United States Patent [19]

Dernedde et al.

[11] **3,754,843**

[45] **Aug. 28, 1973**

[54] **PUMP SUPPORTING AND ALIGNING ARRANGEMENT**

[75] Inventors: **Robert Dernedde**, Frankenthal; **Gerd Niermayer**, Bremen, both of Germany

[73] Assignee: **Klein, Schanzlin & Becker Aktiengesellschaft**, Frankenthal/Pfalz, Germany

[22] Filed: **Dec. 2, 1971**

[21] Appl. No.: **204,044**

[30] **Foreign Application Priority Data**

Dec. 4, 1970 Germany ..... P 20 59 636.5

[52] **U.S. Cl.** **417/363**

[51] **Int. Cl.** **F04b 39/12**

[58] **Field of Search** 417/360, 363, 365

[56] **References Cited**

UNITED STATES PATENTS

2,265,940	12/1941	Forrest	417/360
2,981,463	4/1961	Dagrell	417/363
1,991,761	2/1935	McHugh	417/360
1,471,559	10/1923	Knauf	417/360
3,046,899	7/1962	Biefang	417/363

Primary Examiner—Carlton R. Croyle
Assistant Examiner—Richard Sher
Attorney—Michael S. Striker

[57] **ABSTRACT**

The alignment of a pump shaft and drive shaft, which are connected by coupling means, is maintained by a slanted resilient leg whose upper end is secured to a projecting housing portion of the pump, and whose lower end is secured to a base plate to which the pump and its drive motor are secured. Turning moments exerted on the pump outlet due to pressure, flow of liquid, and the weight of attached parts, are sustained by the slanted leg.

11 Claims, 4 Drawing Figures

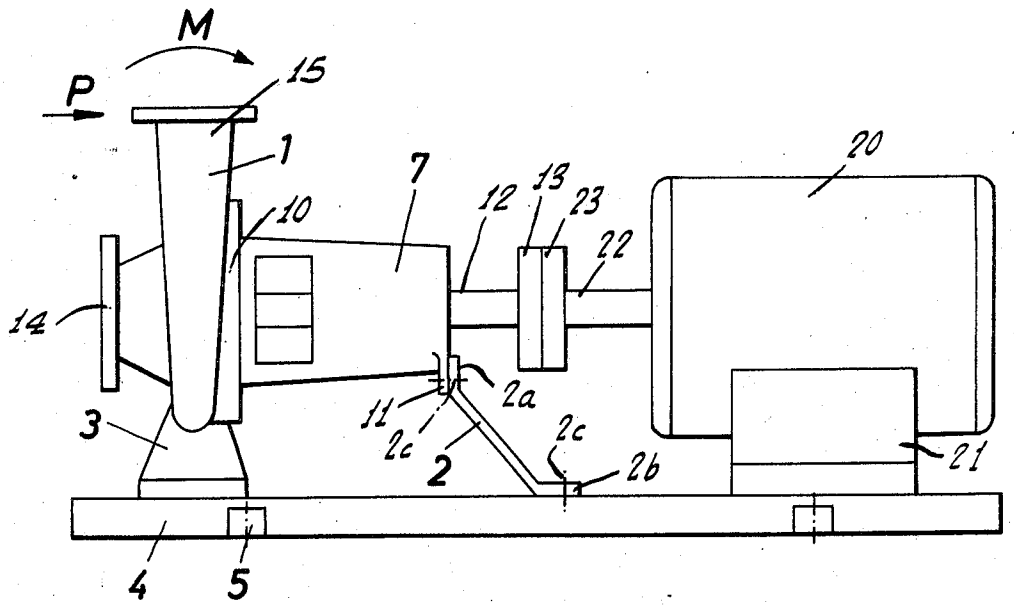
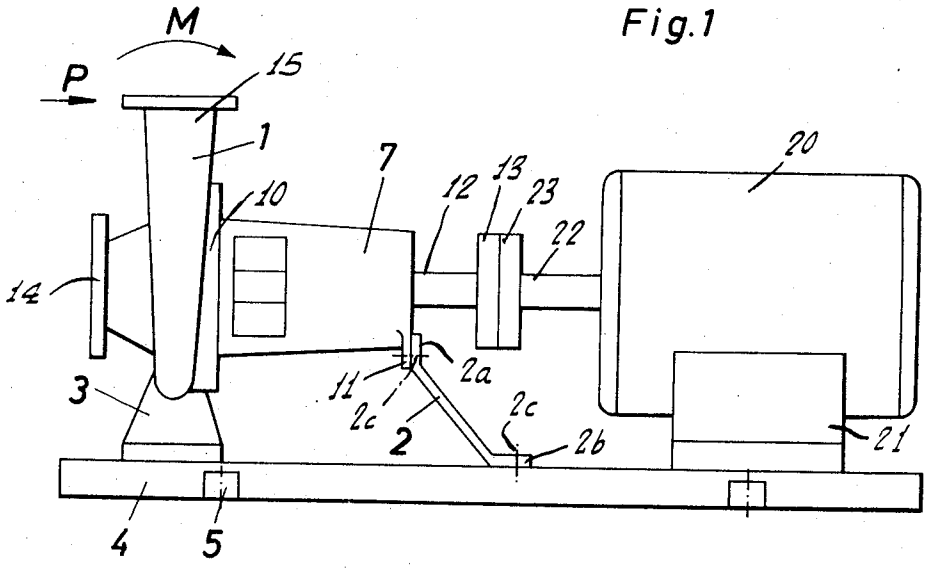


