March 2, 1943. G. C. KUMLIN ET AL 2,312,422

DREDGE PUMP

Filed Aug. 20, 1941 2 Sheets-Sheet 1

Fig. 1

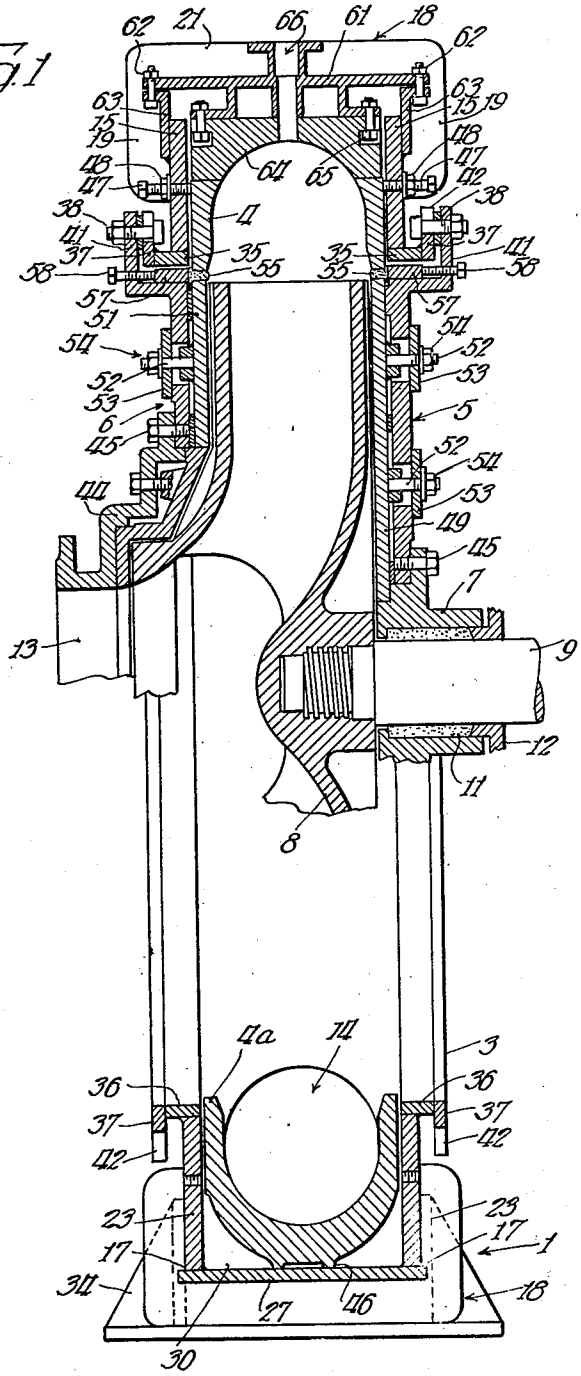


Fig. 3.

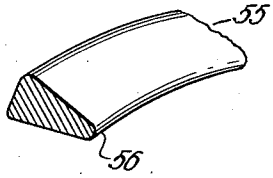
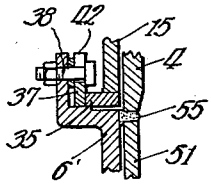


Fig. 4.



