Aug. 7, 1945. J. F. SWIFT 2,381,187

FLUID COUPLING

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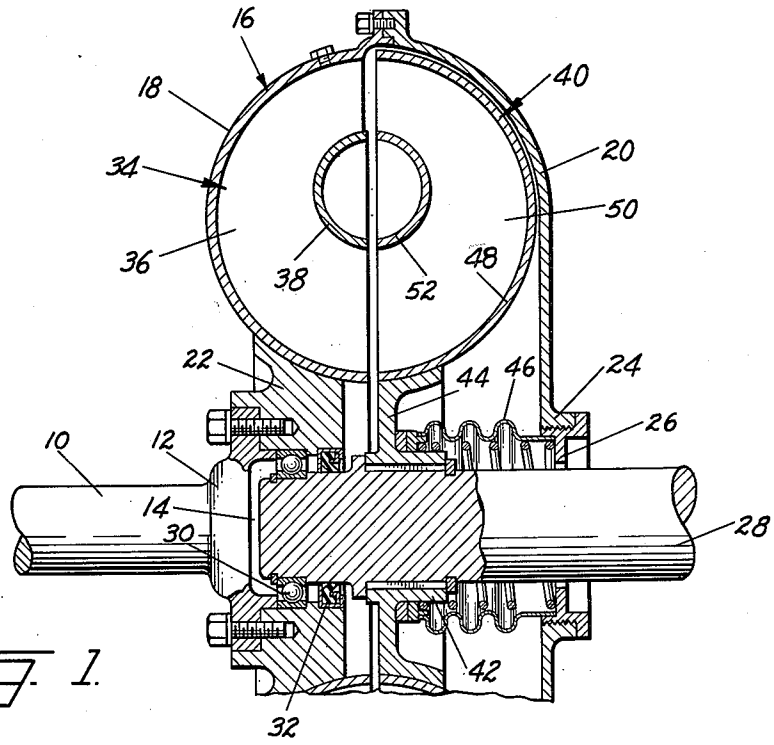


FIG. 1.

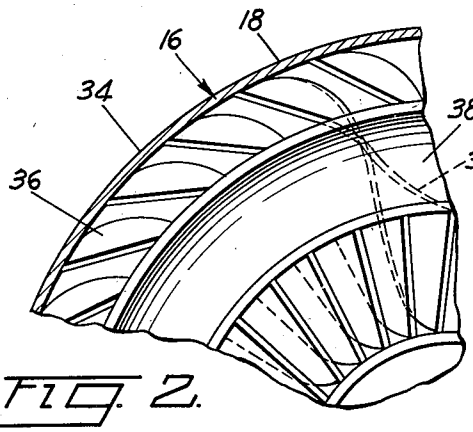


FIG. 2.

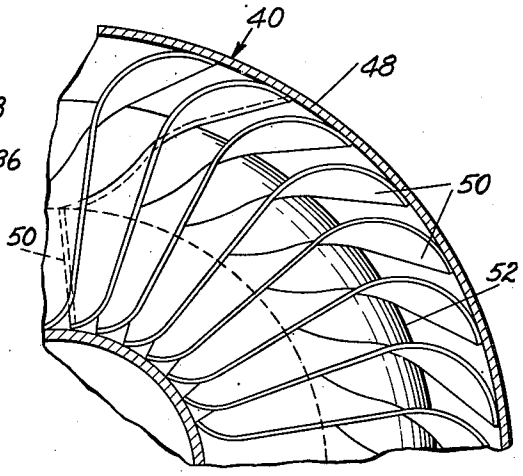


FIG. 3.

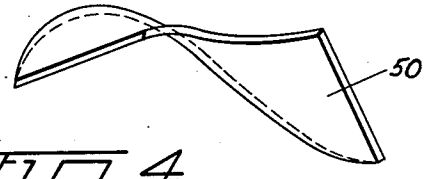


FIG. 4.

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FLUID COUPLING

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3 Claims. (Cl. 60—54)

This invention relates to fluid couplings, and more particularly to an impeller and a turbine, and the relationship of one to the other.

Generally in fluid couplings, the absolute path of fluid flow in the circuit of the coupling provided by the impeller and associated turbine is the resultant of the rotary motion of the impeller and the turbine and the relative motion of the fluid in the channels provided by the blades of the impeller and the vanes of the turbine. This absolute path of the general body of the fluid in the circuit is somewhat similar to the shape of a helical spring deformed or bent into a circle.

The flow of the fluid through the channels provided by the blades of the impeller itself and the vanes of the turbine itself is usually smooth and continuous. However, there is an abrupt discontinuity at the clearances between the impeller and the turbine, introducing serious objections in the way of velocity changes, vibrations, and eddy currents as the blades of the impeller pass the vanes of the turbine, and the instant invention aims to overcome these objections.

