Dec. 2, 1958 H. J. SADLER ET AL 2,862,246

METHOD FOR PRODUCING A ROLLER

Filed Jan. 25, 1956

Fig. 1

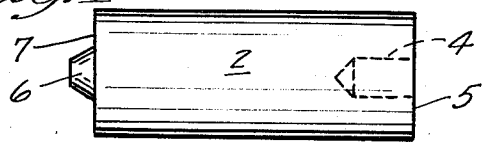


Fig. 2

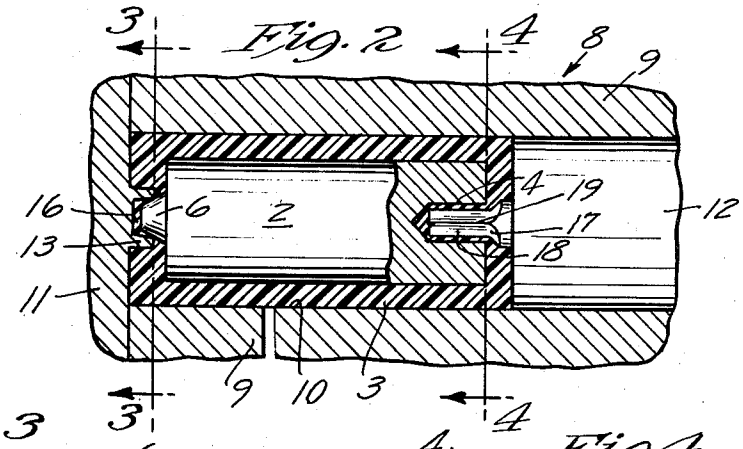


Fig. 3

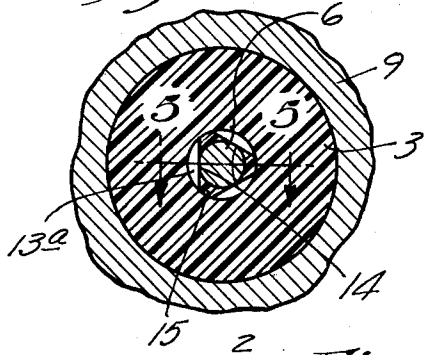


Fig. 4

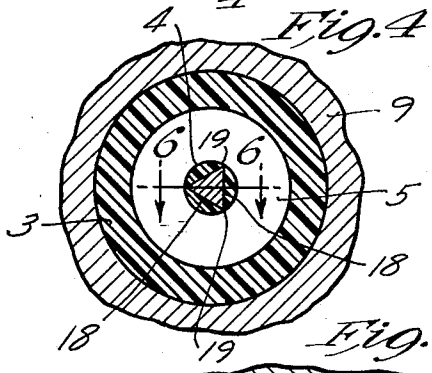


Fig. 5

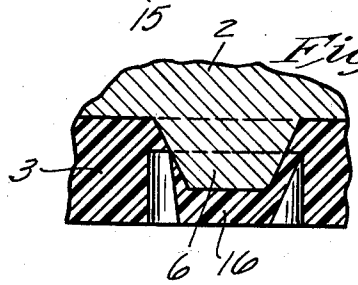


Fig. 6

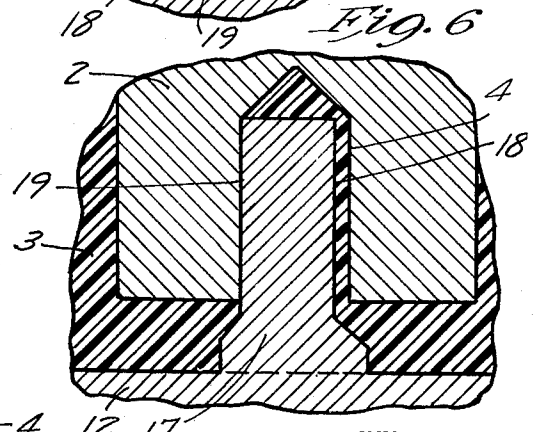
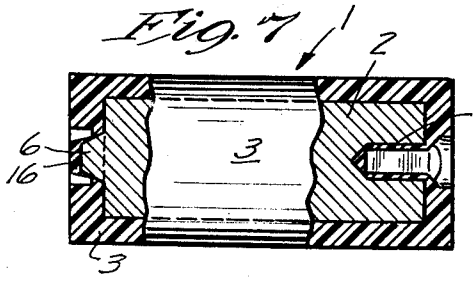


