Nov. 13, 1951 D. S. NOWAK 2,574,492

ROTARY TURBINE TYPE HYDRAULIC COUPLING

Filed May 14, 1948 2 SHEETS—SHEET 1

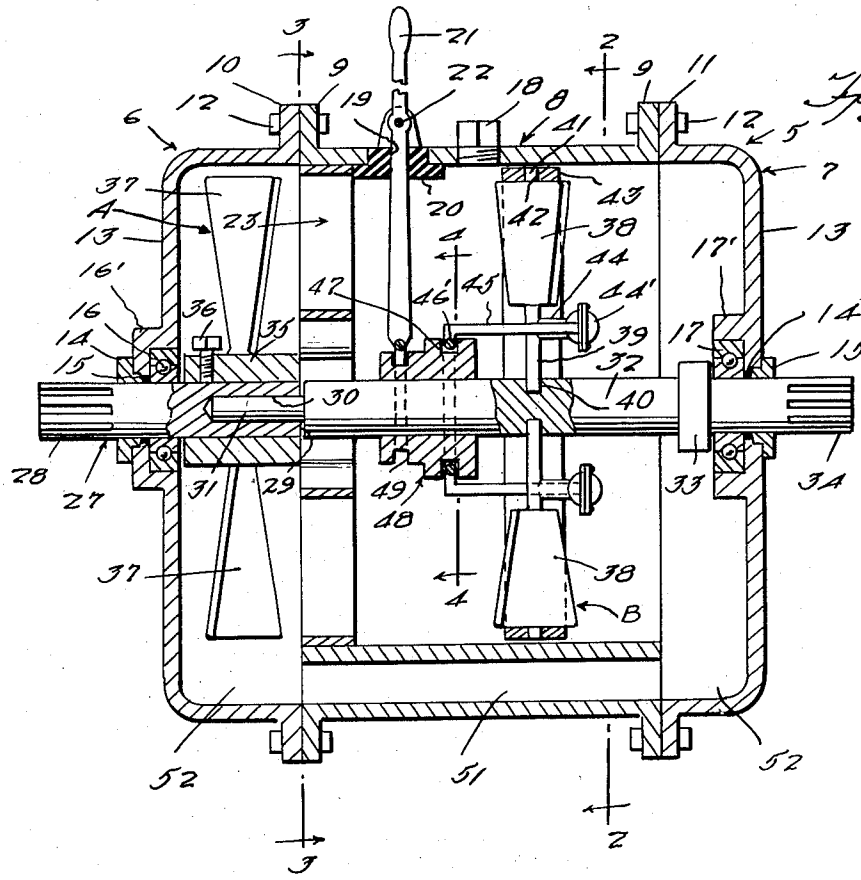



Fig. 1.

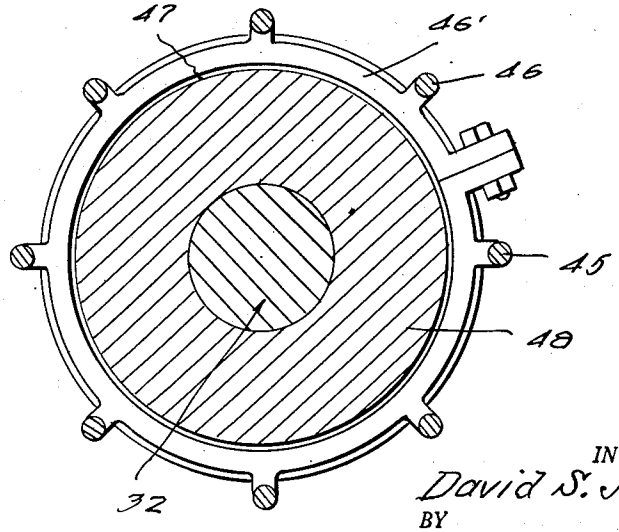



Fig. 4.

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Fig. 2.

