FLUID POWER TRANSMITTER

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My invention relates to fluid driving devices such as fluid couplings employed to transmit drive through the medium of a working fluid.

An object of my invention is to provide a fluid coupling with simplified and improved means for minimizing surge and vibration.

Another object is to provide improved operation of couplings of the type having variable fill of the working fluid.

A further object of my invention is to provide an improved baffle means for the working fluid adapted to provide improved efficiency, reduction in drag, surge, and roughness, especially in fluid couplings of the variable fill types.

Further objects and advantages of my invention will be more apparent as this specification progresses, reference being had to the accompanying drawing illustrating several embodiments thereof and in which:

Fig. 1 is a longitudinal sectional elevational view through the upper half portion of my coupling.

Fig. 2 is a detail sectional plan view taken at line 2—2 of Fig. 1.

Fig. 3 is a view generally similar to Fig. 1 but showing a modification.

Fig. 4 is a sectional elevational view taken along line 4—4 of Fig. 3.

Fig. 5 is a further view generally similar to Figs. 1 to 3 but showing another modification.

Referring to the drawing, I have illustrated in Figs. 1 and 3 a fluid coupling of the variable fill type although my improvements are also applicable with resulting advantages to couplings of the fixed fill type in which the fluid is subjected to a constant fill as in Fig. 5.

In Fig. 1 the driving shaft 10 has fixed thereto the welded assembly comprising the hemi-toroidal impeller A and its shrouding 11 within which the companion hemi-toroidal runner B is disposed for driving the driven shaft 12 fixed to the runner. The Impeller A carries a circumferential series of radial vanes 14 and similar vanes 15 are carried by runner B.

Where the coupling is operated with variable fluid fill to vary the slip some means is provided for controlling the quantity of fluid in the coupling. In Fig. 1 fluid is introduced by supply pipe 16 under control of valve 17 whence the fluid reaches the coupling working chamber at vanes 14 and 15 by the system of passages 18 and 19. The fluid escapes from the coupling at one or more nozzles 20 into a chamber 21 provided by stationary casing 22 having a suitable valve-controlled escape (not shown) at the bottom of the casing. By regulating the amount of fluid introduced to the coupling for a given size of escape at 20 it will be apparent that any desired quantity of fluid may be provided in the coupling. By closing valve 17 the coupling will rapidly empty at nozzle 20.

It has been deemed necessary heretofore, especially with variable fill couplings, to provide a torus ring for the vanes 14 and 15 in order to minimize surge and vibration. With my coupling I provide the vanes 14 and 15 with a recess at 23 and 24 respectively such that a toroidal chamber or space 25 is, in effect, defined around which the fluid circulates in the spaces or vane passages between adjacent vanes of the impeller and runner as at 25'. However, this chamber 25 is freely directly open to the vane passages at points between the inner transfer zone 26 and the outer transfer zone 27.

The space 25 receives a non-active volume of fluid, minimizes surge and vibration and allows free circulation of the fluid without restriction as in the case of more conventional arrangements wherein torus rings are provided bounding the chamber 25. My arrangement is especially beneficial in variable fill couplings especially when operating at relatively small fills and also permits elimination of the customary torus rings with resulting simplification and saving in cost.

I have also provided an improved baffle arrangement at zone 25 comprising baffle plates 28 secured to the terminal portions of vanes 15, preferably at each side of each vane, these plates projecting circumferentially from the associated vane into a vane passage 29. These baffles provide the desired restriction to fluid flow, especially at low speeds of impeller A, but do not fully cut-off the fluid flow at the vane termini thereby resulting in improved coupling efficiency, especially at relatively high coupling speeds and small slips. At high slips the baffle plates serve to minimize drag and surge, and to provide smoother coupling operation than in the case of more conventional types of baffles.

Referring to Fig. 3 the Fig. 1 coupling is provided with a modified form of baffle means in the form of annular generally axially extending rings 29 which have frusto-conical portions projecting forwardly from the terminal of runner vanes 15 and into zone 26 where the rings are deflected radially inward: Fluid may flow between the vane passages of member B and inner zone 26 both inwardly and outwardly adjacent each of the rings 29. The operation and advantages of these baffle rings is substantially the...
same as in the Fig. 1 arrangement. The baffle members 28 or 29 may be employed to advantage either with or without the novel chamber arrangement at 25 and in conjunction with either variable or fixed fill couplings.

