May 22, 1945. J. R. TEAGNO 2,376,462

TURBO TRANSMISSION

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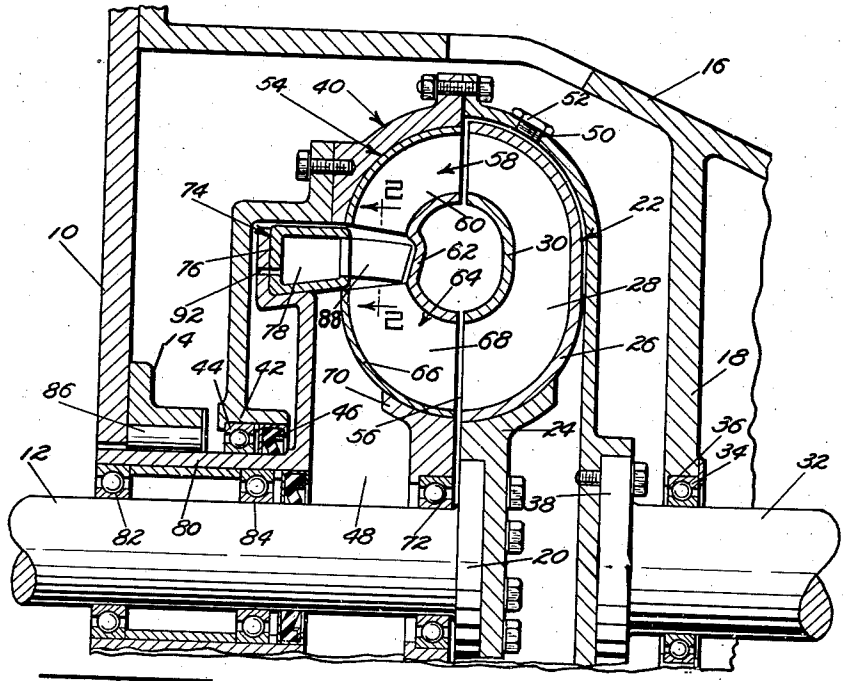


FIG 1

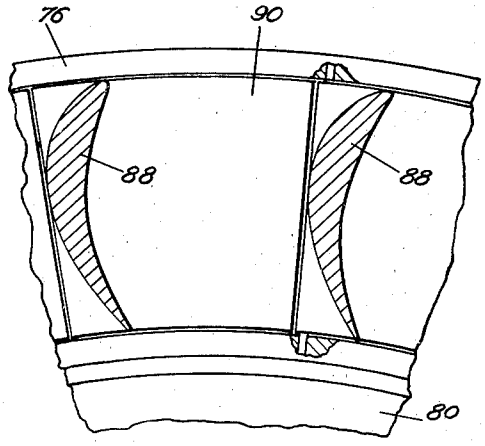


FIG 2

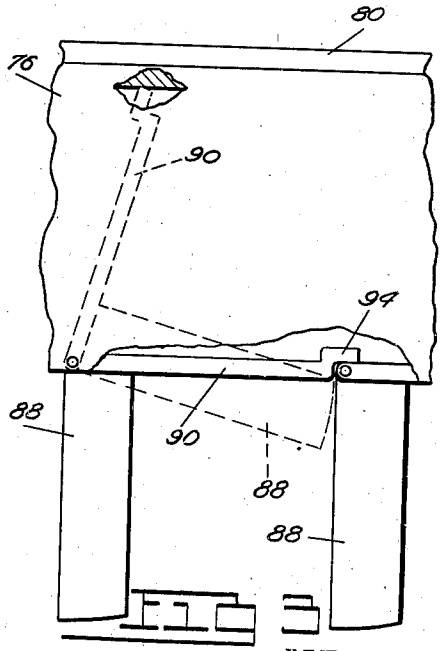


FIG 3

INVENTOR.

BY JOSEPH R. TEAGNO

O. H. Fowler

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TURBOTRANSMISSION

Joseph R. Teagno, Detroit, Mich., assignor to Hydraulic Brake Company, Detroit, Mich., a corporation of California

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10 Claims. (Cl. 60—54)

This invention relates to turbotransmissions, and more particularly to the reaction member thereof.

Broadly the invention comprehends a turbotransmission including an impeller, a turbine, a reaction member associated with the turbine operative automatically due to the directional characteristics of flow from the turbine to provide for operation of the unit as a torque converter or fluid coupling.

An object of the invention is to provide a fluid transmission including means responsive to fluid directional flow within the transmission to provide for function of the unit as a torque converter or fluid coupling.

Another object of the invention is to provide a reaction member having vanes pivoted to swing into and out of the fluid circuit.

