June 28, 1938. P. M. SALERNI 2,122,353

HYDRAULIC POWER TRANSMISSION APPARATUS

Filed Feb. 28, 1936

Fig. 1.

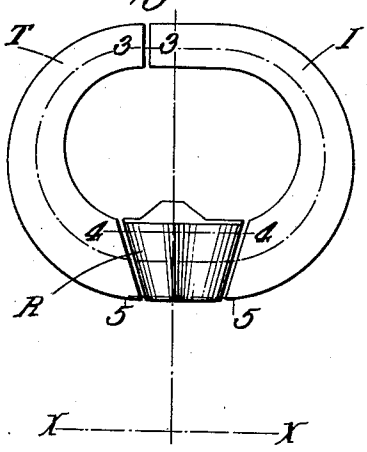


Fig. 2.

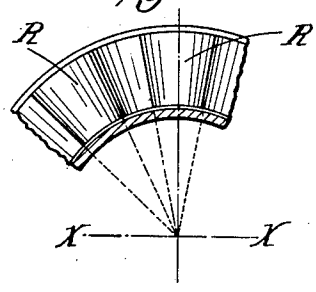


Fig. 3.

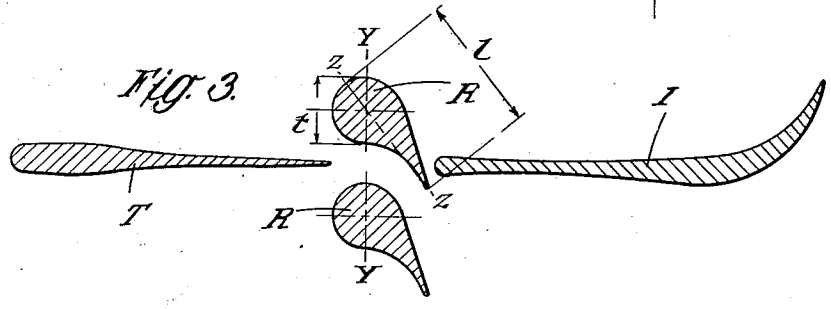


Fig. 4

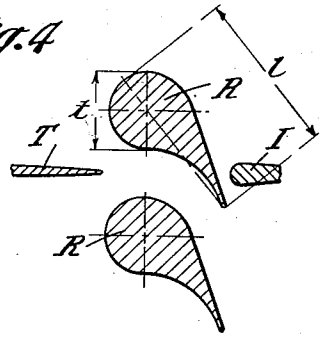
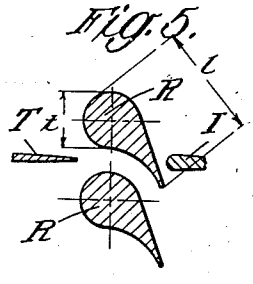


Fig. 5.



Inventor.
Piero M. Salerni.
Cushman, Darby & Cushman
Attorneys

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2,122,353

HYDRAULIC POWER TRANSMISSION APPARATUS

Piero Mariano Salerni, Westminster, England, assignor to Marie Therese Elisabeth Salerni, Nice, France

Application February 28, 1936, Serial No. 66,291
In Great Britain March 2, 1935

5 Claims. (Cl. 60—54)

This invention relates to hydraulic power transmission apparatus of the kind known as torque converter in which the torque imparted by hydraulic means to the driven member is or can be substantially greater than that imparted to the driving member, the power being transmitted by circulation of liquid within a closed circuit due to difference in centrifugal head, and which comprise a primary vaned driving member or impeller, a secondary vaned driven member or turbine, and a tertiary vaned member which when held stationary against rotation in space can operate to deflect the liquid impinging upon it while when it does not so operate it is capable of rotation in space. The said tertiary member and the vanes thereof are hereinafter respectively termed "reaction member" and "reaction vanes".

According to this invention I provide an improved reaction vane having several novel and characteristic features.

In order that the invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the accompanying drawing which illustrates diagrammatically one form or embodiment of the invention.

In the said drawing—

Figure 1 is a view indicating very diagrammatically a hydraulic circuit comprising an impeller vane, a turbine vane and a reaction vane.

Figure 2 is a fragmentary face view showing the receiving ends of the reaction vanes.

Figure 3 is a developed sectional view on the line 3—3 of Figure 1 illustrating an impeller vane and a turbine vane with reaction vanes according to the invention.

Figures 4 and 5 are sectional views on the lines 4—4 and 5—5 of Figure 1 respectively.

