July 12, 1955

M. F. SNYDER

2,712,792

PUMP STRUCTURE

Filed June 28, 1950

FIG 1

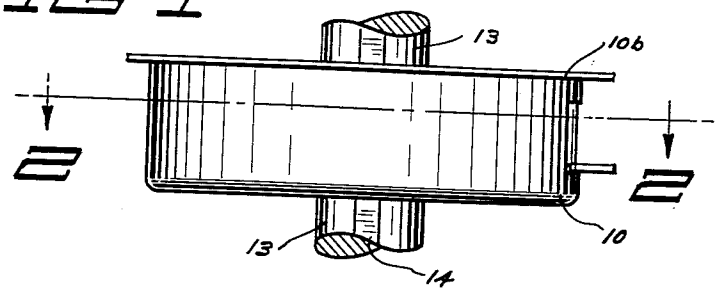


FIG 2

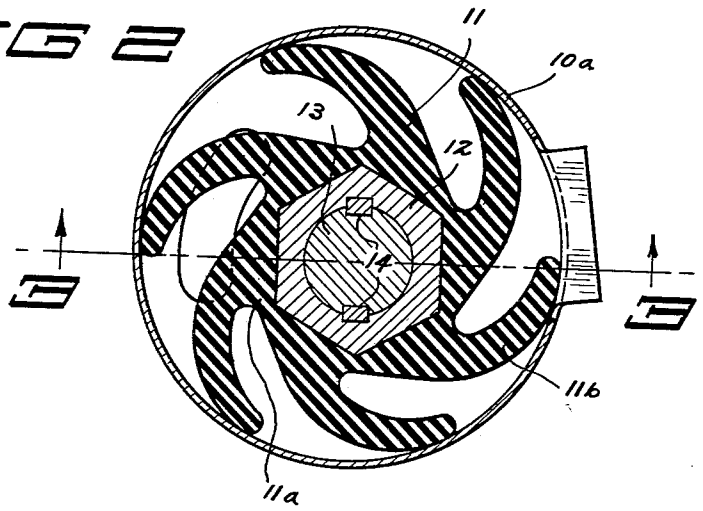
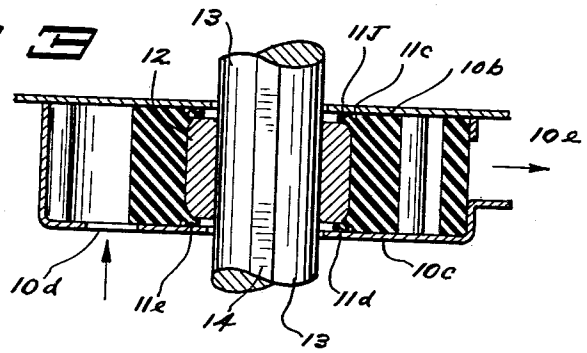


FIG 3



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2,712,792

Patented July 12, 1955

2,712,792

PUMP STRUCTURE

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Application June 28, 1950, Serial No. 170,717

5 Claims. (Cl. 103—117)

This invention relates to a pump of the rotary type comprising an impeller with outwardly extending circumferentially spaced blades, said impeller being disposed in a substantially cylindrical casing and disposed eccentrically thereto, which impeller is made of resilient material. Said casing has circumferentially spaced inlet and outlet openings. Liquid enters the inlet opening and is moved by said blades toward said outlet opening and due to the eccentricity of the impeller and casing the liquid is, so to speak, squeezed out of said outlet opening.

The said type of pump has been used in many places including outboard motors, in which it is used for pumping the water used to cool the motor cylinders. Trouble has been experienced with said pumps in that the blades crack or break off adjacent their attached ends after a certain period of use.

It is an object of this invention to provide a pump of the type above set forth in which the blades of said impeller are made to extend in a tangential rather than in a radial direction.