Another object of the invention is to provide a turbotransmission including a reaction member having vanes pivoted to swing into and out of the fluid circuit upon pivots which are perpendicular to the axis of rotation of the transmission.

A further object of the invention is to provide a turbotransmission including a reaction member having vanes responsive to fluid directional flow pivoted to swing in a plane parallel to the axis of the turbo into and out of the fluid circuit.

Another object of the invention is the provision of a turbotransmission including a reaction member having pivoted fluid direction reactive vanes adapted to swing automatically.

A yet further object of the invention is to provide a turbotransmission including turbine vanes, a fluid reaction member, fluid directional reactive vanes adapted to swing automatically on the member, means resisting rotation of the reaction member in one direction, and means providing for swinging the vanes substantially out of the fluid flow due to the direction of flow.

Other objects and advantages will appear from the following description taken in connection with the drawing forming a part of this specification, and in which—

Fig. 1 is a sectional view of a torque converter embodying the invention;

Fig. 2 is a sectional view substantially on line 2—2, of Fig. 1;

Fig. 3 is a top plan view of the reaction member illustrating the extreme inward and outward positions of the reaction vanes.

Referring to the drawing for more specific details of the invention, 10 represents the crankcase of an internal combustion engine and 12 the crank or drive-shaft of the engine. The crankcase has suitably secured thereto a ring member 14 and a bell housing 16 provided with an internal web 18, the purpose of which will hereinafter appear.

The drive-shaft 12 has on one end a flange 20, and an impeller indicated generally at 22 includes a hub 24 suitably secured to the flange 20. The hub has thereon an outer shroud 26 having arranged thereon a plurality of impeller blades 28 supporting an inner shroud 30.

A driven shaft 32, supported for rotation on a suitable bearing 34 fitted in an opening 36 of the web 18 in axial alignment with the drive-shaft 12, has a flange 38, and bolted or otherwise secured to the flange is a rotatable housing 40.

The rotatable housing 40 is preferably made in sections, bolted or otherwise suitably secured together. One of the sections has a hub 42 supporting a bearing 44 and a fluid seal 46 in axial alignment with the drive-shaft 12. The housing 40 constitutes a reservoir 48 for the reception of fluid, and arranged in the wall of the housing is a filling opening 50 normally closed as by a plug 52.

A two-stage turbine indicated generally at 54 is arranged in oppositely disposed relation to the impeller and provides in conjunction therewith a vortex chamber 56 for the circulation of fluid. The first stage 58 of the turbine includes a plurality of blades 60 fixedly secured to one of the sections of the turbine 40 and supporting an inner shroud 62, and the second stage 64 of the turbine includes an outer shroud 66 having thereon a plurality of blades 68 fixedly secured to the inner shroud 62. The outer shroud 66 of the second stage of the turbine has secured thereto a hub 70 supported on the drive-shaft 12 by a bearing 72.

A reaction member indicated generally at 74 includes a housing 76 in concentric arrangement with the shafts 12 and 32 providing an annular chamber 78 mounted on a carrier 80. The carrier 80 sleeved over the drive-shaft 12 is supported for rotation on bearings 82 and 84 carried by the drive-shaft, and a fluid seal 86 fitted in the carrier embraces the drive-shaft. The bearing 44 and fluid seal 46 supported by the hub 42 of the rotatable housing embrace the outer periphery of the carrier 80. A one-way brake 86 interposed between the ring 14 and carrier member 80 resists rotation of the reaction member in one direction, reverse to the rotation of the turbine.

The housing 76 of the reaction member has mounted thereon a plurality of reaction vanes

88, pivoted to swing into and out of the vortex chamber between the first and second stages of the turbine.

Gates 90 are suitably secured to and angularly offset from the vanes so that they may substantially close off chamber 78 from the vortex chamber when the vanes are in operative position. A plurality of ports 92 in the housing and carrier provide communication between the chamber 78 and that portion of the reservoir outside of the vortex chamber 56, the purpose of which will hereinafter appear. A raised portion 94 on the gates 90 acts as a stop to limit the two extremities of movement of the vanes; that is, in their outward operative position and inward inoperative position. The movement of the vanes out of the vortex chamber is not complete, so that a portion of the vanes may be exposed to the fluid flow therein to assist in automatically returning the vanes to their normal position between the stages of the turbine when the operation of the device so requires.

In a normal operation, assuming that the unit is filled to its normal capacity with suitable fluid, transmission of force from the internal combustion engine through the crank or driveshaft 12 results in driving the impeller with the consequent energization of fluid in the vortex chamber 56.

The energy of the fluid in the vortex chamber is absorbed by the vanes on the first and second stages 58 and 66 of the turbine 54, resulting in rotation of the turbine and consequent transmission of force to the driven shaft 32. During this period the reaction member 74 is restrained against movement by the one-way brake 86, and the fluid impinges on the faces of the vanes.

