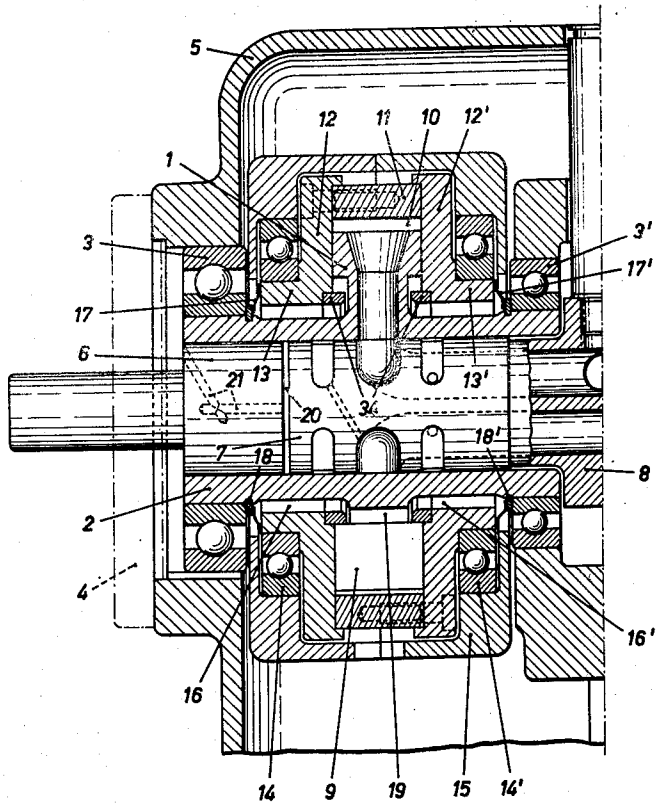
May 7, 1957 E. STURM 2,791,184

HYDRAULIC TRANSMISSION

Filed May 24, 1952 2 Sheets-Sheet 1

Fig. 1



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Filed May 24, 1952 2 Sheets-Sheet 2

Fig. 2

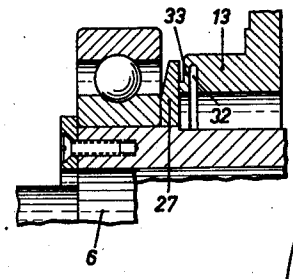
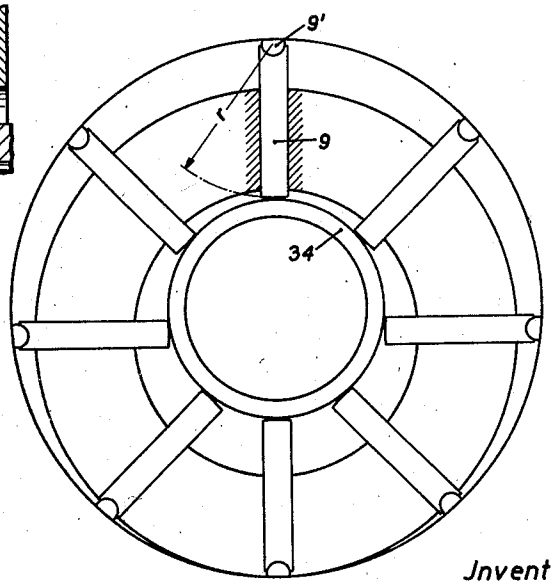


Fig. 3



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HYDRAULIC TRANSMISSION

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Application May 24, 1952, Serial No. 289,710

Claims priority, application Germany June 26, 1951

3 Claims. (Cl. 103—120)

This invention relates to rotary piston engines, and more particularly to improvements of the rotary piston engine described in my Patent No. 2,049,092, of July 28, 1936, for "Rotary piston engine especially for fluid gears."

