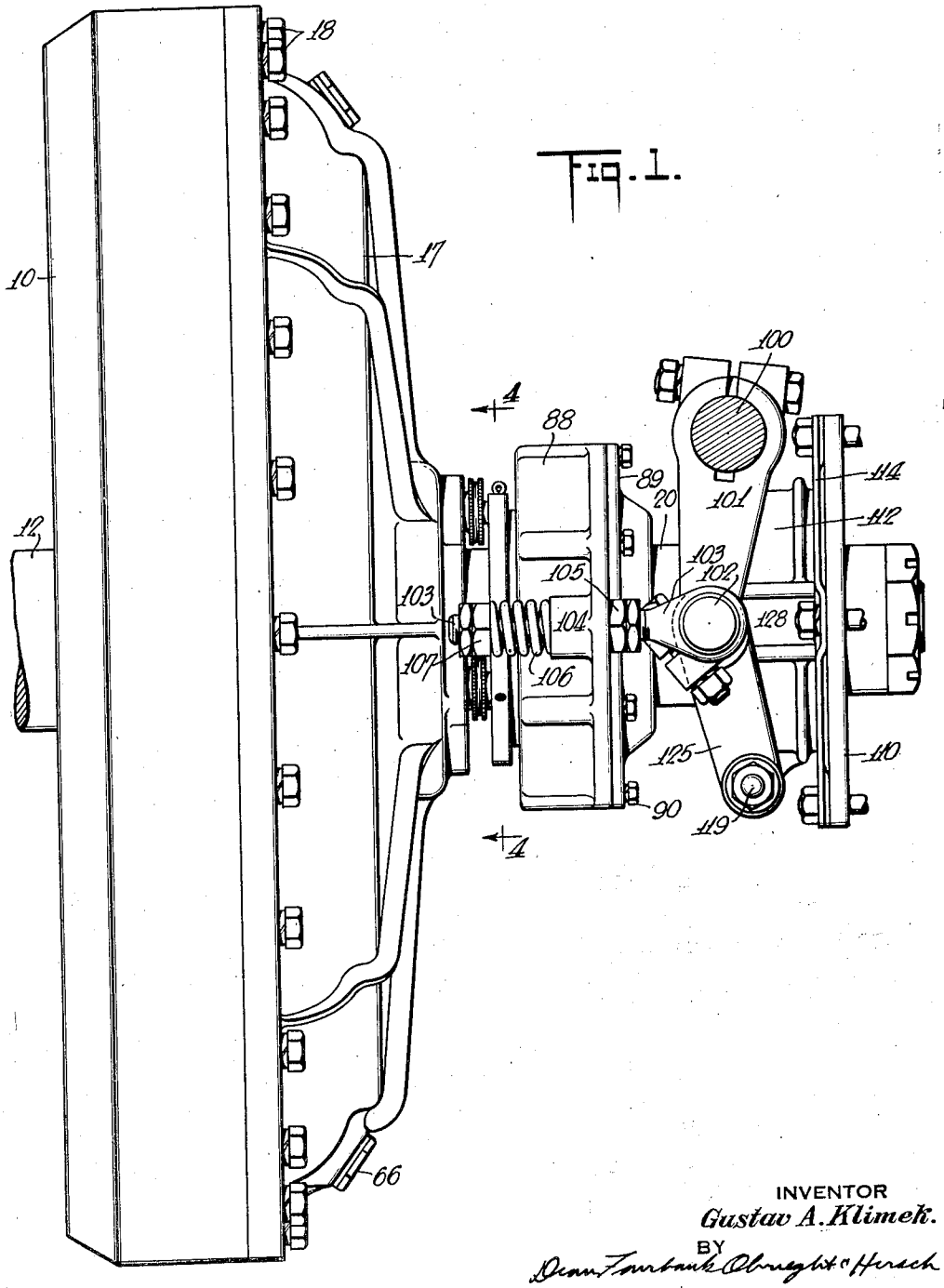
Sept. 19, 1933. G. A. KLIMEK 1,927,040

HYDRAULIC POWER TRANSMITTER

Original Filed June 19, 1929 4 Sheets-Sheet 1

Fig. 1.