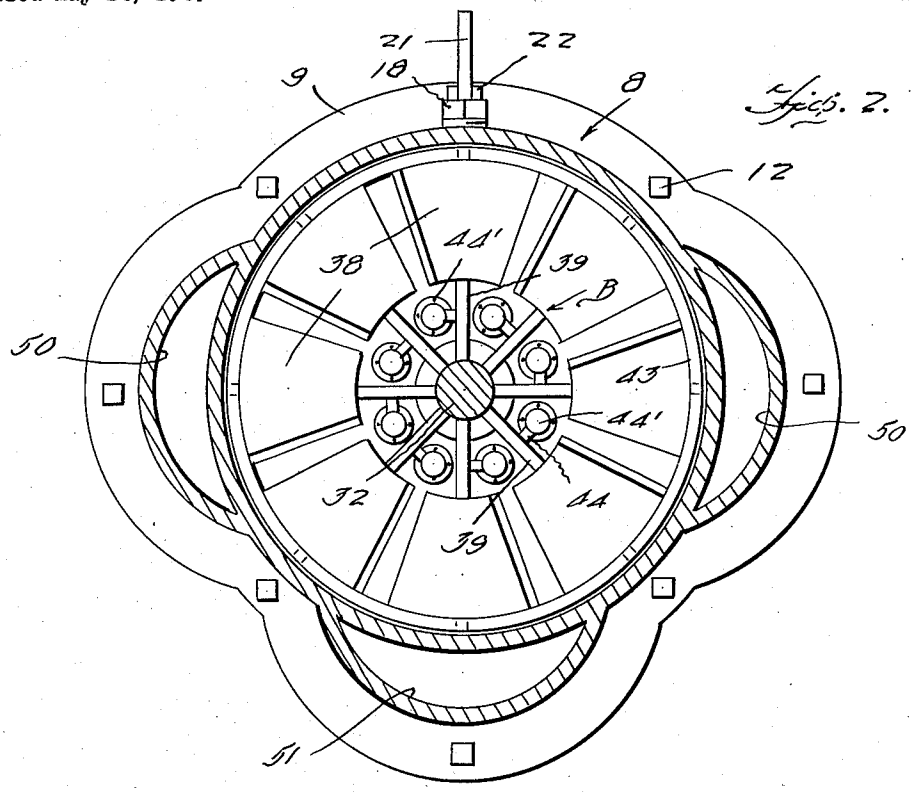
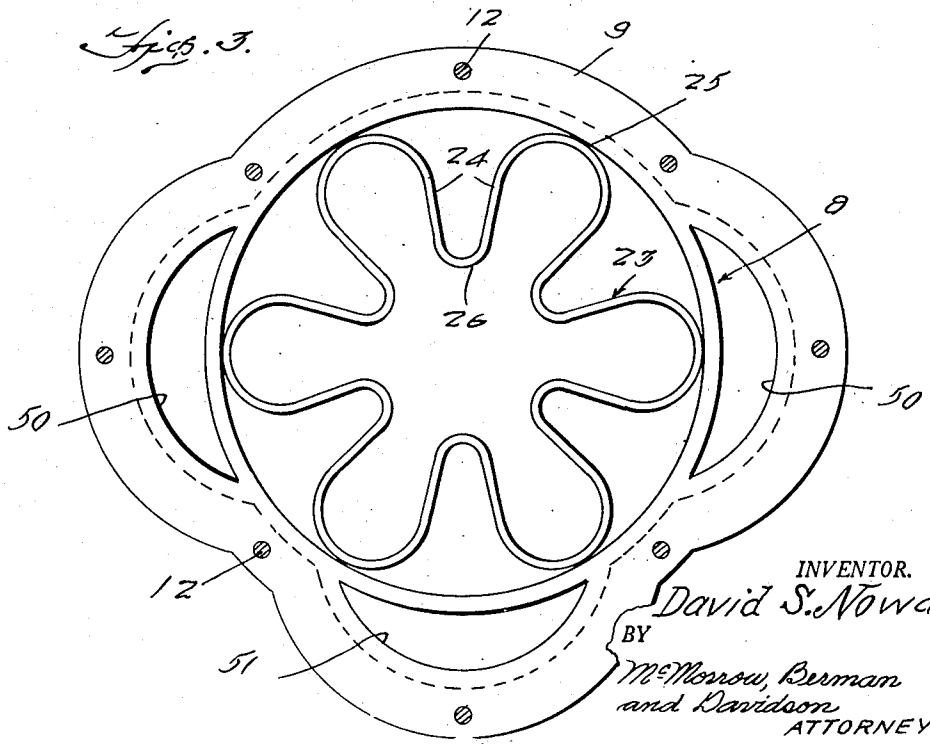



Fig. 3.




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## ROTARY TURBINE TYPE HYDRAULIC COUPLING

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2 Claims. (Cl. 60—54)

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This invention relates to an improved hydraulic transmission or fluid drive in which the pitch of the blades of one of the rotors can be changed to vary the amount of hydraulic coupling between the drive and driven rotors at will, the primary object of the invention being to provide an efficient and effective device of this kind which is simple and relatively inexpensive in construction, and is especially, although not exclusively, adapted for use in automotive vehicles and the like.

