June 24, 1947. G. D. HUNTER 2,422,901

ROTARY PUMP

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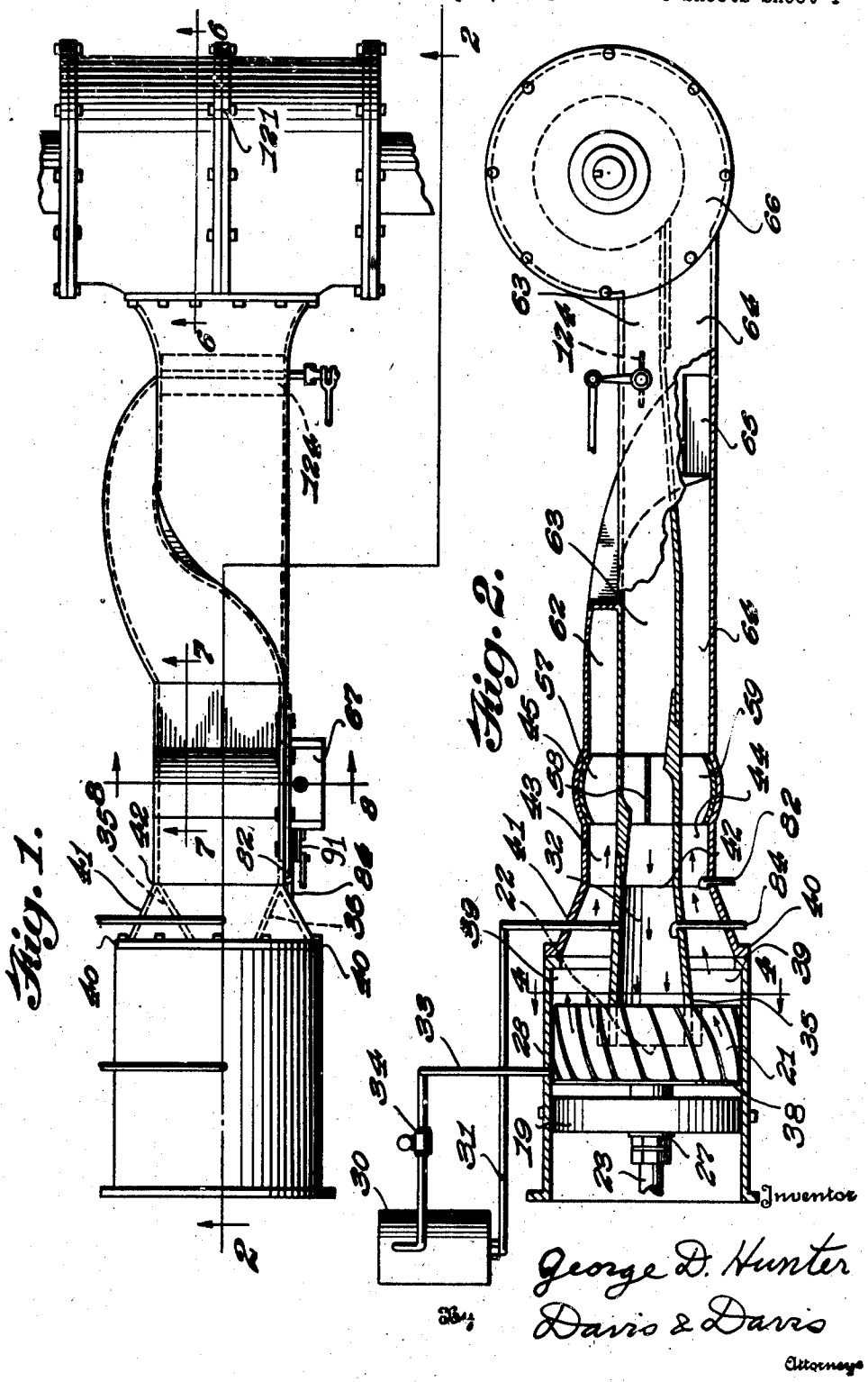


Fig. 1.

Fig. 2.

Inventor

George D. Hunter

Davis & Davis

Attorneys

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Fig. 4.

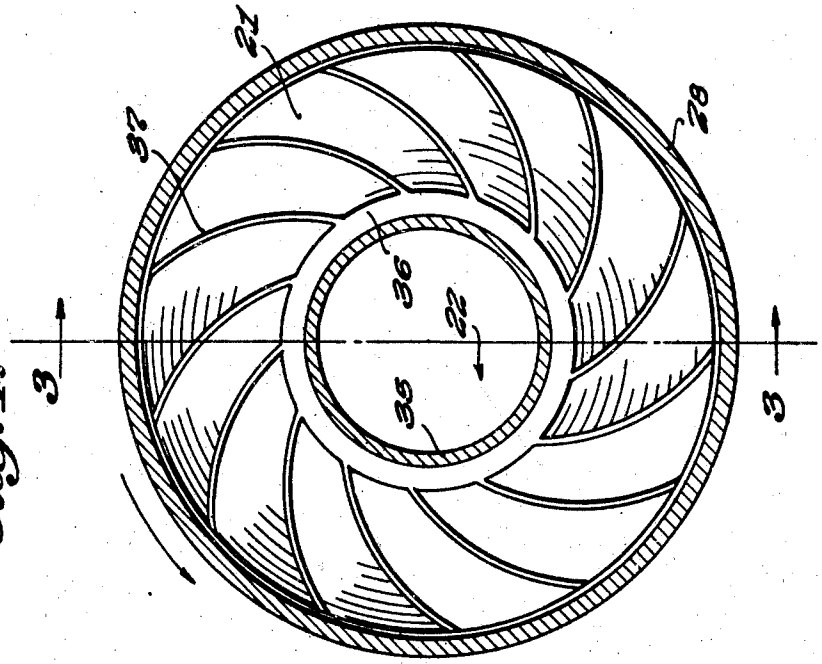
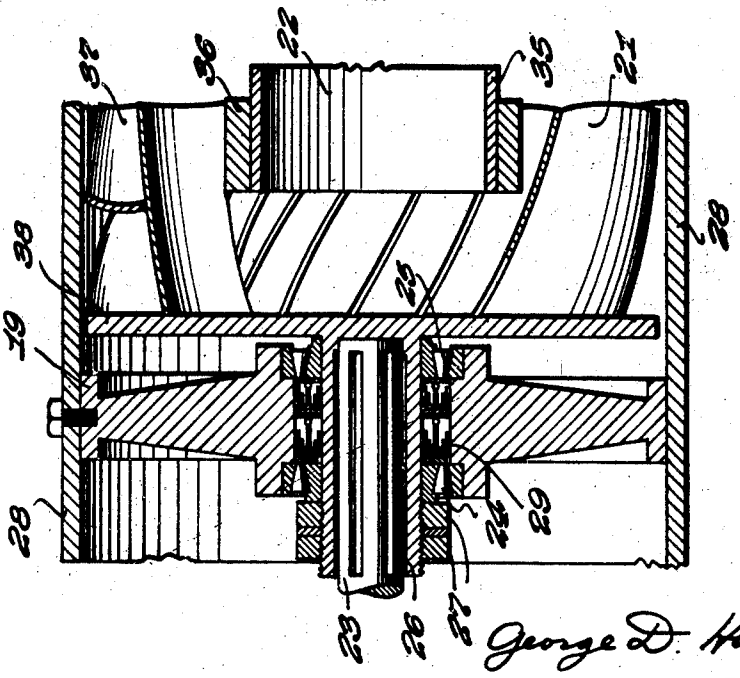