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HYDRAULIC POWER TRANSMITTER

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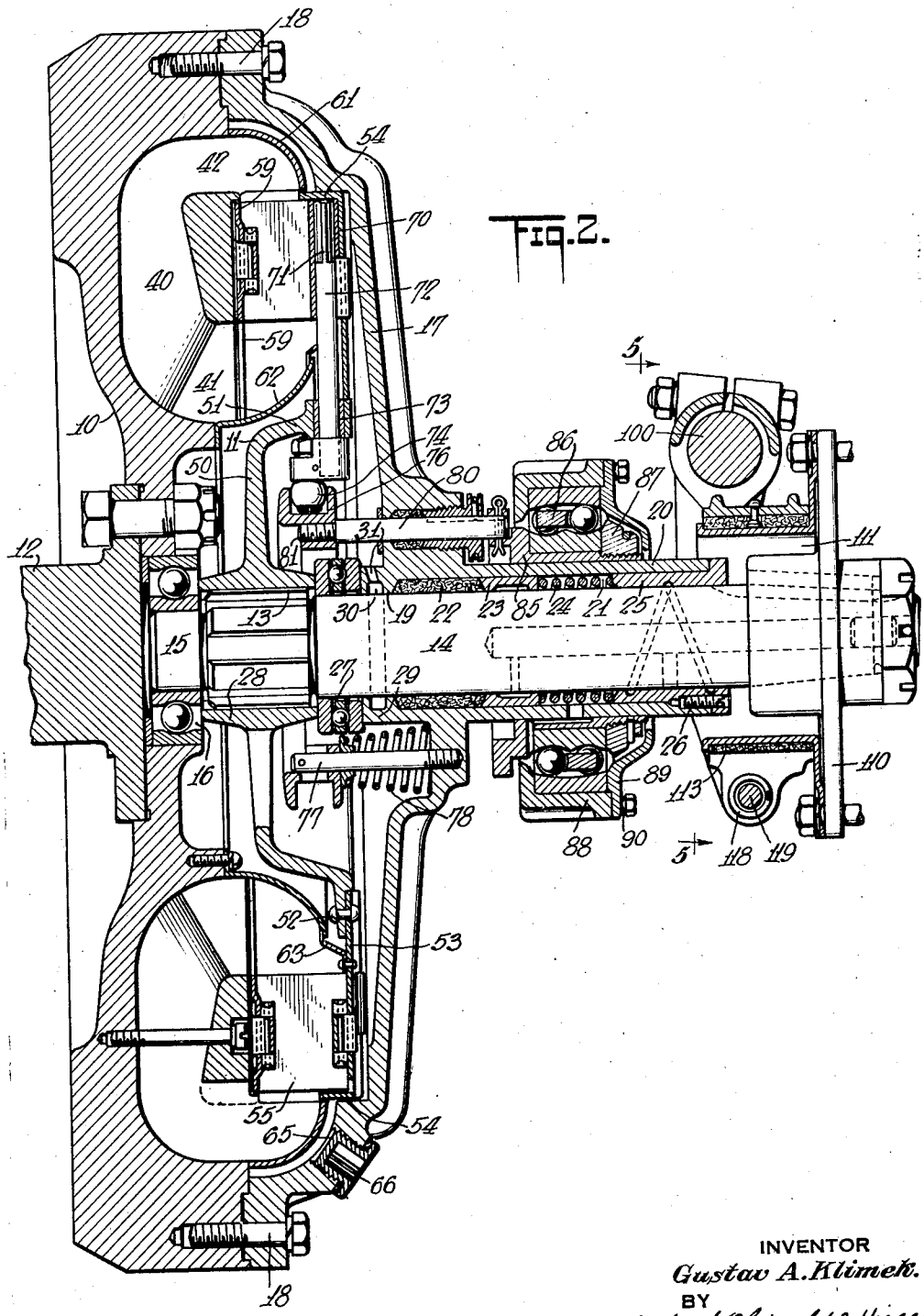


Fig. 2.

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HYDRAULIC POWER TRANSMITTER

Original Filed June 19, 1929 4 Sheets-Sheet 3

Fig. 5.

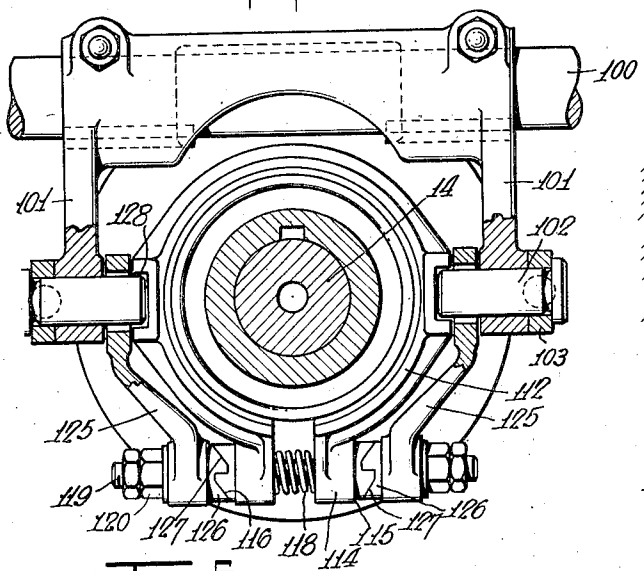


Fig. 6.

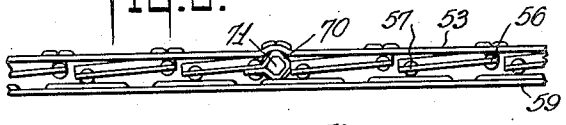


Fig. 7.