Another important object of the invention is the provision of a device of the character indicated above having a driven rotor having blades mounted for rotation on their axes connected to manual means for feathering these blades in a manner to increase or reduce at will the amount of fluid coupling between the drive rotor and the driven rotor, the driven rotor being arranged in a casing having conduit means for by-passing back to the zone of the driven rotor the hydraulic fluid acting upon and passing the driven rotor, whereby interference by such fluid with the action of the driven rotor is eliminated or substantially reduced and efficient circulation of the fluid between the drive and driven rotors is promoted.

Other important objects and advantageous features of the invention will be apparent from the following description and accompanying drawings, wherein for present purposes of illustration only, a specific embodiment of the invention is set forth in detail.

In the drawings:

Figure 1 is a vertical longitudinal section,

Figures 2, 3 and 4 are transverse vertical sections taken through Figure 1 on the lines 2—2, 3—3, and 4—4, respectively.

Referring in detail to the drawings, the numeral 5 generally designates the casing of the illustrated device, comprising an intermediate section 8, a front section 6, and a rear section 7, the intermediate section having lateral flanges 9, 9 which are secured to lateral flanges 10 and 11 on the front and rear sections, respectively, by means of bolts 12, as shown in Figure 1.

The cup-shaped front and rear sections are substantially similar, their end walls 13 having axial shaft openings 14, with fluid seals 15 at the outer sides thereof, and with anti-friction bearings 16 and 17, respectively, seated in annular flanges 16' and 17', respectively, forming recesses on the inner sides of said end walls accommodating the bearings.

The tubular intermediate section 8 has a filling opening in its top wall closed by a plug 18, and forwardly of this an opening 19, closed by a fluid seal 20, through which a feathering hand lever 21 passes into the interior of the casing, which is pivotally mounted on a bracket 22 on the top of the intermediate section.

Secured axially in the forward end of the intermediate section is the fluid turbulence reducer

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and guide 23, formed of flat metal bar and having the symmetrical sexfoil shape shown in Figure 3, the foils 24 being enlarged and rounded at their outer ends 25 where they connect with the intermediate section wall, the portions 26 between the foils being on a circle whose diameter is larger than that of the hubs of the rotors as hereinafter described.

The front drive shaft 27 is splined on its forward end, as indicated at 28, for connection to drive means (not shown), such as an engine, and is journalled in the front section bearing 16 and its rear end 29 terminates close to the guide 23, and is formed with an axial bore 30, in which turns the reduced forward portion 31 of the driven shaft 32.

The driven shaft 32 is journalled in the rear section bearing 17 and has a thrust collar 33 engaging this bearing, and a splined rear end 34 projecting rearwardly from the casing 5 for connection to a driven element (not shown), such as the drive shaft of an automobile.

Mounted on the drive shaft 27, as shown in Figure 1, is the drive rotor A comprising the hub 35 substantially occupying the space between the bearing 16 and the fluid guide 23 and of substantial diameter, which is fixed to the shaft by suitable means such as a set screw 36. Pitched fan blades 37 are fixed on and radiate from the hub 35 intermediate its ends, the outer ends of the blades 37 running close to the sides of the front casing section 6.

As shown in Figure 1, the driven rotor B is located in the intermediate casing section 8 at a point intermediate its front and rear ends, and comprises a plurality of fan or propeller blades 38 having axial stems 39 journalled in radial bores 40 formed in the driven shaft 32, with pins 41 on their outer ends journalled in bores 42 formed in a flat annulus or ring 43 which runs close to the wall of the intermediate section 8. The stems 39 have radial arms 44 terminating in ball and socket joints 44' serving as swivel connections with the rear ends of feathering links 45 which extend forwardly of the driven rotor B substantially parallel to the driven shaft 32.

The forward ends of the links 45 have lateral portions 46 joined to a ring 46' seated in and operatively engaging a peripheral groove or slot 47 in the cylindrical shift block 48 which is rotatably and slidably journalled on the driven shaft 32 forwardly of the driven rotor B beneath the shift lever 21, the last having its lower end operatively engaged in a groove 49 formed in a forward part of the block 48. By means of this arrangement, rearward and forward swinging of the lever 21 will shift the block 48 forwardly and rearwardly, respectively, along the shaft 32 and thereby reduce and increase, respectively, the pitch angle of the blades 38 of the driven rotor B by turning them correspondingly on their stems 39 and pins 41, so as to reduce and increase, cor-

respondingly, the amount of fluid coupling between the driven rotor B and the drive rotor A, when the latter is turning and rotates and drives the hydraulic fluid present in the casing 5 rearwardly against the driven rotor to cause its rotation in the same direction. The fluid guide 23 being positioned directly behind the drive rotor A permits free movement of the fluid as impelled by the drive rotor A toward the driven rotor B, but prevents undue surging of the fluid and reduces the rotation of the fluid and causes the fluid to move rearwardly against the driven rotor B with a predominantly rectilinear motion, by reason of which the fluid pressure from the drive rotor A is more immediately and effectively transmitted to the driven motor B.