Rotary piston engines, especially for fluid gears, have acquired practical importance only when frictional losses were reduced to a reasonable degree by rotatably mounting the casing surrounding the vane drum and the vanes. The vanes reciprocably arranged in radial slots of the piston drum or rotor are guided by the cylindrical inner surface of the rotary casing and by the abutting surfaces arranged centrically relative to said inner surface. According to the rotary piston engine described in above mentioned U. S. Patent 2,049,092 the vanes are in abutting engagement with the associated guiding surfaces by means of semi-cylindrical pins. This construction, however, is comparatively expensive and not quite satisfactory as far as quietness of action is concerned.

It is therefore the main object of the invention to provide for a simplified construction of such type of a device as described and shown in my Patent No. 2,049,092, mentioned hereinabove, whereby a substantially smoother operation of the device and a sealing engagement of the ends of the vanes abutting against the inner surface of the rotary casing may be obtained. This is accomplished according to the invention by providing the vanes only at their outer ends with friction pins having sealing engagement with the inner peripheral wall of the rotary casing whilst the inner ends of the vanes are supported by centering surfaces open to seepage oil chambers provided between the rotary casing and vane drum. If a discharge of the seepage oil collecting in said chambers during the operation of the device is prevented, the pressure exerted by the seepage oil is utilized to hold the outer ends of the vanes or of the pins inserted therein permanently in sealing engagement with the rotary casing. The pressure caused by the seepage oil may rise up to one half of the pressure of operation when the chambers are perfectly sealed.

A further object of the invention is to form the inner end faces of the vanes in such a manner as to remove the small radial slack of the vanes which occurs on account of the eccentricity between vane drum and rotary casing. Thereby the vanes are maintained even in the inoperative condition of the engine in sealing engagement with the circumference and the centering surfaces of the rotary casing.

The invention is illustrated diagrammatically and by way of example on the accompanying drawings on which

Fig. 1 is a longitudinal sectional view of the driving section of an infinitely variable hydraulic transmission according to the invention, the driven section being omitted as being of same construction.

Fig. 2 is a sectional view of a detail of a hydraulic transmission according to the invention illustrating a complete closure of the seepage oil chambers by a rigid disc, and

Fig. 3 shows on an enlarged scale and in diagrammatic form the vanes of Fig. 1 and the manner in which they are supported internally.

Referring now in detail to the drawings the vane or piston drum 1 is shown to have a bearing in form of a substantially cylindrical hub portion 2 supported on two ball bearings 3, 3' in a housing 5. The outer end of the vane drum hub 2 is pinned to a driving shaft journal 6. The vane drum is rotatably mounted upon one of the journals 7 of a diffuser axle 8 providing connection between the two transmission sections through inlet and outlet channels or ducts. The working chamber 10 subdivided by the vanes 9 is enclosed in a rotary casing comprising an annular member 11 having covers 12, 12' screwed thereon at both sides so that the working chamber 10 has a sickle-shaped cross-section as shown in Fig. 2 of my Patent No. 2,049,092, mentioned hereinabove, and in Fig. 12 mentioned hereinafter. Each of these covers is formed with a hub portion 13 and 13' respectively serving to support ball bearings 14, 14' mounted in the rotary casing carrier 15, this latter being capable of any desired eccentric adjustment in the housing 5. Reference is made to the U. S. Patents 2,049,092 and 2,750,895 wherein means for the eccentric adjustment of the rotary casing 15 relative to the piston drum 1 are described in detail. As will be seen, an annular chamber 16 and 16' respectively is formed between the hub portions 2 and 13, 13' respectively of the vane drum and of the rotary casing respectively. These annular chambers are closed laterally by means of rigid or resilient closing means shaped as annular discs such as spring washers 17, 17' abutting on the one hand against the hub portions 13, 13' of the rotary casing and on the other against spring rings 18, 18' secured to the hub portion 2 of the vane drum 1. The ball bearings 3, 3' have interference fit with the hub portion 2 of the vane drum 1 adjacent the spring rings 18, 18'. A cover 4 serves to close the axial opening of the housing 5.