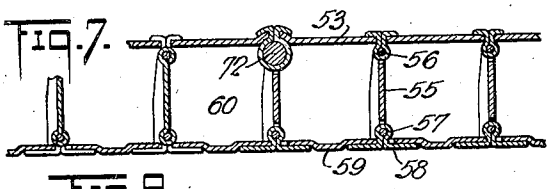


Fig. 9.



Fig. 8.

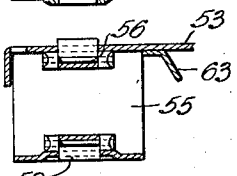
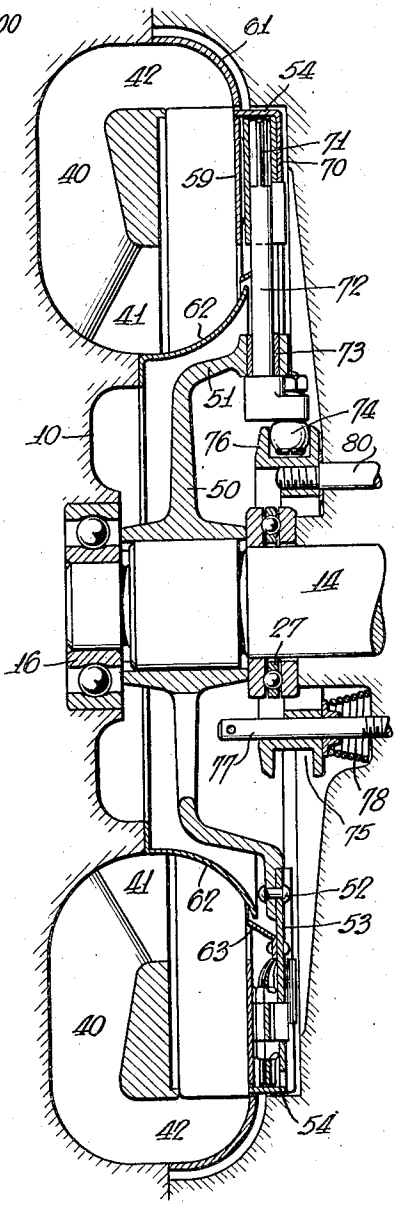


Fig. 10.



Fig. 3.



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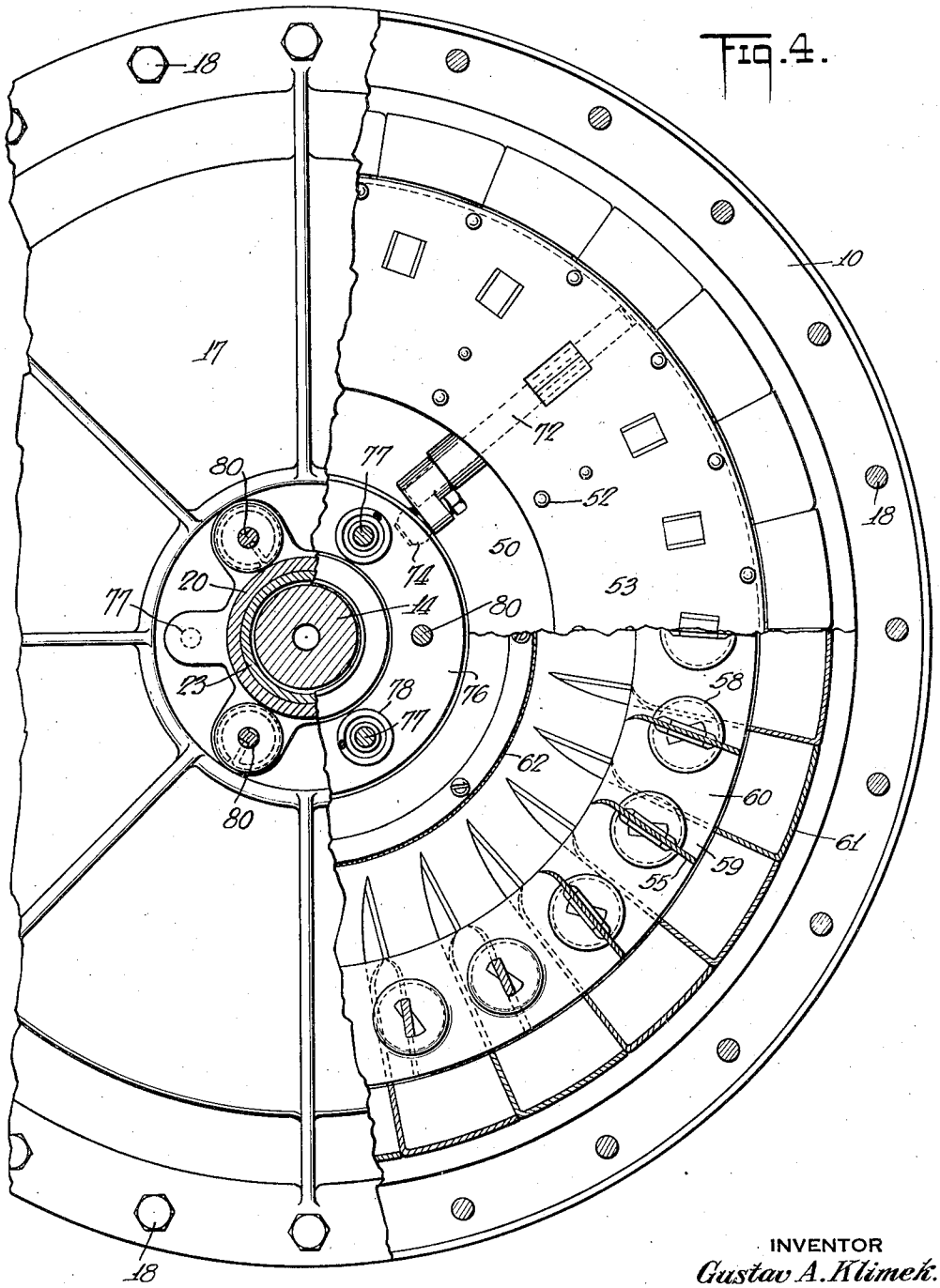
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HYDRAULIC POWER TRANSMITTER