Fig. 3.



Inventor

George D. Hunter

By Davis & Davis

Attorneys

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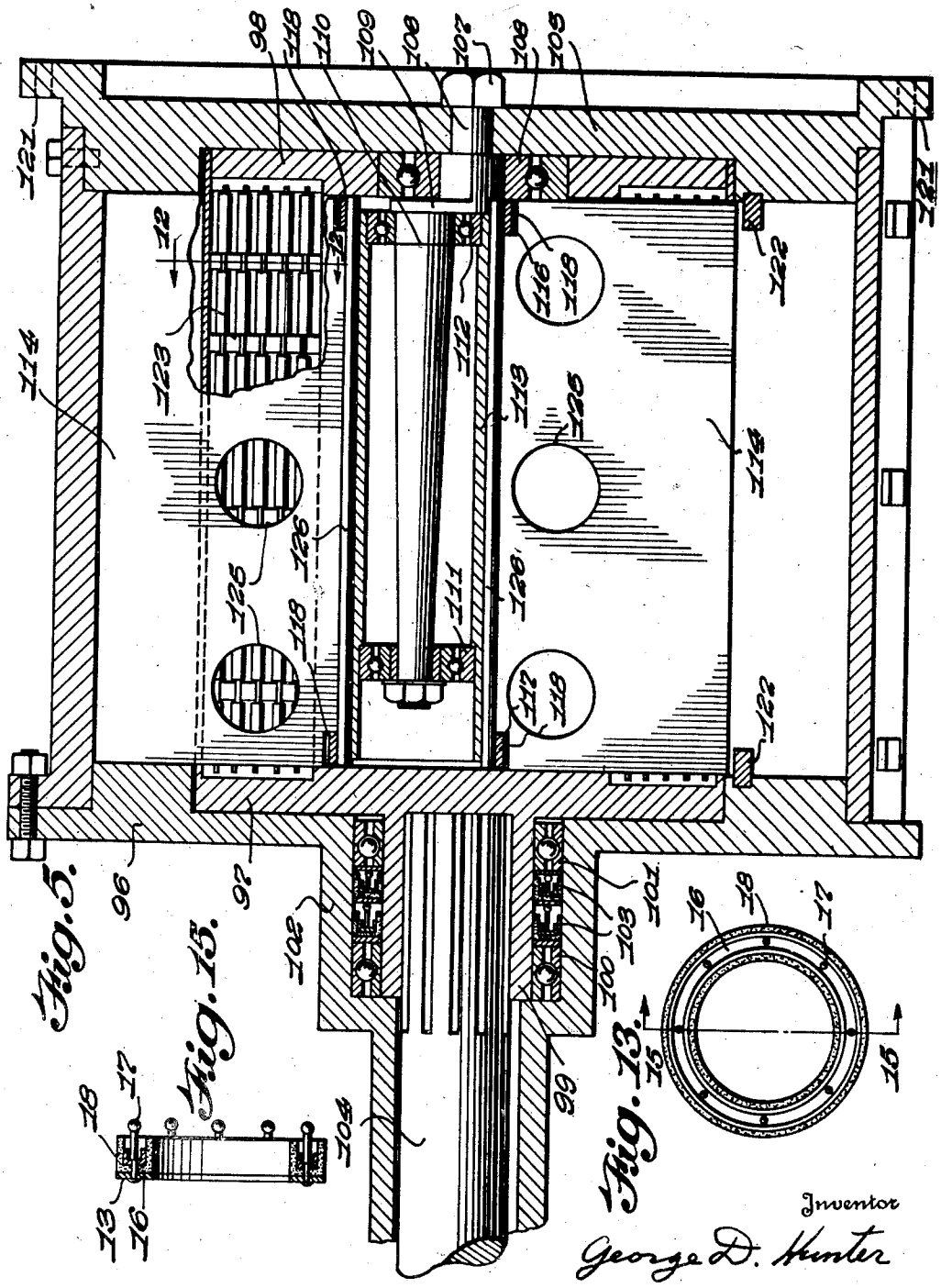


Fig. 5.

Fig. 15.

Fig. 13.