As will be seen in the lower half of Fig. 1, the two chambers 16, 16' are in communication with the chamber 19 behind the vane 9. In all of these chambers the seepage oil from the working chamber 10 between the vane guides is collected. Since this seepage oil is prevented from escaping by the spring rings 18, 18', the oil pressure within the seepage oil chambers 16, 16' holds the vanes 9 in engagement with the inner peripheral wall of the rotary housing. Only when this pressure is rising above a predetermined admissible limit, oil is permitted to escape past the somewhat yielding spring rings 18, 18' into the oil sump in the housing 5. Seepage oil passing between the diffuser axle 8 and its mounting and collecting in the chamber or gap 20 between journal 7 and driving shaft journal 6 is permitted to flow out without pressure through the outlet or bores 21 into the oil sump and separately from the leakage oil flowing to the seepage oil chambers.

As best shown in Fig. 2, the lateral closure of the seepage oil chambers may be obtained by a rigid annular disc 27 instead of by a resilient ring 17 as described above in connection with Fig. 1, so that the vanes are urged against the inner surface of the rotary casing by means of the oil pressure increasing during the operation of the device.

In order to obtain an increased quietness of the engine, in particular when starting, it is important that with the rotary casing being eccentrically adjusted all of the vanes have engagement with the annular member 11 even in the inoperative condition of the engine. This is accomplished in the case of a hydraulic engine according to the invention by shaping the vanes, while being of maximum length, at their inner ends according to a circular arc with the radius r from the center of the rolling pin

9', as shown in Fig. 3. This has as a consequence that with an eccentric position of the rotary casing the vanes roll off on the supporting rings 34 thereby maintaining tight engagement with the annular member 11 of the rotary casing.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

What I claim is:

1. A rotary piston engine, especially for fluid gears, comprising in combination: a central journal having inlet and outlet channels for the liquid fluid, a piston drum rotatable about said journal and having alternating radial slots and radial channels, vanes shiftable in said radial slots, an eccentrically adjustable rotatable casing enclosing said piston drum and forming with the piston drum a sickle-shaped working chamber subdivided by said vanes and communicating by said radial channels with the inlet and outlet channels of said central journal, a plurality of chambers arranged between the hub portions of said rotatable casing and the hub portion of said piston drum, said chambers being connected with one another by said radial slots housing said vanes, and being adapted to be filled with seepage-oil during operation of the engine, closing means laterally closing said chambers and holding the same under seepage-oil pressure, which acts upon the inner end faces of said vanes, crescent-shaped friction pins arranged, respectively, between the outer ends of said vanes and the inner wall of said rotatable casing, each of said pins being rotatable about a longitudinal axis thereof and in close contact with the circular inner wall of said rotatable casing, and a supporting surface for the inner ends of said vanes, said supporting surface being arranged concentrically with said inner wall of said rotatable casing.

2. A rotary piston engine as claimed in claim 1, said inner end faces of said vanes adjacent to said seepage-oil chambers having a circular contour centered on the center of said friction pins and being adapted to maintain said pins in contact with the inner surface of the rotary casing when the piston drum is stationary.

3. A rotary piston engine as claimed in claim 1, said laterally closing means for said seepage-oil chambers comprising resilient annular discs being under axial pressure.

References Cited in the file of this patent

UNITED STATES PATENTS

582,696	Schneible et al.	May 18, 1897
1,626,557	Rolaff	Apr. 26, 1927
1,635,523	Wilson	July 12, 1927
1,927,395	Edwards	Sept. 19, 1933
2,002,827	Morch	May 28, 1935
2,049,092	Sturm	July 28, 1936
2,102,344	Wishart	Dec. 14, 1937
2,233,551	Ott	Mar. 4, 1941
2,678,607	Hufferd et al.	May 18, 1954
2,685,842	Hufferd	Aug. 10, 1954

FOREIGN PATENTS

489,760	Germany	Jan. 22, 1930
596,902	Great Britain	Jan. 13, 1948
854,050	France	Jan. 2, 1940

OTHER REFERENCES

Ser. No. 239,352, Sturm (A. P. C.), published May 11, 1943.