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Fig. 4.



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UNITED STATES PATENT OFFICE

1,927,040

HYDRAULIC POWER TRANSMITTER

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Application June 19, 1929, Serial No. 372,085
Renewed May 4, 1933

14 Claims. (Cl. 60—54)

This invention relates to hydraulic power transmission devices and more particularly to the type wherein there is employed a fluid impelling member, a fluid impelled member, and a liquid which establishes the driving couple therebetween, the liquid being moved by the impelling member through a confined path wherein is located the member which is impelled by impact of the moving fluid therewith. This type is known as the Föttinger transmitter and is disclosed and broadly claimed in Patent 1,199,359, issued Sept. 26, 1916.

One object of the present invention is to improve the construction and mode of operation of hydraulic power transmissions in a manner which particularly adapts them to use for the transmission of power in automotive vehicles, although it is to be understood that the invention is not to be limited to such use, but is readily adaptable to use wherever power transmitters of the hydraulic type may be desired.

A hydraulic power transmitter in order to attain a point of high efficiency should be so constructed and arranged as to provide an effective fluid couple between the driving and driven members when in operation, and at the same time provide for rendering ineffective the fluid couple without producing a drag upon the driven member, and with the expenditure of a minimum of power and with as few moving parts as possible. It is also highly desirable in devices of this character, especially where they are intended for use in automotive vehicles, so to construct the mechanism that the entire structure will be within certain practical limitations as regards weight and size.

In certain types of hydraulic transmissions heretofore devised, it has been proposed to combine with the fluid couple or clutch, a positive mechanical clutch for establishing or breaking the driving connection. Such a construction, however, has not proven satisfactory to the desired degree due mainly to the multiplicity of parts involved, and also to an inherent tendency on the part of the mechanical clutch to develop a drag when in its idle position.

It has also been proposed to eliminate the mechanical clutch and render inoperative the fluid couple between the driving and driven members by a bodily movement of the driven member to a position out of the path of the moving fluid. Such a construction, however, necessitates the use of a housing of large enough dimensions to permit of the driven member being moved into and out of the path of the moving fluid which resulted in a structure so bulky and heavy as to be unsatisfactory for use in automotive vehicles. Another undesirable feature in devices of this type resides in the fact that considerable power is necessary to effect movement of the driven member into and out of the path of moving fluid.

It has also been proposed in the art, to control the fluid couple by means of a valve interposed in the path of the moving fluid which valve when open permits a free flow of fluid, thus establishing an operative fluid couple between the driving and driven members. When closed, the valve intercepts the flow of fluid and thus renders ineffective the fluid couple between the driving and driven members. One highly undesirable condition inherent in devices of this character, however, is that continued rotation of the driving member within the fluid flow intercepted, builds up a back pressure between the valve and the driving member which back pressure seriously effects the operation of the driving member.

The present invention provides a construction in hydraulic power transmitters in which the several disadvantages inherent in the types aforementioned are eliminated, and it is a feature of the present invention to provide new and novel means for rendering ineffective the fluid couple between a driving and driven member in a power transmission of the hydraulic type.

Another feature of the invention resides in a novel form of fluid impelled member constructed and arranged in such a manner that it may be collapsed into a position out of the path of the moving fluid to render ineffective the fluid couple between the driving and driven members, or extended into a position in the path of movement of the fluid to effect an operative fluid couple between said driving and driven members.

A further feature of the invention consists in the new and improved construction of driven member by which construction all drag is eliminated when the fluid couple is rendered ineffective.

