April 29, 1969 N. D. JENSEN 3,440,968

CENTRIFUGAL PUMP

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Fig. 1

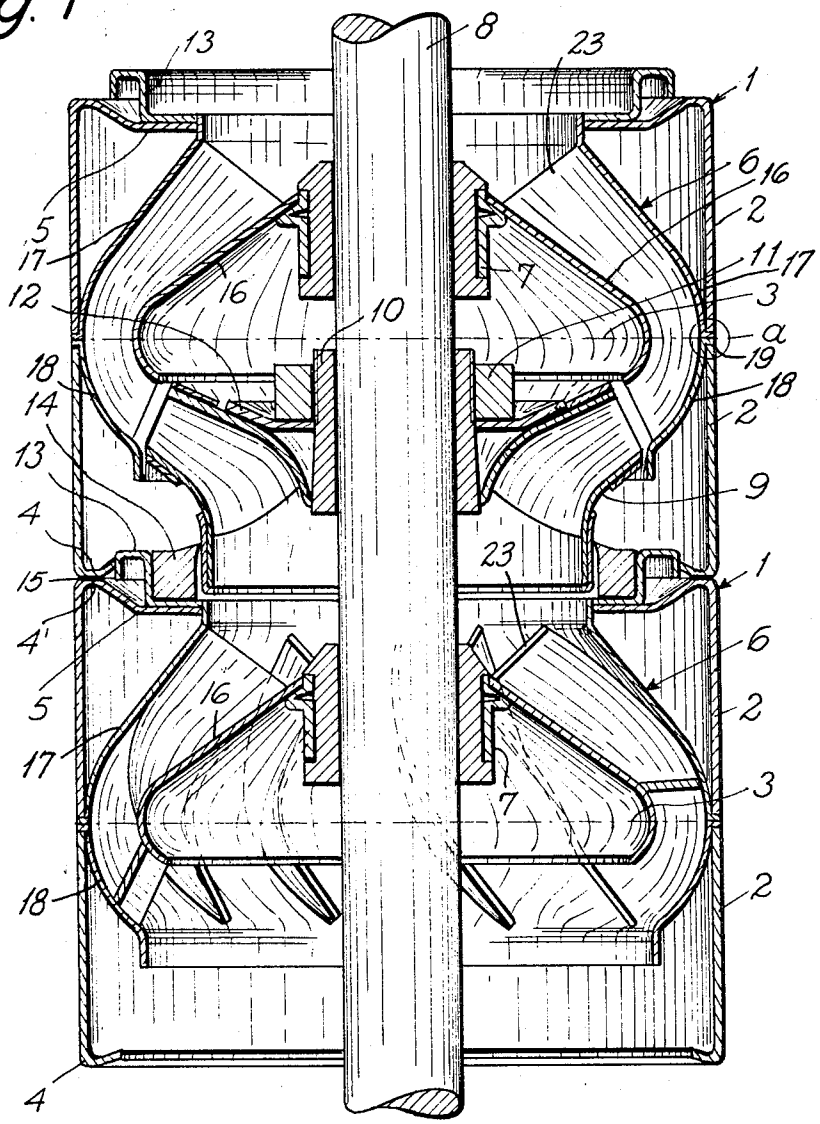
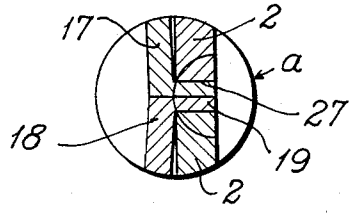