Inventor

George D. Hunter

By Davis & Davis

Attorneys

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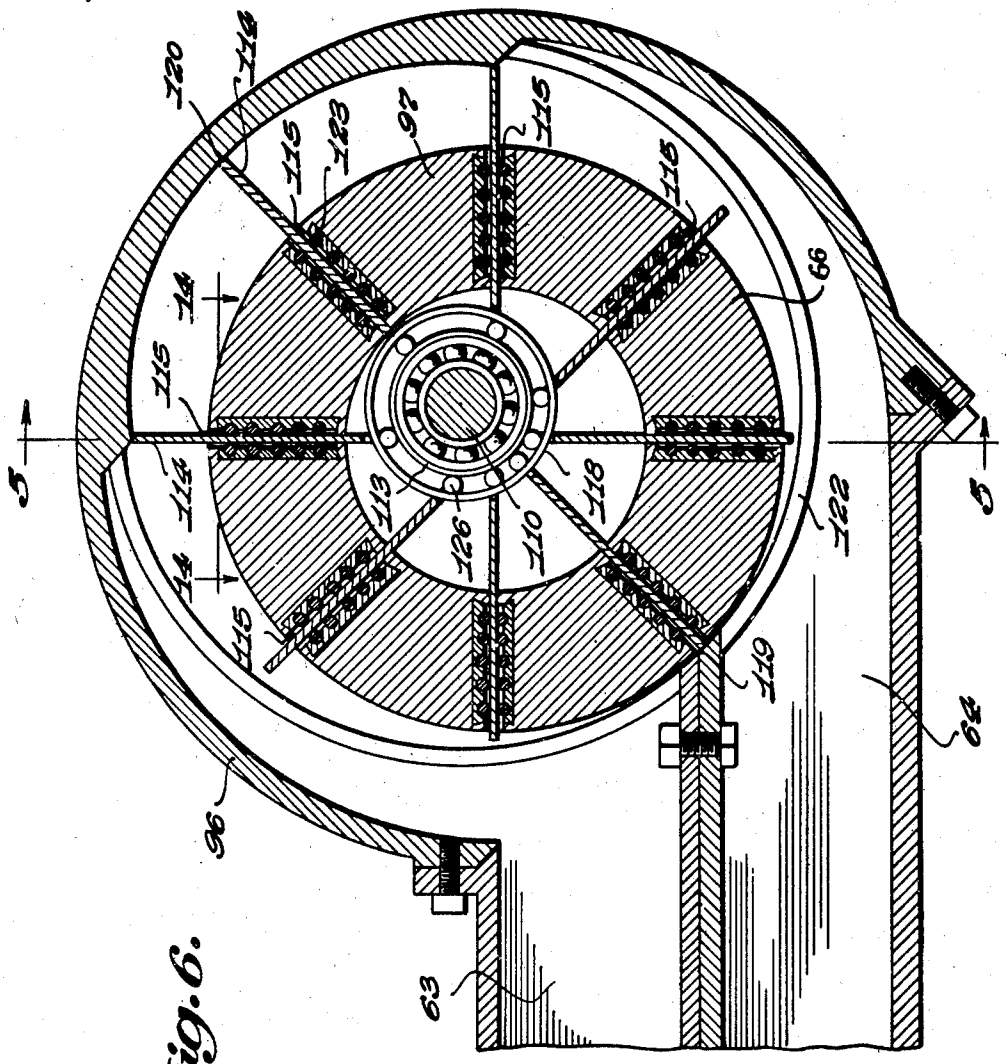


Fig. 6.

Inventor

George D. Hunter

By Davis & Davis

Attorneys

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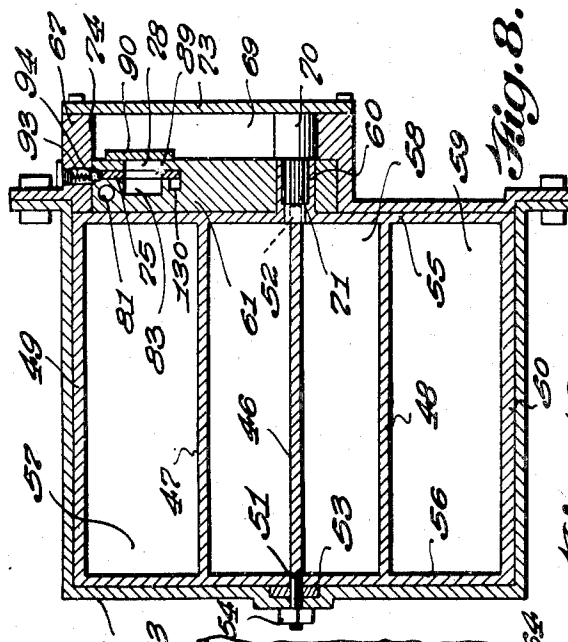


Fig. 8.

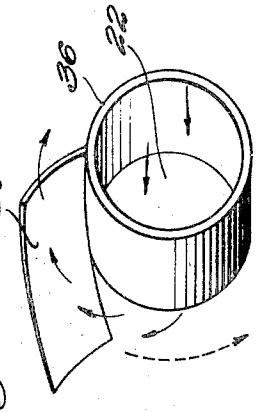


Fig. 10.

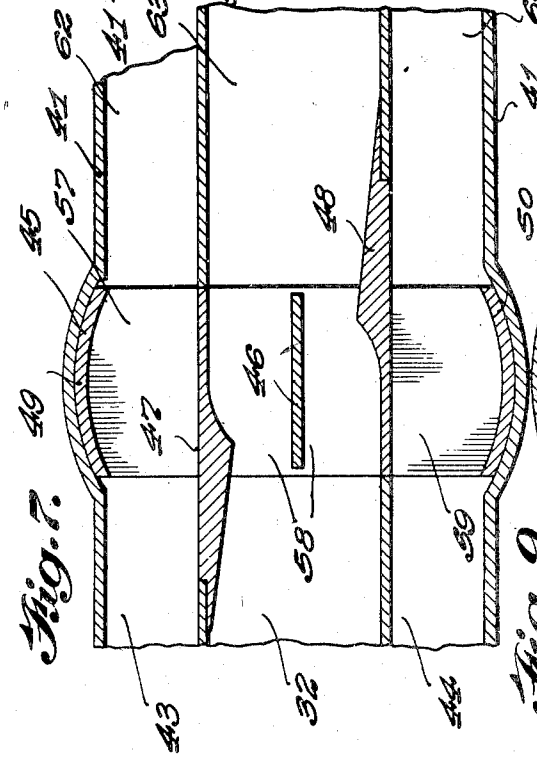


Fig. 7.

