

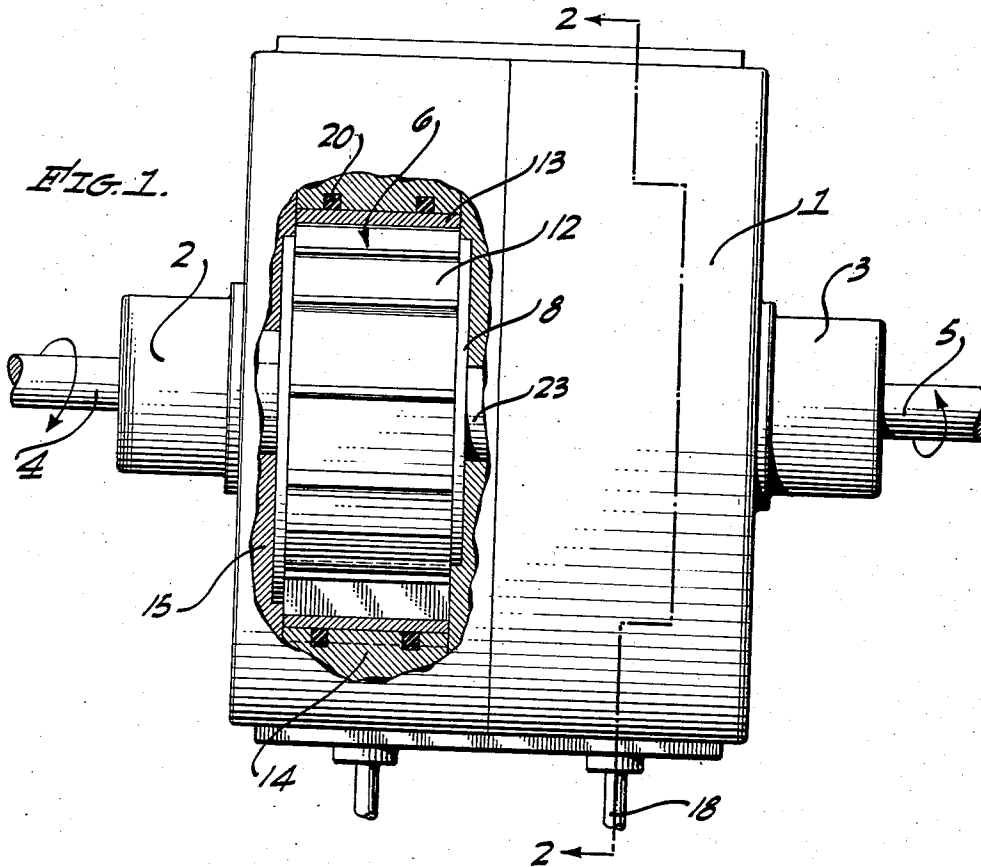
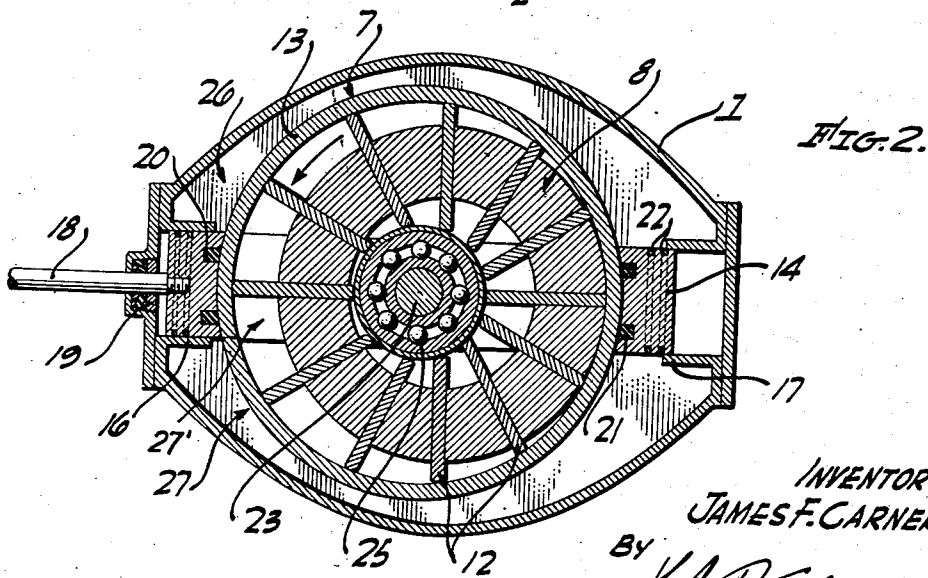
Aug. 3, 1954

