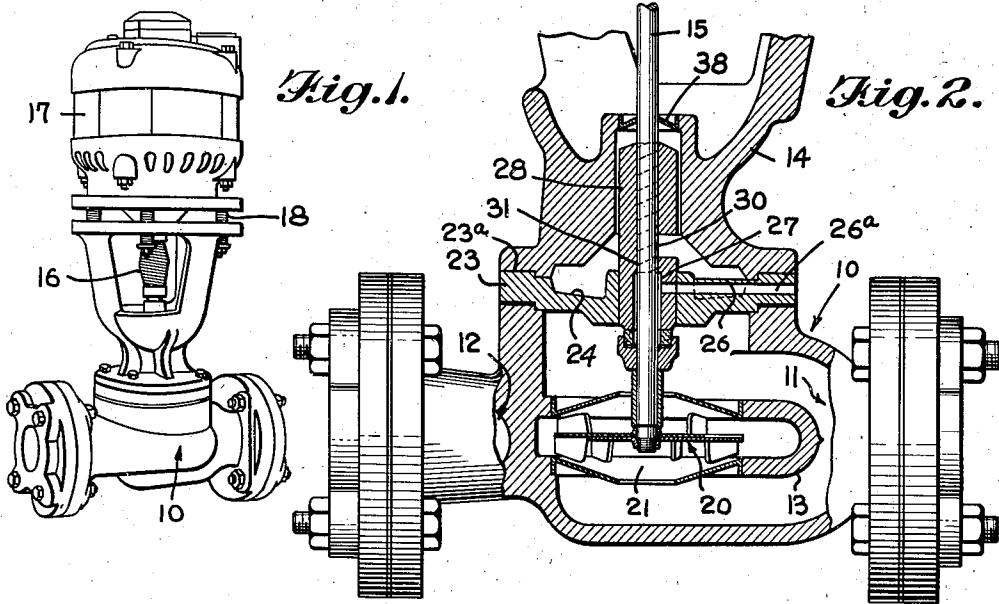


Fig. 4.

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UNITED STATES PATENT OFFICE

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WATER CIRCULATOR

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Application September 27, 1940, Serial No. 358,736

1 Claim. (Cl. 308—36.1)

This invention relates to water circulators for hot water heating systems and the like.

Water circulators, particularly when installed in domestic heating systems, are oftentimes called upon to operate indefinitely without attention from the occupant of the home or servicing by a competent mechanic. It is, therefore, important that the circulator have some dependable type of automatic lubricating means. It is also important that the circulator be of relatively inexpensive construction, since heating systems utilizing forced circulation are now installed in a large percentage of homes irrespective of the cost of the dwelling.

Objects of this invention are to provide a dependable thrust bearing for the impeller shaft of the circulator which will withstand relatively heavy thrusts without breakage, will wear indefinitely, will insure quiet, easy running, which is so made as to equalize wear, and which is more or less self-lubricating.

The foregoing and other objects and advantages will become apparent in view of the following description taken in conjunction with the drawing, wherein:

Fig. 1 is a perspective of a water circulator in accordance with the present invention;

Fig. 2, an enlarged fragmentary detail section of the lower portion of Fig. 1;

Fig. 3, a bottom plan of the impeller;

Fig. 4, a transverse section taken substantially on line 4—4, Fig. 3;

Fig. 5, a perspective of the impeller shaft bearing and lubricating member;

Fig. 6, an enlarged section taken through the impeller shaft thrust bearing assembly; and,

Fig. 7, a section taken on the line 7—7, Fig. 6.

Referring to the drawing, a circulator casing 10 is provided with an inlet conduit 11 and an outlet conduit 12. On its interior the casing has a wall 13 which constitutes a dividing member for the water flowing into the chamber through said inlet. The casing or housing 10 has mounted thereon a bonnet or bracket 14, and an impeller shaft 15 projects upwardly or outwardly through said bracket and at its upper end is connected to a flexible shaft coupling 16. A driving motor 17 is mounted on the bracket 14 through the medium of resilient connections 18 which latter connections serve as noise and vibration dampers and ensure constant alignment of the motor shaft with the impeller shaft.

An impeller 20 is secured on the lower end of the shaft 15 for rotation in the impeller chamber 21, said impeller preferably being made of sheet

metal stampings of disc shape as indicated in Figs. 3 and 4 and having blades 20a struck from the peripheral portion thereof. This impeller constitutes the subject matter of another application Ser. No. 358,735, filed September 27, 1940 by the present applicant, and is, therefore, only generally described herein.

The present invention is primarily concerned with an improved thrust bearing for the impeller shaft. Certain novel lubricating features also described in this case are claimed in my pending application Ser. No. 392,527, filed May 8, 1941, and in my pending application Ser. No. 365,352, filed November 12, 1940.