A still further feature of the invention resides in the mechanism employed for operating the driven member to effect its movement to its extended and collapsed positions.

A still further feature of the invention resides in the provision of a novel braking mechanism so constructed and arranged as to prevent movement of the driven member during those periods when the fluid couple is rendered inoperative.

Other features of the invention relate to certain novel and improved constructions, arrangements,

and combinations of parts, hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be clearly understood from the accompanying drawings illustrating the invention in a preferred form and the following detailed description of the constructions therein shown.

In the drawings:

Fig. 1 is a view in side elevation, partly in section, of a hydraulic power transmission constructed in accordance with the present invention,

Fig. 2 is a vertical sectional view thereof, showing the fluid driven member in extended position,

Fig. 3 is a similar view on the same scale, showing the fluid driven member in collapsed position,

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1, with a portion of the transmission housing or casing broken away, and illustrating certain of the inner construction in section,

Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 2,

Fig. 6 is a detail plan view illustrating the position the several vanes or blades assume when the driven member is collapsed.

Fig. 7 is a detail sectional view illustrating the position the several vanes or blades assume when the driving member is in its extended position, said view also illustrating the attachment to the vanes or blades, of the means for operating them to collapse and expand the driven member,

Fig. 8 is a detail sectional view illustrating one of the mounts of the vanes or blades,

Fig. 9 is a detail sectional view of one of the vanes or blades, and

Fig. 10 is a detail view of a bearing member employed to support the vanes or blades in position.

In the herein illustrated embodiment of the invention, the power transmitter includes a pair of members 10 and 11 of which 10 constitutes the driving member, and 11 the driven member. The driving member may be in the form of a fly wheel connected in any desired manner to the shaft 12 of a suitable prime mover, not herein illustrated.

The driven member as herein illustrated consists of a fluid impelled turbine rotor carried by a shaft 14 which in turn may be connected in any approved manner to any type of mechanism which it may be desired to drive. The driven member is preferably splined to the shaft 14 as at 13 in a manner which permits of a slight sliding movement of the driven member upon said shaft, and the free end 15 of the shaft 14 is preferably supported in a suitable bearing 16 mounted in the driving member 10.

Operative or driving connection between the driving and driven members is established by means of a liquid of which motor lubricating oil is one good example. The fluid is set in motion by a fluid impeller operated by the driving member and during movement of the fluid it is caused to impinge against the driven member, which as heretofore stated preferably is in the form of a fluid impelled turbine rotor, thus setting up a rotation of the driven member.

In the present illustration of the invention the fluid impeller is embodied in the driving member which as heretofore stated may be the fly wheel of any suitable prime mover. In carrying out the invention in such a manner the fly-wheel is of such porportion as will permit of the formation therein at a point preferably adjacent its peripheral edge, of a plurality of substantially radially extending passages such as shown at 40 in the drawings. The inlets and outlets of these radially extending passages are designated at 41 and 42 respectively, and it will be noted that the inlets and outlets 41 and 42 of these passages 40 face approximately axially in a plane substantially at right angles to the axis of rotation.

The driven member 11 may include a main body portion 50 preferably circular in form, and having its peripheral edge provided with a continuous flange 51. Suitably secured to the flanged portion 51 of the main body portion of the driven member as by rivets or the like 52 there is an annular member 53 defining the peripheral edge of which there is a continuous right angularly disposed flange 54 which is located in substantially the same plane as the inner walls of the outlets 42 of the radial passages 40 of the fluid impeller.

Arranged upon the inner face of this annular member 53 closely adjacent the peripheral edge thereof, there is a series of spaced radial vanes or blades 55. As best shown in Fig. 7 these vanes or blades are attached at one of their side edges to the annular member 53 as at 56 by means of a pivotal connection, the axis of which lies parallel to the inner face of annular member 53 and radially, substantially tangent to a circle, coaxially with said member 53 and whose diameter is equivalent to the distance between pivots 56 and 57 of blades 55. The opposite side edge of each of the vanes or blades 55 is pivotally connected as at 57 with a bearing member 58 which bearing members are rotatably mounted in a second annular member 59. Each of these bearing members rotates in said annular member 59 about its own axis which extends parallel to the axis of rotation of the driving and driven members. The annular member 59 is carried or supported from the annular member 53 by the vanes or blades 55 and together with said vanes or blades 55, forms radial passages 60 in the driven member, the inlets of which are juxtaposed to the outlets of the radial passages 40 of the driving member with their outlets juxtaposed to the inlets of said passages 40.

Extending from the driving member to the flange 54 of the driven member, there is an outer wall 61. An inner wall 62 extends from the driving member substantially to the annular member 53 of the driven member, and the peripheral edge of this latter wall preferably lies behind an annular flange 63 upon the inner face of said annular member 53.