Fig.1



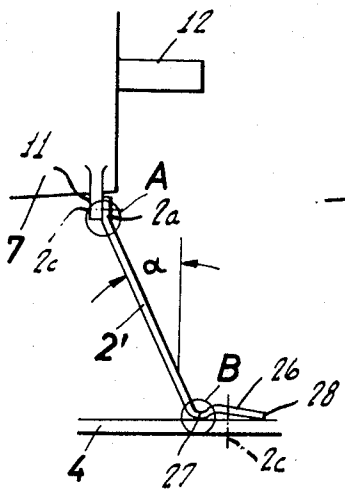


Fig.2

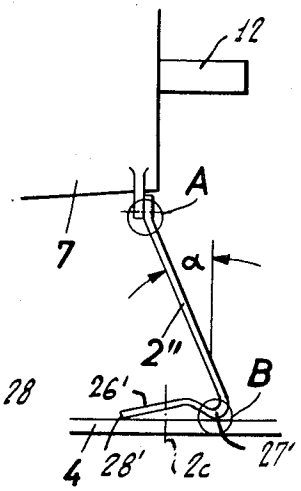


Fig.3

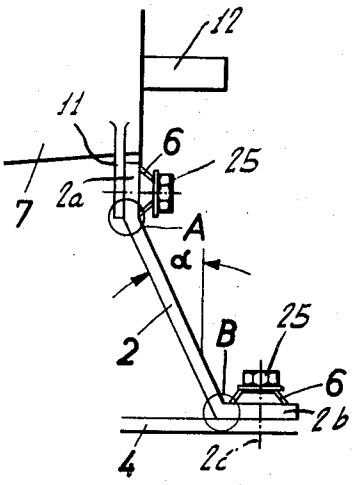


Fig.4

PUMP SUPPORTING AND ALIGNING ARRANGEMENT

BACKGROUND OF THE INVENTION

The present invention relates to a rotary centrifugal pump whose housing has an axially projecting portion for the bearing of the pump shaft, and is mounted by means of legs on a base plate which also supports the drive motor of the pump.

The tubular outlet conduit of a rotary centrifugal pump, always exerts forces and turning moments on the outlet means of the pump. Particularly disadvantageous are forces produced due to thermal expansion of pump conduits caused by temperatures of the pumped medium which are substantially different from the temperature of the surrounding air. Other forces are created by the flow and pressure of the medium and by the weight of parts. Such turning moments and forces which act on the suction inlet as well as on the pressure outlet, stress the housing so that tension develops in the material of the housing which are superimposed on the tension created by the inner pressure. Such tensions always bring about deformation of the housing, and as a result, the shaft of the pump does not run exactly centered. Consequently, the danger of contact between rotary and stationary parts is increased, and the necessary alignment of the shafts of the pump and of the drive motor is impaired. The resultant force of the loads on the inlet and outlet pumps, stresses attaching means such as screws and legs between the pump housing and the base plate, and finally deforms the base plate, and its connection with the foundation for the building floor where stress and deformation take place which further detrimentally affects the alignment of the shafts.

Due to this reason, the maintaining of permissible tolerances causes difficulties, since the tolerances are sometimes very low and arcuate and looped conduit portions are required, which are not only expensive, but cause also additional losses which increase the cost of the operation. Furthermore, pumps mounted in accordance with the prior art cannot serve, as is often desirable, as a supporting element for a conduit, but must be sustained by additional supports.

It is an object of the invention to increase the permissible load caused by forces acting on conduits of the pump, without additional costs, or the maintaining of the permissible load with lesser costs, particularly for pumps having a shaft-supporting housing portion projecting axially far beyond the main housing and the legs of the same.

