Aug. 30, 1938. G. KLEPPER 2,128,828

HYDRAULIC TRANSMISSION GEAR

Filed April 7, 1937

Fig. 1.

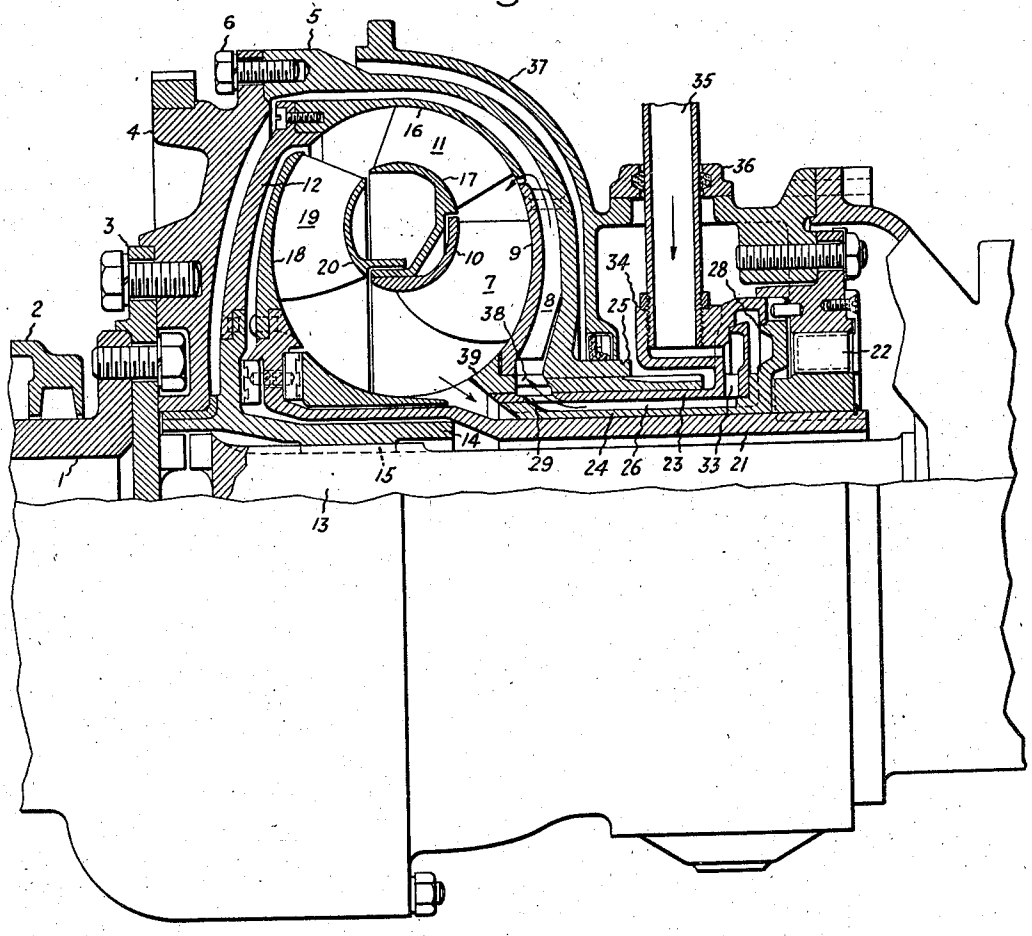
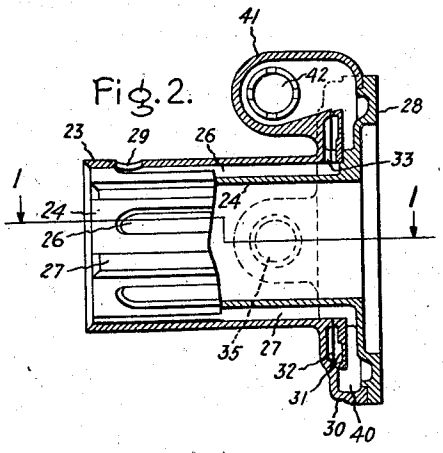


Fig. 2.



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HYDRAULIC TRANSMISSION GEAR

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2 Claims. (Cl. 60—54)

My invention relates to hydraulic transmission gears, and more particularly to the Föttinger type of hydraulic transmission gear.