As heretofore stated, the spaced blades 55 of the driven member together with the annular members 53 and 59 thereof form fluid passages 60 which extend radially of the driven member, the inlets of which passages are juxtaposed to the outlets of the radial passages 40 of the driving member, while the outlets of the passages 60 are juxtaposed to the inlets of said passages 40. The heretofore described walls 61 and 62 serve respectively to complete these passages 40 and 60 and to direct the fluid in its flow to the inlets thereof.

The driven member operates within a suitable casing or housing which in the present embodiment of the invention is illustrated as comprising two parts, with the driving member 10 constituting one of the parts. The other or outer member

of the casing or housing is preferably in the form of a plate suitably secured adjacent its peripheral edge to the driving member as at 18. This outer casing member 17 may be provided with a suitable opening 19 for the reception of the shaft 14 and projecting axially from the outer casing member 17 there is a sleeve extension 20. The internal diameter of this sleeve extension 20 is preferably greater than the diameter of the shaft 14 whereby to provide an annular space 21 between the inner face of the sleeve extension and the outer face of the shaft 14. Mounted in this annular space 14 there is a suitable packing 22 maintained under compression by a packing ring 23 and a coiled spring 24 backed up by a collar or gland 25 which latter is retained in position by a suitable lock bolt or the like 26. Mounted upon the shaft 14 and interposed between the hub portion 28 of the driven member 11 and a projecting flange 29 of the outer casing member 17, there is a thrust bearing 27 preferably of the antifriction type. It will also be noted that the projecting flange 29 of the outer casing is provided with an internal annular channel 30 which has communication with the interior of the casing or housing through a passage 31 by which construction the point of bearing of the outer casing member 17 may be at all times supplied with lubricant from the interior of the casing or housing.

The casing or housing is adapted to contain a suitable liquid such as motor lubricating oil in a sufficient quantity to substantially fill the interior thereof including the passages 40 and 60. This fluid may be introduced into the casing or housing through a suitable filling opening 65 which may be closed after filling by a screw plug or the like 66.

From the foregoing it will be apparent that if the casing or housing is filled with suitable liquid, and the several parts are in the positions in which they are shown in Fig. 2, rotation of the driving member 10 will set up a movement of the fluid through the passages 40. The fluid in its discharge from the passages 40 is directed against the vanes or blades 55 and through the passages 60 of the driven member and causes the same to rotate as long as rotation of the driving member is continued. Thus it will be seen that the fluid in its movement through the passages 40 and 60 establishes an effective fluid couple between the driving and driven members.

In certain installations, such for example as in automotive vehicles, it is necessary to provide for continuous operation of the driving member without effecting operation of the driven member. and in the present embodiment of the invention this result is accomplished by rendering ineffective the fluid couple between the driving and driven members.

To render ineffective the fluid couple between the driving and driven members, the present invention contemplates a collapsing or folding of the turbine rotor. As heretofore described, the vanes or blades 55 of the turbine rotor are pivotally connected to the annular members 53 and 59, the said annular member 59 being carried and supported by said vanes or blades. It will thus be apparent that if the vanes or blades are moved about their pivotal points, they will fold or collapse to position against the annular member 53 and in so doing will move the annular member 59 into juxtaposed position to said annular member 53. The annular member 59 in its movement towards the annular member 53, moves in a plane parallel to the axis of rotation of the annular member 53 by reason of the fact that the bearing members 58 to which the vanes or blades are pivotally connected, are free to rotate in the annular member 59 during movement thereof.

In the embodiment of the invention herein illustrated, the vanes or blades are moved about their pivotal points to effect a collapsing of the turbine rotor by suitable means operated from the exterior of the casing or housing which means is operably connected to three of the vanes or blades, the remaining vanes or blades being operated by the annular member 59 in its movement toward the annular member 53 which movement is effected by operation of the three blades to which the operating means is connected. As more clearly illustrated in Figs. 6 and 7, three of the vanes or blades preferably have a squared socket such as 70 in Fig. 6 and said socket is adapted to receive the squared end 71 of a rod or shaft 72 which as more clearly shown in Fig. 2 is mounted in a suitable bearing such as 73 in the flanged periphery 51 of the main body portion of the driven member 11. Suitably attached to the inner end of this rod or shaft, and offset with relation to the axis thereof there is a thrust receiving member 74 substantially spherical in form and this thrust receiving member occupies a position in the peripheral channel 75 of a ring or similar member 76. This ring is preferably slidably mounted upon a plurality of rods or the like 77 carried by the outer casing member 17 and interposed between said ring and the inner face of the outer casing member 17, and preferably surrounding said rods 77 there are coil springs 78 which tend to force the ring member 76 in the direction of the main body portion of the member 11.

