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PUMP DRIVE ASSEMBLY WITH FLUID SEAL

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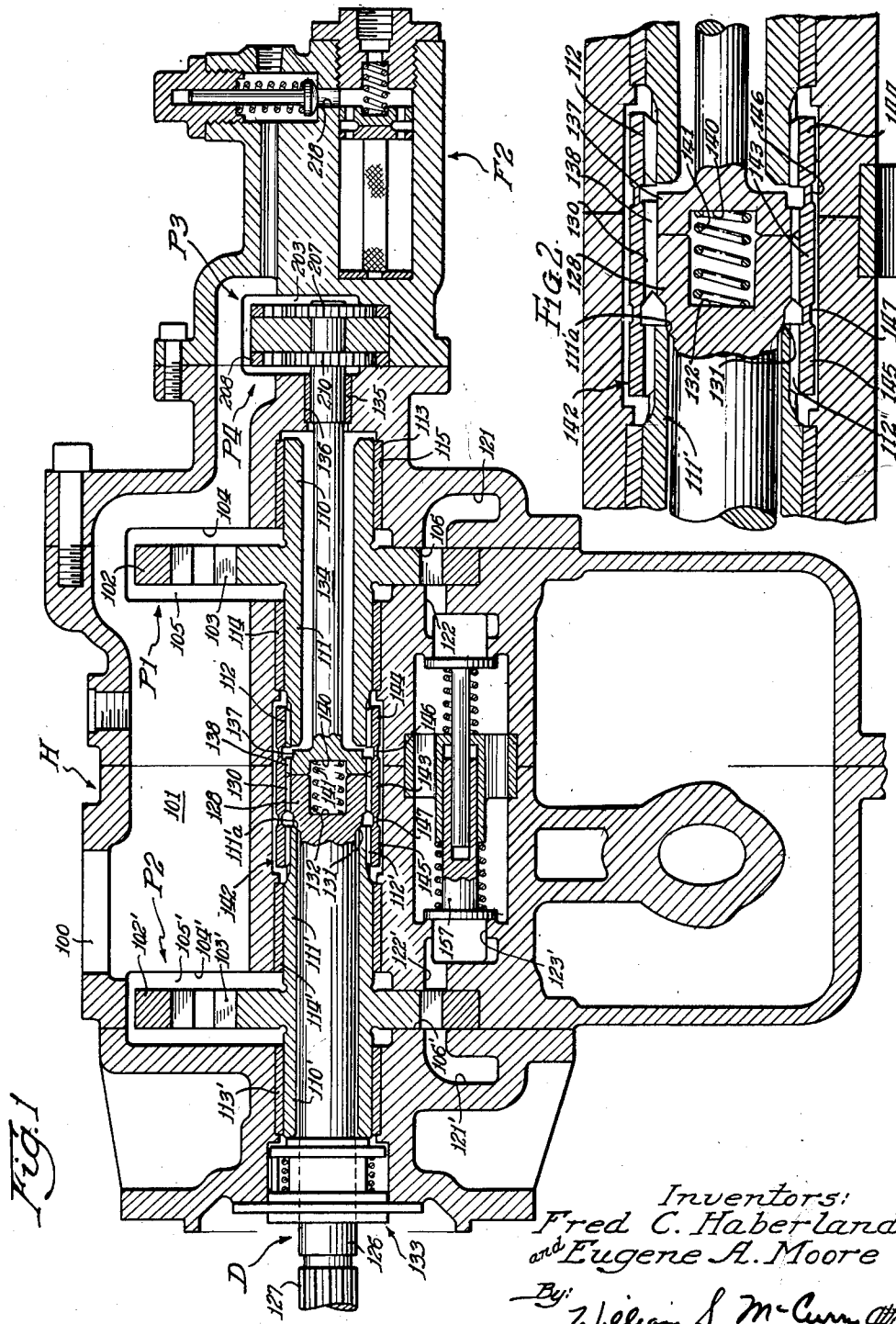


Fig. 1

Fig. 2

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PUMP DRIVE ASSEMBLY WITH FLUID SEAL

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Original application Feb. 19, 1957, Ser. No. 641,198, now Patent No. 2,979,902, dated Apr. 18, 1961. Divided and this application Nov. 17, 1960, Ser. No. 73,475

3 Claims. (Cl. 277—8)

The present application is a division of Serial No. 641,198, filed February 19, 1957, now U.S. Patent No. 2,979,902, issued April 18, 1961.

