Sept. 16, 1969 H. D. MORRIS, SR 3,466,724

METHOD OF MANUFACTURING CENTRIFUGAL PUMP CASINGS

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Fig. 1

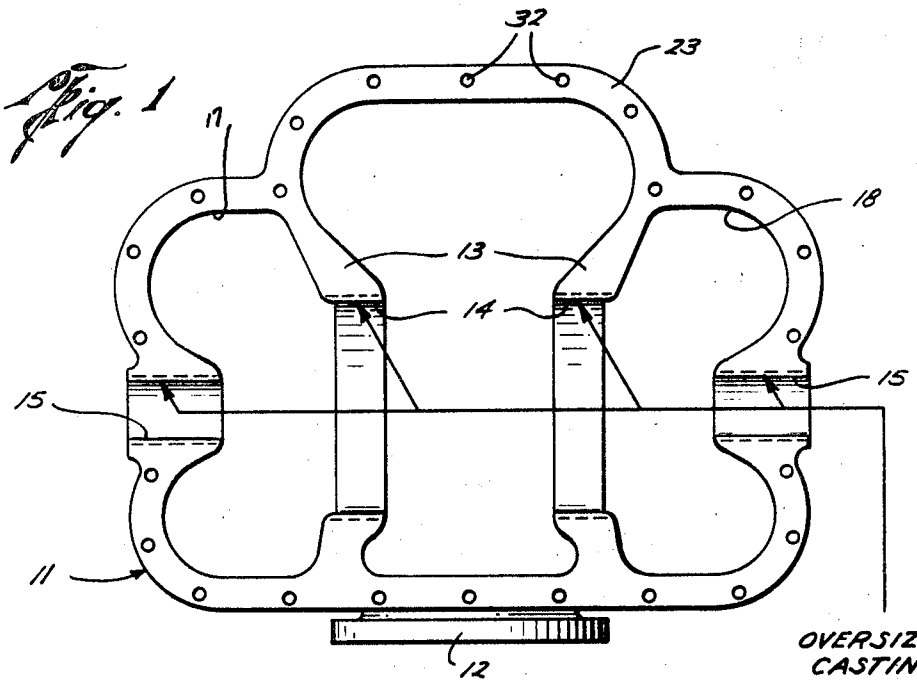
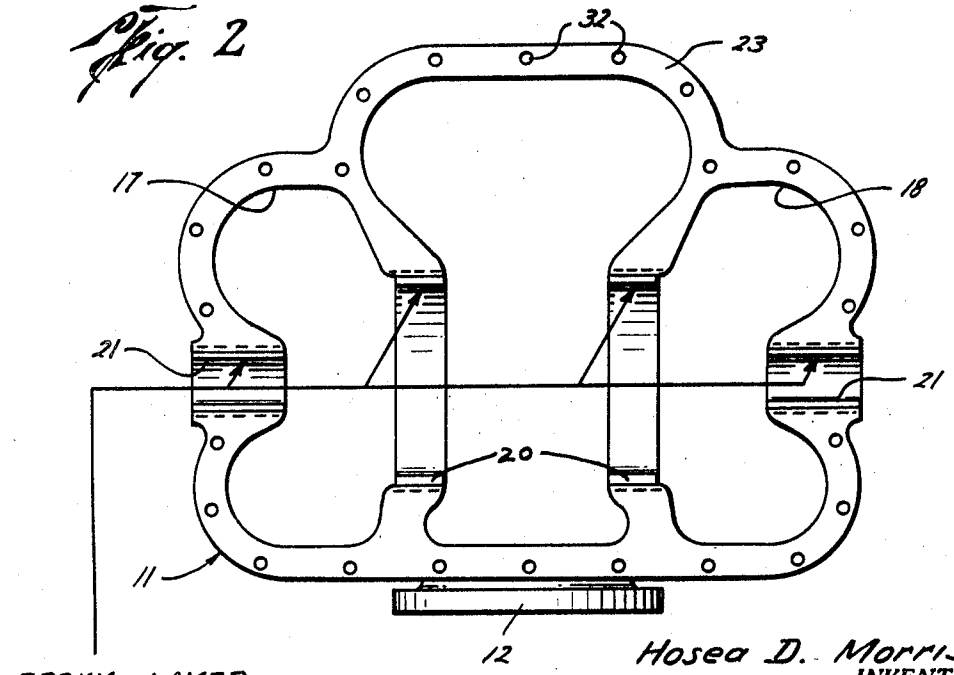