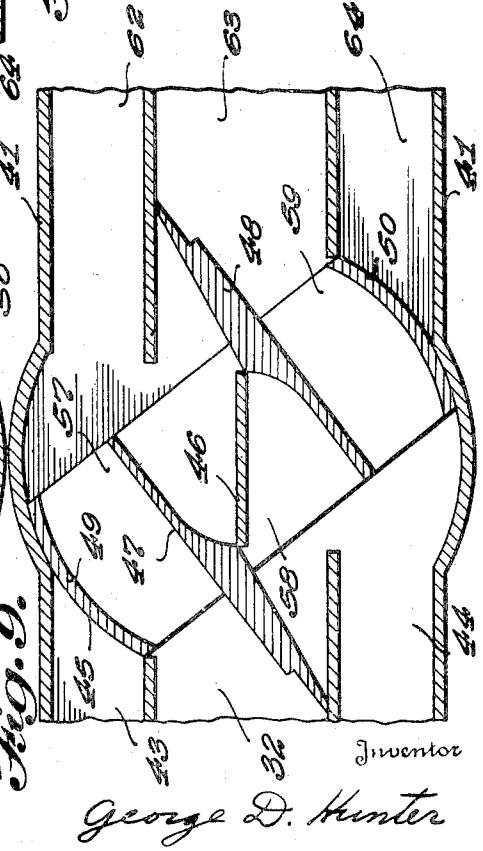


Fig. 9.

Inventor

George D. Hunter

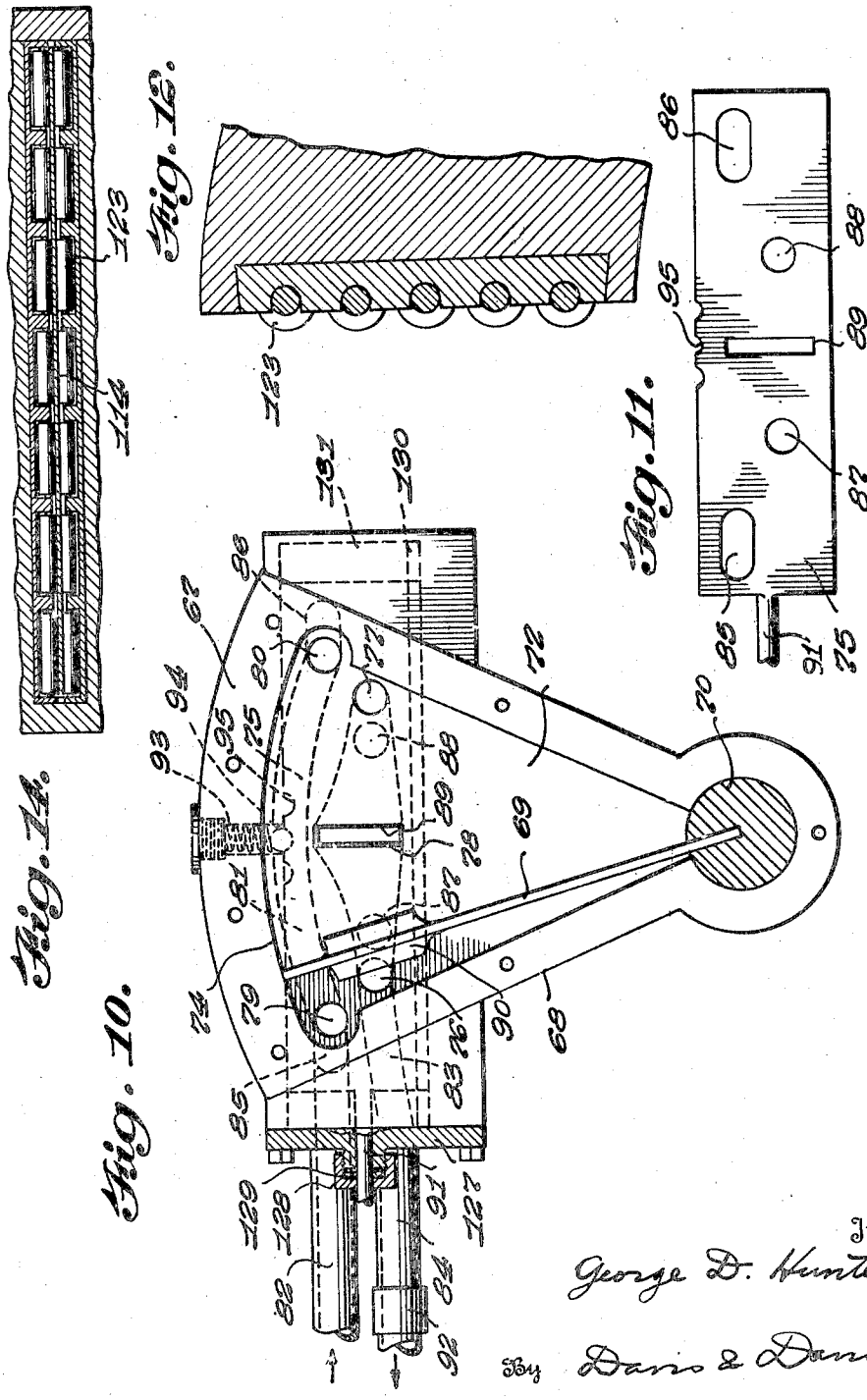
By Davis & Davis

Attorneys

June 24, 1947. G. D. HUNTER 2,422,901

ROTARY PUMP

Filed July 5, 1941 6 Sheets-Sheet 6



Inventor
George D. Hunter
By Davis & Davis
Attorneys

Patented June 24, 1947

2,422,901

UNITED STATES PATENT OFFICE

2,422,901

ROTARY PUMP

George D. Hunter, Rocky Mount, N. C.

Application July 5, 1941, Serial No. 401,248

3 Claims. (Cl. 103—87)

1

This invention relates to improvements in power transmissions of the fluid type and has for an object to provide an improved transmission device adapted to perform the functions of the usual transmission gearing and differential. The invention is capable of application to any device where it is desired to utilize power delivered by a prime mover and while particularly designed for use in place of the ordinary transmission gearing used in automobiles, trucks and tractors, it will be readily apparent as the description proceeds that the fluid transmission mechanism of this invention is likewise applicable for the transmission of power for motorcycles, airplanes, boats, ships, locomotives, machine tools, and in various other ways and for various purposes which will readily suggest themselves to the manufacturer.

Further, while the embodiment of the invention herein illustrated discloses the invention as applied to a pair of driven units, it is readily apparent that the same is applicable to a single driven unit or to a plurality of driven units.

An object of my invention is to provide an improved centrifugal pump for the transmission of force from a driving member to a fluid medium. The pump having provided an inlet at the center thereof adapted to direct an inflowing fluid medium radially outward and directly behind the expelling edge of the blades of the said pump so that the said blades upon being rotated by the driving member will strike the fluid medium in such a manner as to force the same axially from the pump.