Fig. 2



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Fig. 3

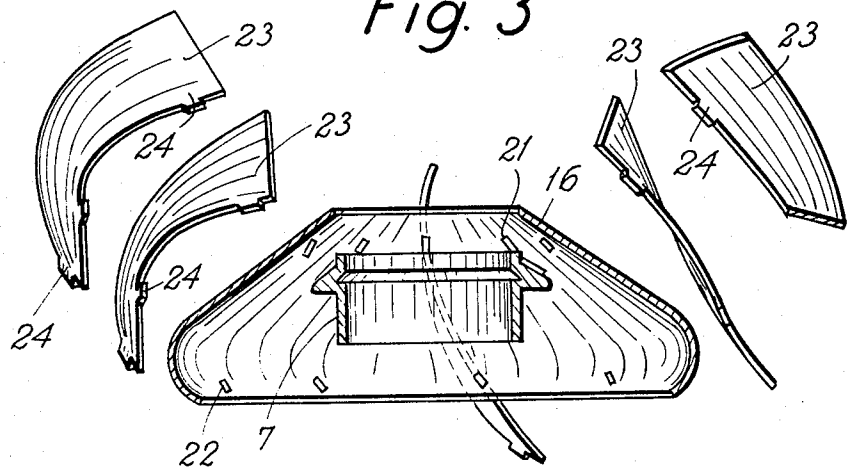
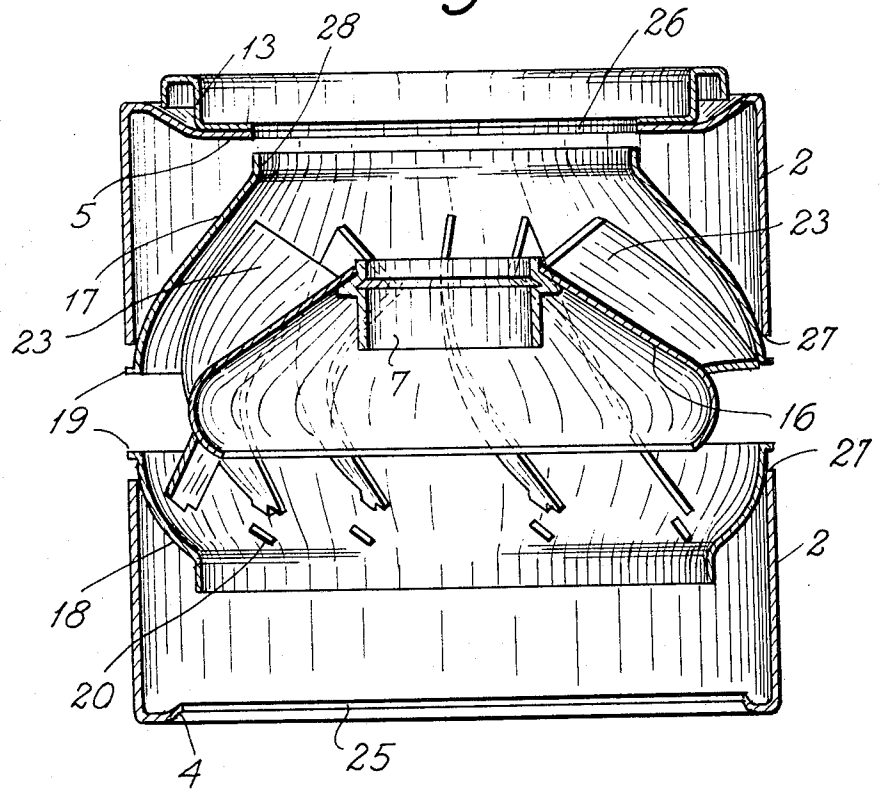


Fig. 4



United States Patent Office 3,440,968 Patented Apr. 29, 1969

3,440,968

CENTRIFUGAL PUMP

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Filed Aug. 8, 1967, Ser. No. 659,166
Claims priority, application Denmark, Aug. 9, 1966, 4,105/66
Int. Cl. F04d 1/06
U.S. Cl. 103—108 4 Claims

ABSTRACT OF THE DISCLOSURE

Centrifugal pump with a tubular pump housing and a guiding device attached therein and consisting of two skirts and guide vanes lying therebetween, and in which all parts are made by punching of sheet material, preferably stainless steel sheet and welded to each other and, for example, guided by means of pins and holes. A unit of the said kind is assembled axially with similar units with intermediate layers of resilient sealing means. Each section of housing and each outer skirt are made of two pieces which are joined, abutting in a plane at right angles to the longitudinal axis of the housing section and connected by a single welded seam extending around the tubular housing in said plane in order to facilitate the manufacturing of said parts and placing of the guiding device in the housing section and further to make possible the use of an inwardly projecting flange on the housing section so as to provide a flat contact surface for a sealing ring.