J. F. CARNER  
VANE TYPE HYDRAULIC DRIVE

2,685,255

Filed Aug. 25, 1950

2 Sheets-Sheet 1



INVENTOR.  
JAMES F. CARNER,  
By *H. A. Richman*  
ATTORNEY.

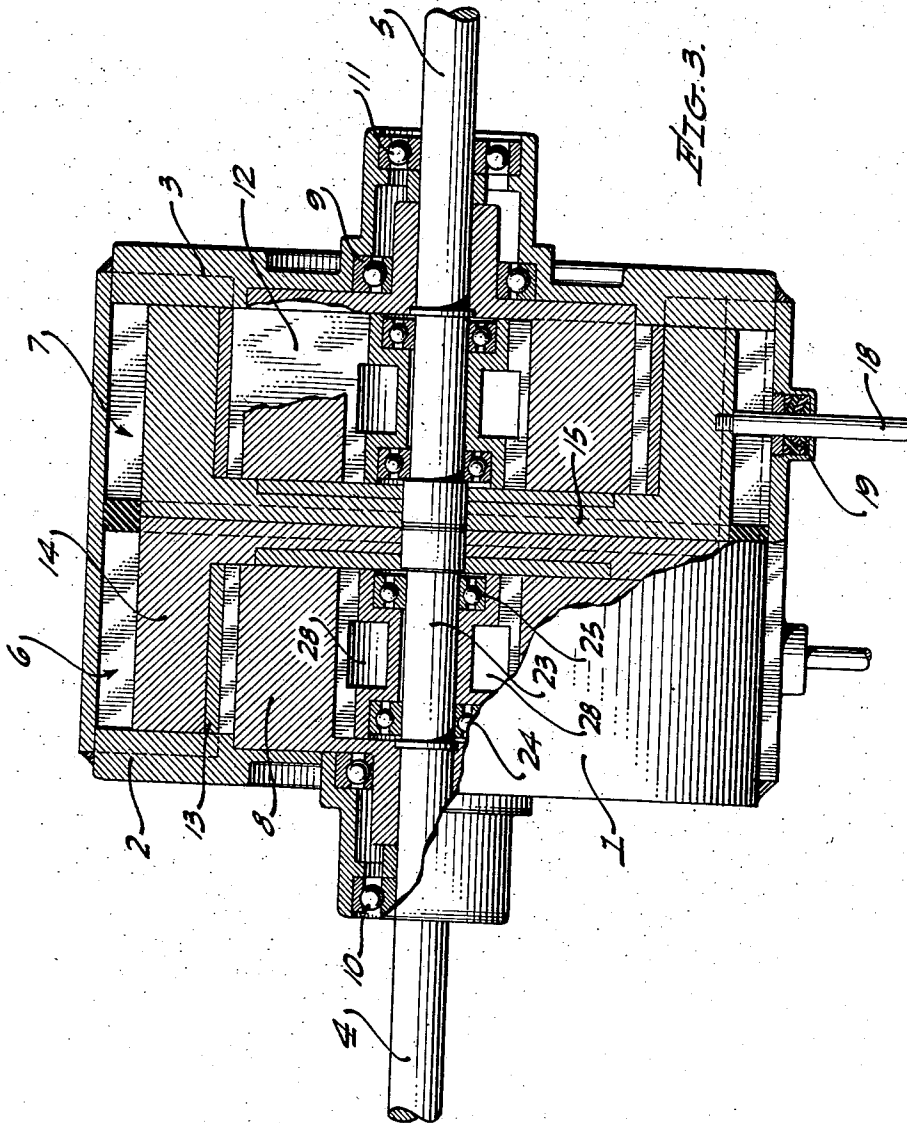
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INVENTOR.  
JAMES F. CARNER,  
BY  
*W. A. Dickman*  
ATTORNEY.