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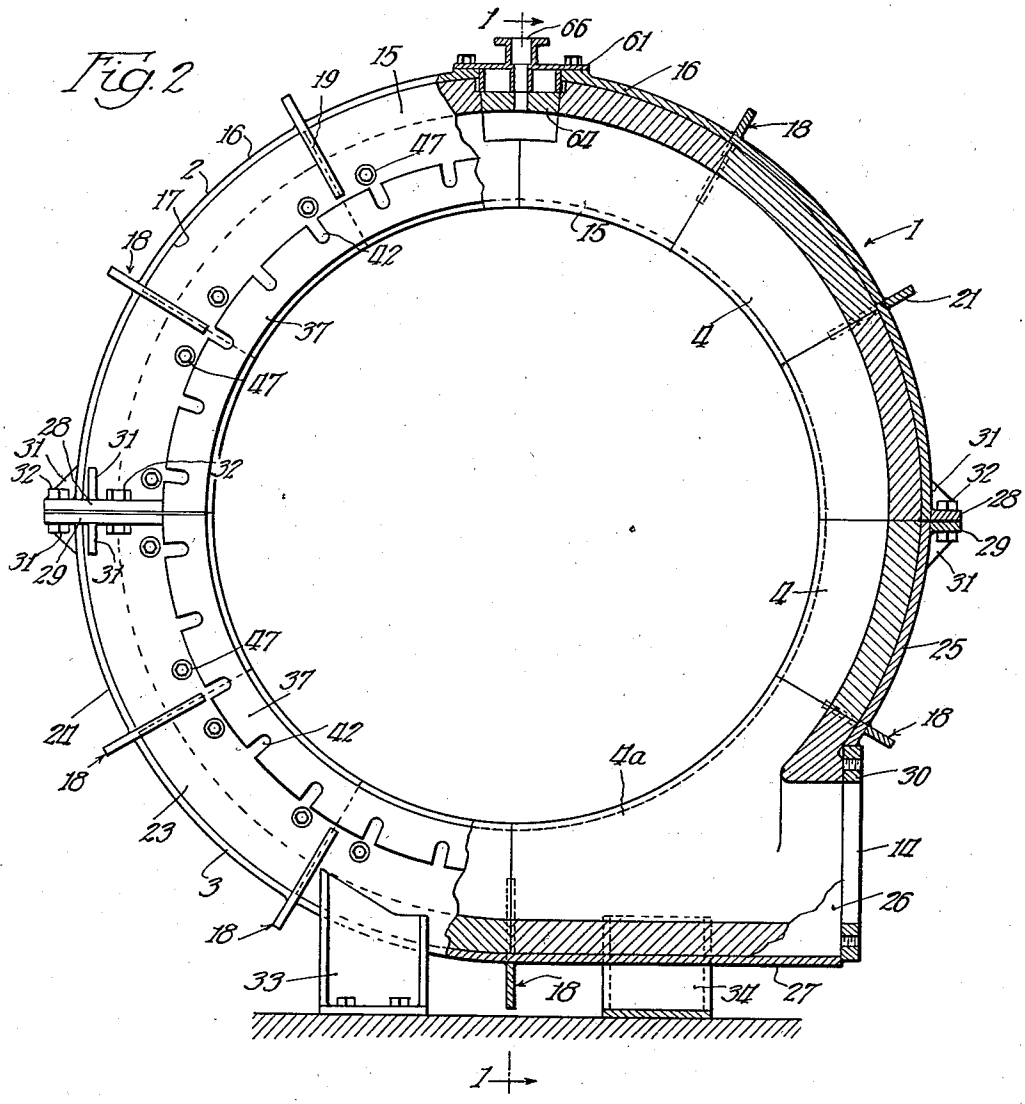
Witness:
V. Siljander

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DREDGE PUMP

Filed Aug. 20, 1941 2 Sheets-Sheet 2

Fig. 2



Witness:
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Patented Mar. 2, 1943

2,312,422

UNITED STATES PATENT OFFICE

2,312,422

DREDGE PUMP

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Application August 20, 1941, Serial No. 407,570

13 Claims. (Cl. 103—114)

The invention relates generally to pumps and more particularly to commercial centrifugal pumps for dredges and the like.

The invention has among its objects the production of a pump structure which may be readily assembled, is relatively inexpensive to manufacture and very efficient for the purposes intended.

Another object of the invention is the production of a pump utilizing a fabricated casing or housing in combination with removable liners adjacent the periphery of the impeller which liners may be readily removed or replaced.

Another object of the invention is the production of such a pump wherein the pump casing may be constructed of structural steel and the removable liners from suitable alloys, both the casing and liners having an involute or volute curvature.

Another object of the invention is the production of such a pump having novel means for maintaining the liner members in position.

A further object of the invention is the production of novel means whereby the wear of the liners may be readily ascertained.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

In the drawings wherein like reference characters indicate like or corresponding parts,

Fig. 1 is a sectional view of the assembled pump taken approximately on the line 1—1 of Fig. 2;

Fig. 2 is a front elevational view of the pump casing with a portion thereof shown in section to disclose the lining construction;

Fig. 3 is a perspective view of a portion of the resilient means for maintaining the liners in position; and

Fig. 4 is a sectional view through a portion of a modified construction.