Background of the invention

In pumps hitherto manufactured of this kind the pump housing section has been drawn up from a flat sheet and the guiding device has been assembled to form a unit by the skirts being welded to the guide vanes. The said unit has subsequently been introduced through one open end of the housing section, which therefore has to be open with a diameter corresponding to the inner diameter of the section, and the guiding device has thereafter been attached in the housing section by welding at the end opposite to the end through which the device was introduced and where there is an inwardly projecting flange. Thus, the guiding device is only retained at the said place, and owing to the open end the housing sections cannot be sealed in relation to each other by butt welding, but by means of telescope joints with sealing means lying between two axial surfaces, which gives no ideal sealing by axial assembly.

Summary of the invention

The centrifugal pump according to the invention has a tubular pump housing composed of several coaxial sections; in each section there is attached a guiding device consisting of an outer skirt, an inner skirt and a number of guide vanes mounted therebewteen, all of the said parts are made separately by drawing or punching of sheet material and assembled by means of welding or, for example, guiding means such as pins and holes; the housing sections are joined axially with intermediate layers of resilient sealing means, and the housing sections and the outer skirts of the guiding devices are each formed of two parts abutting to each other in a plane at right angles to the longitudinal axis of the housing, the said four parts being assembled with each other by means of a single welded seam extending around the housing in the said plane.

By this design various advantages are obtained. The drawing process by manufacturing the housing section is facilitated, the height to which drawing is performed being

reduced to one half, and annealing operations may thus be dispensed with. The guiding device need not as in the known pumps be welded to form a finished unit before it is mounted in the housing since the individual parts may be loosely assembled and introduced into the half section, after which the two section halves and the parts of the guiding device alike are joined and retained to each other by a single welding connecting the guiding device to the wall of the housing, by which a very rigid assembly is provided.

Another advantage obtained is that the parts of the guiding device may be introduced through the open end of the half section involved, so that each half section of the housing at the end remote from the welded seam may have an inwardly projecting flange constituting a substantially flat contact surface for a sealing ring which is axially compressible between two such flanges. This provides a better sealing than that of telescope connections, since an increasing overpressure in the housing section will cause increased compression of the sealing material. The flanges may readily be manufactured by simple pressing operations.

An embodiment of a centrifugal pump according to the invention will now be described with reference to the drawing, in which:

FIGURE 1 shows a section through a part of the pump, viewed from the side,

FIGURE 2 a part of FIGURE 1 on a larger scale,

FIGURE 3 an exploded view, showing some of the parts of the guiding device, and

FIGURE 4 an exploded view of a pump section with a guiding device, prior to assembly.

FIGURE 1 shows that part of the housing of a centrifugal pump which contains two stages, that is, two impellers and two guiding devices. The housing of the centrifugal pump is formed of tubular sections, denoted as a whole by **1** and mounted coaxially with each other. Each section is divided into two half parts **2** joined to each other on a transverse plane which is indicated by a dash and dotted line **3** in FIGURE 1.

The halves **2** of the housing section are drawn from a flat blank, and one half has a relatively narrow, inwardly projecting flange **4**, whereas the other half has a wider, inwardly projecting flange **5**. In each housing section **1** is attached a guiding device, denoted as a whole by **6** and carrying a bearing **7** for the pump shaft **8** which carries impellers **9**, of which only one s indicated in the upper housing section in FIGURE 1; however, there is a corresponding impeller in the lower housing section **1** and in the remaining housing sections of the pump. The impeller **9** is attached to the shaft **8** by means of a bushing **10** screwed into a ring **11** which is attached to the disc **12** provided on the impeller.

To each flange **5** is welded a ring **13** to form bearing for a sealing ring **14** in which the impeller is rotating. Between the flange **4** and the flange **4'** is provided a flat seal **15**, and the housing sections **1** are assembled in axial direction by retaining means (not shown), such as longitudinal bolts.

All parts are made of steel sheet, preferably stainless steel, by drawing or punching.

The manufacture of the pump is illustrated in FIGURES 3 and 4, from which it will be evident that the guiding device **6** consists of an inner, bowl-shaped skirt **16** and an outer bowl-shaped skirt formed of two parts, that is, an upper part **17** and a lower part **18**. The two parts carry outwardly projecting flanges **19** which face each other, and one part has a number of holes **20**. The inner skirt **16** has two rows of holes **21** and **22** which similarly as the holes **20** are formed as slits. Between the two skirts **16** and **17**, **18** are mounted a number of guide

vanes 23 provided with guide webs 24 adapted to be received in the holes 20, 21 and 22.