It is another object of the invention to provide a pump comprising a casing having a cylindrical wall and substantially flat top and bottom portions, an impeller of resilient material disposed in said casing, the same comprising a hub and a plurality of circumferentially spaced blades extending outwardly from said hub, said blades extending substantially tangentially to said hub, and means for driving said impeller, said impeller being disposed eccentrically of said casing and said blades having a length to be bent and engage the cylindrical wall of said casing with their sides and to slide along said wall in the operation of said pump.

It is more specifically an object of this invention to provide a pump comprising a casing having a substantially cylindrical wall and substantially flat top and bottom portions, an impeller of resilient material disposed in said casing, the same having a hub and having a series of outwardly extending circumferentially spaced blades preferably of slightly tapered form, said blades extending tangentially to said hub and being of a length to be bent and engage said wall with their sides, a shaft secured to said hub coaxially thereof for driving said impeller, the axis of said shaft being offset from the central axis of said casing having circumferentially spaced inlet and outlet openings.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a view in side elevation of said pump;

Fig. 2 is a horizontal section taken substantially on line 2—2 of Fig. 1, as indicated by the arrows; and

Fig. 3 is a central vertical section taken substantially on line 3—3 of Fig. 2, as indicated by the arrows.

Referring to the drawings, a pump is shown comprising a casing 10. While this casing can be varied somewhat

in form, in the embodiment of the invention illustrated it is shown as having a substantially cylindrical wall 10*a* and substantially flat top and bottom portions 10*b* and 10*c* respectively. Casing 10*a* is provided with circumferentially spaced inlet and outlet openings 10*d* and 10*e*, and while these may be differently formed and located, in the embodiment of the invention illustrated the inlet opening 10*d* is shown as a somewhat arcuate slot formed in the bottom 10*c* and the outlet opening 10*e* is formed in the wall 10*a*. An impeller 11 is provided which is preferably made of resilient material, such as rubber or a rubber compound. Said impeller has a central or hub portion 11*a* from which extend outwardly a plurality of blades 11*b*, said blades being shown as six in number and being equally and circumferentially spaced. The hub 11*a* has a uniform diameter so that the radii extending from the center of the impeller to the innermost portion between said blades are substantially equal in length. The blades 11*b* are slightly tapered toward their outer ends and have their outer ends of semi-cylindrical form. A metallic member 12 is inserted in and secured to hub 11*a*, which member is of non-circular form in transverse cross section and specifically is shown as hexagonal in said cross section. A shaft 13 extends centrally through member 12 and axially of hub 11*a* and is secured to member 12 in any suitable manner, as by the keys 14. The axis of shaft 13 is offset from the central axis of the wall 10*a* so that the impeller is disposed eccentrically of the casing. Said impeller has annular grooves 11*c* in each side thereof adjacent member 12, said grooves forming annular lips 11*d*. Said lips are preferably provided with the annular grooves 11*e* so that said lips have spaced annular edges engaging the top 10*b* and the bottom 10*c* respectively.

In operation the casing 10 is disposed so that the liquid is adjacent the side and bottom thereof. Shaft 13 is rotated and the impeller 11 is rotated in the casing 10. The blades 11*b* are of such a length that they are bent or curved when disposed in casing 10 and engage said casing or wall 10*a* with their side portions. The water enters opening 10*d* and thus passes between adjacent pairs of the blades 10*a* and said water is moved circumferentially by said blades and as the blades approach the outlet opening 10*e* they are brought closer together due to the eccentric disposition of the impeller so that the space between the blades is diminished and the water is thus forced out of the opening 10*e*. The pump is thus of the gyrating type rather than the centrifugal type.

