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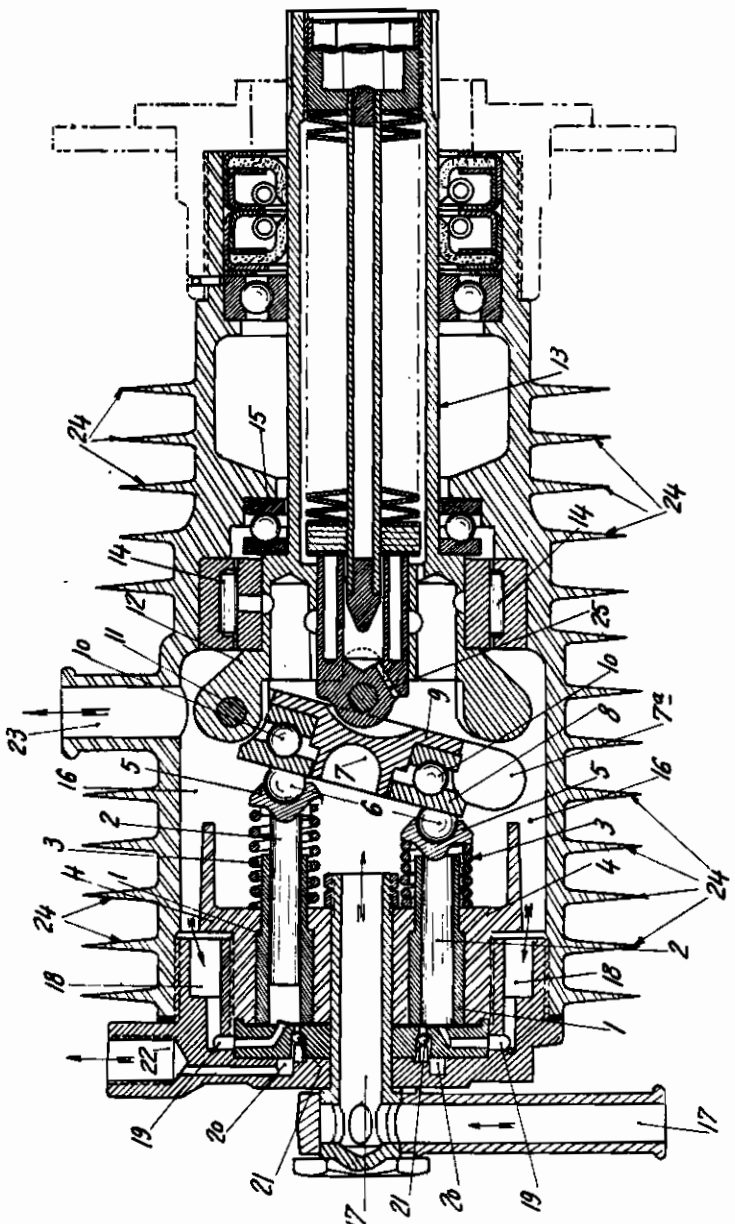

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ALIEN PROPERTY CUSTODIAN

PUMPS

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The present invention relates to pumps for liquids, more especially for use on aircrafts, in connection with hydraulic, oleo-pneumatic and similar systems.

The pump with which the present invention is concerned is of the type including parallel pistons actuated by a cam, more particularly as described in my French Patent No. 809,826, filed November 27, 1935.

A pump of this kind includes a plurality of parallel pistons, preferably disposed along generatrices of a circular cylinder, and actuated by means of a rotating cam. This cam is mounted to oscillate with respect to a piece, intended to give it its rotary movement, about an axis perpendicular to the axis of rotation of said cam with respect to said piece. The oscillations of the cam about said axis of rotation are produced, in the direction which tends to reduce the inclination of the cam, by the reaction of the pistons resulting from the action of the liquid that is discharged and of the return springs, and, in the opposed direction, which tends to increase the inclination of the cam, by the action of a sliding push-piece parallel to the axis of revolution, said push-piece bearing against the cam and being subjected to the thrust of an elastic device.

Therefore, this pump ensures an automatic regulation of the discharge pressure, since the inclination of the cam depends upon the value of said pressure. For a given maximum value of this discharge pressure, the cam is at right angles to the axis of revolution and no liquid is any longer discharged by the pump.