Operation of the ring member 76 from the exterior of the casing or housing is had through the medium of a suitable number of driving rods 80 slidably mounted in the outer casing member 17, which are suitably connected at their inner ends as by a screw threaded connection 81 to the ring member 76. These driving rods 80 preferably operate in stuffing boxes 82 to prevent leakage of the fluid from the interior of the casing or housing. At their outer ends, these rods are connected to a suitable operating means herein illustrated as a flanged collar 85 which is slidably mounted upon the sleeve extension 20 of the outer casing member 17. Surrounding the collar there is a suitable antifriction bearing 86 which is retained in position thereon by means of a nut 87 having threaded engagement with the flanged collar 85. The antifriction bearing 86 is enclosed in a housing preferably formed of two members 88 and 89, suitably secured together as at 90 to enclose the bearing.

A suitably operated rock shaft 100 may be supported in any desired manner preferably above the shaft 14, and depending therefrom on opposite sides of the shaft 14, there is a lever 101. As more clearly illustrated in Fig. 5, each lever 101 has mounted in its lower end a pin such as 102. Extending from each of these pins 102, and passing through suitable bearings 104 in the housing of the antifriction bearing 86 there is a driving rod 103. Each driving rod 103 is preferably screw threaded, as shown in Fig. 1, to receive nuts 105 which function as operating shoulders upon the driving rods 103 and which engage the housing of the roller bearing 86 to move the same in one direction. Movement of said housing in the opposite direction is preferably cushioned by coil spring 106 surrounding the extended ends of the

driving rods 103 and preferably placed under compression between the bearings 104 and nuts 107 threaded on said extended ends of the driving rods 103.

When the shaft 100 is rocked in a direction to swing the levers to the right in Fig. 1, the driving rods 103 move the antifriction bearing 86 together with its housing to the right in Fig. 2, said bearing 86 sliding upon the sleeve extension of the outer casing 17. In this movement the driving rods 80 operate the ring 76 which in turn partially rotates the rods or shaft 72 and they in turn move the vanes to which they are attached about their pivotal points and move the annular member 59 into juxtaposition to the annular member 53. This causes the remaining vanes or blades to move about their pivotal points and effects a complete collapse of the turbine rotor to the position in which it is shown in Fig. 3. In this position the collapsed turbine rotor is out of the path of travel of the fluid moved by the fluid impeller, and thus the fluid couple between the driving and driven member is rendered ineffective.

To insure proper slowing down or stopping of the driven member upon complete collapse of the turbine rotor, a suitable brake mechanism is employed. This brake mechanism is best illustrated in Figs. 2 and 5 and by reference to said figures it will be seen to include in its present embodiment, a flanged collar 110 suitably secured to the shaft 14. This collar forms the support or attaching means for a brake drum 111 which is surrounded by a flexible brake band 112 having a suitable brake lining 113. This brake band 112 is preferably of the split type and at its ends it is provided with lugs 114 which in turn are formed with lateral projections 115 each of which has a plurality of cam surfaces 116. Interposed between the ends of the brake band there is a coil spring 118 which tends to normally spread the resilient band to prevent braking engagement of the brake drum therewith.

Passing through the lugs 114 and the coil spring 118 there is a shaft 119 preferably in the form of a bolt both ends of which are screw threaded as shown for the reception of nuts or the like 120. Interposed between the nuts 120 and the lateral extensions 115 of the resilient band 112, and carried by each end of said shaft 119 there is an arm 125. The upper end of each of these arms 125 engages its respective pin 102. The lower end of each of these arms is provided with an offset portion 126 which is preferably formed with cam faces 127 adapted to cooperate with the heretofore mentioned cam faces 116 for the purpose to be hereinafter specifically described.

From the foregoing description it will readily be seen that each time the shaft 100 is rocked to effect a collapsing of the turbine rotor, the arms 125 will be rocked about the shaft 119, and through the medium of the engaging cam faces 116 and 127, the brake band will be contracted about the brake drum to produce braking action thereon and thus stop rotation of the driven member during the interval of time the turbine is maintained collapsed. The brake band 112 is provided with grooves 128 engaging with the end of the pins 102. The purpose of this arrangement is to absorb all tangential forces in the brake band during the collapsing of the turbine rotor by the pins 102, arms 101 and rock shaft 100.

The means by which the rock shaft 100 is operated is not herein shown and it is to be understood that it is within the province of this invention to rock this shaft in any manner most suitable to the installation of the device. If the installation is in an automotive vehicle, this rock shaft 100 would preferably be operated by a foot pedal but in other types of installations the means for operation of the shaft may take that form which is most suitable to the installation. Whatever form the operation means of the shaft 100 may take it is to be understood that the normal position of the parts is shown in Fig. 2, and the operating means of the shaft 100 would preferably be of a type which will tend to move the parts to their normal position when the operating means is released.