One object of my invention is to provide improved means for circulating the fluid of the transmission through a cooling circuit.

For a better understanding of my invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the accompanying drawing, Fig. 1 is a side view, partly in cross section along line 1—1 of Fig. 2, of a hydraulic gear embodying my invention, and Fig. 2 is a sectional view of the fluid directing elements mounted on the hub of the hydraulic gear illustrated in Fig. 1; the section illustrated in this figure being at right angles to the sectional view of the same elements illustrated in Fig. 1.

Referring to the drawing in detail, Fig. 1 is a vertical cross sectional view, through the center, of the gear assembly, and discloses a hollow drive shaft 1 mounted in a bearing 2 and provided with a flywheel comprising a plate 3, and a ring 4, the inner surface of which is dished and forms a part of the inner surface of a housing for the transmission gear.

A complementary annular member 5, the cross section of which parallel to its axis of rotation is substantially semicircular, is bolted to the rim of the ring 4 by bolts 6. These two members 4 and 5 thereby form an annular casing which rotates with the shaft 1. One side of this casing is closed by the plate 3 and through the other side several elements, hereafter described, project into the casing. Attached to the inner surface of the annular member 5 are pump vanes 7 and 8 having a combined area of approximately one-quarter of the cross sectional area of the casing. The vanes 7 and 8 are separated into two parallel groups of vanes by an annular fin 9, the vanes 8 being attached to the fin 9 and member 5 respectively, and the vanes 7 are held in spaced relation to each other by being attached to the opposite side of the fin 9 and at their other ends to a ring member 10. The vanes 7 circulate a fluid within the casing when the shaft 1 is driven, and direct this fluid against similar vanes 11 mounted on a turbine wheel 12, which is attached to a driven shaft 13 by means of a hub member 14 and a key 15. The driven shaft 13 is axially alined with the driving shaft and projects into the casing through its open end. The vanes 11 are directly attached to an annular member 16 which is bolted to the turbine wheel 12, and the vanes are separated at their respective other edges by an annular member 17.

A third element of the gear comprises a wheel 18, provided with vanes 19 which are held in position at their other ends by a ring 20 which together with the rings 10 and 17 forms a circular core within the casing and thereby forms an annular path in which a suitable fluid is set into motion by pump vanes 7 against the turbine vanes 11, thereby setting this wheel into motion and then, after giving off part of its energy, striking the vanes 19 which redirect the fluid to the pump vanes 7. The wheel 18 is further provided with a hub 21 which is mounted in a roller type of overrunning clutch 22 which allows this wheel to rotate only in the forward direction, that is in the direction of the pump and turbine wheels. The hydraulic gear so far described is disclosed more fully in Patents 1,199,359, and 1,199,360, Föttinger, and it is believed unnecessary to set forth in greater detail the operation of this mechanism in the present application.

In accordance with my present invention, I provide an improved means for circulating the fluid in the hydraulic gear casing through a cooling circuit. My improved means includes a pump incorporated within the hydraulic gear; the pump being an integral part of the gear, thereby effecting a minimum of increase in the bulk of the gear. The circulating pump comprises, in part, the pump vanes 8 mounted on the pump or driving element of the hydraulic gear, and separated from the main pump or driving vanes by the fin 9. The circulating pump vanes 8 are of a slightly larger diameter than the main pump vanes because of the resistance encountered in the cooling circuit. The pump vanes 8 discharge the cooled fluid into the space between the casing member 5 and the turbine wheel 16, from which space it enters the operating circuit in the gear through the clearance space between the fin 9 and the turbine wheel 16. The fluid is directed to the vanes through channels placed in a pair of telescoped sleeves 23 and 24 which are placed between the hub 21 and the flange 25 on the casing member 5.

