Jan. 12, 1954

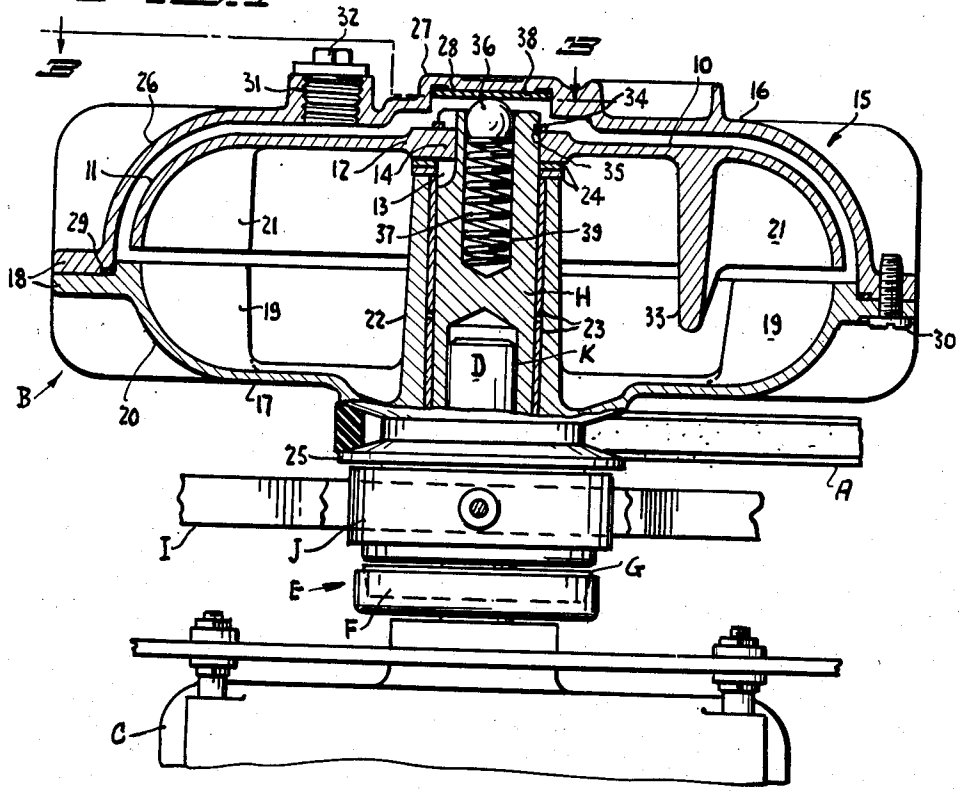
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2,665,553

ROTARY TURBINE-TYPE HYDRAULIC COUPLING

Filed June 7, 1952

FIG. 1



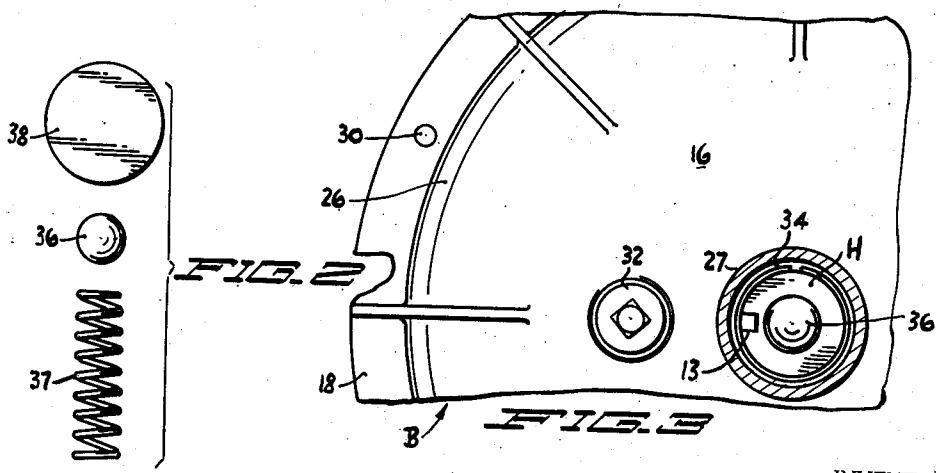


FIG. 2

FIG. 3

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ROTARY, TURBINE-TYPE HYDRAULIC COUPLING

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3 Claims. (Cl. 60—54)

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This invention relates generally to improvements in fluid couplings for driving certain operating parts of clothes washing machines and of the general type disclosed in the George P. Castner Patent No. 2,513,845, issued July 4, 1950. The fluid coupling per se is also similar in general to the Harry J. Mertz Patent No. 2,526,082, issued October 17, 1950.

