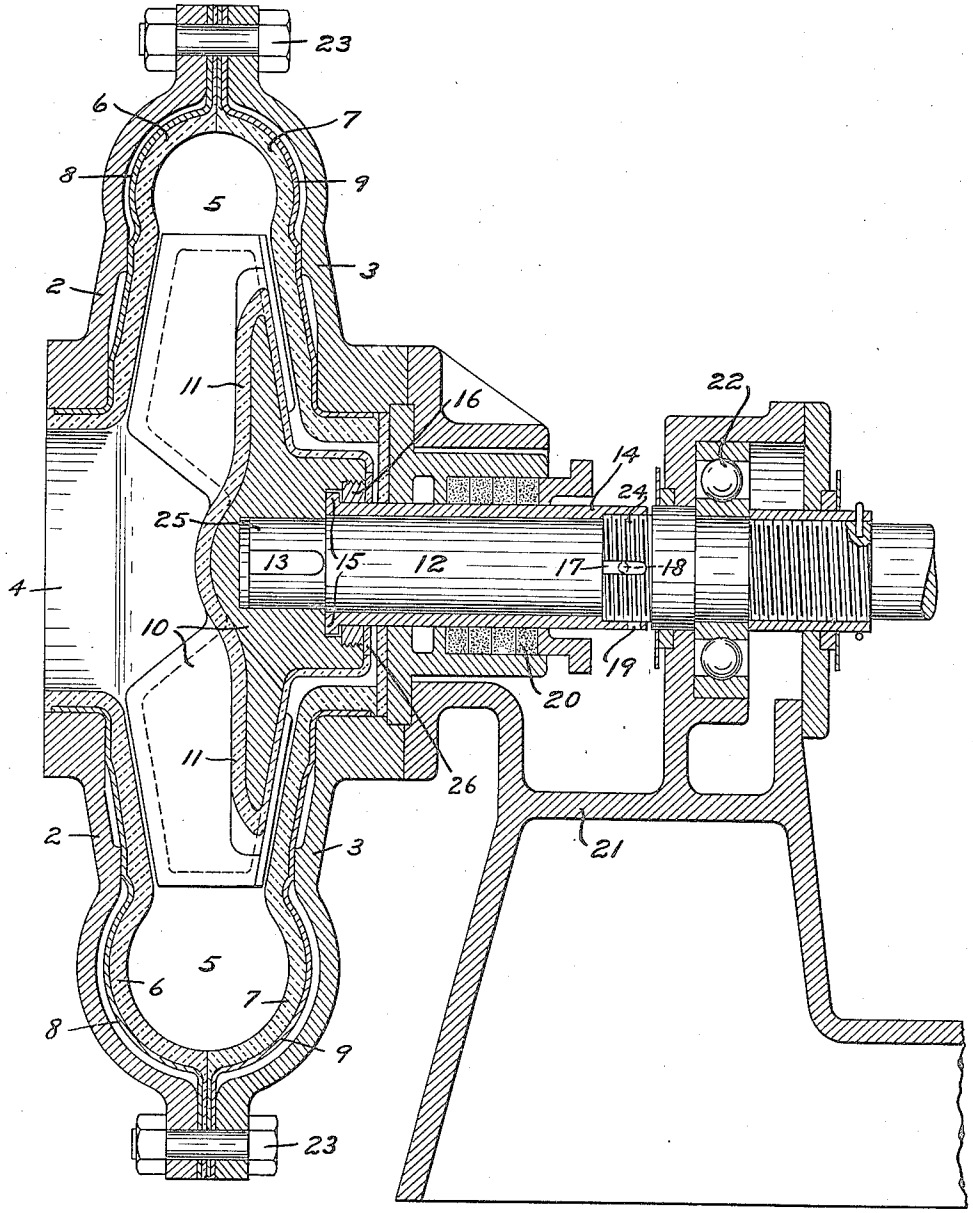
H. P. BINDER.

HYDRAULIC MACHINE.

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1,404,712. Patented Jan. 24, 1922.



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HYDRAULIC MACHINE.

1,404,712. Specification of Letters Patent. Patented Jan. 24, 1922.

Application filed January 21, 1921. Serial No. 438,842.

To all whom it may concern:

Be it known that HOMER P. BINDER, a citizen of the United States, residing at West Allis, in the county of Milwaukee and State of Wisconsin, has invented a certain new and useful Improvement in Hydraulic Machines, of which the following is a specification.

This invention relates in general to improvements in the art of constructing and of operating hydraulic machinery, and relates more specifically to improved means for attaching the rotor of a hydraulic turbine or pump to the main shaft thereof.

An object of the invention is to provide simple and efficient means for attaching the rotor of a hydraulic machine to its supporting shaft. Another object of the invention is to provide means for attaching a rubber or similarly coated rotor to a shaft without necessitating perforation of the coating. A further object of the invention is to provide means operable from the exterior of the casing of a hydraulic machine, for effecting adjustment of elements located within the casing. Still another object of the invention is to provide simple and efficient means for removing the rotor of a hydraulic machine from the main shaft. Another object of the invention is to provide rotor adjusting and removing means which are protected against the action of gritty substances and chemicals contained in the water passing through the machine. These and other objects and advantages of the present invention will be apparent from the following description.