## UNITED STATES PATENT OFFICE

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## VANE TYPE HYDRAULIC DRIVE

James F. Carner, Long Beach, Calif.

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9 Claims. (Cl. 103—120)

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This invention relates to a vane type hydraulic drive, particularly for automotive vehicles, and the prime object of my invention is to provide a hydraulic drive which will take the place of the present clutch and transmission, and which will provide varied driving ranges by the shifting of a control yoke in the drive unit.

Another object of my invention is to provide a novel hydraulic drive in which a single lever operated by the driver will control all of the driving ranges both forward and reverse, and also the idling position.

A feature of my invention is to provide a novel hydraulic drive in which I provide not only the usual forward driving ranges, but also overdrive, as desired, by the driver; also, a hydraulic drive in which the wheels respond smoothly to the acceleration of the engine; and, also, there is no free wheeling at any time.

Another object of my invention is to provide a novel hydraulic drive of the character stated, in which valves and other complicated mechanisms are eliminated, thus reducing the cost of construction and providing a drive which is less expensive than the types presently in use.

Another object of my invention is to provide a novel hydraulic drive in which the thrust of the vanes at high speed created by centrifugal force is carried on ball bearings, and the vanes are held in position by a ring so that even at low speeds the vanes are held in proper pumping position and do not require the radial thrust of centrifugal force to operate correctly.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing:

Figure 1 is a side elevation of my hydraulic drive, with parts broken away to show interior construction.

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 3 is a top plan view of my hydraulic drive with parts broken away to show interior construction.

Referring more particularly to the drawing, the numeral 1 indicates an outer housing, which includes heads 2-3 on each end thereof. A driving shaft 4 extends into the head 2 and is journaled therein, in a manner to be subsequently described. A driven shaft 5 extends from the head 3, and is journaled in this head, also in a manner to be subsequently described.

As here shown, there are two units 6-7, 55

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mounted in the housing 1, and as far as the detailed construction is concerned, these units are identical. The unit 6, however, is called the pumping unit, and the unit 7 is called the driving unit. Since the units 6-7 are substantially identical, only one will be described in detail.

A rotor 8 is journaled in the housing 1 and in either the head 2 or 3, as may be required, and an annular bearing 9 in the head 2 or 3 journals the hub of the rotor. The shaft 4 also rides in a bearing 10 and the shaft 5 in a bearing 11. These bearings being mounted in the heads 2-3, respectively, substantially as shown. The shaft 4 is fixedly attached to the rotor 8 and in the same manner the shaft 5 is fixedly attached to the rotor of the driving unit. The shafts 4 and 5 are thus not continuous through the hydraulic drive, but terminate at each of the rotors, as shown.

A plurality of vanes 12 extend radially through the rotor 8 projecting beyond the periphery of the rotor, and also inwardly within the rotor, substantially as shown in Figure 2.

A ring 13 surrounds the vanes 12 and the vanes bear against the inside of this ring, substantially as shown in Figure 2. The ring 13 is open on both sides to permit fluid to pass through freely from side to side, as may be required. It is evident that by shifting the ring 13, it is possible to move the vanes 12 in the rotor 8, and thus vary projection of these vanes beyond the periphery of the rotor. To accomplish this shifting of the vanes, I provide the following structure:

A yoke 14 is shiftably mounted within the housing 1, and this yoke has a one side wall 15, while the other side of the yoke is open. The outer ends of the yoke are guided in cylinders 16-17, and these cylinders are arranged on opposite sides of the housing 1, as shown in Figure 2. The ring 13 rotates within the shift yoke 14 and both ends of this shift yoke engage the ring for the purpose of shifting the same laterally, as shown in Figure 2. The shift yoke 14 can be manually controlled by means of the rod 18, which projects from one side of the housing 1 and extends through a suitable packing gland 19. The shift yoke can also be moved within the housing 1 by hydraulic pressure, if desired. In this instance, the hydraulic fluid under pressure is introduced into the cylinders 16 and 17.