As shown in the Castner patent above referred to, the clothes washing machine, for use with which our invention is adapted, includes a clothes receptacle which is rotated by an electric motor for centrifugally extracting the cleansing liquid, and the receptacle is driven from the motor through the intermediary of a rotary fluid coupling. This coupling is so constructed and arranged that it has high initial slippage characteristics and this is very desirable in that it allows the receptacle to be gradually accelerated when the spinning rotation is started for centrifuging the washing liquid from the receptacle. This gradual acceleration reduces the starting load on the motor and reduces the vibration to which extractors of this type are subject, all as pointed out in detail in the patent in question. The fluid coupling itself includes cooperating, superimposed fluid containing and vaned driving and driven elements which are arranged on a vertical axis and the coupling is not completely filled with fluid as is customary. This uppermost of said vaned elements is the driving element or impeller and in order to set the fluid in motion it is then necessary to provide this element with one or more starting vanes which depend into the body of fluid in the lower element.

In order to utilize the resulting high rate of starting slippage in this coupler it is, of course, necessary that the driving and driven elements be arranged for free relative motion and some difficulty has been encountered from the fact that end play develops between these elements and causes an undesirable chattering effect. In the George P. Castner application Serial No. 62,009, filed November 26, 1948, now Patent No. 2,623,359, issued December 30, 1952, there is shown a similar fluid coupling with provision for taking up this end play and preventing noisy operation of the coupler but it is the primary object of our present invention not only to improve the construction of the coupling itself in order to facilitate manufacture, installation and servicing thereof, but to provide an improved and very effective but simple means for continuously taking up or eliminating end play between the relatively movable parts of the unit, without interfering with the desirable relative rotation of such parts.

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Another object of our invention is to provide an improved end play take-up for a fluid coupling of this kind, consisting of but three parts, i. e., a ball, a spring and a thrust or wear dish, and the latter being so arranged that it may be readily and inexpensively replaced when worn.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawing, in which—

Fig. 1 is a vertical diametrical sectional view of a coupling according to our invention showing a simple arrangement for driving same from an electric motor, and illustrating the end play take-up means.

Fig. 2 is a composite view of the elements making up the end play take-up means, per se.

Fig. 3 is a fragmentary plan and horizontal sectional view taken substantially along the line 3—3 in Fig. 1.

Since the details of the clothes washing machine are shown in the prior Castner patents identified above, they are not repeated herein and it will suffice for an understanding of the present invention to explain that the rotary receptacle or tub containing the clothes and cleansing liquid is rotated by a drive belt here shown at A, through a fluid coupling designated generally at B, which in turn is driven by an electric motor C. This motor is arranged with its shaft D upwardly, vertically extended and the coupling is mounted directly upon this shaft, the coupling thus operating on a vertical axis. Not material to the present disclosure, but shown merely to illustrate one manner in which torque is transmitted to the coupling from the motor, is a clutch E the female part F of which is secured to the motor shaft D and the male part G of which is secured to a center drive shaft or sleeve H in the coupling. So far as material to this invention the shaft H may be considered as an extension of, or adapter on, the motor shaft D, with which it rotates when clutch E is engaged.

Turning now to the construction of the fluid coupling itself the same comprises a circular impeller or driving element 10 dished downward around its peripheral edge 11 and centrally provided with an apertured hub 12 to receive the upper end portion of the shaft H. This shaft has a keyway 13 and the hub 12 a key 14 entering the keyway to drive the impeller. Surrounding the impeller 10 is a housing 15 made up of

upper and lower reversely dished sections 16 and 17 outwardly and marginally flanged at 18 where they meet. The lower section 17 acts as the driven element of the coupler and has a series of radial vanes 19 around its upwardly dished peripheral edge 20, spaced from and facing similar drive vanes 21 on the impeller 10. Centrally the lower housing section 17 has a long upwardly extending tubular bearing sleeve 22 journaled by means of bushings 23 upon the shaft H, the upper end of this sleeve being spaced from the underside of the hub 12 by interposed washers 24. This lower housing section 17 further has, below its center, an integral pulley 25 to accommodate and drive the aforesaid belt A.