It will be understood that the said drawing illustrates the parts in a very diagrammatic manner, all constructional features so far as the apparatus itself is concerned being omitted, that which is illustrated being sufficient to indicate in the simplest possible manner the improvements in the reaction vane according to the invention. The impeller, the turbine and the reaction member may be of any appropriate construction, each having a set of vanes between which the liquid in the hydraulic circuit passes in the known manner. In the drawing I represents one of the impeller vanes, T one of the turbine vanes, and R, R indicate two of the improved reaction vanes. These vanes are arranged in the hydraulic circuit in the relative positions shown in Figure 1, and it will be understood that any desired number of each set of vanes may be employed according to requirements. The reaction vanes as shown are of the cross-sectional shape indicated in Figures 3, 4 and 5. The vane is tapered in plan-form preferably so that the lines of the rear or trailing edges and of the front surface and at all parts of the surface intersect at a common point at or near the axis of rotation shown at X—X in Figures 1 and 2. The tapered plan-form of the vanes can be clearly seen from the cross-sectional views in relation to Figure 1, the view in Figure 4 being taken near the outer part of the vane, while that in Figure 3 is taken at the middle of the vane, the view in Figure 6 being at the inner part of the vane. These cross-sectional views also show the shape of the passage between any pair of the vanes. The vanes at their receiving ends are of rounded, bulbous form and they are of substantial thickness compared with the rear or delivery end of the vane. The thickness of the receiving ends of the vanes is taken along the line Y—Y as indicated at *t* in Figures 3, 4 and 5, this line Y—Y passing substantially through the centers of the bulbous receiving ends of the vanes. The length of the vane may be regarded as the dimension extending from the rounded surface of the bulbous receiving end of the rear or trailing edge on the line Z—Z as shown at *l*. The receiving ends of the vanes are approximately circular in cross-section, the circumference towards the rear or delivery end merging into the faces of the rear or delivery part of the vane so that the thickness at the receiving end taken on the line Y—Y is substantially greater than the thickness at any part of the rear or delivery end. The approximately circular cross-section of the receiving end of the vane provides the rounded receiving surface and the general bulbous form as hereinbefore referred to. The thickness of the vane as taken on the line Y—Y is equal to at least one-third of the pitch of the vanes, that is, the distance between the centers of the receiving ends of two adjacent vanes, these centers being the centers of the circular cross-sectional formation of the receiving ends of the vanes. This relation of the thickness of the receiving end of the vane to the pitch of the vanes is an important feature of the invention. Preferably this thickness of the vanes is equal to or somewhat greater than the width of the passages between the vanes. The thickness of the receiving ends of the vanes bears also a relation to the length of the vanes, and in this

respect the thickness of the receiving ends is equal to at least one-third of the length as shown in the cross-sectional views (Figures 3, 4 and 5). As shown, the thickness of the receiving ends of the vanes in some instances may be equal to about half the length. In the embodiment illustrated, owing to the tapered plan-form the thickness of the receiving ends of the vanes is greater at a point farther removed from the axis of rotation of the apparatus (indicated at X—X in Figures 1 and 2), than at a point nearer the said axis, while the length of the vanes is also greater at a point removed from the axis of rotation than at a point nearer to the said axis as shown in Figures 1, 3, 4 and 5.

The approximately circular cross-sectional formation of the vane is an important feature, and owing to this formation and the tapered plan-form, the front or receiving end of the vane regarded from the outer part to the inner part, presents the approximate form of a truncated cone as shown more particularly in Figures 1 and 2, and although the rear part of the vane tails off from the substantially conical portion with a rapid decrease in cross-section, the shape of the vanes is such that any lines on the surface of the conical part or other part from the outer edge to the inner end, extending towards the center or axis of rotation of the apparatus, will intersect at a common point, preferably near the axis of rotation. This formation of the vane insures that the proper curved formation of the passage for the liquid between the vanes is maintained or substantially maintained throughout the radial depth of the passage. The reaction vanes are preferably located at that point of the hydraulic circuit which is nearest the axis of rotation, as for example in the embodiment illustrated in the drawing. The vanes may be made of a moldable substance such as synthetic resin or of alloys or other materials that can be provided with a glossy surface. The reaction vanes may be used in conjunction with any suitable form of impeller vanes and turbine vanes, and preferably the impeller vanes are constructed as claimed in my copending patent application Serial No. 43,789, filed October 5, 1935. The passages between the impeller and the turbine vanes and between the reaction vanes may be formed as set forth in the specification of my copending patent application Serial No. 66,292, filed February 28, 1936.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A hydro-kinetic power transmitter comprising a vaned impeller member, a vaned turbine member and a vaned reaction member, the vanes of the latter having rounded, bulbous receiving ends which are shaped to the approximate form of a cone.

2. A hydro-kinetic power transmitter comprising a vaned impeller member, a vaned turbine member and a vaned reaction member, the vanes of the latter having rounded, bulbous receiving ends, while the working surface or the greater part thereof is disposed between lines intersecting a common point located at or near the axis of rotation of the apparatus.

3. A hydro-kinetic power transmitter comprising a vaned impeller member, a vaned turbine member and a vaned reaction member, the vanes of the latter having rounded, bulbous receiving ends of a thickness equal to at least one-third of the pitch of the vanes, and to at least one-third of the length of the vanes, the said reaction vanes being of conical form at their receiving ends and being located at that portion of the hydraulic circuit nearest the axis of rotation of the apparatus.

4. A hydro-kinetic power transmitter comprising a vaned impeller member, a vaned turbine member and a vaned reaction member, the vanes of the reaction member having bulbous receiving ends, the thickness of which is approximately equal to at least one-third of the pitch of the vanes and has a thickness equal to at least one-third of the length of the vanes, the said thickness and the length of the vanes being greater at a point farther removed from the axis of rotation of the apparatus than at a point nearer the said axis of rotation.

5. A hydro-kinetic power transmitter comprising a vaned impeller, a vaned turbine member and a vaned reaction member, which latter member is located between the outlets of the turbine member and the inlets of the impeller member, the said vanes of the reaction member having bulbous ends of a thickness equal at least to one-third of the pitch of the vanes and equal at least to one-third of the length of the vanes, the said vanes having their surfaces tapered towards the axis of rotation of the apparatus and being of approximately cone shape at their receiving ends.

PIERO MARIANO SALERNI.