A further object of my invention is to provide an improved motor of the expansible chamber type operated under the pressure of the said fluid medium. The said motor so constructed as to transmit such force by rotary motion to a driven member with a minimum loss through friction.

Another object of my invention is to provide an improved control means connected between the pump and the motor for regulating the direction of the flow of the fluid medium into the motor and accordingly the direction of the rotation of the said motor.

It is also an object of my invention to provide a simple and efficient mechanism for operating the control means aforesaid.

Another object of my invention is to provide

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an improved braking means for the said motor comprising a valve member adapted to close the outlet channel of the motor in such a manner that the fluid medium flowing out of the motor will be impeded causing a backing up of the fluid medium which will result in a braking effect upon the motor, which braking effect will be increased by the further rotation of the motor.

A further object of my invention is to provide a power transmission which may be constructed at low cost and which may be easily and efficiently operated.

Other objects and advantages of my invention are set forth in the following description, taken with the accompanying drawings, and the novel features thereof are pointed out in the appended claims. The disclosure, however, is illustrative only, and I may make changes in detail especially in matters of shape, size and arrangement of parts within the principle of the invention to the full extent indicated by the broad and general meanings of the terms in which the appended claims are expressed:

On the drawings:

Figure 1 is a top plan view of the device.

Figure 2 is a cross section of Figure 1 taken along the line 2—2 and looking in the direction of the arrows with certain parts broken away.

Figure 3 is a sectional view of the circulating pump taken on the line 3—3 of Figure 4.

Figure 4 is an enlarged front elevation of the circulating pump taken along the line 4—4 of Figure 2 looking in the direction of the arrows.

Figure 5 is a transverse section of Figure 6 taken along the lines 5—5 and looking in the direction of the arrows.

Figure 6 is an enlarged sectional view taken along the line 6—6 of Figure 1 and looking in the direction of the arrows.

Figure 7 is an enlarged sectional view taken along the line 7—7 of Figure 1.

Figure 8 is an enlarged sectional view taken along the line 8—8 of Figure 1.

Figure 9 is a view of Figure 7 with the control valve pivoted in another adjusted position.

Figure 10 is a front elevation of the power shift mechanism with the cover plate removed.

Figure 11 is a front elevation of the valve slide member shown in Figure 10.

Figure 12 is an enlarged sectional view of the

roller support taken along the line 12—12 of Figure 5.

Figure 13 is an enlarged end view of an oil retainer shown in Figures 3 and 5.

Figure 14 is a sectional view of the roller and plate assembly taken along the line 14—14 of Figure 6.

Figure 15 is a sectional view of an oil retainer taken along the line 15—15 of Figure 13.

Figure 16 is a diagrammatic view illustrating the operation of the rotary pump blade upon the inflowing fluid medium.

Similar characters of reference refer to similar parts and portions throughout the several views of the drawings.

My power transmission mechanism comprises a rotary pump 21 of the centrifugal type with an inlet 22 at the center thereof. The said rotary pump 21 has the sleeve member 26 splined or connected in any convenient manner to the shaft 23 which is in turn connected to the prime mover or source of power.

The sleeve member 26 is journaled so as to rotate on suitable bearings 24 and 25 positioned in the forward end plate 19 and the said sleeve member 26 has provided at the end thereof screw threads to which there are engaged the screw threaded nuts 27 by means of which the pump member 21 is rotatably fastened in the forward end plate 19. The forward end plate 19 is further bolted or secured in any convenient manner to the casing 28 so as to seal the forward end of the said casing 28 from the loss of the fluid medium, preferably oil held by the said casing. Positioned between the bearings 24 and 25 are the oil retainers 29, Figures 13 and 15, which comprise the fabric or leather material 18 attached by the rivets 17 to the rings 13 and 16. The rivets 17 are elongated as shown to serve as a means of separating the said retainers. The pressure of the oil or fluid medium against the lips of the leather or fabric material 18 forces the same against the inner wall of the plate 19 and the sleeve 26 thereby forming a tight fit against the escape of the fluid.

A tank 30 for supplying the pump 21 with a fluid medium preferably oil is provided having an outlet pipe 31 leading into the channel 32 which is connected to the inlet opening 22 of the pump 21. Further, there is provided an inlet pipe 33 to the said supply tank 30. The said inlet pipe 33 having an opening at the side of the pump 21 as shown in Figure 2 and the said inlet pipe 33 has further provided a pet cock 34 for opening and closing the said inlet to the supply tank 30.

The said channel 32 is formed by the casing 35 which at the opening or inlet 22 of the pump 21 is circular in shape and is journaled at the forward end thereof so that the collar 36 of the pump 21 may revolve freely thereon. The said casing 35 at the forward end thereof fits within the collar 36 as shown in Figure 3. Attached to the collar 36 of the pump 21 are a plurality of blades 37 which are spaced an equal distance apart and are curved transversely in such a manner that upon rotation of the said pump the concave side of each of the said transversely curved blades will strike the fluid medium. The said blades 37 extend forward from the said collar 36 at an acute angle thereto slanting in the direction of the rotation of the said pump 21 as indicated by the arrow in Figure 4 and the dotted arrow in Figure 16. The said blades 37 are secured at the forward end to the plate 38.

The forward plate 38 is separated from the collar 36 so that a fluid medium preferably oil upon being forced into the inlet 22 will be fed to the blades 37 through the said space provided between the collar 36 and plate 38 and into the spaces separating the said blades 37. The said blades 37 are so adapted that upon the rotation thereof the said blades will force the fluid medium fed thereto axially toward the rear of the machine as indicated by the arrows in Figure 16.

At the idle speed of motor or source of power there is very little force created and therefore no clutch is necessary to relieve the motor of its load. At high speed however great force is created and the speed with which the fluid medium or oil is forced rearward will increase in proportion to the lessening of the resistance against the rearward flow of the said fluid medium.

There is surrounding the pump 21 and the casing 35 a second and outer casing 28 which is circular in shape.

The space between the inner casing 35 and the casing 28 forms the outlet channel 39 of the pump 21.