A clear conception of an embodiment of the invention and of the operation of a device constructed in accordance therewith, may be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the same or similar parts.

The single figure of the drawing is a central vertical section through a rubber protected centrifugal pump.

The centrifugal pump comprises in general a main outer casing formed of sections 2, 3, a rotor or impeller 10 located within the casing, an inlet or suction passage 4 leading to the center of the impeller, and an annular discharge chamber 5 surrounding the impeller and communicating with a tangential discharge conduit not shown.

The main pump casing is supported from an end of a base or frame 21 which may also support the driving pulley or motor, and has the interior of its sections 2, 3, protected by soft rubber liners 6, 7 respectively, which are secured, as by vulcanizing, to metal backing plates 8, 9 respectively. The casing sections 2, 3 are clamped together by means of an annular series of bolts 23 which also serve to hold the liners 6, 7 and the plates 8, 9 in position. The liner 6 serves to protect the inlet passage 4 as well as the casing section 2, while both of the liners 6, 7 cooperate to form a protecting coating for the annular discharge chamber 5. Removal of the casing section 2, effects free access to all portions of the interior of the pump casing, without disturbing the pump supporting casing section 3.

The pump rotor or impeller 10 comprises a series of outwardly directed vanes extending from the suction passage 4 to the discharge chamber 5, and a hub formed integral with the vanes and forming a support therefor. The entire impeller 10 including the vanes and hub, is provided with a coating 11 of soft rubber or similar material adapted to protect the structure against the action of gritty substances and chemicals which may be contained in the water passing through the pump. The impeller hub is bored to snugly fit the reduced extremity 25 of the main horizontal shaft 12, and is drivingly connected with this shaft extremity 25 by means of one or more keys 13 located in alined keyways in the hub and shaft. The horizontal shaft 12 penetrates the pump casing section 3 through a stuffing box 20 and is supported in one or more bearings 22 mounted upon the frame 21.

In order to permit adjustment of the impeller 10 relatively to the casing sections 2, 3 after the pump has been assembled, means manipulable from the exterior of the casing are provided. These means besides performing such impeller adjustment function, serve to effect removal of the impeller 10 from the shaft 12 when the casing section 2 has been removed. The impeller adjusting and removing means comprises an annular sleeve 14 surrounding the main shaft 12 and extending through the stuffing box 20. The end of the sleeve 14 adjacent to the impeller

hub is provided with an outwardly extending annular flange 15 which fits within an annular internal recess in the impeller hub. The annular internal recess in the impeller hub is formed by the insertion of a threaded ring 16 in the hub end, this ring 16 being removable upon release of the lock in order to permit withdrawal of the sleeve flange 15 from the hub recess. The ring 16 is protected against gritty substances and chemicals in the water, by means of a rubber washer 26 cemented or otherwise attached thereto. The end of the sleeve 14 remote from the impeller is provided with an internal thread which coacts with external screw threads 24 on the shaft 12. This threaded portion of the shaft 12 is provided with two or more longitudinal recesses 17 within any one of which a set screw 18 passing transversely through the sleeve 14, is adapted to coact in order to lock the sleeve 14 to the shaft 12 in an adjusted position. The threaded outer end of the sleeve 14 which is located in a readily accessible space between the gland of the stuffing box 20 and the bearing 22, is provided with one or more holes 19 for the insertion of the lug of a spanner wrench whereby rotation of the sleeve 14 relatively to the shaft 12 may be effected when the set screw 18 has been removed. The sleeve 14 besides serving as means for adjusting and for removing the impeller 10, is preferably formed of suitable wear resisting material to provide protection for the portion of the shaft 12 which is thereby surrounded.

During normal operation of the pump, the impeller 10 is rotated within the main casing by means of the shaft 12 rotating in the bearings 22, thereby causing the impeller vanes to draw water through the suction passage 4 and to deliver the water into the discharge chamber 5 from which the fluid is discharged through the tangential discharge conduit. The fluid thus passing through the impeller 10 is delivered from the suction passage 4 directly against the end of the impeller hub which is formed to deflect the flow and to direct the water toward the impeller vanes. The soft rubber liners 6, 7 and the coating 11 serve to resist destructive action of gritty substances and chemicals contained in the fluid, upon the internal pump elements. The protective liners 6, 7 and the coating 11 may be replaced when worn, free access to the interior of the pump for purposes of inspection and removal of the coated elements being effected by removal of the bolts 23 and of the casing section 2.