This application relates in general to fluid pressure and flow systems, and is particularly related to a pump drive assembly.

It is a principal object of the present invention to provide a dual pump assembly which is driven in tandem on a common driving means through a novel shear section permitting the continued operation of either of the pumps in the event of seizure of one of the pumps and, in addition, a new and improved seal structure is provided between the shaft and the remainder of the pump assembly so constructed and arranged that leakage is prevented without the requirement of any non-metallic seals of any type whatsoever, permitting our system to be used for high temperature purposes.

Therefore, still another object of our invention is the provision of a new and improved fluid pressure system having at least a pair of variable displacement pumps adapted to be commonly driven through a novel shear section coupling which permits the continued operation of either of the pumps in the event of seizure of one of the pumps.

Another object of our invention is the provision of a new and improved liquid seal means between a driving means, such as a shaft, and the remainder of a pump assembly.

These and other objects and features of our invention will become apparent from the following description when taken with the accompanying drawings, in which:

FIGURE 1 is a partial sectional view of a pump assembly embodying the present invention; and

FIGURE 2 is a detailed cross-sectional view of a portion of the pump drive assembly.

Referring now to FIGURES 1 and 2, there is illustrated, in detail, the structural elements of our fluid pressure system enclosed in the housing H. The housing H comprises a plurality of housing elements suitably secured together by means of bolts or the like, and is provided with an inlet port 100, adapted to receive a suitable hose, conduit or the like, opening into a common inlet chamber 101 for the pumps P–1, P–2, P–3 and P–4. The pumps P–1 and P–2 are substantially identical in construction, and are substantially of the same construction as those described and claimed in our copending application Serial No. 609,423, filed September 12, 1956, entitled "Variable Displacement Pump," now abandoned. To facilitate further description, since the pumps are substantially identical, the corresponding parts of the pump P–2 will be identified by using the same reference characters as applied to the pump P–1 but distinguished by a prime (').

The pump P–1 comprises meshing internal and external gears 102 and 103, respectively received within a pumping chamber 104 in the housing H. The pumping chamber 104 is formed to have portions of different dimensions, which comprise a relatively wide portion 105 in communication with the chamber 101 and a narrower portion 106 having a width substantially equal to the thickness of the gears. The internal or ring gear 102 is floatingly supported on bearings (not shown), and by

lug-like, inwardly extending, gear aligning elements. The bearing means and the lug-like elements are substantially the same as the corresponding parts described and illustrated in the aforementioned copending application. The external gear or pinion 103 is provided with axially extending, hollow, cylindrical journal members 110 and 111, formed integrally therewith or attached thereto, and the journal member 111 is provided with an external splined portion 112. The hollow journal members 110 and 111 are rotatably supported in cylindrical bearing members 113 and 114, respectively, received in a complementary shaped bore 115 formed in the housing H. The journal portion 111' associated with the pump P–2 is slightly different from the journal portion 111 associated with the pump P–1 in that it is formed with a concave surface 111'*a* at its splined end, the purpose of which will become apparent.

The intermeshing gears 102 and 103 discharge fluid under pressure into discharge passages 121 and 122 located on opposite sides fo the gears. The passage 122 communicates directly with a common discharge cavity 123 and the passage 121 is communicated with the cavity 123 by means of the passage 124. The pumps P–1 and P–2 discharge from their discharge cavities 123 and 123', respectively, into a common outlet (not shown).