Fig. 2



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Fig. 3

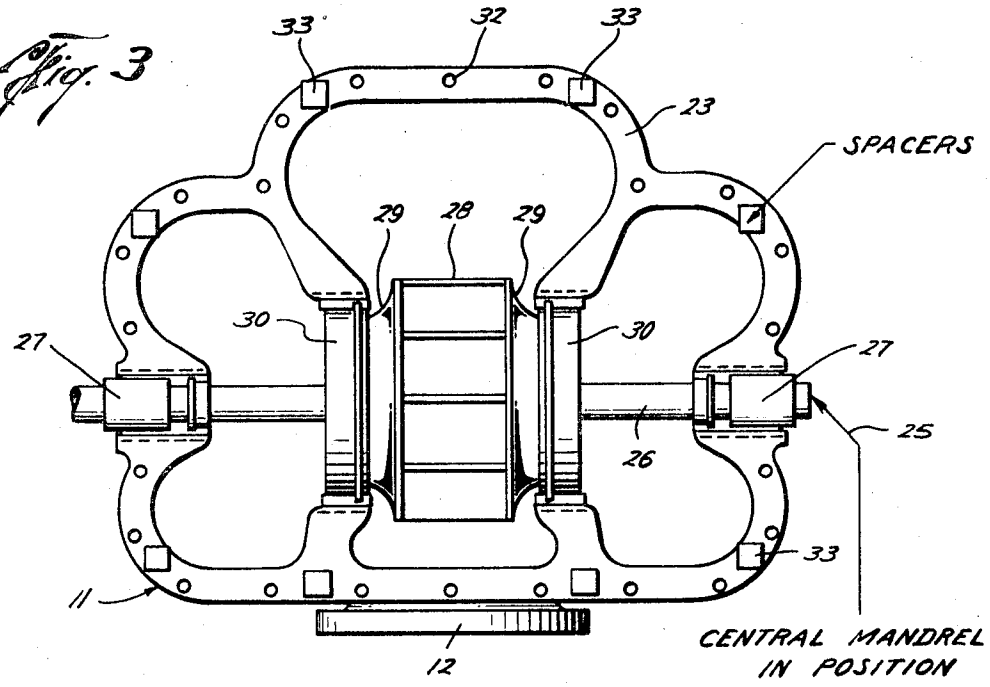
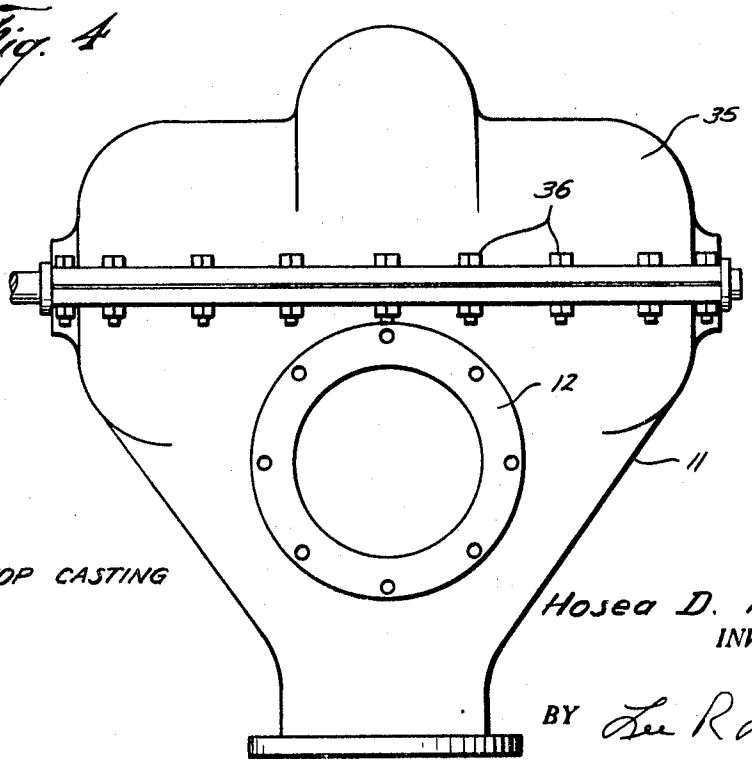


