

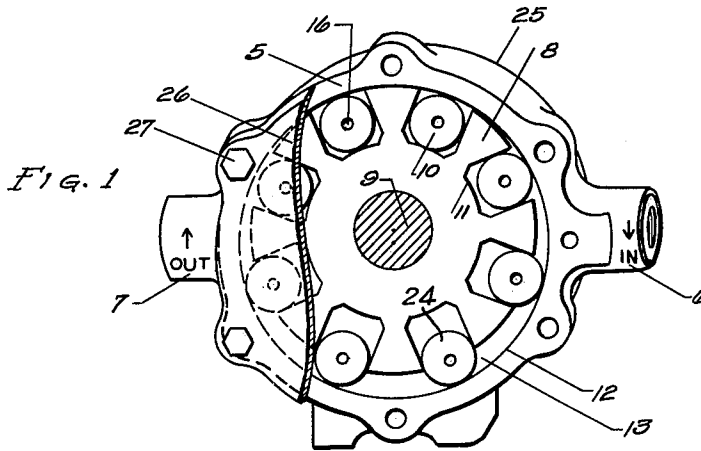
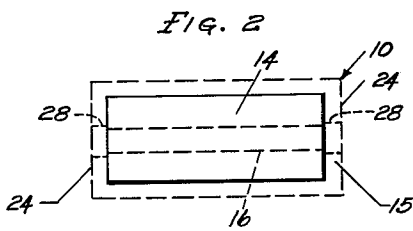
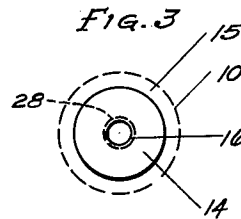
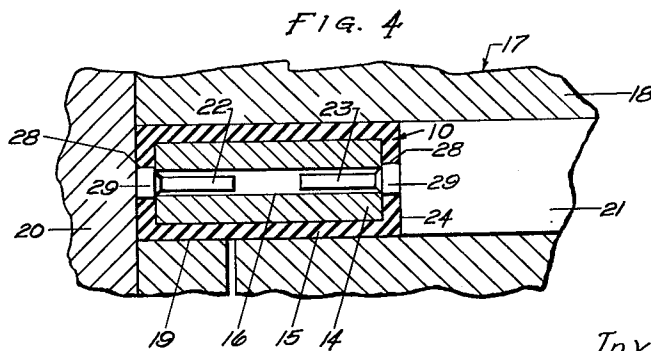
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A. F. WINTERCORN

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ROTARY PUMP ROLLER

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Inventor
Andrew F. Wintercorn

Andrew F. Wintercorn
Atty.

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ROTARY PUMP ROLLER
Andrew F. Wintercorn, Rockford, Ill.
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This invention relates to rotary pumps and is more particularly concerned with improvements in the rollers utilized as the impeller elements in the rotors.

Pump impeller rollers, as heretofore constructed, have comprised a cylindrical metal core covered all over, or nearly so, with a relatively light weight non-metallic shell of nylon, which is a thermo-plastic resin, ideal for the purpose because of its resistance to chemical action and its long-wearing qualities, a good example of such a roller construction being that disclosed in Cook et al. Patent No. 2,776,625, issued January 8, 1957. As stated in that patent, attempts were made to use rollers made throughout of corrosion resistant synthetic resins, but these have not been successful, due to the fact that these materials are too light to make satisfactory sealing contact with the wall of the pump chamber during the pumping operation. On the other hand, the use of corrosion resistant metal for the entire body of the rollers is not practical because of too high cost and also because of excessive wear when pumping liquids containing abrasives. Use of nylon for the shell or jacket, however, introduced another serious problem where the cylindrical metal core was subject to corrosion, because it was necessary, as disclosed in the Cook et al. patent, to see to it that there was a minimum amount of exposure of the core to the corrosive action of the liquid being pumped, and that in turn necessitated specially constructing the metal core with a frusto-conical boss extending axially outwardly from one end, and a generally cylindrical recess extending axially inwardly in the other end, in order to center the insert in the mold cavity by entry of the boss in a socket in one end of the cavity and entry in the recess of a specially shaped stem provided in the other end of the mold cavity. As a result, these cores were appreciably heavier at the boss end than at the recessed end, and it was not surprising therefore that the rollers incorporating these cores would wear unevenly, the nylon shell being subject to excessive wear at the heavier end of the rollers so that they changed from the initial cylindrical form to a frusto-conical form. Rollers so constructed therefore required frequent replacement, and pumps using such rollers were subject to excessive wear and operated with progressively less and less efficiency in direct relationship to the extent of wear on the heavier ends of the rollers.