The circulating channels for cooling the fluid of the hydraulic gear may be readily understood by reference to both figures of the drawing. Fig. 1 is a cross sectional view of the apparatus in a vertical plane through the axis of the apparatus and Fig. 2 is a cross sectional view of the sleeves 23 and 24, also taken through the axis of the apparatus, but in a plane which is at right angles

to the plane of the section illustrated in Fig. 1. Fig. 2 shows sleeve 23 in cross section from end to end and sleeve 24 in cross section for only one-half of its length, the other half being a view of its outer surface. In the outer surface of the inner sleeve 24 are grooves 26 and 27 which run parallel to the axis of the sleeve. They are alternately arranged and equally spaced over this surface. The grooves 26 extend from a point within a short distance of the end of the sleeve 24 to a point within a short distance of a flange 28 on the other end of this sleeve. The grooves 27 extend from the end of the sleeve 24 up to the inner surface of the flange 28. The sleeve 23 fits snugly over the surface of the sleeve 24, thereby closing the grooves, and thereby forming ducts through which the gear fluid circulates. The sleeve 23 is provided with holes 29 which register with the ends of the grooves 26 and is further provided with a flange 30 which, together with a ring 31, provides an annular header 32 into which the short grooves 26 open through holes 33. The header 32 opens into a hollow boss 34, illustrated in Fig. 1, into which a pipe 35 is threaded leading to any suitable liquid cooling unit or system (not shown). The pipe 35 is also supported by a collar 36 attached to the stationary housing 37 of this transmission. By reference to Fig. 1, it will now be understood that fluid reaches the circulating pump vanes through the pipe 35, header 32, grooves 26, holes 29, and holes 38 in a sleeve 39 mounted between the flange 25 on the casing member 5 and the sleeve 23.

The grooves 27 in the surface of the sleeve 24 extend from the end of the sleeve to the surface of its flange 28 at the other end. The open end of the grooves 27 open into the inside of the gear casing in a space between the hub 21 and the sleeve 39, the sleeve 39 being, as above stated, between the sleeves 23 and flange 25 on the member 5 and extending, axially from the inner, or base, end of the flange on hub 21 to the flange 30 on the sleeve 23. The fluid in the casing of the gear is sucked into the grooves 27 and is collected in a header 40 formed between the flange 28 and the outer surface of the ring 31, which also forms the header 32. The header is provided with a hollow boss 41 from which a pipe 42 carries the fluid to the cooling apparatus (not shown). The complete cooling circuit therefore begins at the ends of the grooves 27 in the casing of the hydraulic gear wherein the liquid is heated due to the transmission of power and is sucked through these grooves to the header 40, from the header to the pipe 42, to the cooler (not shown), from this cooler through pipe 35, header 32, grooves 26, pump vanes 8, and back into the casing.

I have therefore provided a simple means for circulating the fluid of a hydraulic gear through a cooling system requiring only a small fraction of the power which is being transmitted by the gear, and have accomplished this without any substantial complication of the gear structure, nor any substantial increase in the size thereof.

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

1. In a hydraulic power transmitting gear, the combination of a pair of shafts axially alined, an annular casing connected to one of said shafts and arranged to rotate therewith, pump vanes arranged in said casing and attached to said wall, a turbine wheel in said casing attached to said second shaft and provided with vanes, a fluid in said casing circulating between said pump and turbine vanes during rotation of the said casing, and means for cooling said fluid including a dividing fin on said pump vanes, said fin forming with said turbine wheel a working circuit for said pump and turbine vanes and simultaneously dividing the surface of said pump vanes to form a second group of pump vanes between itself and the wall of said casing, said second group of pump vanes being separated from said first set of pumping vanes but rotating in unison therewith, a sleeve surrounding said driven shaft and provided with ducts opening respectively into said casing and to the intake end of said second pumping means, separate headers on said sleeve, and connections thereon adapted for connection to the terminals of a cooling system whereby fluid from said casing is circulated through said ducts and said cooling system by the said second pumping means.

2. In a hydraulic power transmitting gear, a pair of shafts, an annular casing attached to one of said shafts and provided with pumping means comprising two sets of pumping vanes attached to the wall of said casing, a dividing fin dividing said pump means into two parallel channels, a turbine wheel attached to said second shaft, a fluid in said casing circulated by a portion of said pump means to transmit power between said shafts, a sleeve surrounding said driven shaft provided with a series of parallel grooves on its surface and with a flange, a second sleeve surrounding said outer surface thereby closing said grooves and provided with holes connecting alternate ones of said grooves to the intake side of the second portion of said pumping means, and provided with a flange which with the flange on said first sleeve forms two separate headers to which said alternate grooves are respectively connected and connections to said headers adapted for connection to a cooling system.

GUSTAV KLEPPER.