Fig. 4



BOLT TOP CASTING DOWN

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METHOD OF MANUFACTURING CENTRIFUGAL PUMP CASINGS

Filed March 9, 1967 3 Sheets-Sheet 3

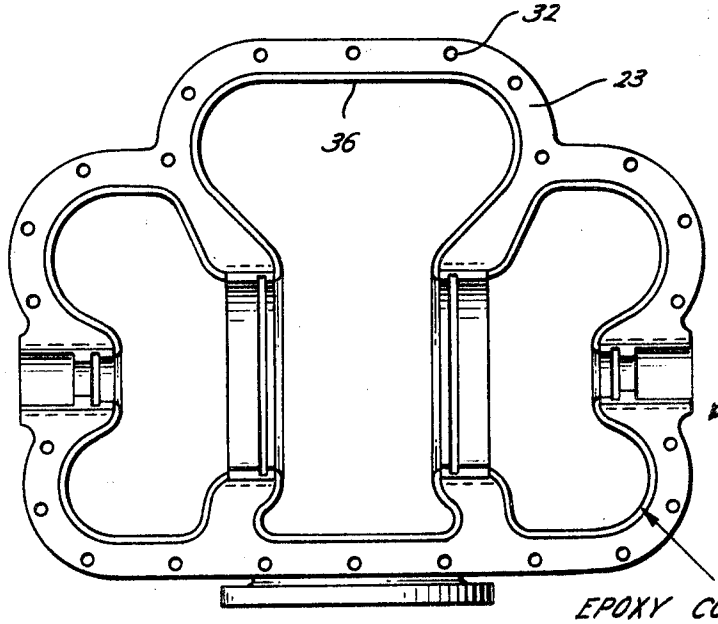


Fig. 5

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METHOD OF MANUFACTURING CENTRIFUGAL PUMP CASINGS

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U.S. Cl. 29—156.4 6 Claims

ABSTRACT OF THE DISCLOSURE

A method of manufacturing centrifugal pump casings having a layer of corrosive-resistant material covering the entire internal surface of the casing, including the ring recesses which receive the rotor assembly.

This invention relates to a method of manufacturing centrifugal pumps. More particularly, it relates to a method of manufacturing centrifugal pumps having a layer of corrosive resistant material in the form of epoxy resin covering the entire internal surface of the casing of the pump. It has particular reference or utility in connection with pumps having upper and lower sections made of cast iron and in which each of the sections has at least one semi-annular recess, which recesses together form an annular opening in the assembled condition and wherein the pump has a rotor assembly a portion of which is adapted to be received in the annular opening in the assembled condition.

One of the reasons which causes corrosion of certain metals in centrifugal-type pumps is that unlike metals in the presence of an electrolytic fluid, such as water, form a galvanic cell with one of the metals acting as the anode and is thereby destroyed by the electrolytic action thereon. Normally, the housing for centrifugal-type pumps is cast iron, and therefore acts as the anode and is thereby corroded more readily than other parts of the pump.

It is therefore desirable to have a centrifugal pump wherein the entire insides of the cast iron pump casing is completely coated and thereby electrically insulated from the electrolyte or otherwise separated from the corrosive fluid being pumped therethrough.

In the past, certain coatings have been used to coat portions of the inside of centrifugal pumps, but no method has heretofore been devised whereby the entire internal surface of the casing could be coated with a corrosive resistant material such as epoxy resin and with a minimum of time and effort.

In the normal manufacture of centrifugal pumps of the foregoing type wherein protective coatings were not provided to the entire internal surface of the pump casing, the pump had a case body which was cast to the desired general size and thereafter the ring recesses were milled by machines to the exact specification of the rotating assembly which was to be mounted therein. This machining operation is expensive and time consuming.