It is, therefore, the principal object of my invention to provide a pump roller made up of a cylindrical core of metal having a relatively high specific gravity and of a form having uniform weight from end to end, and a non-metallic corrosion resistant covering of relatively low specific gravity and relatively long wearing qualities, whereby the core, in addition to adding sufficient weight to insure effective sealing engagement between the roller and the pump chamber wall, also insures close uniformity of bearing pressure on said wall from end to end of the roller.

Another object is the provision of a pump roller of the kind described in which the cylindrical core is of corrosion resistant metal and can therefore be exposed to

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the liquid being pumped without any harmful effect, the core being moreover provided with an axial hole there-through, which, besides receiving centers in the opposite ends of the mold to center the core for accurate molding of the nylon shell to uniform thickness from end to end of the roller, also functions as a passage for the liquid being pumped, so that the uniformly weighted roller not only exerts the same bearing pressure against the pump chamber wall at both ends for uniform peripheral wear and therefore greatly increased roller life but is also assured of uniform and minimum wear on its flat end surfaces by reason of having the same hydraulic pressure active on its both ends.

The invention is illustrated in the accompanying drawing, in which—

FIG. 1 is a side view of a rotary pump with most of the cover plate broken away so as to disclose the impeller rollers made in accordance with my invention shown assembled in the radial peripheral slots in the rotor for rolling engagement with the pump chamber wall in the usual way;

FIGS. 2 and 3 are a side view and end view, respectively, of a core for the impeller roller of my invention, indicating in dotted lines the nylon shell or jacket that is molded thereon in the manner shown in FIG. 4, and

FIG. 4 is an axial section of a mold showing how the core is centered therein in the production of the impeller roller.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to the drawing, the reference numeral 5 designates the body of a rotary pump provided with a suction or inlet neck 6 on one side and an outlet or discharge neck 7 on the diametrically opposite side and having a rotor 8 disposed off-center therein and driven by a shaft 9. The rotor turns at about 600 r.p.m. so that the cylindrical impeller rollers 10 assembled in the radial peripheral slots 11 and extending the full width of the body from the back wall to the cover plate are thrown outwardly under centrifugal force and are pressed against and have rolling contact with the wall 12 of the pump chamber 13 in the usual way to draw liquid in through the neck 6 and discharge it under pressure through neck 7.

Each of the impeller rollers 10 has a cylindrical stainless steel core 14 provided therein enclosed within a cylindrical shell or jacket 15 of nylon of uniform thickness throughout. There is an axial hole 16 through the core 14 which serves several purposes:

(1) In the mold 17, comprising a main body member 18 defining a cylindrical mold cavity 19 having a removable end wall 20 and a cylindrical end wall forming plunger 21 at the opposite ends thereof, pins 22 and 23 having conical centering portions thereon are carried in coaxial relationship on the parts 20 and 21, respectively, and enter the opposite ends of the axial hole 16 to center the core in the mold cavity for accurate molding of the nylon shell 15 to uniform thickness from end to end of the roller as well as on the ends thereof, and

(2) In the pump, when the parallel flat end faces 24 of the rollers are disposed in sliding abutment with the flat inner side of the back wall 25 of the pump body and the parallel flat inner side of the cover plate 26, the liquid being pumped, of course, fills the hole 16 so that pressure

at the opposite ends of each roller is equalized, and hence there is the same thickness of film of liquid between the roller and the end walls of the pump cavity 13 at both ends of the roller at all times to reduce wear on the ends of the rollers to a minimum.

While nylon has been mentioned for the non-metallic shell or jacket material the same may be made of any one of a number of materials having similar properties suitable for the present purposes, namely, a high degree of resistance to wear when operating with liquids containing abrasive, and a high degree of resistance to corrosive action of acids and caustics. Nylon, a thermo-plastic resin, has been found to be ideal for the shell or jacket material because it gives long wear and is extremely resistant to chemical action with a wide variety of liquids being pumped.

In operation, rollers of the present construction outperform the old unevenly weighted rollers, giving longer and much more uniform wear and higher pumping efficiency at all times. The improved performance is traceable, first of all, to the fact that the cylindrical core is of uniform weight from end to end in addition to being accurately centered with respect to the nylon shell or jacket that surrounds it, thereby insuring the same bearing pressure against the pump chamber wall 13 at both ends of the roller. Consequently, since the rollers have rolling contact with the pump chamber wall and the wear is accordingly distributed uniformly circumferentially of the roller, it follows that the roller retains its cylindrical shape and does not have a tendency to wear to a frusto-conical form as before, smaller in diameter at the heavier end. The equalized hydraulic pressure on both ends of each roller, which is due to the open communication established between the ends through the axial holes 16 makes for reduced frictional drag by maintaining substantially the same thickness of liquid film between the rollers and the opposite end walls of the pump chamber at all times. Obviously, where the rollers were unevenly weighted at the opposite ends and wore unevenly to a more or less frusto-conical shape, the ends being no longer in true parallelism with respect to the adjacent end walls of the pump chamber rubbed heavily thereon and eventually the small end of the now frusto-conical roller would acquire a spheroidal shape, and it can be easily appreciated what wear and tear on the pump was entailed in this undesired "lapping" operation. It also required more power to drive the pumps under these conditions and the pumping efficiency was, of course, greatly reduced.