Fig. 7



INVENTORS
ERNEST E. COOK
HARRY J. SADLER
BY
Merchant & Merchant
ATTORNEYS

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METHOD FOR PRODUCING A ROLLER

Harry J. Sadler and Ernest E. Cook, Minneapolis, Minn.

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6 Claims. (Cl. 18—59)

Our invention relates generally to a means and method for producing rotary pump rollers of the type illsutrated, described and claimed in our co-pending application S. N. 611722, filed September 24, 1956 now Patent No. 2,776,625.

Heretofore, in the pumping of certain liquid containing corrosive and abrasive substances, difficulty has been experienced in the maintenance of pumps because of early failure of impeller rollers made from brass, steel or various other materials due to abrasion or the corrosive action of the liquid delivered by the pump. Undue wear has been further accelerated by engagement of impeller rollers with metallic roller supporting rotors and with the metallic inner wall surfaces of pump housings. Attempts have been made to utilize rollers made from nonmetallic materials such as corrosion resistant synthetic resins without much success, inasmuch as most synthetic resins are of insufficiently high specific gravity to make effective sealing contact with the engaged wall of the pump chamber when pumping liquids. Moreover, the use of corrosion resistant metal in such rollers is relatively expensive without solving to any particular degree the problem of excessive wear when pumping liquids containing abrasives.

An important object of our invention is the method of producing a pump roller as set forth having long wearing qualities as well as a high degree of resistance to corrosion, and which will produce a minimum of wear on the engaged wall of the pump chamber.

Another object of our invention is the method of producing a pump roller having a core of relatively high specific gravity and a nonmetallic corrosion resistant jacket of relatively low specific gravity and of relatively long wearing qualities, whereby the core adds sufficient weight to the roller to insure effective sealing engagement therebetween and the engaged pump chamber wall.

Another object of our invention is the method of producing a pump roller having a core and a nonmetallic jacket, in which a minimum surface portion of the core is exposed to the corrosive action of liquid being moved through the pump, such exposed area being sufficiently small to render the corrosive action of the liquid thereon substantially ineffective.

The above and still further highly important objects and advantages of our invention will become apparent from the following detailed specification, appended claims, and attached drawings:

Referring to the drawings which illustrate the invention, and in which like numerals indicate like parts throughout the several views:

Fig. 1 is a view in side elevation of a core utilized in the impeller roller of our invention;

Fig. 2 is a fragmentary view in axial section of a mold utilized in the producing of our impeller roller;

Fig. 3 is an enlarged fragmentary transverse section taken on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged fragmentary transverse section taken on the line 4—4 of Fig. 2;

Fig. 5 is a still further enlarged fragmentary section taken substantially on the line 5—5 of Fig. 3;

Fig. 6 is an enlarged fragmentary section taken on the line 6—6 of Fig. 4; and

Fig. 7 is a view in side elevation of our complete impeller roller, some parts being broken away and some parts shown in section.

In the preferred embodiment of our invention illustrated, a generally cylindrical impeller roller is indicated in its entirety by the numeral 1 and is shown as comprising a generally cylindrical, preferably metallic, core 2 enclosed within a generally cylindrical, preferably nonmetallic jacket 3. It will be appreciated that the core 2 may be made from any suitable material of a density to provide, with the jacket 3, a roller of sufficiently high specific gravity for smooth and efficient operation in pumping liquids of predetermined densities. For most uses we prefer to use a metallic core, such as made from copper alloys or ferrous metals. The nonmetallic jacket 3 may be made from any one of a number of materials having a high degree of resistance to wear when utilized in connection with liquids containing abrasive particles, and together with a high degree of resistance to corrosive action of acids or other caustic solutions. Such abrasion and corrosive resistant materials are found among the synthetic resins which are relatively easily moldable about a suitable core. We have found that nylon, which is a thermoplastic resin, is well adapted as a jacket material because of its long wearing qualities and its extreme resistance to chemical action with a wide variety of liquids.

