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PUMP CONSTRUCTION

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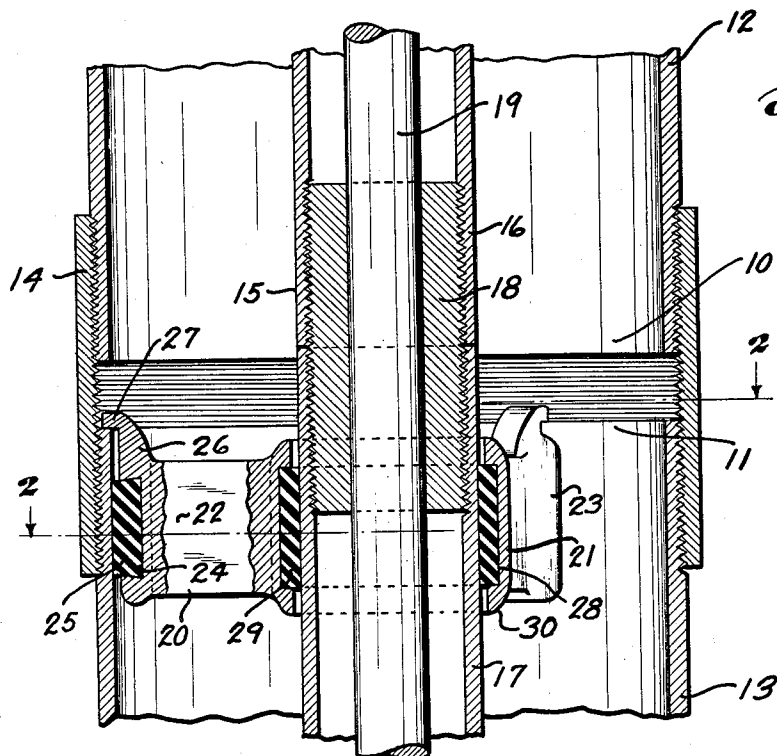


Fig. 1.

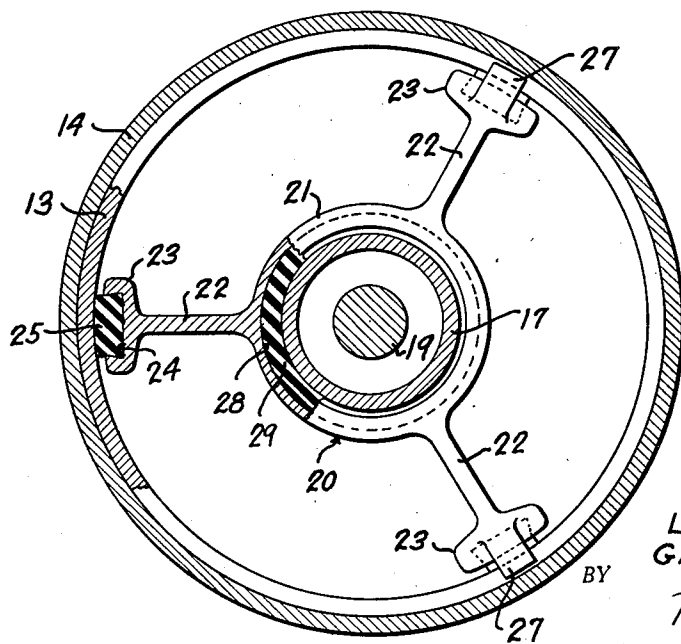


Fig. 2.

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PUMP CONSTRUCTION

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3 Claims. (Cl. 103—102)

This invention relates to improvements in pump construction, and more particularly to an improved column spider for centering and supporting the shaft tube in pump well columns of deep well turbine pumps, and the like.

An object of the present invention is attained in the provision, in a pump-column assembly, of an improved structure for centering and supporting a pump shaft tube within the outer column, the structure being substantially self-centering in a column structure formed of commercially available pipe sections having the usual mill-production variations in dimensions.

Another object is to provide a greatly improved spider for the purpose noted, which includes a central portion or hub provided with a plurality of radially extending arms, the free ends of the arms being provided with resilient cushioning elements for engagement with the inner surface of the outer column. The cushioning elements engaging the column and carried by the arms of the spider, are arranged to permit the spider to center itself within the column, and substantially to reduce the transmission of vibration from the shaft tube to the outer column.

A further object is to provide an improved spider for the purpose described, which is adapted to be assembled in a pump column without the usual securing expedients, such as screwing or clamping portions of the spider to the pump column.

Yet a further object is realized in the provision of a greatly improved column spider, which is adapted to be secured to a section of a shaft tube without the necessity of machining the tube section prior to such assembly, this advantage and economy being made possible through the provision of a resilient bearing element disposed between the spider and the shaft tube.

Further objects and advantages will appear from the following description and from the drawing, in which:

Fig. 1 is a longitudinal sectional elevation of a portion of a pump column assembly, illustrating one form of spider embodying improvements of the present invention, and Fig. 2 is a transverse section thereof, as viewed from line 2—2 of Fig. 1.

In the following description, suitable characters of reference will be employed to designate the several elements of the structures, and corresponding elements will receive the same reference character.

Referring to the drawing, numerals 10 and 11 designate the end portions of adjoining pump

column sections 12 and 13, the ends being, by preference, externally threaded for engagement with an internally threaded coupling sleeve 14. Disposed within the column assembly is a pump shaft tube structure 15 comprising tubular sections joined together in any suitable manner. As shown in Fig. 1, the adjoining ends of adjacent tubular sections 16 and 17 are secured in assembly by threaded engagement with a threaded tubular member 18 disposed internally of the tube sections. The member 18 may serve, in addition, as a bearing member for the pump shaft section 19.