In the molding operation, the core 14 is placed in the mold cavity with the pin 23 entered in one end of the hole 16, after which the pin 22 on the wall 20 is entered in the other end, and the conical portions on these pins center the core as the mold is closed. Then the nylon material is injected into the mold cavity all around the core, completely filling the cavity. After the nylon material has set, wall 20 is removed and plunger 21 ejects the finished roller from the mold cavity. The counterbores 28 at opposite ends of the roller are formed in the end walls of the nylon shell or jacket by the enlarged cylindrical butt portions 29 of the pins 22 and 23, and, of course, these counter-bores are in accurate concentricity with the hole 16 for even balance at opposite ends of the rollers.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. In a rotary pump having a casing defining a generally cylindrical chamber having a peripheral wall and parallel opposed end walls, and a rotor having a radially slotted portion eccentrically mounted therein and adapted to have an impeller roller mounted in the slotted portion

thereof, the improvement which comprises an impeller roller disposed in said rotor for rolling engagement on said peripheral wall and sliding engagement on said end walls and including a cylindrical core of a high specific gravity material having parallel flat ends normal to the axis, and a cylindrical plastic jacket of a lower specific gravity material enclosing said core to uniform thickness peripherally and to uniform and like thickness on opposite ends, said core having an axial through hole of the same diameter end to end provided therein and being of uniform diameter and weight from end to end and being adapted to be accurately centered by means of said axial hole at both ends in the jacket which is also of uniform diameter and equal weight at both ends and has center holes of the same size provided through both ends communicating with the axial through hole in the core, whereby the impeller roller is of even weight at both ends and is adapted to engage with precisely the same bearing pressure peripherally at both ends the inside of the peripheral wall of said pump chamber on which it has rolling engagement its full length the full width of said chamber, the plastic covered flat ends of said impeller roller also slidably engaging the end walls of said pump chamber with evenly balanced pressure by virtue of these ends being maintained through said axial hole under the same hydraulic pressure in the operation of the pump.

2. A rotary pump as set forth in claim 1, wherein the cylindrical core is of corrosion resistant metal and the jacket is of nylon.

3. As an article of manufacture, an impeller roller for a rotary pump of the type having a casing defining a generally cylindrical chamber having a peripheral wall and parallel opposed end walls, and a rotor having a radially slotted portion eccentrically mounted therein and adapted to have an impeller roller mounted in the slotted portion thereof, said roller comprising a cylindrical core of a high specific gravity material, and a cylindrical plastic jacket of a lower specific gravity material enclosing said core to uniform thickness peripherally and to uniform and like thickness on opposite ends, said core having an axial through hole of the same diameter end to end provided therein and being of uniform diameter and weight from end to end and being accurately centered by means of said axial hole at both ends in the jacket which is also of uniform diameter and equal weight at both ends and has center holes of the same size provided through both ends communicating with the axial through hole in the core, whereby the impeller roller is of even weight at both ends and is adapted to engage with precisely the same bearing pressure peripherally at both ends the inside of the peripheral wall of said pump chamber on which it has rolling engagement its full length the full width of said chamber, the plastic covered flat ends of said impeller roller also slidably engaging the end walls of said pump chamber with evenly balanced pressure by virtue of these ends being maintained through said axial hole under the same hydraulic pressure in the operation of the pump.

4. An article of manufacture as set forth in claim 3, wherein the cylindrical core is of corrosion resistant metal and the jacket is of nylon.

5. As an article of manufacture, an impeller roller for a rotary pump of the type having a casing defining a generally cylindrical chamber having a peripheral wall, and a rotor having a radially slotted portion eccentrically mounted therein and adapted to have an impeller roller mounted in the slotted portion thereof, said roller comprising a cylindrical core of a high specific gravity material, and a cylindrical plastic jacket of a lower specific gravity material enclosing said core to uniform thickness peripherally and to uniform and like thickness on opposite ends, said core having center holes of the same diameter and length at opposite ends and being of uniform diameter and weight from end to end and being accurately

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centered by means of said center holes at both ends in the jacket which is also of uniform diameter and equal weight at both ends and has center holes of the same size provided through both ends communicating with the first-mentioned center holes in the core, whereby the impeller roller is of even weight at both ends and is adapted to engage with precisely the same bearing pressure peripherally at both ends the inside of the peripheral wall of said pump chamber on which it has rolling engagement its full length the full width of said chamber.

6. An article of manufacture as set forth in claim 5, wherein the cylindrical core is of corrosion resistant metal and the jacket is of nylon.

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