At 40 the end of the outer casing 28 is bolted to the end of a second casing 41. Further from the point 40 the side walls of the casing 35 project outwardly as shown in dotted lines in Figure 1 while the side walls of the casing 41 begin to extend inwardly until at the point 42 the ends of the side walls of the casing 35 are welded or fastened in any convenient manner to the sides of the casing 41. From the point 42 the opposite side walls of the said casing 41 continue rearwardly in a parallel relation.

From the point 40 the top and bottom walls of the said casing 41 extend downwardly and upwardly respectively as shown in Figure 2, to the point 42, while the top and bottom walls of the casing 35 extend from the point 40 rearward in substantially parallel relation as shown in Figure 2. The side edges of the top and bottom walls of the casing 35 extending from the point 42 are welded or fastened in any convenient manner to the side walls of the casing 41.

Thus at the point 42 there are formed three separate passageways, the inlet channel 32 and the outlet channels 43 and 44 connected to the channel 39 as shown in Figure 2.

At the rearward end of the channels 32, 43 and 44 there is provided the pivotally mounted control valve 45 shown in Figure 2 and in detail in Figures 7, 8 and 9 and described and claimed in my copending divisional U. S. application for patent Ser. No. 720,026, filed January 3, 1947.

The valve 45 has provided the side walls 55 and 56 to which are securely fastened the peripheral top and bottom walls 49 and 50 and the partition walls 47 and 48 forming the three channels 57, 58 and 59.

The top and bottom walls of the casing 41 are curved as shown in Figures 2, 7 and 9 so as to house the peripheral top and bottom walls 49 and 50 of the valve 45. The said walls 49 and 50 being adapted to be adjusted upon pivotal movement of the valve 45.

The valve 45 has the side walls thereof 55 and 56 pivoted on the shaft 51 and the shaft 52 respectively indicated in Figure 8 in dotted lines and which shafts project from the opposite ends of the rigidly mounted partition wall 46. The said partition wall 46 is mounted between the partition walls 47 and 48.

The shaft 51 of the partition wall 46 is splined or fastened in any convenient manner to the

member 53 which is engaged in the side wall of the casing 41 so as to prevent the pivoting or turning of the partition wall 46 upon the pivotal movement of the valve 45. The said shaft 51 is fastened at the outer side of the casing 41 by the securing nut 54.

The valve 45 further has provided a sleeve member 60 which is journaled in the housing member 61 so that the valve 45 may be readily pivoted either by manual means or by a simple power shift illustrated herein in Figures 8 and 10 and which will be explained in detail hereinafter.

Rearward of the valve 45 there is formed in the casing 41 the channels 62, 63 and 64. As shown in Figure 2 the channel 62 is connected to the channel 64 at the opening 65 and the channels 63 and 64 are attached to opposite channels of a motor of the expansible chamber type operated by fluid under pressure, and said motor indicated generally by the numeral 66. The motor 66 may be of a type described and claimed in my copending divisional U. S. application for patent Ser. No. 720,025, filed January 3, 1947.

Thus it will be readily seen that if the fluid medium is forced into the motor 66 through channel 63 the motor 66 will rotate in one direction, while if the fluid medium is forced into the motor 66 through channel 64 the motor will rotate in the opposite direction. It will be readily seen that the direction of the flow of the fluid medium in the channels 63 and 64 may be reversed by the adjustment of the valve 45.

Thus if the valve be adjusted as shown in Figure 7 the fluid medium in the channels 43 and 44 impelled by the rotary pump 21 will be forced through the corresponding valve channels 57 and 59 into the channels 62 and 64. The fluid medium in the channel 62 will be forced through the opening 65 as previously described into the channel 64 where the same is combined with the fluid medium therein under force of the rotary pump 21. The said fluid medium from the channel 64, Figure 2, will force the motor indicated generally by the numeral 66 to rotate in a counterclockwise direction. The said fluid medium returning through the channel 63 which fluid medium with the valve adjusted as shown in Figure 7 will pass through the valve channel 58 through to the channel 32 to the inlet opening 22 and returning thereby to the rotary pump 21.

Upon pivoting the valve 45 to the position shown in Figure 9 the channel 43 will be closed by the peripheral wall 49 of the valve 45 so that the fluid medium under force of the rotary pump 21 must be carried by the channel 44. However the peripheral wall 50 of the valve 45 in the adjusted position shown in Figure 9 will close the channel 64 to the flow of the fluid medium in the channel 44. Moreover upon pivoting the valve 45 to the adjusted position shown in Figure 9 the fixed partition wall 46 will close the channel 58 of the valve 45 and the fluid medium in the channel 44 will be directed through the valve channel 59 into the channel 63. The said fluid medium in the channel 63 Figure 2 under force of the rotary pump 21 will force the motor 66 to rotate in a clockwise direction, the said fluid medium returning through the channel 64. However since the channel 64 is blocked by the peripheral wall 50 of the valve 45 the returning fluid medium in the channel 64 will pass through the opening 65 into the channel 62. From the channel 62 the returning fluid medium will pass through the valve channel 57 into the channel 32 to the inlet opening 22 of the rotary pump 21.

Thus it will be readily seen that by adjusting the valve 45 to the position shown in Figure 7 the fluid medium under pressure of the rotary pump 21 will be directed so as to rotate the motor 66 in a counterclockwise direction and by adjusting the valve 45 to the position shown in Figure 9 will cause the motor 66 to be rotated in a clockwise direction. Further if the valve 45 be adjusted to a position between that shown in Figure 7 and the extreme position shown in Figure 9 the fluid medium under pressure of the rotary pump 21 will be directed so as to have a neutral effect on the motor 66. In the neutral position the partition walls 47 and 48 and the peripheral wall 49 of the valve 45 are adjusted so as to permit the fluid medium under pressure in the channels 43 and 44 to pass directly into the return channel 32 without passing through the motor 66.

In order to pivot the valve 45 to the three positions noted that is forward, reverse and neutral there is provided an improved power shift indicated generally in Figures 1, 8 and 10 by the numeral 67.