The core 2 is provided with a generally cylindrical recess 4 which extends axially inwardly from one end wall 5, and a frusto-conical boss 6 extending axially outwardly from the opposite end wall 7 of the core 2. As shown, the recess 4 and boss 6 are preferably coaxial with the core 2, and the recess 4 is of greater axial depth than the axial length of the boss 6.

The recess 4 and the boss 6 of the core 2 are engaged by cooperating portions of a mold 8 shown fragmentarily in Figs. 2–6. The mold 8 is of the type generally used in the art of plastic molding, and is shown as comprising a main body member 9 which defines a cylindrical mold wall 10, a removable end wall forming member 11, and a cylindrical end wall forming plunger element 12 axially slidably contained in the end portion of the body member 9 opposite the end wall forming member 11. The mold may be assumed to be further provided with conventional means for injecting material to be molded into the cylindrical cavity defined by the mold elements 9, 11, and 12. The injecting means, being conventional in nature, do not themselves comprise the instant invention. Hence, for the sake of brevity, showing and description thereof is omitted. The end wall forming element 11 is provided with an annular boss-receiving and supporting member 13, the inner end of which is formed to provide a plurality of circumferentially spaced lug elements 13*a* which define relatively sharp straight edges 14 that are adapted to make a minimum area contact along a tangential line with circumferentially spaced portions of the conical surface of the boss 6 when the core 2 is placed in the mold cavity. The boss-receiving element 13 is shown in Fig. 3 as providing three such lugs 13*a*, together with intervening spaces 15 through which the nonmetallic jacket forming material flows when

injected into the mold cavity, whereby to provide a cap portion **16** over the outer end of the boss **6**. With reference to Figs. 2, 5, and 7, it will be seen that the boss engaging element **13** positions the core **2** in the mold cavity so that the end wall **7** of the core is axially spaced from the adjacent end wall surface of the mold cavity, so that the nonmetallic jacket **3** outwardly of the end wall **7** is of substantial thickness. Furthermore, when the finished roller **1** is removed from the mold **8** the conical surface of the boss **6** is exposed to atmosphere only at the three circumferentially spaced points where the edges **14** have made tangential line contact therewith.

The end wall forming plunger element **12** is provided with a core supporting stem **17** that is cross sectionally polygonal, preferably triangular. The stem **17** is coaxial with the boss receiving element **13** and cooperates therewith to support the core **2** in concentric relationship to the cylindrical wall **10** of the mold cavity. The stem **17** is defined by longitudinally extending flat faces **18**, adjacent ones of which intersect to provide axially extending relatively sharp edges **19** which make line contact with circumferentially spaced portions of the recess **4**. Furthermore, the stem **17** is of a length greater than the axial depth of the recess **4** so that, when the stem **17** is bottomed in the recess, as shown in Fig. 6, the end wall **5** of the core **2** is maintained in spaced relation to the adjacent end of the end wall forming plunger element **12**. Injection of nonmetallic jacket forming material into the mold cavity under pressure causes the material to flow into the recess between the flat surfaces **18** and the cylindrical wall of the recess **4**, and to completely line the walls of the recess except where line contact is made therebetween and the edges **19** of the stem **17**. After the completed roller **1** is removed from the mold **8**, the recess end of the roller exposes the core **2** only where the wall of the recess **4** made relatively fine line contact with the sharp edges **19** of the stem **17**.

In the producing of the roller **1**, the core **2** is placed into the mold cavity with the stem **17** being received in the recess **4**. The end wall forming element **11** is then positioned as in Fig. 2, after which the jacket material is injected into the mold cavity to completely fill the same. After the nylon jacket material has properly set, the wall forming element **11** is removed and the plunger **12** moved axially in a direction to eject the finished roller from the mold cavity.

As above indicated, the metallic core **2** gives sufficient weight to the roller **1** to enable the same to operate in an efficient manner when put into use in a pump employing such rollers as vanes. The nylon jacket provides excellent wearing qualities and relatively high resistance to abrasion and corrosion. The exposed areas of the core are sufficiently small to render negligible the problem of corrosion of the core **2** when the roller **1** is utilized in pumps for delivering acids and the like.