In the pumps of the known type, the inlet and outlet conduits or channels were provided at one end of the pump and they were directly connected with the ends of the cylinders containing the pistons. Now, this arrangement, although it gave very satisfactory results under ordinary working conditions, has been found to be insufficient in the case of very high working speeds of the pump, and especially when re-starting a pump which has been stopped for a certain time. This is due to the fact that the space located beyond the pistons ends and which contains the cam is, in this latter case, nearly empty and must be connected, on the one hand, to a special conduit serving to ensure the restarting, and, on the other hand, to the conduits or channels through which the inflow of fluid to the cylinders takes place.

The general object of the present invention is to provide a pump of the type above mentioned which is better adapted to meet the requirements practice than the pumps of the same type made up to this time, and, in particular, which is simpler to construct.

A more specific object of the invention is to provide a pump of this type which eliminates the inconvenience of providing a special re-starting device.

Still another object of the invention is to provide a pump of this type working in a perfectly smooth and regular manner.

According to an essential feature of the present invention, the feed channels or conduits of the pump open directly into the space containing the cam and located beyond the piston heads, and the particular and individual inlet conduits or channels relative to each cylinder respectively open into the peripheral zone of the above mentioned space surrounding the cam.

It will be readily understood that in the case of a very quick rotation of the parts contained in the space surrounding the cam, there is produced, under the effect of the centrifugal force resulting from this rotation, an extra-pressure in the above mentioned peripheral zone. If the cylinders are fed with fluid coming from this zone, two advantages are obtained:

a. First, the feed remains always perfectly regular, and,

b. Re-starting becomes an easy operation, automatically obtained without any special device, owing to the above mentioned pressure, which is established as soon as the parts of the pump are started rotating.

Other features of the present invention will result from the following detailed description of specific embodiments thereof.

A preferred embodiment of the present invention will be hereinafter described, with reference to the accompanying drawings, given merely by way of example, and in which:

The only figure is an axial sectional view of a pump of the type above mentioned made according to the invention.

In the embodiment of the invention shown by the drawings, the pump includes a plurality of cylinders **1**, in which are slidably mounted pistons **2** subjected to the action of return springs **3** bearing on the one hand against the block **4** in which the cylinders are provided, and, on the other hand, against pieces **5** belonging to the pistons. These pistons **5** carry the balls **6**, flattened on one side, which bear on a cam **7**. This cam includes two plates **8** and **9**, which are capable of rolling with respect to each other, owing to the provision of ball bearings **10**. Plate **9** is pivoted at **11** to a lateral piece **12**, carried by a

tube 13 which is caused to rotate about the axis of the apparatus by means of any suitable motor, not shown. This tube is mounted on ball bearings 14 and 15.

The space 16 which surrounds the piston heads and cam 7 communicates, through tube or conduit 17 with any suitable supply. The individual feed of each cylinder 1 is obtained through a circular groove or channel 18, provided in block 4 and connected through channels 19 with the ends of the respective cylinders 1.

Channels 20, provided with check valves 21 connect the ends of the respective cylinders 1 with the discharge 22.

The operation of the pump above described is as follows:

As a rule it is identical to that of the pump described in the above mentioned French patent. Tube 13, brought in rotation and driven by any suitable motor, rotates cam 8—8, the inclination of which is variable according to the pressure of the fluid fed by the pump.

The fluid is in space 16, to which it is fed through tube 17. It is driven in rotation and under the effect of the centrifugal force it is expelled into the peripheral zone of space 16 which is in communication with channels or grooves 18. An extra-pressure is produced in the zone in question and it is clear that, under these conditions, cylinders 1 are fed with fluid under a given pressure. Furthermore, when the pump is being restrated after having been stopped for a more or less considerable period of time, the rotation of the elements present in space 16 produces an overpressure in the vicinity of conduits 18, which ensures a correct restarting, which is a very interesting result obtained without any special device.

In view of ensuring a sufficient pressure at the inlet check valves, it is preferable to incline the inlet conduits, taking of course into account the direction of revolution of the pump. Also, I may make these conduits with the shape of blades, especially at the inlet end thereof.

The end portion 7a of the cam may be made of the shape of the blades of a turbine, which further drives the liquid toward the periphery.

I further provide a supplementary conduit 23, preferably of relatively small section, which connects the zone of overpressure with the ordinary oil or analogous reservoir. This ensures an intensive circulation of the liquid in the casing and increases the evacuation of the calories.

Blades 24 may also be provided on the outer surface of the pump body and they further improve the cooling.

An orifice 25, of small cross section, may be vrovided in the push piece acting on cam 7, so as to deaden the oscillations produced by the reciprocating movement of this push piece.

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