The power shift 67 is composed of a V shaped box 68 bolted or fastened in any suitable manner to the side wall of the casing 41 as shown in Figures 1 and 8, and fitted about the sleeve member 60 of the valve 45. Lever plate 69 is fitted and secured at the lower end in a slot formed in the shaft 70 which is splined or fastened in any convenient manner to the sleeve member 60 as shown by numeral 71. The said shaft 70 is further pivotally engaged by the shaft 52 formed at the end of the fixed partition plate 46. The shaft 70 is pivoted by movement of the lever plate 69 in the V shaped chamber 72. The said lever plate 69 is adapted to swing on the said shaft 70 in the V shaped chamber 72 from one end of the said chamber 72 to the other end thereof. The plate 69 extends within the chamber 72 from the inner edge of the housing 61 to the inner edge of the cover plate 73 and from the shaft 70 to the upper peripheral edge 74 of the chamber 72, thus serving as an adjustable plate partitioning the said chamber 72. The swinging adjustment of the lever plate 69 causes a corresponding adjustment of the valve 45 to the forward reverse or neutral positions previously described.

In order to accomplish the adjustment of the lever plate 69 I have provided a rectangular shaped valve plate 75, Figure 11, slidably fitted in a channel 131 in the housing 61 as shown in Figure 8 and in dotted lines in Figure 10.

The said valve plate 75 controls the openings 76, 77, 78, 79 and 80 in the housing 61. Openings 79 and 80 are pressure vents which are connected through openings in the valve plate 75 to the channel 81 shown in dotted lines in Figure 10. The said channel 81 is connected to the conduit 82 which is in turn connected to the pressure channel 44 as shown in Figures 1 and 2.

Openings 76, 77 and 78 are outlet vents which through openings in the valve plate 75 are connected to channel 83 in housing 61 as shown in dotted lines in Figure 10. The channel 83 is connected to the conduit 84 which is connected to the inlet channel 32 as shown in Figure 2.

The valve plate 75 has provided the openings 85 and 86 adapted to control the vents 79 and 80 respectively; and the openings 87 and 88 adapted to control the vents 76 and 77 respectively. Further there is provided the opening 89 adapted to control the vent 78.

Moreover at the upper end of the adjustable plate 69 is provided a plate 90 adapted to sepa-

rately close each of the outlet control openings 76, 77 and 78 provided in the said housing 61.

Further the valve plate 75 is positioned within a suitable channel 131 provided in the housing 61 and may be slidably adjusted by the rod 91 which may be controlled by cable or similar contrivance adjusted from dash or steering column. The channel 131 within which the valve plate 75 is slidably positioned is closed by the plate 127. The rod 91 protrudes through the plate 127 and has provided the nut 128 screwed on to the plate 127 and the packing 129 adapted to prevent loss of the fluid medium from the said channel.

When by adjustment of the rod 91 the valve 75 is slidably positioned to the extreme left in Figure 10 the opening 86 of the valve 75 coincides with the pressure vent 80 and opening 87 of the valve 75 coincides with the outlet vent 76 and all other vents in the housing 61 are closed by the valve 75.

The fluid medium preferably oil will then flow from the channel 81, through the valve opening 86 and out the pressure vent 80 under pressure of the rotary pump 21 into the chamber 72 forcing the lever plate 69 to swing toward the left under pressure of the said fluid medium. Any of the fluid medium at the opposite side of the lever plate 69 will be forced out through the outlet vent 76, through the valve opening 87 and through the channel 83 to the channel 32, until the plate 90 mounted at the upper end of the said plate 69 covers the outlet vent 76 thereby closing the said opening and cutting off further escape of the said fluid medium. The said movement of the plate 69 will pivot the shaft 70 causing the adjustment of the valve 45 to the position shown in Figure 9.

When the sliding valve 75 is adjusted to the extreme right in Figure 10, the valve opening 85 will coincide with the pressure vent 79 and valve opening 88 will coincide with the outlet vent 77 all other vents in the housing 61 are closed by the valve plate 75.

The fluid medium under pressure in the channel 81 will then pass through the valve opening 85 and out of the vent 79 forcing the plate 69 to swing to the right, the fluid medium at the opposite side of the plate 69 expelling through the outlet vent 77, through the valve opening 88 and into the channel 83 until the plate 90 covers the outlet vent 77. The said movement of the lever plate 69 will cause the adjustment of the valve 45 to the position shown in Figure 7.

When the sliding valve 75 is adjusted to the neutral position shown in Figure 10 the opening 85 will coincide with the pressure vent 79, valve opening 86 will coincide with the pressure vent 80 and valve opening 89 will coincide with the outlet vent 78. Pressure will then be applied through both pressure vents 79 and 80 at opposite sides of the lever plate 69 as shown in Figure 10. The force exerted will always be greater on the side of plate 69 away from the outlet vent 78 until the plate 69 is forced to a middle position. Then the plate 90 will cover the outlet vent 78 and the pressure of the fluid medium from the opposite pressure vents will be equal holding the plate 69 in the neutral adjusted position and adjusting the valve 45 to a neutral position intermediate to that shown in Figures 7 and 9.

In the adjusted positions noted it will be readily seen that the pressure of the fluid medium will hold the plate 69 in its adjusted position, thus holding the valve 45 securely in adjusted position. There is further provided a check valve 92 in the outlet conduit 84 to prevent any possible back

pressure from causing a change in the position of the plate 69. It will further be observed from Figure 10 that the pressure vents in the housing 61 are positioned beyond the end of the stroke of the lever plate 69 thus permitting pressure upon the proper adjustment of the valve plate 75 to always be applied to the desired side of the plate 69.

There is further provided a spring member 93, Figures 8 and 10, adapted to hold a ball 94 under spring tensions in the notches 95 in the valve 75 thereby holding the valve 75 in proper adjusted position until sufficient force is applied to the adjustment rod to release the same.

Also as shown in Figures 8 and 10, there is provided in the channel 131 the auxiliary channel 130. The said channel 130 is adapted to serve as a means to allow any fluid medium which may accumulate in either end of the channel 131 to escape to the opposite end of the channel 131 upon the adjustment of the valve plate 75 into such end of the said channel 131.

My invention further embodies improvements in the motor 66 as disclosed in Figures 5 and 6 and described and claimed in my copending divisional U. S. application for patent Ser. No. 720,025, filed January 3, 1947.

The motor 66 is composed of a housing 96 in which is mounted a spider drum or rotary driven unit 97. The spider drum 97 is a slotted cylinder having one end closed by the end plate 98, Figure 5, and the other end formed integral with the cylinder. The latter end of the said drum 97 has provided a sleeve 99 which is mounted on the bearings 100 and 101 in the sleeve 102 of the housing 96. Between the bearings are provided the oil retainers 103 shown in Figures 13 and 15 and constructed the same as the oil retainers 29 of the rotary pump 21 previously noted. Sleeve 99 is splined or fastened in any convenient manner to the driven axle 104.