It is therefore the object of this invention to provide an improved method of manufacturing centrifugal type pumps wherein the entire inside surface of the pump casing is provided with a coating of corrosive resistant material in the form of a polymerized epoxy resin.

Briefly stated, this invention is a method of manufacturing a centrifugal pump having a layer of corrosive resistant material covering the entire internal surface of the casing of the pump and wherein the pump has upper and lower sections made of cast iron, each of the sections having at least one semi-annular recess, which recesses together form an annular opening in the assembled condition, and wherein the pump has a rotor assembly a portion of which is adapted to be received in the annular opening in the assembled condition.

The method comprises the steps of casting the upper and lower sections with oversized, semi-annular recesses. Thereafter, each of the semi-annular recesses is initially coated with a layer of unpolymerized epoxy resin, with the thickness of the layers being greater than the radial distance between the annular opening and the portion of the rotor assembly positioned therein in the assembled condition. Thereafter the rotor assembly is placed in one of the sections in the rotating position and the other section of said casing is mounted thereover, with spacing means between the sections. The sections are then drawn together against the spacing means, thereby pressing the layers of epoxy resin in said recesses to the desired thickness. The sections are then separated after the epoxy resin has polymerized to a hardened condition. The balance of the internal surface of the casing sections is then coated with a layer of epoxy resin which is allowed to polymerize. Thereafter the sections and rotor assembly are reassembled in the operating condition.

In the preferred embodiment, the thickness of the epoxy resin layer in the ring recesses in the final condition is approximately ¼ inch thick.

Reference to the drawing will further explain the invention wherein:

FIG. 1 is a top plan view of the lower section of a pump casing showing recesses and rotor shaft recesses cast in an oversized condition.

FIG. 2 is a view similar to FIG. 1, but showing the ring recesses and rotor shaft recesses initially coated with layers of unpolymerized epoxy resin.

FIG. 3 is a view similar to FIG. 2, but showing the rotor assembly mounted in the rotating position in the lower section and with spacer elements spaced around the gasket area of the section.

FIG. 4 is a side elevation view of the lower section shown in FIGS. 1–3, and also showing the upper section of the pump casing mounted thereon, and drawn together or pressed together by bolt means.

FIG. 5 is a view similar to FIG. 3, showing the top section of the casing housing removing and showing the balance of the internal surface of the lower section of the casing having a layer of epoxy resin added thereto.

Referring now to FIG. 1, the numeral **11** is used to generally designate the lower section of a centrifugal pump case. This particular pump is provided with annular flange **12**, forming inlet means to the pump casing. Section **11** also has a pair of webs **13** which webs mate with similar webs in the top section of the pump casing to form two partition walls in the casing. Each of the webs **13** is provided with a semi-annular recess **14** which mates with similar recesses in the webs of the top section of the casing to form annular openings in the partition walls, which openings receive the rotor assembly in the assembled condition.

In addition, each end of casing section **11** is provided with a rotor shaft recess **15** which mate with similar recesses in the top section of the casing, and which recesses are coaxially aligned with recesses **14**.

It is to be understood that the pump casing is also provided with inlet means (not shown) which admit fluid to end chambers **17** and **18** provided in the casing and that the fluid being pumped passes axially through portions of the rotor assembly mounted in recesses **14** and thence outwardly through the opening at flange **12** by operation of the rotor assembly.

It is to be further understood that recesses **14** and **15** are initially cast to oversized dimensions, as are the mating recesses in the top section of the casing housing. The openings formed by these recesses are preferably about ½ inch larger in diameter in the assembled condition

than the diameter of the portion of the rotor assembly received thereinto.

As shown in FIG. 2, recesses **14** and **15** of casing section **11** and the corresponding recesses of the top section of the casing are each provided with a layer of unpolymerized epoxy resin, with the thickness of the layers being greater than the radial distance between the recesses and the outside circumference of the portion of the rotor assembly to be received therein. Recesses **14** are shown having built-up layers **20** of unpolymerized epoxy and recesses **15** are shown with layers **21** of the same material. It is to be understood that these layers can be initially peaked, but it is important that the initial thickness be greater than will be the distance between the recesses and that portion of the rotor assembly to be mounted therein.