It is a particular object of the invention to compensate the misalignment of the pump shaft and drive shaft, and of the corresponding coupling parts, caused by forces acting in the conduits connected with the pump.

In accordance with the prior art, an axially projecting housing portion with a bearing for the shaft, is supported by vertical supporting leg, provided in addition to the legs which support the main housing of the pump. In many cases, the standard vertical supporting leg is not sufficient to hold the relative misalignment of the shafts and coupling parts within permissible limits.

SUMMARY OF THE INVENTION

With the above objects in view, the present invention provides a slanted supporting leg which extends from

the projecting bearing housing portion of the pump housing, downward toward the drive motor, and has a lower end supported by the base plate substantially in the region under the coupling between the shafts of the pump and of the drive motor. Preferably, the supporting leg and the attaching portions of the same are hinge-shaped and are resiliently bendable.

The geomtric locus for the transmission of force from the leg to the base plate must be selected so that the smallest possible relative displacement between the coupling parts of the shafts takes place. Furthermore, due to the elastic bendable construction of the supporting leg of the invention, a guiding effect is obtained so that when forces occur on the pump conduits, a relative displacement of the coupling parts is opposed in upward direction.

One embodiment of the invention comprises a base plate; drive motor means mounted on the base plate and including a drive shaft; centrifugal pump means including a pump shaft, and housing means having a main housing secured to the base plate, and housing portion axially projecting from the main housing and supporting the pump shaft; coupling means for coupling the drive shaft and the pump shaft in an aligned position; and slanted resilient supporting means having an upper end secured to the projecting housing part and a lower end secured to the base plate substantially in the region under the coupling means for resiliently supporting the housing means against angular displacement with the base plate by a turning moment exerted on the housing means.

As a result, stressing of the housing means and base plate is prevented, and the pump shaft and drive shaft, and also the coupling parts, remain aligned.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic side elevation illustrating a centrifugal pump, a drive motor for the same mounted on a common base plate, and being provided with a slanted supporting leg in accordance with the invention; and

FIGS. 2, 3 and 4 are schematic side views illustrating modifications of the arrangement shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, a rotary centrifugal pump 1 has a main housing portion 10 with an outlet means 15 and an inlet means 14 for a fluid medium. Main housing 10 has legs 3 secured by screws, not shown, to the base plate 4 whose legs 5 are secured by screws, not shown, but schematically indicated by chain lines, to the floor of a building. A housing portion 7 projects in axial direction from the main housing 10, and supports in its free end bearing means, not shown, for the pump shaft 12 which is connected by the two coupling parts 13, 23 of a coupling with the drive shaft 22 of a drive motor 20 whose legs 21 are also secured to the base plate 4.

The free end of the projecting housing portion 7 has a projecting bracket part or portion 11 to which the attaching portion 2a of a slanted supporting leg or link 2 is secured by a schematically indicated screw 2c. The lower end of the slanted supporting leg 2 has also an attaching portion 2b, secured by schematically indicated screw 2c to the base plate 4. The lower end of supporting leg 2 and consequently attaching portion 2b are substantially located under the coupling means 13, 23, and since portion 11 is spaced from the coupling means 13, 23, the leg 2 is slanted to the plane of the base plate, and extends from the projecting housing part 7 downward towards the base plate 4 and the drive motor 20.

When forces P and turning moments M act in the plane of the drawing on the outlet means 15, pump 1 is urged by the respective forces to turn with legs 3 so that base plate 4 is deformed. Since pump 1 is connected by legs 3 with the base plate 4, pump 1 is angularly displaced with part of base plate 5, which angularly displaces drive motor 20.

When the projecting housing portion 7 of pump 1 has a tendency to be lowered with shaft 12 and coupling part 13 due to the angular displacement of pump 1 by forces P and moments, M, which would cause misalignment between the shafts 12 and 22 and between the coupling parts 13 and 23, the supporting leg 2 opposes such movement and maintains the distance between projecting housing portion 7 and the downwardly pressed base plate 4 so that shafts 12 and 22 remain aligned with coinciding axes.

FIGS. 2, 3 and 4 illustrate modifications of the supporting means 2. In the embodiment of FIG. 2, a comparatively thin supporting leg 2' consisting of sheet metal is used, which is so shaped that the force acting in the region indicated by the circle A is transmitted from the supporting housing portion 7 to the supporting leg 2', and is transmitted in the region indicated by the circle B to the base plate 4. Screw 2c is screwed through a bore in attaching portion 2a into a threaded bore of wall portion 11. At the lower end of supporting leg 2', a foot portion 26 is bent to form in the region B, an edge 27 which abuts the base plate 4. Since foot portion 26 is curved, the free end of foot portion 26 also abuts base plate 4. A screw, only schematically shown at 2c, passes through a bore in foot portion 26 into a threaded bore in base plate 4.