As previously mentioned, the pumps P–1 and P–2 are commonly driven by means of a driving means D. The driving means D comprises a driving shaft 126 extending from outside of the housing H through the journal members 110' and 111' of the pump P–2 to and within the housing H. Externally of the housing the shaft 126 is provided with an externally splined portion 127 adapted to be drivingly connected to a source of power (not shown), and internally of the housing the shaft is provided with an enlarged end portion 128 provided with external splines 130. The shaft 126, except for the enlarged portion thereof has a diameter less than the internal diameter of the journal members 110' and 111', and, as shown most clearly in FIGURE 2, is provided with a convex surfaced juncture 131 between the main portion of the shaft and its enlarged portion which is adapted to seat on the concave surface 111'*a* of the journal member 111' associated with the pump P–2. The enlarged end 128 of the shaft is also formed with an open-ended cavity 132 therein. The shaft 126 is supported at one end of the housing H by means of sealing means generally indicated at 133. The sealing means 133, constructed in the same manner as that shown and described in the aforementioned copending application, is arranged to not contact the shaft 126, and the shaft 126 is out of engagement with the journal members 110' and 111' throughout their length.

The driving means D also includes an elongated quill shaft 134 rotatably supported at one end in a cylindrical bearing means 135 received in a suitable bore 136 in the housing. The quill shaft 134 is formed with an enlarged terminal end 137 having external splines 138 thereon. The enlarged end 137 of the shaft 134 is of a diameter substantially equal to the diameter of the enlarged portion 128 of the shaft 126, and is further provided with an open-ended cavity 140 therein, the cavity 140 being in substantial alignment with the previously mentioned cavity 132 in the shaft 126. A coil spring 141 is disposed within the chamber formed by the open-ended cavities 132 and 140 for a purpose to be described.

A coupling sleeve member, generally indicated at 142, is provided to couple the shafts 126 and 134 for concurrent rotation and comprises a central portion 143 and terminal end portions 144 and 145 joined by means of reduced diameter shear sections 146 and 147, respectively. The portions 143, 144 and 145 are each internally splined to receive in driving relation the external splines 130, 138

on the shafts 126 and 134, the splines 112 on the journal member 111, and the splines 112' on the journal member 111', respectively.

The coil spring 141, as will be obvious, resiliently urges the shafts 126 and 134 in opposite directions and causes the convex surface of the juncture 131 to seat on the concave surface 111'*a* of the journal member 111' associated with the pump P–2, the seating thereof effectively providing a seal between the outwardly extending surface of the shaft 126 and the remainder of the pump assembly. The particular configuration of the juncture 131 and the surface 111'*a* allows misalignment of the shaft 126 relative to the shaft 134 without losing the seal just described.

The sealing means 133, as fully described in the aforementioned copending application, effectively isolates the pumping chamber from the drive shaft, the seal being particularly effective to prevent the leakage of fluid from the pumping chamber to the drive shaft and to the outside of the housing H. The seal formed by the juncture 131 and the surface 111'*a* together with the seal 133 effectively prevent leakage between the drive shaft and the remainder of the pump. While the shaft 126 is isolated, leakage to the various bearing means and the like to provide lubrication thereof is permitted.

The coupling member 142 having the reduced shear sections 146 and 147 provides a means whereby in the event of seizure of one or the other of the pumps P–1 and P–2, its associated shear section will shear and allow the other pump to continue to operate in its usual manner.

We claim:

1. In a pump drive assembly, a driving shaft having a portion with an external, curviform surface, a driven shaft coaxially journalled with respect to said driving shaft, said shafts being subject to misalignment, said driven shaft having a portion with an internal, complementary surface,

means urging said internal and external surfaces into engagement to maintain a fluid seal between said surfaces, and shearable means connecting said driving and driven shafts together for conjoint rotation.

2. The combination defined in claim 1 wherein said external, curviform surface is convexly formed and said internal, complementary surface is concavely formed.

3. A fluid seal structure and driving means for a fluid device comprising, a hollow cylindrical driven member having at least a portion thereof disposed in a fluid chamber of said device, a second driving member having at least a portion thereof disposed within said hollow member, said members being so constructed and arranged to be subject to misalignment relative to one another, complementary curved surfaces on said members, means to urge said surfaces into engagement whereby the leakage of fluid therebetween is substantially prevented, external splines on said members closely adjacent said surfaces, a coupling member for drivingly connecting said members and having spaced internal splined portions on said coupling member operatively associated with said external splines, and a shear section disposed between said internal splined portions whereby said coupling member may shear upon an excessive torque being applied thereto and break the driving connection between said members.

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