The rotor assembly, generally designated by the arrow **25** in FIG. 3, is then placed in the rotating position in the casing section **11** as shown. In this particular embodiment the rotor assembly includes a shaft **26**, one end of which is connected for rotation by any convenient power source, and is provided with sealed bearings **27** at each end of casing **11**, which bearings are received in recesses **15**.

In addition, shaft **26** has mounted thereon rotor blades **28** which are spaced between a pair of wear rings **29** having vanes therein for axial movement of fluid therethrough. Wear rings **29** are adapted for rotation inside of and in close fitting relationship with casing rings **30** which are mounted in recesses **14** in a stationary position. Though casing rings **30** do not rotate, they are considered part of the rotor assembly for purposes of this description. It is to be understood that the rotor assembly is generally made of a non-corrosive type material such as stainless steel or the like.

It will be observed that the top outside edge **23** of the casing section **11** is generally flat and adapted to receive a gasket thereagainst, and is also provided with a plurality of bolt holes **32** for receiving bolts for connecting the top section of the pump casing thereto.

In addition, FIG. 3 shows a plurality of spacer means loosely mounted thereon in the form gasket pieces **33**. These gasket pieces are normally cut from a gasket of the type which will normally be used in assembling the pump and will be generally of the same thickness. The purpose of gasket pieces **33** is to properly space the top section of the pump casing with respect to floor section **11**, as will be explained hereinafter. Since pieces **33** do not cover the entire gasket area, but only a small portion thereof, the pieces are more compressible than the full gasket, and hence, the top section of the casing housing and the lower section **11** can be drawn to a slightly closer position during the manufacturing process as will be explained hereinafter.

Referring now to FIG. 4, top section **35** of the pump casing is mounted over section **11** and bolted thereto by bolts **36** with gasket pieces **33** therebetween. As explained above, top section **35** has upper webs, which webs match webs **13** of section **11**, and that these upper webs have recesses which match recesses **14** and **15** of section **11**. These upper recesses will have similarly been coated with a built-up layer of unpolymerized epoxy resin as was described with respect to recesses **14** and **15** in section **11**.

Sections **11** and **35** will be drawn or pressed together by operation of bolts **35**, with the rotor assembly mounted therein. This thereby reduces the thickness of the epoxy layers **20** and **21** in section **11** and the matching layers in the upper recesses in section **35**, to thereby reduce these layers to the desired or predetermined thickness, which is preferably about ¼ inch. The epoxy resin is then allowed to stand for approximately 6 hours or until polymerized to a hardened condition.

Thereafter section **35** is removed from section **11** and the rotor assembly **25** is removed. The balance of the interior surfaces of sections **11** and **35** are then coated as by brushing with layer **36** of epoxy resin to a thickness of approximately 3/10 inch, for example. After all the epoxy resin layers have polymerized to a hardened condition, sections **11** and **35** and rotor assembly **25** are reassembled again with a full gasket between sections **11** and **35**. Since the normal gasket is less compressible than gasket pieces **33**, by a few thousands of an inch, rings **30** are provided with a very small tolerance for fitting into the polymerized layers of resin coating recesses **14**.

Since casing rings **30** have an outside diameter of approximately ½ inch less than the outside diameter of the openings formed by recesses **14**, the layer of resin covering recesses **14** will be approximately ¼ inch thick.

It will thus be apparent that the art is provided with a method of coating the entire internal surface of the casing of a cenrifugal pump with a coating of epoxy resin to thereby eliminate the corrosive problems described above. This method eliminates the necessity for milling the ring recesses to the desired configuration and easily adapts a particular rotor assembly to a particular pump casing. In addition, the entire internal surface of the cast iron casing, including the ring recesses, is provided with an epoxy coating which eliminates the corrosive action described above. Moreover, the milling work required to size the recess openings to fit the particular rotor which is to be mounted therein is eliminated, thereby saving time and money in the manufacture of the pumps. The pumps thus coated have a much longer usable life than noncoated pumps or pumps which are not entirely coated over all the internal surface of the casing.