In order properly to center the shaft tube assembly 15 within the outer column, and to provide lateral support therefor, spacing members are, by preference, disposed at spaced intervals along the shaft tube. Such a spacing member or spider is illustrated at 20, and it is this member of the pump column structure which embodies the improvements of the present invention. The spider may be formed of any suitable material possessing the required strength and rigidity, such as bronze or cast iron.

As shown, the spider 20 includes a hub portion 21 adapted to surround, in sleeved relation, the shaft tube structure 15, and a plurality of radially extending arms 22. In the presently preferred example, the spider is provided with three such arms, the number of arms being a minimum consistent with a stable structure, whereby to facilitate a self-centering of the member in the well column. It will also be observed from Fig. 2, that the lateral width of each arm is relatively small, in order to effect a skeleton structure and so reduce to a minimum obstruction of the upward flow of water in the column. The free end of each arm is provided with a holder portion 23, which may be formed integrally with the arm. Formed in the portion 23, is a pocket 24 which is, by preference, of dovetail section, as shown. A cushion element 25 of rubber or other resilient material, is secured in the dovetail pocket, preferably by pressing the element therein, so that a portion thereof extends radially beyond the end of the portion 23, whereby the cushion element will frictionally engage, normally under a slight compression, the inner surface of the outer column. The size and resilience of the element 25 is so proportioned, according to the size of the spider to which it is to be assembled, as to effect a substantial frictional gripping action of the element upon the internal surface of the column. It will be clearly seen that, by reason of the spacing of the spider arms

and the resilient elements 25, the spider is substantially self-centering, and hence in the assembled pump structure, the shaft tube will be centered within the outer column. It will be noted, also, that the resilient elements 25 effect a cushioning action between the spider and the outer column, whereby the transmission of vibrations from the shaft tube structure to the column is substantially reduced, in comparison with rigid assemblies of corresponding parts.

As a presently preferred means for preventing the spider from moving or slipping down the column, one or more of the arms may be provided with an angulate finger or lug 26, the outer end portion 27 of which is adapted to be disposed between the adjacent ends of outer column sections 12 and 13, as clearly illustrated in Fig. 1. The finger portion 26 rests upon the upper edge of column section 13, and the lower end of the adjacent column section 12 is, by preference, spaced from the end of the lower column section a distance sufficient to prevent binding of the finger or fingers between the ends of the column sections.

The spider hub 21 is, by preference, provided with a bore 28 having a diameter substantially larger than that of the shaft tube 15 extending through the hub. Seated in the bore 28, is a resilient ring element or centering member 29, formed of rubber or other suitable resilient material. The centering element is preferably of such size as to require it to be compressed into assembly in the hub bore 28. In order to insure against displacement of the centering element, the hub is provided with a flange shoulder 30 on each end thereof, in overlying relation to the ends of the centering element, whereby effectively to confine the centering element to this hub bore. In assembling the spider to the shaft tube structure 15, the tube section to which the spider is to be applied is inserted through the rubber centering member, which is thereby compressed about the tube to effect a firm securement thereof. The centering member being formed of a resilient material such as rubber, will absorb such vibrations as normally occur in the shaft tube structure during operation of the pump assembly.

From the foregoing description of a spider embodying the improvements of our invention, it readily may be seen that the improved spiders clearly attain the several objects enumerated hereinabove, and that a sturdy and compact spider structure is provided which is fully capable of a long life under all pump operating conditions. As before described, the spider arms are,

by preference, formed of minimum thickness, consistent with the requisite strength, in order to reduce the obstruction to the upward flow of water in the well casing.

It will be understood, of course, that the embodiment of our invention herein described and illustrated may be altered or modified without departing from the spirit and intended scope of the invention, as defined by the appended claims.

We claim:

1. In a pump, in combination with an outer casing, a pump shaft extending within the casing, a stationary tube enclosing said shaft, and means for centering said shaft tube within the casing, comprising a spacing member having a hub portion about said shaft tube, and a plurality of arms extending radially therefrom, resilient elements in the ends of said arms, adapted for frictional engagement with said casing, a resilient bearing member carried by said hub, for frictional engagement with said tube, and means carried by said arms adapted for engagement with a portion of said outer casing, for positioning said centering means along said shaft tube.

2. In a pump, in combination with an outer casing, a pump shaft extending within the casing, a stationary tube enclosing said shaft, a tube-centering spider within the casing, including a skeleton spacing member having a hub portion about said shaft tube and a plurality of radial arms, rubber cushions interfitted to the ends of the arms and adapted for frictional engagement within the inner surface of the casing, a resilient bearing member carried by said hub for frictional engagement with said tube, and means carried by said arms adapted for engagement with a portion of said outer casing for positioning said centering means along said tube.

3. In a pump, in combination with an outer casing, a pump shaft extending within the casing, a stationary tube enclosing said shaft, a tube-centering spider within the casing, including a skeleton spacing member having a hub portion about said shaft tube and a plurality of radial arms, rubber cushions projecting from the ends of the arms and adapted for frictional engagement within the inner surface of the casing, a rubber sleeve carried internally of said hub for frictional engagement with said tube, and a lug element carried by each of said arms, the lugs being spaced from said cushions, and adapted for engagement with a portion of said outer casing for positioning said centering means along said tube.

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