Upon attaining a speed of rotation dependent upon the magnitude of the torque transmitted, the direction of the fluid flow changes and the fluid impinges on the backs of the vanes 88 of the reaction member 74, and this results in the vanes 88 being pivoted about radial axes so that their movement is parallel to the axis of rotation of the unit. This movement of the reaction vanes results in the retraction of the greatest portion of the vanes from the vortex chamber 56, and simultaneously therewith the one-way brake 86 releases the carrier 80 and the reaction member is free to rotate. There is no resistance to movement of the gates 90 into the annular chamber 78, as the fluid therein is in communication with the reservoir and is free to flow through ports 92 providing communication as the gates swing about their pivots. Inasmuch as the force of fluid is such as to impinge on the backs of the vanes, the gates are moved thereby to their inward limit wherein a portion of the vanes remains in the fluid circuit.

Upon decrease in speed of rotation of the unit, the direction of flow of fluid in the vortex chamber again changes, and this change slows down the reaction member. The fluid is now pocketed by the face portions of the reaction vanes remaining in the vortex chamber, resulting in the vanes swinging back into their normal position in the vortex chamber between the stages of the turbine. As the vanes are once again completely introduced into the vortex chamber, the gates 90 move to close off communication between the vortex chamber 56 and the annular chamber 78 to substantially inhibit passage of fluid therebetween. Thereafter, the fluid impinging on the faces of the vanes retains the vanes in operative position to again provide for torque multiplication. This completes the cycle.

While this invention has been described in connection with certain specific embodiments, the principle involved is susceptible of numerous other applications that will readily occur to persons skilled in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

Having thus described the various features of the invention, what I claim as new and desire to secure by Letters Patent is:

1. In a fluid transmission, an impeller, a turbine providing in conjunction therewith a vortex chamber, a reaction member, and pivoted vanes on the reaction member arranged to swing automatically into and out of the chamber due to fluid flow in the vortex chamber.

2. In a fluid transmission, an impeller, a turbine providing in conjunction therewith a vortex chamber, and a reaction member having vanes mounted on radial pivots and arranged to swing parallel to the axis of the turbine into and out of the vortex chamber depending on the course of fluid flow in the chamber.

3. A fluid transmission comprising an impeller, a two-stage turbine associated therewith, and a reaction member having vanes arranged to swing between the stages of the turbine under the influence of fluid flow in the transmission, the pivots of said vanes having their axes on radial lines of the transmission.

4. A fluid transmission comprising an impeller, a turbine providing in conjunction therewith a fluid circuit, a reaction member having an annular housing, reaction vane structures pivoted on the reaction member having parts adapted to move automatically from the fluid circuit into the annular housing and provide for a substantially closed circuit when in retracted position.

5. A fluid transmission comprising an impeller, a turbine providing in conjunction therewith a fluid circuit, a reaction member rotatable in one direction, and vanes pivoted on the reaction member arranged to swing automatically into and out of the fluid circuit in a path parallel to the axis of rotation of the transmission, said vanes adapted to substantially close the circuit when in retracted position.

6. A fluid transmission comprising an impeller, a turbine providing in conjunction therewith a fluid circuit, and a reaction means cooperating with the turbine having parts pivoted to swing automatically into and out of the fluid circuit under the influence of directional flow of the fluid.

7. A fluid transmission comprising an impeller, a two-stage turbine comprising in conjunction therewith a fluid circuit, a reaction member, and vanes on the reaction member normally positioned in the circuit between the stages of the turbine and pivoted to swing automatically therefrom in the direction of rotation of the turbine activated by fluid flow in the circuit.

8. A fluid transmission comprising an impeller, a turbine providing in conjunction therewith a fluid circuit, a reaction member comprising a housing and a housing carrier, and reaction vane structure pivotable on the housing having parts normally enclosing the housing from communication with the fluid circuit and other parts integral with the first-mentioned parts and at right angles thereto normally positioned in the fluid circuit, the parts enclosing the housing arranged to swing into the housing and said parts normal-

ly positioned in the circuit operative to swing out of the circuit due to directional fluid flow in the circuit.

9. In a fluid transmission, an impeller, a turbine providing in conjunction therewith a fluid circuit, a reaction member, and a unitary gate and vane structure pivoted on the reaction member arranged to swing automatically into and out of the fluid circuit.

10. In a fluid transmission, an impeller, a turbine providing in conjunction therewith a fluid circuit, and a reaction member having a unitary vane and gate structure arranged to swing automatically into and out of the fluid circuit, the vanes adapted to provide for torque multiplication when in the circuit and to complete the circuit when retracted.

JOSEPH R. TEAGNO.