While we have shown and described a commercial form of our novel pump roller and mold for making the same, it will be understood that the same is capable of modification without departure from the spirit and scope of the invention as defined in the claims.

What I claim is:

1. The method of producing a roller comprising providing a metallic core with an axially outwardly extending boss at one end and an aligned axially inwardly extending recess in the opposite end, centering said metallic core within a mold by engaging the surface of said boss at spaced points in axially spaced relation to the adjacent end of said core, engaging the surface of the recess along spaced generally opposed line contacts in axially spaced relation to the other end of the core and molding a nonmetallic coating to said core, whereby the non-engaged portion of the surface of the recess will be substantially covered by said coating.

2. The method of molding a cylindrical jacket about a cylindrical core which comprises, providing a cylindrical core with an axially outwardly extending frusto-conical boss at one end of less diameter than that of said core and an axially extending recess at its other end, placing said core in a cylindrical mold cavity of greater diameter and length than said core and having opposed axial core engaging elements extending inwardly from opposite end walls of the mold cavity, imparting relative movement to said core engaging elements to cause one thereof to enter and engage the surface of said recess along a plurality of line contacts which are disposed in generally opposed relationship to each other and the other core engaging element thereof to contact the frusto-conical surface of said boss at circumferentially spaced points thereon to support said core in spaced relation to the end walls of the mold cavity and centrally with respect to the cylindrical wall of the mold cavity, and filling the unoccupied portion of the mold cavity with a moldable non-metallic material, whereby the non-engaged portion of the surface of the recess will be substantially covered with said material to substantially enclose said core therewithin.

3. The method of molding a cylindrical jacket about a cylindrical core which comprises, providing one end portion of a core with a generally axially extending mold engaging recess, placing said core in the cavity of a mold having a core engaging portion projecting axially inwardly of the mold cavity for engagement with the said mold engaging recess, bringing the core engaging portion into contact with the mold engaging recess along a plurality of substantially equally circumferentially spaced line contacts on the surface of the mold engaging recess while engaging the other end portion of the core by a minimum area contact to dispose the opposite end portions of said core in inwardly spaced relation to the adjacent end wall of said mold cavity, and filling the unoccupied portion of the mold cavity with a moldable non-metallic material, whereby the non-engaged portion of the surface of the mold engaging recess will be substantially covered by said material to substantially enclose said core therewithin.

4. The method of producing a roller comprising providing one end portion of a metallic core with a generally axially extending recess, centering said metallic core within a mold by engaging the other end portion of the core by a minimum area contact and engaging the surface of the recess along spaced generally opposed line contacts and thereafter molding a non-metallic coating to said core, whereby the non-engaged portion of the surface of the recess will be substantially covered by said coating.

5. The method of molding a jacket about a core which includes, providing a core with a generally axially extending recess at one end thereof, placing said core in a mold cavity of greater cross-sectional area and length than said core and having an opposed generally axially inwardly extending core engaging element aligned with the recess, imparting relative movement to said core engaging element to cause same to enter said recess and engage the surface thereof along a plurality of line contacts which are disposed in generally opposed relationship to each other while engaging the other end of the core by a minimum area contact to support the core in spaced relation to the mold cavity and thereafter filling the unoccupied portion of the mold cavity with a moldable non-metallic material, whereby the non-engaged portion of the surface of the recess will be substantially covered by said non-metallic material to substantially enclose said core therewithin.

6. The method of molding a jacket about a core which comprises, providing a core with a generally axially extending recess at one end thereof, placing said core in a mold having a core engaging portion projecting generally axially inwardly for engagement with the recess, bringing the core engaging portion into spaced generally opposed line contacts with the surface of the recess while engaging the other end of the core by a minimum area contact to dispose the opposite ends of said core in

inwardly spaced relation to the mold and thereafter filling the unoccupied portion of the mold with a moldable non-metallic material, whereby the non-engaged portion of the surface of the recess will be substantially covered by said material.

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