The two half parts 2 of the housing section are made by drawing from a flat sheet blank, and owing to their relatively low height this operation is easy to perform and annealings may be dispensed with. From the bottom is cut a circular part so as to form the flanges 4 and 5 and corresponding circular openings 25 and 26. The opposite ends of the half parts 2 have free edges 27 surrounding an opening corresponding to the inside diameter of the half part. The ring 13, which is likewise made by drawing, is welded to one half part 2 of the housing section as shown in FIGURE 4.

The parts of the guiding device 6 are assembled separately thereby that the guide vanes 23 are mounted on the inner skirt 16, the pins 24 being pressed into the holes 21 and 22. The pins are adapted to fit rather snugly and firmly in the holes, when pressed into these, and the lower half 18 of the outer skirt is then mounted, the lower pins 24 of the guide vanes being introduced into the holes 20. Pins and slits have such an oblique position that the introduction is readily performed by a slight screwing movement of the part 18.

The upper part 17 is then lowered into position over the loosely mounted guide vanes 23 which are formed in such manner as to thereby provide a certain distance between the flanges 19. The combined guiding device is subsequently introduced into the upper half part 2, while the lower half part 2 is raised to join the upper one and assembled with the latter by means of a suitable tool, by which the flanges 19 are pressed together by the edges 27 as illustrated in FIGURE 2, in which the section surrounded by the circle *a* corresponds to that shown in FIGURE 1 and marked *a*. Owing to the guiding device being wedged in this manner, the interior casing 16 is subjected to such a strain that it is capable of supporting the shaft bearing 7 which is pressure welded in the skirt before or after the final assembly. The guiding device is assembled and attached in the housing by means of a single circumferential welding which includes the edges 27 and the flanges 19 and extends along the dash and dotted line 3 in FIGURE 1. At the upper end the guiding device is guided by the tubular part 28 fitting in the opening 26.

The aforesaid circumferential welding may be performed as electric arc welding with protective gas, and as filler material may be used the flanges 19. If desired, the flange 19 may be made of a smaller diameter than the outer diameter of the parts 2 of the housing section so as to form a circumferential groove when assembling, which is then filled with foreign filler material during the welding operation.

It will be appreciated from the foregoing description that a safe and stable connection between all parts is obtained by means of the welding seam referred to so

that by the said single operation there is produced a rigid pump unit which may be assembled with corresponding units and in which shaft and impeller may be inserted.

I claim:

1. A centrifugal pump comprising a tubular pump housing including a plurality of coaxial sections, a guiding device in each section comprising an outer skirt, an inner skirt and a number of guide vanes between said skirts, said skirts, guide vanes and sections being constituted of sheet material assembled together, guiding means between sad inner skirt and said vanes for engaging the same together, intermediate layers of resilient sealing means clamped between adjacent coaxial sections, each housing section being constituted of two coaxial portions and the outer skirt of each guiding device including two parts with abutting annular surfaces disposed in a plane at right angles to the longitudinal axis of the housing, said annular surfaces being clamped between adjacent edges of said coaxial portions, and a single weld seam extending around the housing in said plane of the abutting flanges to join the same and said edges of said coaxial portions.

2. A pump as claimed in claim 1 wherein each coaxial portion of the housing section includes, at the end remote from the welded seam, an inwardly projecting flange constituting a substantially flat contact surface for the sealing means which is clamped between two such flanges.

3. A pump as claimed in claim 2 wherein each said outer skirt includes, at one end, an annular part which is adapted to be received in an opening formed by the inner edge of said inwardly projecting flange of the associated coaxial portion of the housing section, the inner skirt adjacent said annular part having an opening and a bearing, attached to said inner skirt in said opening, for a pump shaft.

4. A pump as claimed in claim 1 wherein the two parts of the outer skirt include outwardly projecting flanges at their abutting surfaces, said flanges being wedged between the adjacent edges of said coaxial portions and united thereto by said weld seam.

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HENRY F. RADUAZO, *Primary Examiner.*

U.S. Cl. X.R.

103—102, 111, 115