Referring to the drawings, 1 indicates generally the pump casing or housing of substantially U-shape in cross section and divided horizontally into an upper half 2 and lower half 3 in which are positioned a plurality of liner segments 4. Side or end plates indicated generally by the numerals 5 and 6, respectively, complete the shell structure, the bearing hub 7 being carried by the side plate 5. The impeller 8 is secured to a drive shaft 9 journaled in the hub 7, the latter being provided with a suitable stuffing box 11 and gland 12 to prevent the passage of fluid through the hub 7. The side member 6 is provided with a suction opening 13 through which the fluid enters to be expelled through the exhaust opening 14 in the lower half 3 of the housing 1.

The upper half 2 of the pump shell comprises a pair of longitudinally spaced flat semi-annularly shaped plates 15 connected by rectangular shaped semi-cylindrical members 16, the curve of the members being substantially the same as that of the outer edges of the plates 15 and secured thereto as shown at 17 to form a shell of substantially U-shape in cross section, as clearly shown in Fig. 1. Engaged with the plates 15 and members 16 are a plurality of radially extending substantially U-shaped reinforcing members 18, the legs 19 of the latter being secured by welding or other suitable means to the respective side plates 15, while the connecting portions 21 of the members are similarly connected to the members 16, thereby reinforcing plates 15 and members 16 and assuring proper alignment of plates 15 with respect to one another.

The lower half 3 of the shell, constructed in a similar manner, comprises side plates 23 and semi-cylindrically curved members 24 and 25, the plates 23, however, having horizontally extending portions 26 connected by a tangentially extending portion 27 of the member 24, thereby forming the exhaust opening 14, which is bounded by a coupling ring 30 providing means for connecting exhaust piping to the housing. The adjacent ends of the plates and members are secured to respective flanges 28 and 29 which are similar in shape to the reinforcing members 18 and secured to the respective halves by welding or other suitable means. The flanges 28 and 29 are reinforced by triangular shaped members 31 and are bolted together by bolts 32 which thereby secure the halves 2 and 3 to one another. Legs 33 and 34 secured to the lower half 3 of the shell support the pump structure.

Secured to and extending laterally outward from the inner edges of the plates 15 and 23 are arcuately curved rings 35 and 36, respectively, and carried by the ring members 35 and 36 are slotted flanges 37, the latter extending substantially parallel to the plates 15 and 23, respectively, with the side or end members 5 and 6 secured to the members 37 by means of bolts 38 passing through flanges 39 and 41 on the respective end members and the slots 42 of the flanges. The bearing hub 7 and the member 44 having the suction opening 13 therein, in the construction illustrated, are secured by bolts 45 to the remainder of their respective end members 5 and 6.

The liner segments 4, with the exception of one, 4a, are all similar in shape and size, the segment 4a being constructed to conform to the shape of the housing adjacent the exhaust opening 14, and are seated as shown at 46 upon the respective members 16, 24 and 25. The liners are laterally aligned in the shell 1 by screws 47 threaded into the respective plates 15 and 23, lock nuts 48 securely maintaining the bolts 47 in adjusted position.

It will be noted that the liners 4 and shell 1 have an involute curvature and therefore are not concentric with the axis of the shaft 9 as are the flange rings 37. This construction is desirable to achieve maximum efficiency from the pump, but due to the necessary machining heretofore required on the liners and shell it was not possible to inexpensively manufacture an involute curved shell and liners. However, with the present construction the plates 15 and 23 may be readily and accurately cut, by flame or otherwise, on an involute curve. Likewise the relatively small liner castings can readily be cast sufficiently accurate to require no machining.

Positioned adjacent the inner faces of the side members 5 and 6 are liner members 49 and 51, respectively, the liner members being secured to their respective side members by studs 52 extending from the liners through the respective side members and secured thereto by washers 53 and nuts 54.