For the purpose of eliminating or reducing the interference which the fluid moving beyond the driven rotor B would otherwise have upon the action of the fluid impelled by the drive rotor A toward and against the driven rotor B, and hence upon the efficient action of the transmission as a whole, the intermediate casing section 8, which like the front and rear casing sections 6 and 7 is cylindrical in form, has crescent cross section tubular conduits 50, 50 on opposite sides thereof, and a single similar conduit 51 on the bottom thereof, as indicated in Figures 2 and 3, the opposite ends of these conduits opening into the front and rear casing sections, which has crescent shaped bulges 52 in their side walls registering with these conduits. The conduits 50, 50 and 51, extending as they do the full length of the intermediate section 8, as by-passes enabling the fluid under pressure beyond the driven rotor B to pass forwardly to the region of the drive rotor A, without interfering with or backing up the fluid impelled by the drive rotor A toward the driven rotor B, while at the same time supplying quiet fluid to the drive rotor A at circumferentially spaced points adjacent to the periphery of the rotor A.

What is claimed is:

1. A hydraulic coupling comprising a cylindrical casing adapted to contain a fluid therein, a rotatable drive shaft arranged longitudinally of and within said casing adjacent one end thereof and having one end rotatably projecting through and out of said one end of said casing for connection to a driving element, a rotatable driven shaft arranged longitudinally of and within said casing in end to end aligned relation with respect to the other end of said drive shaft, and having its adjoining end journaled in the adjoining end of said drive shaft and having the other end rotatably projecting through and out of the other end of said casing for connection to a driven element, a hub positioned within said casing adjacent said one end thereof and fixedly supported on said drive shaft, a first group of blades fixedly arranged radially about said hub, a second group of blades arranged radially about said driven shaft, said driven shaft having radial sockets formed therein, said blades of the second group having reduced inner ends journaled in the sockets and each of said blades being mounted on said driven shaft for rotation therewith, and for oscillation about an axis radially of said driven shaft, a shift block slidably circumposed about said driven shaft and mounted thereon for movement toward and away from said second group of blades, means operatively connected to said block and each of the blades of said second group for effecting the simultaneous oscillation of said blades about axes radially of said shaft upon the movement of said block toward and away from said second group of blades to change the pitch of said blades, and means exteriorly of and pivotally connected to said casing for rocking movement about an axis transverse of said casing and having one end engageable with said block for effecting the movement of said block toward and away from said second group of blades.



2. A hydraulic coupling comprising a cylindrical casing adapted to contain a fluid therein, a rotatable drive shaft arranged longitudinally of and within said casing adjacent one end thereof and having one end projecting through and out of said one end of said casing for connection to a driving element, a rotatable driven shaft arranged longitudinally of and within said casing in end to end aligned relation with respect to the other end of said drive shaft and having the end adjoining said drive shaft journaled in the adjoining end of said drive shaft and having the other end rotatably projecting through and out of the other end of said casing for connection to a driven element, a hub positioned within said casing adjacent said one end thereof and fixedly supported on said drive shaft, a first group of blades fixedly arranged radially about said hub, a second group of blades arranged radially about said driven shaft, said driven shaft having radial sockets formed therein, said blades of the second group having reduced inner ends journaled in the sockets and each of said blades being mounted on said driven shaft for rotation therewith, and for oscillation about an axis radially of said driven shaft, a shift block slidably circumposed about said driven shaft and mounted thereon for movement toward and away from said second group of blades, an arm projecting transversely from each of the blades of said second group adjacent to and spaced from the inner end of each of said blades, a longitudinally disposed link positioned adjacent to the inner end of each of the blades of said second group having one end universally connected to the projecting end of the adjacent one of said arms and having the other end operatively connected to said shift block for effecting the simultaneous oscillation of said blades about axes radially of said shaft upon the movement of said block toward and away from said second group of blades to change the pitch of said blades, and said casing having an opening in its side wall, a resilient packing member in said opening, a lever disposed through said packing member and pivoted exteriorly of said casing for rocking movement about an axis transverse of said casing and having an inner end engageable with said block for effecting the movement of said block toward and away from said second group of blades.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 843,874 | Dörwald | Feb. 12, 1907 |
| 1,095,132 | Thomson | Apr. 28, 1914 |
| 1,304,566 | Hornbrook | May 27, 1919 |
| 1,927,040 | Klimek | Sept. 19, 1933 |
| 1,993,741 | Jandasek | Mar. 12, 1935 |
| 2,368,279 | Wemp | Jan. 30, 1945 |
| 2,382,034 | Wemp | Aug. 14, 1945 |