It has heretofore been proposed to have pumps with a resilient impeller having blades extending radially from a central hub. Considerable trouble has been experienced with such propellers due to the blades cracking and breaking off. To overcome this trouble the inventor conceived of making the blades tangential and of such a length that they are bent and slide around the wall of the casing with their side portions in engagement with said wall. With such tangentially disposed blades the degree of bending or curvature adjacent the hub is considerably less and the degree of bending at the outer ends of the blades is much less. There is thus less stress placed on the blades both adjacent the hub of the impeller and the wall of the casing. In a test with such a pump on an outboard motor, which test included a continuous 200 hour run, a majority of the blades were cracked adjacent the hub and the outer ends of some of the blades were entirely broken off. In a similar test with the disclosed construction having tangentially extending blades, the impeller was entirely intact after the 200 hour run and showed no appreciable effects of wear. The construction thus constitutes a decided advance in the art and overcomes former serious objections to such an impeller.

It is believed applicant is the first to provide a resilient impeller with a hub of uniform diameter and blades extending tangentially from said hub. Such a structure has produced new and really unexpected improved results.

The device has been amply demonstrated in actual practice, found to be very successful and is being commercially made.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicant's invention, which generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. A pump structure having in combination, a casing having a substantially cylindrical wall and top and bottom portions, said casing having an inlet opening and having an outlet opening spaced circumferentially from said inlet opening, an impeller of flexible resilient material disposed in said casing having a hub spaced from said wall at all points of said hub and a series of outwardly extending circumferentially spaced blades, said blades being of comparatively small thickness circumferentially and extending tangentially to said hub and being of a length to be bent and engage said wall with their sides in spaced relation, a shaft secured axially to said hub for driving said impeller, the axis of said shaft being offset from the axis of said casing.

2. A pump structure having in combination, a casing having a substantially cylindrical wall and top and bottom portions, said casing having an inlet opening through its bottom portion and having an outlet opening through said wall and spaced circumferentially from said inlet opening, an impeller of resilient material disposed in said casing having a hub spaced from said wall at all points of said hub and four or more outwardly extending comparatively thin substantially flat blades, said blades being quite flexible and extending between said top and bottom portions and extending tangentially to the circumference of said hub and being of a length to be bent and engage said wall with their sides in circumferentially spaced relation, a rigid metallic member of non-circular shape in cross section being disposed in and secured to said impeller, and a shaft for driving said impeller being secured to said member coaxial with said hub, the axis of said shaft being offset from the axis of said casing.

3. A pump structure having in combination, a casing having a substantially cylindrical wall and parallel top and bottom portions in planes substantially perpendicular to the axis of said wall, said casing having an inlet opening and having an outlet opening circumferentially spaced from said inlet opening, an impeller of resilient material disposed in said casing and having a hub of substantially uniform diameter, said hub being spaced from said wall at all points of said hub, said hub having a diameter of substantially one-half the diameter of said casing and six equally and circumferentially spaced blades extending tangentially to the circumference of said hub, said blades being solid, flexible and tapering in thickness from said hub to their outer ends and having a length of substantially one-third of the diameter of said casing the center of said hub being spaced from the central axis of said cylindrical wall.

4. A pump structure having in combination, a casing having substantially flat top and bottom portions and a cylindrical wall, said casing having spaced inlet and outlet openings, an impeller of resilient material disposed in said casing having a hub portion spaced from said wall at all points thereof, and a plurality of circumferentially spaced solid flexible and resilient blades extending outwardly and having their ends bent oppositely to the direction of rotation of said impeller and engaging said wall, said blades extending substantially tangentially to said hub and being circumferentially spaced from each other, and a shaft coaxial with said hub for driving said impeller, the axis of said shaft and hub being eccentric to said casing.

5. The structure set forth in claim 4, said impeller engaging said top and bottom portions over the major portions of its top and bottom surfaces.

References Cited in the file of this patent

UNITED STATES PATENTS

2,189,356	Briggs	Feb. 6, 1940
2,203,974	Weinhardt	June 11, 1940
2,258,371	Wernert	Oct. 7, 1941
2,293,268	Quiroz	Aug. 18, 1942
2,455,194	Rumsey	Nov. 30, 1948
2,460,952	Simer et al.	Feb. 8, 1949
2,466,440	Kiekhaefer	Apr. 5, 1949

FOREIGN PATENTS

2,024	Great Britain	of 1893