Further modifications may be made in the invention as described without departing from the scope thereof. Accordingly, the foregoing description is to be construed as illustratively only and is not to be considered as a limitation upon the invention as defined in the following claims.

What is claimed is:

1. The method of manufacturing a centrifugal pump casing having a layer of corrosive resistant material covering the entire internal surface of said casing, wherein said pump casing has upper and lower sections made of cast iron, each of said sections having at least one semi-annular recess, which recesses together form an annular opening in the assembled condition and wherein said casing is arranged for reception therein of a rotor assembly a portion of which is adapted to be received in said annular opening in the assembled condition, said method comprising the steps of:

casting said upper and lower sections with oversized semi-annular recesses;

initially coating each of said semi-annular recesses with a layer of unpolymerized epoxy resin, said layers being of a thickness greater than the radial distance between said annular opening and said portion of said rotor assembly in the assembled condition;

placing said rotor assembly in one of said sections of said casing in the rotating position, and mounting the other one of said sections of said casing over said rotor, with spacing means between said sections;

drawing said sections of said casing together against said spacing means, thereby pressing said layers of epoxy resin to the desired thickness;

separating said sections of said casing after said epoxy resin has polymerized to a hardened condition;

and coating the balance of the internal surface of said casing sections with a layer of polymerized epoxy resin.

2. The method as claimed is claim **1** wherein:

said upper and lower sections are cast with oversized semi-annular recesses, which recesses together form said annular opening having a diameter about ½ inch larger than the outside diameter of said portion of said rotor assembly which is received therein in the assembled condition;

and wherein each of said layers of unpolymerized epoxy resin initially coated in said recesses is substantially more than ¼ inch in thickness.

3. The method as claimed in claim 2 wherein:

the layer of epoxy resin coating the balance of the internal surfaces of said casing sections is at least about 3/10 inch in thickness.

4. The method of manufacturing a centrifugal pump casing having a layer of corrosive resistant epoxy resin covering the entire internal surface of the said casing, wherein said pump casing has upper and lower sections made of cast iron, each of said sections having at least two webs, which webs in the assembled condition of said sections form two partition walls in said casing, and which webs are each provided with a semi-annular recess, with the recess in one section mating with the recess of another section in the assembled condition, whereby an annular opening is provided in each of said partition walls, and wherein said casing is arranged for reception therein of a rotor assembly having at least two casing rings, one of which is adapted to be received in each of said annular openings, said method comprising the steps of:

casing said upper and lower sections with oversized semi-annular recesses;

initially coating each of said semi-annular recesses with a layer of unpolymerized epoxy resin, each of said layers being of a thickness greater than the radial distance between said recesses and the outside circumference of said casing ring to be received therein;

placing said rotor assembly, including said casing rings, in one of said sections in the rotating position, and mounting the other one of said sections over said rotor assembly;

pressing said sections together to thereby reduce the thickness of said epoxy layers in said recesses to a predetermined thickness;

separating said sections of said casing after said epoxy resin has polymerized to a hardened condition;

and coating the balance of the internal surface of said casing sections with a layer of polymerized epoxy resin.

5. The method as claimed in claim 4 wherein:

each pair of mating recesses in said upper and lower sections form an annular ring having a diameter about ½ inch larger than the outside diameter of said casing ring received therein, whereby the thickness of said layer of epoxy covering said recesses is about ¼ inch thick in the radial direction.

6. The method as claimed on claim 4 wherein:

said layers of unpolymerized epoxy covering said recesses are reduced to said predetermined thickness by placing spacer means between said sections when said sections are pressed together.

References Cited

UNITED STATES PATENTS

2,422,412	6/1947	Van Der Merwe Haarhoff.	
2,850,999	9/1958	Kaplan et al.	29—528 X
3,155,045	11/1964	Lown et al.	103—114 X
3,290,199	12/1966	Willhoite	264—135 X
3,354,537	11/1967	O'Connor	29—156.4 X

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29—528; 103—104, 114; 264—134