An object of the invention is to provide a fluid coupling including an impeller and a turbine providing in conjunction with one another a fluid circuit, and blades on the impeller and vanes on the turbine of such contour and relationship as to insure continuous flow of the fluid through the circuit.

Another object of the invention is to provide blades for the impeller and vanes for the turbine of such contour and relation to one another that fluid channels provided by the vanes on the turbine, when the coupling is running at normal speeds and loads, conform to the theoretical flow of the fluid through the fluid circuit.

Another object of the invention is to provide a fluid coupling including an impeller and a turbine having blades and vanes, respectively, of substantially the same contour but arranged in oppositely disposed relation so that the adjacent blades of the impeller and the vanes of the turbine are tipped off radially in opposite senses in order that the passages of the impeller and the turbine completely overlap.

Other objects and advantages of the invention 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 vertical sectional view of a fluid coupling embodying the invention;

Fig. 2 is a fragmentary view of the impeller;

Fig. 3 is a fragmentary view of the turbine; and

Fig. 4 is an enlarged view of a blade corresponding to the blades and vanes incorporated in the impeller and turbine, respectively.

Referring to the drawing for more specific details of the invention, 10 represents a driving shaft having a flange 12 provided with a concentrically disposed recess 14. A housing 16 preferably fabricated in two parts 18 and 20 suitably joined together has concentrically disposed hubs 22 and 24. The hub 22 is bolted or otherwise secured to the flange 12, and the hub 24, has suitably secured therein a ring 26.

A driven shaft 28 is supported for rotation coaxially with relation to the driving shaft. As shown, the driven shaft extends through the ring 26 and housing 16 into the recess 14 in the driving shaft, and is journaled on a bearing 30 fitted in the hub 22. A fluid seal 32 also fitted in the hub 22 embraces the driven shaft to inhibit seepage of fluid from the housing to the bearing.

The part 18 of the housing 16 constitutes the outer shroud of an impeller indicated generally at 34, and arranged on the inner wall of the part 18 are blades 36 supporting an inner shroud 38.

A turbine indicated generally at 40 is mounted on the driven shaft 28 within the housing in oppositely disposed relation to the impeller 34. The turbine 40 includes a hub 42 keyed or otherwise secured to the driven shaft 28. The hub has a web or flange 44, and interposed between the flange 44 and the ring 26 in the hub 24 is a fluid seal 46 for inhibiting seepage of fluid from the housing 16. The flange 44 supports an outer shroud 48 having arranged thereon a plurality of turbine vanes 50 supporting an inner shroud 52.

The blades 36 of the impeller and the vanes 50 of the turbine are substantially alike, but are arranged in oppositely disposed relation. This arrangement of the blades on the impeller and turbine is of paramount importance, particularly the relationship of the blades on the impeller to the vanes of the turbine, because it is due to such arrangement that the fluid in the circuit flows across the clearances between the impeller and turbine without velocity changes introducing objectional vibrations and eddy currents.

It is to be observed that the blades of the impeller and the vanes of the turbine are twisted throughout their lengths, as most clearly shown, so as to conform to the theoretical flow of the fluid through the circuit. Then, too, the adjacent blades of the impeller and vanes of the turbine are tipped off radially in the opposite senses so that the passages through the impeller

and turbine completely overlap, and this overlapping of the passages promotes continuous flow of the fluid across the clearances between the impeller and the turbine, thus minimizing the setting up of velocity changes, eddy currents, vibration impulses, and objectional noises.

In a normal operation, actuation of the impeller **34** results in energization of the fluid in the housing **16**, and the energy of the fluid is absorbed by the turbine **40**, resulting in rotation thereof.

When the fluid is energized by the impeller, it passes through the channels provided by the blades of the impeller and the vanes of the turbine across the clearances between the blades of the impeller and the vanes of the turbine, and, due to the particular conformation of the blades of the impeller and the vanes of the turbine and of the relationship of the blades to the vanes, the fluid flow follows the optimum path for smoothness in operation of the coupling.

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. A fluid coupling comprising an impeller having blades twisted throughout their lengths with their inlet and outlet edges tipped in opposite directions, and a turbine associated with the impeller having vanes twisted throughout their lengths with their inlet and outlet edges tipped in opposite directions and being in oppositely disposed relation to the impeller blades.

2. A fluid coupling comprising an impeller having blades twisted throughout their lengths with their inlet and outlet edges inclined in opposite directions, and a turbine opposed to the impeller having blades twisted throughout their lengths with their inlet and outlet edges inclined in opposite directions, the edges of the impeller blades and turbine vanes crossing one another.

3. A fluid coupling comprising an impeller, a turbine opposed to the impeller in spaced relation providing small clearance, blades on the impeller curved and twisted throughout their lengths with their inlet and outlet edges inclined in opposite directions, and vanes on the turbine curved and twisted throughout their lengths with their inlet and outlet edges inclined in opposite directions, the edges of the vanes crossing the adjacent edges of the blades.

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