In Figs. 5-1 have illustrated the coupling of Fig. 1 without provision for variable fill, this coupling being of the fixed fill type. The Fig. 5 coupling is shown provided with the novel toroidal chamber 25, as in Figs. 1 and 3, although of slightly different shape.

In Figs. 1, 3 and 5 the fluid circulates in the vortex circuit passages provided by the vanes of Impeller A and runner B, the circuit having a smooth boundary except for the restriction introduced by the baffle members 23 in Fig. 1 and 24 in Fig. 3. If desired, only one of the coupling members may have its vanes recessed as at 23 or 26 thereby defining an annular chamber of substantially hemi-toroidal shape at the central region of the vortex fluid circulation.

I claim:

2. A fluid coupling comprising a cooperating pair of rotatable substantially hemi-toroidal driving and driven members each having a series of circumferentially spaced generally radially extending vanes substantially normal to the plane of rotation of the members defining vortex fluid passages providing vortex fluid flow between said members, the vanes of said members being recessed at the central region of the vortex and defining a coreless substantially toroidal fluid chamber coaxial with said members at said region directly open to said vane passages substantially throughout the peripheral edges of said recesses.

3. A fluid coupling comprising a cooperating pair of rotatable substantially hemi-toroidal driving and driven members each having a series of circumferentially spaced generally radially extending vanes substantially normal to the plane of rotation of the members defining vortex fluid passages providing vortex fluid flow between said members, the vanes of said members being recessed at the central region of the vortex and defining a coreless substantially toroidal fluid chamber coaxial with said members at said region directly open to said vane passages between adjacent vanes of said members throughout the extent of the peripheral edges of said recesses.

4. A fluid drive transmitter comprising a pair of cooperating rotatable members in fixed axial relationship to each other arranged face to face and conjointly defining a liquid working chamber each member having a series of circumferentially spaced generally radially extending vanes substantially normal to the plane of rotation of the members defining vortex fluid passages providing vortex fluid flow between said members, the vanes of said members being recessed at the central region of the vortex and defining a coreless substantially toroidal fluid chamber at said region co-axial with said members having unobstructed access to said vane passages between adjacent vane edges of said members.

5. A fluid coupling of the type having variable fill of the working fluid, comprising a pair of cooperating rotatable members arranged face to face and conjointly defining a fluid working chamber, each member having a series of circumferentially spaced generally radially extending vanes substantially normal to the plane of rotation of the members defining vane passages providing vortex fluid flow between said members, the vanes of said members being recessed at the central region of the vortex thereby defining a coreless substantially toroidal fluid chamber coaxial with said members at said region directly open to said vane passages between adjacent vanes of said members throughout the extent of the peripheral edges of said recesses and means for varying the fluid fill of the coupling at will during operation thereof.

6. A fluid coupling of the type having a variable fill of the working fluid, comprising a cooperating pair of rotatable hemi-toroidal, rotatable driving and driven members conjointly defining a liquid working chamber, each member having a series of circumferentially spaced generally radially extending vanes substantially normal to the plane of rotation of said members with adjacent vanes on each member defining passages between them for vortex fluid flow between said vane passages for receiving fluid during operation of the coupling, and means for varying the fluid fill of said working chamber during operation of the coupling.

7. A fluid coupling of the type having variable fill of the working fluid, comprising a cooperating pair of rotatable hemi-toroidal, rotatable driving and driven members conjointly defining a liquid working chamber, each member having a series of circumferentially spaced generally radially extending vanes substantially normal to the plane of rotation of said members with adjacent vanes on each member defining passages between them for vortex fluid flow between said vane passages for receiving fluid during operation of the coupling, and means for varying the fluid fill of said working chamber during operation of the coupling, including inlet and outlet passages and a casing surrounding said working chamber to receive fluid discharged from said outlet passage.