Interposed between adjoining edges of the liner segments 4 and the liner members 49 and 51 are ring-like strips 55 of rubber or other resilient material. In the construction illustrated the strips 55 are substantially triangular shaped in cross section and are interposed between the members 49 and 51 and the liner segments 4, with the apex 56 of the strips adjacent the inner faces of the members and segments. In the construction illustrated in Fig. 1, the strips 55 are backed by compression rings 57 adapted to be urged toward the strips by compression screws 58 in the respective side members 5 and 6, whereby the strips are wedged between the adjoining edges of the liner members 49 and 51 and the respective edges of the liner segments 4. It will be apparent that as the strips 55 are forced inwardly the liner segments 4 will be urged radially outward into engagement with the members 16, 24 and 25 and maintained in such engagement. Thus the liner segments 4 may be accurately aligned with the impeller 8 and securely held in position. The strips 5 also compensate for slight inaccuracies in the liner castings. It might be mentioned that the strips 55 do not prevent the entry of fine particles of the pumped material between the segments 4 and the shell or housing 1, as such fine particles might pass through the cracks between adjoining segments. In fact in some respects this action is desirable, as such particles may fill up the spaces between the segments and the housing and act as a cushion between the two to absorb shocks and the like.

Illustrated in Fig. 4 is a slightly modified form of construction wherein the compression rings 57 and the bolts 58 are omitted. The side member 6' bears directly against the strip 55, so that when the bolts 38 are drawn down the member 6' will urge the strip 55 inwardly in a manner similar to the compression rings 57. The resulting action is substantially the same as that illustrated in Fig. 1, with the exception that the means of adjustment is not incorporated in the structure.

It will be apparent that the construction just described permits both the housing and the liner segments to be constructed from materials most suitable for their respective functions. Thus the housing may be constructed of structural steel, while the liners may be constructed from suitable cast alloys. The use of structure steel results in a housing capable of withstanding heavy shock loads which might break the housing in an ordinary cast pump, while the use of the cast liners in combination with the structural steel housing permits the use of relatively expensive alloys, whereby very durable and wear resisting liners may be employed.

To provide means for determining the amount of wear on the liners, an opening is provided in the top of the shell 2 and covered by a cap plate 61 secured by bolts 62 to flange plates 63 welded to the side plates 15. Secured to the cap plate 61 is a small liner section 64, the latter being bolted to the cap by bolts 65. If desired a priming opening 66 may also be provided in the cap 61.

Thus the wear on the liners may be determined merely by removing the plate 61 and with it the liner section 64, which can readily be examined and the approximate wear ascertained. It will be apparent that this construction permits an examination of the liners without taking the pump down.

The novel construction illustrated also permits replacement of liners with a minimum amount of effort and time, as the upper half 2 of the housing and impeller assembly may be readily removed without disturbing the lower half 3, after which the arcuate liner segments may be replaced.

It will be apparent from the above description that we have provided a pump housing of novel construction offering numerous advantages and having novel means for maintaining a plurality of liner segments in operative position.

Having thus described our invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of our invention; hence we do not wish to be understood as limiting ourselves to the exact form, construction, arrangement and combination of parts herein shown and described, or uses mentioned.

What we claim as new and desire to secure by Letters Patent is:

1. In a shell housing, the combination of a pair of laterally spaced annular shaped plates, a cylindrical shaped member connecting said plates adjacent their outer edges, and a plurality of circumferentially spaced radially extending U-shaped reenforcing elements secured to said plates and member, and ring members secured to the respective inner edges of said plates and extending laterally outward from the faces thereof, the ring members on one side of the housing being concentrically positioned with respect to those on the opposite side.

2. In a shell housing, the combination of a pair of laterally spaced annular shaped plates, a cylindrical shaped member connecting said plates adjacent their outer edges, said member having substantially an involute curve, and a plurality of circumferentially spaced radially extending U-shaped reenforcing elements secured to said plates and member, and ring members secured to the respective inner edges of said plates and extending laterally outward from the faces thereof, the ring members on one side of the housing being concentrically positioned with respect to those on the opposite side.

3. In a shell housing, the combination of a pair of laterally spaced annular shaped plates, lying in parallel planes, a cylindrical shaped member connecting said plates adjacent their outer edges, a plurality of circumferentially spaced radially extending U-shaped reenforcing elements secured to said plates and member, and ring members secured to the respective inner

edges of said plates and extending laterally outward from the faces thereof.