The upper section 16 of the housing 15 is larger than and encloses the impeller 10, being correspondingly dished downwardly around its peripheral edge portion 26, and centrally this upper section 16 is upwardly embossed at 27 forming a raised circular center or recess 28 aligned with and spaced above the upper end of the shaft H. The aforesaid flanges 18 are provided with a seal gasket 29 and are secured together at intervals by cap screws 30. The housing is thus fluid tight and it is partially filled with fluid through a filler opening 31 on the upper section 16, normally closed by a plug 32. In practice the coupling contains fluid in an amount such that, at rest, it is below the level of the upper driving vanes 21 or thereabouts, and to set the fluid in motion causing it to vortex and establish driving engagement with both sets of vanes the impeller or driving element 10 is provided with one or more starting vanes 33. This vane, as shown, extends down into the lower part of the housing, inwardly of the driven vanes 19, and so dips into the fluid with the result that, as the element 10 begins to rotate, the starting vane gradually sets the fluid in motion until it establishes a fluid torque transmission between the vanes 21—19. As this occurs the housing 15 begins to rotate and since it is loaded by the receptacle through the belt A and pulley 25 there results a considerable initial slippage between the driving and driven parts of the coupling. As stated supra this permits a very desirable gradual and smooth acceleration of the receptacle.

The impeller or driving element 10 is held against upward displacement on shaft H by means of a snap ring 34 in a groove 35 in said shaft and overlying the hub 12. The entire coupling in the arrangement here shown is raised or lowered slightly, for engaging and disengaging the clutch E, by a shipper lever I operating a shifting collar J and in so doing the shaft H is moved axially on the motor shaft D, the former having a downwardly opening bore K receiving the motor shaft as shown. However, according to our invention the housing 15 is continuously spring biased upwardly and axially with respect to the impeller 10 by what we refer to as an end play take-up consisting of a bearing ball 36, a spring 37 and a thrust disk or wear plate 38.

The shaft H has an upwardly opening axial bore or chamber 39 of a diameter such as to nicely accommodate first the spring 37 and then the ball 36 with the ball supported on the spring and urged thereby upwardly from the bore. The circular center 28 of the housing 15 receives the thrust disk 38 and the ball bears upwardly on

the underside thereof centered on the axis of rotation so that the housing is continuously urged upward to take up any end play which may be present initially or develop during the life of the unit, preventing undesirable chattering noises and reducing wear as will be apparent. Since the actual added contact between the relatively movable parts is only by the ball 36 the interference with the desired relative rotation of these parts will be negligible and the use of the thrust disk 38 permits convenient and inexpensive replacement of this part whenever necessary.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described our invention, what we claim to be new and desire to protect by Letters Patent is:

1. In a fluid drive coupling for mounting on a rotating drive shaft, an impeller secured on the shaft, a fluid containing housing enclosing the impeller and rotatable with reference to said shaft and having limited end play with reference to the shaft and impeller, said drive shaft having an axial bore with an end opening toward the adjacent center of the housing, a ball in the open end of the bore and a spring in the bore biasing the ball toward the center of the housing, and a thrust disk between the ball and the housing whereby the spring bias on the ball will take up end play between the impeller and housing.

2. In a fluid drive coupling for mounting on a rotating drive shaft, an impeller secured on the shaft, a fluid containing housing enclosing the impeller and rotatable with reference to said shaft and having limited end play with reference to the shaft and impeller, the said housing having a circular center recess adjacent to and spaced from the end of the drive shaft and said shaft having an axial bore opening through this end, a thrust disk fitted into said chamber inside the housing, a ball in the said bore, and an expansion coil spring in the bore engaging the ball and thrusting it against said disk for taking up end play between the impeller and housing.

3. In a fluid drive coupling for mounting on a rotating drive shaft, an impelller secured on the shaft, a fluid containing housing enclosing the impeller and rotatable with reference to said shaft and having limited end play with reference to the shaft and impeller, the said housing having a central emboss and interiorly thereof a recess facing the adjacent end of the shaft and spaced therefrom, a replaceable thrust disk in said recess, the shaft having an axial bore opening toward the thrust disk, a ball in said bore, and an expansion coil spring in the bore braced against the ball and thrusting the same against the disk to continually take up end play between the impeller and housing.

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