A pair of spaced packing strips 20—20 and 21—21 are mounted on the shift yoke 14 and engage the outer surface of the ring 13. These spaced strips serve to prevent fluid from passing around the periphery of the ring 13, and from top of

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the shift yoke 14. Each end of the shift yoke 14 is also provided with suitable piston rings 22, as may be required.

A trunnion 23 is mounted in the wall 15 of the shift yoke 14, and projects from this wall into the center opening of the rotor 8. The trunnion 23 is mounted at one end only in wall 15, and its other end is unsupported. A pair of annular bearings 24—25 are mounted on this trunnion and the inner ends of the vanes 12 bear against these annular bearings or against the outer race thereof. Thus, as the shift yoke 14 is moved laterally, as viewed in Figure 2, the trunnion 23 and the bearings 24—25 thereon will press the vanes 12 in the same direction, and due to the ring 13 these vanes will be moved relative to the rotor 8 to the adjusted position required. The shift yoke 14 is also in constant engagement with the periphery of the ring 13 and, consequently, the shift yoke, the ring, and the vanes will move as a unit. The movement also is relative to the rotor 8 which remains fixed as far as lateral movement is concerned.

The housing 1 is provided with an open space 26 above the shift yoke 14, and a second open space 27 below the shift yoke. These spaces are open from the unit 6 to the unit 7 so that fluid pumped by the unit 6 can move laterally into the unit 7 and thereby turn the rotor of the driving unit. The two shift yokes butt against each other with their inner faces. The shift yoke 14 is U shaped and therefore the space above and below this shift yoke (as viewed in Figure 2) is open to the passage of fluid from the unit 6 to the unit 7.

In my construction, the outer end of the rotor 8 is closed, as shown in Figure 3, and also the inner end of the yoke 14 is closed, as shown in this same figure. Consequently, the vanes 12 extend between the outer wall of the rotor and the inner wall of the shift yoke and project beyond the periphery of the rotor 8, as adjusted by the operator.

To prevent the building up of pressure on the inside of the vanes 12 due to their reciprocation, I cut these vanes, as shown at 28, permitting oil to flow around the inside of all of the vanes.

In operation, the shaft 4 is driven by a suitable engine (not shown) and rotation of this shaft will rotate the rotor 8 in the same direction. Assuming the rotation to be as shown by the arrow in Figure 2, the vanes 12 project beyond the rotor on one side and, therefore, the pumping action will occur for the width of the shift yoke 14, that is, from the top to the bottom thereof, causing oil to be picked up at the space 26 above the shift yoke and move downwardly to the space 27 below the shift yoke through the space 27' between the periphery of the rotor 8, and the inside of the ring 13. The space 27' is termed a fluid transfer space. The oil under pressure in the space 27 now moves transversely engaging the projecting vanes 12 of the adjacent unit 7, driving this unit in the usual and well known manner. By shifting the yoke 14 the vanes 12 can be extended or retracted, as required. The greater the extension of the vanes 12 on the left side, as shown in Figure 2, the more direct will be the power transmission from the shaft 4. The ring 13 engages the outer edges of the vanes 12 at all times and, consequently, takes the radial thrust of these vanes due to centrifugal force. The inner edges of the vanes ride on the bearings 24—25, which reduces friction. Also, these bearings will shift with the trunnion 23, which is

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attached to the shift yoke 14 and thus an effective means is provided for adjusting the vanes 12 in the rotor.

Having described my invention, I claim:

1. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, means on the yoke engaging the inner radial ends of the vanes, and means on the yoke to shift the same, means in the housing engaging the outer radial ends of the vanes and larger in diameter than the rotor and eccentric to the first named chamber providing pumping chambers between said last named means, the rotor and the vanes, said last named means being also engaged by the yoke, said pumping chambers being axially open except when passing the yoke, said chamber being divided into a fluid inlet space on one side of the shift yoke, a second fluid outlet space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces, said intake being arranged between the periphery of the rotor and the yoke, one side of the second fluid space being open to provide an outlet therefrom the fluid entering the pumping chambers axially from said inlet space and leaving the pumping chambers axially to the outlet space.

2. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, a trunnion mounted on the yoke and extending into said rotor, the inner radial ends of the vanes engaging said trunnion, and means on the yoke to shift the same, means in the housing engaging the outer radial ends of the vanes and larger in diameter than the rotor and eccentric to the first named chamber providing pumping chambers between said last named means, the rotor and the vanes, said last named means being also engaged by the yoke, said pumping chambers being axially open except when passing the yoke, said chamber being divided into a fluid inlet space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces, said intake being arranged between the periphery of the rotor and the yoke, one side of the second fluid space being open to provide an outlet therefrom, the fluid entering the pumping chambers axially from said inlet space and leaving the pumping chambers axially to the outlet space.

3. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, a trunnion projecting laterally from said yoke and extending into the rotor, a bearing mounted on said trunnion, the inner radial ends of the vanes

engaging said bearing, and means on the yoke to shift the same, means in the housing engaging the outer radial ends of the vanes, said last named means being also engaged by the yoke, said housing having a fluid space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces, said transfer space being arranged between the periphery of the rotor and the yoke, one side of the second fluid space being open to provide an outlet therefrom.

4. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, means on the yoke engaging the inner radial ends of the vanes, and means on the yoke to shift the same, a ring engaging the outer radial edges of each of said vanes and encircling the same, said housing having a fluid space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces arranged between the periphery of the rotor and the yoke, one side of the second named fluid space being open to provide an outlet therefrom.

5. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, means on the yoke engaging the inner radial ends of the vanes, and means on the yoke to shift the same, a ring engaging the outer radial edges of each of said vanes and encircling the same, the inner axial surface of said yoke extending over the ring and engaging the outer radial face of said ring, said housing having a fluid space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces arranged between the periphery of the rotor and the yoke, one side of the second named fluid space being open to provide an outlet therefrom.

6. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, means on the yoke engaging the inner radial ends of the vanes, and means on the yoke to shift the same, a ring engaging the outer radial edges of each of said vanes and encircling the same, the inner axial surface of said yoke extending over the ring and engaging the outer axial face of said ring, a pair of opposed cylinders within the housing, each end of said yoke extending into one of said cylinders, said housing having a fluid space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces arranged

between the periphery of the rotor and the yoke, one side of the second named fluid space being open to provide an outlet therefrom.

7. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, a trunnion projecting from the yoke and extending into the rotor, the inner radial ends of the vanes engaging said trunnion, means on the yoke to shift the same, a ring encircling the vanes and engaging the outer radial edges thereof, said housing having a fluid space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces arranged between the periphery of the rotor and the yoke, one side of the second named fluid space being open to provide an outlet therefrom.

8. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, a trunnion projecting from the yoke and extending into the rotor, the inner radial ends of the vanes engaging said trunnion, means on the yoke to shift the same, a ring encircling the vanes and engaging the outer radial edges thereof, the inner axial surface of the shift yoke extending over and engaging the outer axial surface of the ring, said housing having a fluid space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces arranged between the periphery of the rotor and the yoke, one side of the second named fluid space being open to provide an outlet therefrom.

9. In a vane type hydraulic drive comprising a housing, said housing having a chamber therein, a rotor concentrically journaled in said chamber, a shaft attached to said rotor to drive the same, a plurality of radially extending vanes slidably mounted in said rotor for radial movement, a shift yoke slidably mounted in said housing for movement relative to the rotor, a trunnion projecting from the yoke and extending into the rotor, the inner radial ends of the vanes engaging said trunnion, means on the yoke to shift the same, a ring encircling the vanes and engaging the outer radial edges thereof, and the inner axial surface of the shift yoke extending over and engaging the outer axial surface of the ring, a pair of diametrically opposed cylinders in said housing, each end of said shift yoke extending into one of the cylinders, a bearing on said trunnion, said bearing engaging the inner ends of the vanes, said housing having a fluid space on one side of the shift yoke, a second fluid space on the other side of the shift yoke from said first named fluid space, and a fluid transfer space connecting both of said fluid spaces arranged between the periphery of the rotor and the yoke, one side of the second named fluid space being open to provide an outlet therefrom.

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