While the foot portion 26 of FIG. 2 projects at the lower end of supporting leg 2' toward the drive motor 20, the foot portion 26' of the embodiment of FIG. 3, projects from the bent edge 27' at the lower end of supporting leg 2'' toward the legs 3 of the pump 1.

In the embodiment of FIG. 4, the supporting leg 2 has attaching end portions 2a and 2b, and is rigid, as described with reference to FIG. 1. Screws 25 pass through bores and end portions 2a and 2b into threaded bores in wall 11 and base plate 4, respectively. Between the head of each screw 25, and the respective end portions 2a or 2b, disked springs 6 are provided so that supporting means 2, 25, 6 is resilient as are the supporting means 2', 26 and 2'', 26' described with reference to FIGS. 2 and 3.

All embodiments of the invention have it in common that the region B where the force is transmitted from the supporting leg to the base plate 4, is not located under the region A, and also is not slanted on the region A toward the legs 3 of pump 1, but is slanted from the region A downward and toward the drive motor 20 so that the region B can be placed substantially under the coupling means 13, 23.

Forces P and turning moments M exerted on the outlet means 15, and tending to turn the entire pump 1 so that the portion of the base plate 4 secured to the legs 3 is deformed, urge movement of the wall portion 11 along a circular path having its center in the region of legs 3 and base plate 4. Supporting leg or link 2 extends substantially tangentially to this circular path at an angle α to a vertical plane so that shaft 12 remains in the desired position aligned with shaft 22, and the coupling parts 13, 23 are not displaced transversaly to each other.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of pump supporting and aligning arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in a slanted supporting leg for a pump housing portion, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptions should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

We claim:

1. Pump supporting and aligning arrangement, comprising a base plate;

drive motor means secured to said base plate and including a drive shaft;

centrifugal pump means including a pump shaft aligned with said drive shaft, and housing means having a main housing secured to a portion of said base plate and a housing part axially projecting from said main housing and supporting said pump shaft;

coupling means for coupling said drive shaft and said pump shaft in an aligned position;

said main housing being angularly displaceable about an axis by forces acting on said pump means and causing deformation of said base plate, said drive motor means being angularly displaceable by said base plate when said base plate is deformed by said main housing and said projecting housing part moves about said axis; and

slanted link means rigid in the longitudinal direction thereof, and having an upper end transversely tiltably connected with said projecting housing part, and a lower end transversely tiltably connected with said base plate and located substantially under said coupling means so that forces transmitted from said projecting housing part to said upper end act longitudinally on said link means whereby said pump shaft and said drive shaft remain aligned.

2. Pump supporting arrangement as claimed in claim 1, wherein said slanted link means is elastic in a transverse direction.

3. Pump supporting arrangement as claimed in claim 1, wherein said link means holds said projecting housing part in a position in which the axes of said drive shaft and of said pump shaft intersect in the plane of said coupling means.

4. Arrangement as claimed in claim 1 wherein said supporting means includes a slanted leg, and attaching means securing the ends of said leg to said housing portion and said base plate; and wherein said leg has portions of reduced thickness adjacent said attaching means whereby said leg is resilient.

5. Arrangement as claimed in claim 1 wherein the lower end of said resilient leg is bent to form a foot portion abutting said base plate and secured to the same.

6. Arrangement as claimed in claim 5 wherein said foot portion projects toward said drive motor means.

7. Arrangement as claimed in claim 5 wherein said foot portion projects toward said main portion of said housing means.

8. Arrangement as claimed in claim 5 wherein said foot portion is curved so that a connecting edge between said leg and said foot portion, and the free end of said foot portion abut said base plate.

9. Arrangement as claimed in claim 1 wherein said supporting means includes a rigid link leg, and resilient attaching means for attaching the ends of said supporting leg to said projecting housing part and to said base plate, respectively.

10. Arrangement as claimed in claim 9 wherein said ends of said leg are rigid end portions abutting said housing part and said base plate, respectively; and wherein said resilient attaching means include screws passing through said rigid end portions and threaded into said housing portion and said base plate, and dished springs between said screws and said end portions.

11. Arrangement as claimed in claim 1 wherein said main housing has feet secured to said base plate and located in a vertical plane passing through said main housing.

* * * * *