Referring particularly to Figs. 2, 5 and 6, a lubricating and bearing assembly is generally indicated at 23 and includes an annular base 23a connected between the casing 10 and bonnet 14, said base being provided with a well or sump 24 adapted to receive absorbent material (not shown) for retaining the proper amount of oil in the well or sump at all times. The base 23a may be formed with a radial web or like portion 26 having a bore 26a formed therein which connects an annular clearance space 27, formed around shaft 15 in a bearing member 28, with the exterior for draining off any water which may pass upwardly into said space.

The assembly 23 also includes the bearing 28 which projects upwardly from the center of the base 23a and is formed with an interior spiral oil-lift groove, indicated at 29, the oil being fed to said groove from the well 24 through opening or slot 30 formed through the base of the bearing member.

The spiral groove 29 is relatively small, being comparable to a very fine thread. In other words, the groove is of a depth just sufficient to hold a quantity of oil in excess of the oil film between the shaft and adjacent smooth surface of the bearing so that the latter will exert pressure thereon and cause the oil to pass upwardly due to rotation of the shaft, the upwardly moving oil in the grooves and the cohesive force inherent in the oil coat on the film of oil in the restricted space around the shaft and cause a general upward movement of oil from the well or sump 24.

By referring to Fig. 2 it will be noted that the bearing 28 is continued below the inlet 30 and above the clearance space 27, as indicated at 31. The groove 29 is continued into this area and exerts a lifting force on any oil that may pass thereinto.

The bearing 28 is preferably made of a sep-

arate piece with respect to the base 23a and rigidly connected to the latter although the parts could be made integral.

A thrust bearing unit is provided below the radial bearing 28 and preferably comprises a carbon bearing ring 32, a resilient cushioning ring 33 and a retainer or holder 34, the latter being formed with an annular cavity 35 for receiving the resilient cushioning ring and the carbon ring. A sleeve 36 is secured on the shaft and may constitute an extension of the holder 34 or may be rigidly secured to said holder.

To ensure retention of the carbon ring 32 within the cavity 35, the retaining ring 34 has the opposite side walls thereof indented or peened over, to form opposed inwardly projecting members as indicated at 37, not Fig. 7, the indented metal engaging longitudinal grooves 37a formed in the carbon ring and holding it against radial displacement while at the same time permitting the ring to give or move axially with the cushioning rubber ring 33. Grooves 37a permit an adjustment of the position of the carbon ring to be made when said ring has worn down, as a thicker resilient ring 33 may be placed in the holder 34 to take up the wear of the carbon ring. This type of thrust bearing will wear indefinitely irrespective of the relatively heavy thrust applied thereon due to the operation of the impeller, while at the same time it ensures a quiet, easy running action. The described mounting of the carbon ring 32 prevents breakage under heavy duty and automatically equalizes wear on its surfaces.

At the point where the shaft 15 projects through the upper end of the bore in the bracket 14, a stabilizing and sealing member 38 is detachably engaged in said bore.

The operation of the circulator will be apparent in view of the foregoing description taken in conjunction with the drawing. The motor 17 drives the impeller 20 through the shaft 15, and as the impeller rotates an upward thrust is ex-

erted on the shaft and which thrust is taken by the carbon bearing ring 32. The absorbent material 25 carries just enough of oil to ensure proper lubrication for the radial bearing 28, there being sufficient absorbent to carry this amount of oil in suspension without bringing the absorbent material to full saturation point.

A bearing of this type is advantageous in that the time required for the assembling operation is materially reduced and the device as a whole rendered less expensive while at the same time more efficient and susceptible of long life.

It will be understood that certain changes in construction and design may be adopted without departing from the spirit or scope of the invention as defined by the appended claim.

What is claimed is:

In combination with a rotatable shaft and a radial thrust bearing therefor, a combined thrust bearing and seal assembly comprising a carbon seal and bearing ring surrounding said shaft and having a surface in sealing engagement with said thrust bearing, said ring having a relatively flat surface portion at its extremity opposite its sealing surface, a holder for said carbon ring secured to said shaft for rotation therewith, said holder having a cup-shaped relatively deep substantially flat-bottom socket for said carbon ring, a relatively thin resilient cushioning member in said socket resting against said flat bottom, said carbon ring having a substantial portion located in said socket and having its flat surface and the flat bottom of the socket cooperatively confining said cushioning member therebetween, and being capable of slight relative tilting by the resiliency of said cushioning member, said socket and said carbon ring fitting together in a manner to substantially exclude liquid from said cushioning member and therefore avoid swelling of said cushioning member and consequent leakage of the seal, and means for causing said carbon ring to rotate with its holder.

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