While the invention has been herein illustrated in its preferred forms, it is to be understood that it is not to be limited to those forms in which it is illustrated, but is capable of embodiment in such other forms as rightfully fall within the purview of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a hydraulic power transmitter, a fluid impeller and a fluid impelled member forming a fluid couple therebetween in which the liquid is impelled from said impeller to drive said impelled member, said fluid impelled member comprising a plurality of spaced annular members, vanes or blades pivotally connected to said annular members, and means cooperating with said blades or vanes to move them about their pivotal points to effect a collapsing of said fluid impelled member, said means including one of said annular members.

2. In a hydraulic power transmitter, a fluid impeller and a fluid impelled member forming a fluid couple therebetween in which the liquid is impelled from said impeller to drive said impelled member, said fluid impelled member comprising a plurality of annular members vanes or blades pivotally connected to said annular members, and means for moving one of said annular members toward the other annular member to effect a collapsing of the fluid impelled member.

3. In a hydraulic power transmitter, a fluid impeller and a fluid impelled member forming a fluid couple therebetween in which the liquid is impelled from said impeller to drive said impelled member, said fluid impelled member comprising a plurality of annular members, vanes or blades pivotally connected to said annular members, and means for moving one of said annular members toward the other annular member to effect a collapsing of said fluid impelled member, said means including at least one of said vanes or blades.

4. In a hydraulic power transmitter, a fluid impeller and a fluid impelled member forming a fluid couple therebetween in which the liquid is impelled from said impeller to drive said impelled member, said fluid impelled member comprising a plurality of annular members, vanes or blades pivotally connected to said annular members, and means for moving one of said annular members toward the other annular member to effect a collapsing of said fluid impelled member, said means including at least one of said vanes or blades and one of said annular members.

5. A turbine rotor for hydraulic power transmitters comprising a main body portion, an annular member secured thereto, a plurality of vanes or blades pivotally mounted on said annu-

lar member, and a second annular member carried by said vanes or blades and movable toward and from said first mentioned annular member.

6. A turbine rotor for hydraulic power transmitters comprising a main body portion, an annular member secured thereto, a plurality of vanes or blades pivotally mounted on said annular member, and a second annular member carried by said vanes or blades and being pivotally attached thereto and movable toward and from said first mentioned annular member.

7. A turbine rotor for hydraulic power transmitters comprising a main body portion, an annular member secured thereto, a plurality of vanes or blades pivotally mounted on said annular member, and a second annular member carried by said vanes or blades and being pivotally attached thereto, said second mentioned annular member being movable into and out of juxtaposition with the first mentioned annular member by movement of the vanes or blades about their pivotal points.

8. A turbine rotor for hydraulic power transmitters comprising a main body portion, an annular member secured thereto, a plurality of vanes or blades pivotally mounted on said annular member, and a second annular member carried by said vanes or blades and being pivotally attached thereto, said second mentioned annular member being movable into and out of juxtaposition with the first mentioned annular member by movement of the vanes or blades about their pivotal points, and means carried by the main body portion for operating said blades.

9. A turbine rotor for hydraulic power transmitters comprising a body member, an annular member carried by said body member, a plurality of vanes or blades carried by said annular member, and a second annular member supported from the first mentioned annular member by said vanes or blades, said vanes or blades being pivotally connected to both of said annular members, whereby they may be moved to positions substantially parallel with or at right angles to said members upon relative movement of said members toward and from each other.

10. A turbine rotor for hydraulic power transmitters comprising a body member, an annular member carried by said body member, a plurality of vanes or blades carried by said annular member, and a second annular member supported from the first mentioned annular member by said vanes or blades, said annular members and said vanes or blades being pivotally connected to one another, whereby to permit movement of the second mentioned annular member toward and away from the first mentioned annular member.

11. In a collapsible rotor for fluid power transmitters, a plurality of pivotally mounted vanes or blades, one side of said vanes or blades being mounted for pivotal movement about axes in one plane, with the opposite side of said vanes or blades mounted for pivotal movement about axes lying in a parallel plane.

12. In a collapsible rotor for fluid power transmitters, a plurality of pivotally mounted vanes or blades, one side of each vane or blade being mounted for pivotal movement about an axis in a transverse radial plane, and the opposite side of each vane or blade being mounted for pivotal movement about an axis in a transverse radial plane spaced axially of the rotor from said first mentioned plane.

13. A collapsible rotor for hydraulic power transmitters of the Föttinger type, including a pair of annular members, a plurality of blades pivotally mounted on one of said members to swing about axes substantially parallel to said member and extending in directions substantially tangential to a circle coaxial with the rotor and of a diameter substantially equal to the distance between successive blades, and pivotal connections between each of said blades and the other member, the pivotal connections at opposite edges of each blade being substantially parallel, and the pivotal connections between said blades and said second mentioned member being free to oscillate in respect to said member about axes parallel to the axis of rotation of said rotor.

14. A collapsible rotor for hydraulic power transmitters of the Föttinger type, including a pair of annular members, and a plurality of vanes connecting said members, said vanes being pivoted along opposite edges of said members, whereby said members may be moved toward or from each other.

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