There is rigidly fastened to the opposite wall 105 of the housing 96 a shaft 106 which is splined to the said wall 105 and fastened by the nut 107. The spider drum 97 is rotatably mounted on the bearings 108 provided on the said shaft 106. Further there is rigidly mounted at the inner end of the said shaft 106 an arm 109 to which there is attached off center from the center of the said drum 97 and the said shaft 106 the spindle 110 on which there are mounted at the opposite ends thereof the bearings 111 and 112 on which is rotatably mounted the sleeve 113. The off center sleeve 113 serves as a cam means to force the plates 114 of the spider drum 97 outward through the slots 115 as the spider drum revolves, Figure 6.

The plates 114 as shown in Figures 5 and 6 have provided at the inner end thereof the member 126 and the slots 116 and 117 in which is positioned a retainer ring or guide ring 118 in which is journaled the members 126 of the said plates 114. The guide ring 118 serves to hold the member 126 and the plate 114 always in contact with the cam sleeve 113 which revolves on the spindle 110 with the plate 114 and spider drum 97 thereby reducing friction to a minimum.

Thus it will be readily seen that as the spider drum revolves each of the said plates 114 as the same move from the wall 119 will be forced by the cam sleeve 113 outward through the slots 115 until the plate approaches a point diametrically opposite the wall 119 indicated on Figure 6 by the numeral 120 at which point this outward cam action ceases.

Then guide ring 118 positioned around the cam

sleeve 113 and the members 126 of the plates 114 causes the said plate 114 as it passes this point 120 to slide inwardly as the drum 97 continues to revolve, until the said plate is flush with the outer surface of the drum 97 at the wall 119. The wall 119 serves as the dividing wall between the channels 63 and 64. Thus the sliding plates serve as a valve closing the opening between the spider drum 97 and the housing 96, against which the fluid medium entering through channel 63 or 64 will be forced causing the spider drum 97 and its connected parts to revolve turning the driven axle. Furthermore by retracting the said plates when past the point of force, point 120, the fluid medium is released and allowed to pass outward through the outlet channel. There is further provided a rib 122, Figures 5 and 6, to prevent jamming should any of the spider plates 114 become accidentally disengaged from the ring 118.

The spider plates 114 are slidably mounted between the rollers 123, shown in Figures 5, 6, 12 and 14, so as to reduce friction and the operation and construction of which is clear from the drawings thereof without the necessity of further description.

Adding to the efficiency of the motor 66 are the apertures 125 provided in the plates 114 near the inner end thereof. The said apertures 125 allow for the free passage through the plates 114 of any fluid medium within the revolving spider drum 97 thereby lessening any pressure which may be created within the revolving drum 97 which would otherwise retard the rotary action of the said drum 97.

Where desired particularly in automobiles, trucks and tractors double units as shown in Figure 1 may be used, in which case identical units are merely bolted together at 121 and the channels 63 and 64 directed to both units. Additional units may be similarly attached as desired.

Furthermore the casing 41 forming the channels 63 and 64 may obviously in order to assume greater flexibility be divided into smaller parts which because of their smaller size will bend more easily or the said conduits may be made of suitable flexible material.

Further there is disclosed in my invention a braking means comprising a butterfly type valve 124 positioned in the channel 63 which may be controlled by cable or other suitable means.

When the transmission is adjusted for normal forward movement the said valve 124 may be adjusted so as to close the return channel 63. Such adjustment will cause a backing up of the fluid medium in the motor 66 resulting in a braking effect on the spider drum which will be increased by any continuance in the rotation of the spider drum. This device provides a very effective means of slowing down or stopping the driven members.

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

1. A rotary pump comprising a collar having an opening provided therein, a blade attached at one end to the collar and projecting radially from said collar, a casing in which said blade is rotatably mounted, an inlet conduit projecting into said collar and providing a bearing surface upon which said collar may freely rotate, said casing forming about said inlet conduit an annular fluid discharge passage, a driving member, said blade extending from said collar at an acute angle to the axis of rotation of the collar and said blade being attached at the other end to the driving member, means for closing the other end of said blade to passage of fluid, the driving member and the collar aforesaid being positioned in a spaced relation whereby upon a fluid medium being introduced through the inlet conduit the fluid medium may upon rotation of said blade be fed to the blade through the space provided between the collar and the driving member and forced out said discharge passage, and driving means for rotating said blades.

2. A rotary pump comprising a collar having an opening provided therein, a plurality of blades each being attached at one end to the collar and projecting radially therefrom, said blades each extending forward from the collar at an acute angle to the axis of rotation of the collar and each of said blades being curved transversely in the direction of rotation of said collar, a casing in which said blades are rotatably mounted, an inlet conduit projecting into said collar and providing a bearing surface upon which said collar may freely rotate, said casing forming about said inlet conduit a fluid discharge passage, a rotatable plate rigidly fastened to the forward end of the blades and closing the forward ends of said blades, the said plate positioned in spaced relation with the collar in such a manner that upon a fluid medium being introduced through the inlet conduit aforesaid the fluid medium may upon rotation of said blades be fed through the space provided between the plate and the collar to the blades, driving means for rotating said blades whereby upon rotation of said plate the blades aforesaid will rotate in such a manner as to force the fluid medium axially rearward out said discharge passage.

3. A rotary pump comprising a rotatable collar, a tubular conduit projecting into said collar and open at its inner end, a plurality of blades attached to the collar and projecting radially therefrom, a casing in which said blades are rotatably mounted and forming a passage for the discharge of fluid from said blades, driving means for rotating said blades, each of said blades extending at an acute angle to the axis of rotation of said collar and each of said blades being curved transversely in the direction of rotation of the collar, a plate closing one end of said blades and spaced from the open end of the tubular conduit to form an outlet from the tubular conduit to the blades aforesaid whereby upon a fluid medium being introduced through the conduit the fluid medium may be fed directly to the blades aforesaid, and said blades open at the other end so that upon rotation of the collar the blades aforesaid will revolve in such a manner as to force the fluid medium axially outward through the open ends of said blades and into the fluid discharge passage formed by the casing.

GEORGE D. HUNTER.

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