The impeller 10 may be adjusted longitudinally of the shaft 12 or removed from this shaft after the casing section 2 has been removed, by rotating the sleeve 14 relatively to the shaft 12 with the aid of a spanner wrench applied at the openings 19. As the sleeve 14 is rotated relatively to the shaft 12 after the locking set screw 18 which normally engages the slot 17 has been removed, the screw threads 24 produce relative longitudinal movement of the sleeve 14 along the shaft 12. Such movement of the sleeve 14 is transmitted through the flange 15 and ring 16 to the impeller 10 which is locked against rotation relatively to the shaft 12 by the key 13, but which may be shifted longitudinally of the shaft extremity 25 by the sleeve 14. Mere adjustment of the impeller 10 to produce desired clearances within the pump casing, may be procured by giving the sleeve 14 only a limited rotary movement relatively to the shaft 12, the sleeve being again locked to the shaft 12 after the desired degree of adjustment has been attained, by means of the set screw 18. By continuing the movement of the sleeve 14 along the shaft 12 in a direction toward the reduced extremity 25 of the shaft, the impeller 10 may be entirely removed from the shaft 12, without removing or longitudinally displacing the shaft 12 in its bearings. During such complete removal of the impeller 10, the sleeve 14 is withdrawn with the impeller, through the stuffing box 20. This sleeve 14 may be later detached from the impeller hub by removing the ring 16, such removal of the ring being effected by means of a spanner wrench fitting holes in the side of the ring 16. The adjusting and removing device is readily manipulable from the exterior of the pump casing, and avoids necessity of puncturing or perforating the coating 11 of the impeller 10, such perforation of the coating being undesirable as the wear resisting qualities of the coating are thereby reduced.

It will be obvious that the application of this improved device is not limited to a pump such as shown, and that the same is applicable to hydraulic turbines or other hydraulic machines having coated impellers or rotors. It should be understood that it is not desired to limit the invention to the exact details of construction and to the precise manner of manipulation herein shown and described, for obvious modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination, a casing, a shaft extending into said casing, a rotor secured to said shaft within said casing, means for preventing displacement of said rotor around said shaft, and means operable from the exterior of said casing for effecting movement of said rotor along said shaft.

2. In combination, a casing, a shaft having an end extending into said casing, a rotor secured to said shaft end within said

casing, means for preventing relative rotation of said rotor and said shaft, and means operable from the exterior of said casing for effecting relative longitudinal movement of said rotor and said shaft.

3. In combination, a casing, a shaft having an end extending into said casing, a rotor provided with a coating adjacent to said shaft, said rotor being locked against rotation relatively to said shaft end, and means operable from the side of said rotor remote from said coating for moving said rotor longitudinally of said shaft.

4. In combination, a casing, a shaft having an end extending into said casing, a rotor having a hub fitting said shaft end and locked against rotation relatively to said shaft, a rubber lining for said rotor in alinement with said shaft end, and means manipulatable from the side of said rotor remote from said coating for moving said rotor longitudinally of said shaft.

5. In combination, a casing, a shaft extending into said casing, a rotor having a hub secured to said shaft, said hub of said rotor being provided with a recess, and a sleeve having screw thread co-action with said shaft and having a projection fitting said hub recess.

6. In combination, a casing, a shaft having an end extending into one side of said casing, said casing having an opening in the opposite side thereof, a rotor secured to said shaft end and having a protecting coating in alinement with said casing opening, and means associated with said rotor on the side thereof remote from said casing opening for adjusting said rotor longitudinally of said shaft.

7. In combination, a casing, a shaft extending into said casing, said casing having an opening for conducting fluid thereto located in alinement with said shaft, a rotor secured to said shaft and having a rubber coating protecting said shaft against the action of fluid passing through said opening, and means co-acting with the side of said rotor remote from said opening for effecting adjustment of said rotor from the exterior of said casing.

8. In combination, a casing, a shaft having an end located within said casing, a rotor keyed to said end of said shaft within said casing, said rotor having an annular recess therein, a sleeve surrounding said shaft and having an annular flange co-acting with said recess, and means located outside of said casing for locking said sleeve to said shaft.

9. In combination, a casing, a shaft having an end located within said casing, a rotor having a hub keyed to the end of said shaft within said casing, said rotor hub having an annular recess therein, a sleeve surrounding and extending longitudinally of said shaft and having an annular flange co-acting with said hub recess, said sleeve having screw thread co-action with said shaft, and means located outside of said casing for rotating said sleeve upon said shaft and for locking said sleeve to said shaft.

10. In combination, a casing, a shaft having an end located within said casing, a rotor having a hub keyed to said end of said shaft within said casing, said rotor hub having an annular recess therein, a sleeve having an annular flange co-acting with said hub recess and being rotatable relatively to said hub and said shaft, and means located outside of said casing for locking said sleeve to said shaft and against rotation relatively to said hub.

11. In combination, a casing, a shaft having an end located within said casing, a rotor having a hub keyed to said shaft end, said hub having an annular recess therein, a sleeve surrounding said shaft and having an annular flange co-acting with said recess, said sleeve having screw thread co-action with said shaft, and means for rotating said sleeve relatively to said shaft and said hub to move said rotor longitudinally of said shaft.

In testimony whereof, the signature of the inventor is affixed hereto.

HOMER P. BINDER.