4. In a pump structure, the combination of a cylindrical shaped housing, a plurality of liner segments positioned in said housing, said housing having shoulders oppositely disposed with respect to the inner edges of said liner segments, and a pair of resilient rings interposed between the inner edges of said segments and said housing shoulders, and laterally adjustable means for forcing the resilient rings between the inner edges of said segments and said housing shoulders to form a seal and to urge the segments radially outward into engagement with the circumferential portion of the housing.

5. In a pump structure, the combination of a cylindrical shaped housing, a plurality of liner segments peripherally positioned within said housing and including radially inwardly extending side wall portions, and means engageable with the inner edges of said side wall portions for urging said liner segments radially outward into abutting engagement with the circumferential portion of the housing.

6. In a pump structure, the combination of a circumferential housing having a substantially involute curve, side members closing the ends of said housing, a plurality of liner segments positioned against said housing, the inner surface of said liners having an involute curve, disk like liner members carried by the housing and having their outer edges oppositely disposed with respect to the inner edges of said liner segments, and operably movable means disposed between said disc and liner edges and adapted for urging said liner segments radially outward into engagement with the circumferential housing.

7. In a pump structure, the combination of a cylindrical shaped housing, side members closing the ends of said housing, a plurality of liner segments positioned in said housing, disk like liner members carried by the housing and having their outer edges oppositely disposed with respect to the inner edges of said liner segments, and a pair of resilient rings interposed between the adjacent inner edges of said liner members and segments adapted to urge said liner segments radially outward into engagement with the circumferential portion of the housing.

8. In a pump structure, the combination of a ring-like shell, side members at opposite sides of said shell, a plurality of liner segments peripherally positioned within said shell, said side members having shoulders oppositely disposed with respect to the inner edges of said liner segments, the respective edges and shoulders being substantially uniformly spaced from one another, and a pair of resilient rings of substantially V-shaped cross section interposed between the inner edges of said liner segments and said shoulders with the apexes of said rings adjacent the inner faces of said liners, said rings being adapted to urge said liner segments radially outward into tight engagement with the circumferential portion of the shell.

9. In a pump structure, the combination of a cylindrical shaped housing, a plurality of liner segments peripherally positioned within said housing, said housing having an opening therein adjacent a portion of said liner segments, a cover for said opening removably secured to said housing, and a partial liner segment forming a contiguous portion of said plurality of liner segments and removable therefrom, said partial liner segment having dimensions less than that of said opening and being secured to said cover and removable therewith for wear inspection without the removal of any of said plurality of pump liner segments.

10. In a pump structure, the combination of an annular housing forming the peripheral portion of said pump, liner segments in said annular housing, side plates including lining members forming the balance of the pump enclosure, cooperative flange elements connected with said annular housing and said side plates respectively for fastening the latter to the housing and in radial spaced relation thereto, and seal means disposed between the liner segments and said lining members to prevent fluid leakage from within the pump and between the housing and said side plates.

11. In a pump structure, the combination of an annular housing forming the peripheral portion of said pump, liner segments in said annular housing, side plates including lining members forming the balance of the pump enclosure, cooperative flange elements connected with said annular housing and said side plates respectively for fastening the latter to the housing and in radial spaced relation thereto, and axially adjustable seal means operative between the liner segments and said lining members to prevent fluid leakage from within the pump and between the housing and said side plates.

12. In a pump structure, the combination of an annular housing forming the peripheral portion of said pump, liner segments in said annular housing, side plates including lining members forming the balance of the pump enclosure, cooperative flange elements connected with said annular housing and said side plates respectively for fastening the latter to the housing and in radial spaced relation thereto, and wedge shaped seal means adapted to be forced between said liner segments and said lining members, and adjustable means connected with certain of said flange elements and engageable with said seal means to force the latter into sealing position.

13. In a pump structure, the combination of an annular housing forming the peripheral portion of said pump, liner segments in said annular housing, side plates including lining members forming the balance of the pump enclosure, cooperative flange elements connected with said annular housing and said side plates respectively for fastening the latter to the housing and in radial spaced relation thereto, and wedge shaped seal means adapted for axial engagement between said liner segments and said lining members, and adjustable means disposed between said housing and said side plates and connected with either for axially abutting said seal means to force the latter into sealing position and to exert radial pressure upon said liner segments to hold the latter tightly against said annular housing.

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