

Sept. 9, 1941.

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2,255,589

CONSTANT SPEED HYDRAULIC SYSTEM

Filed Feb. 20, 1939

2 Sheets-Sheet 1

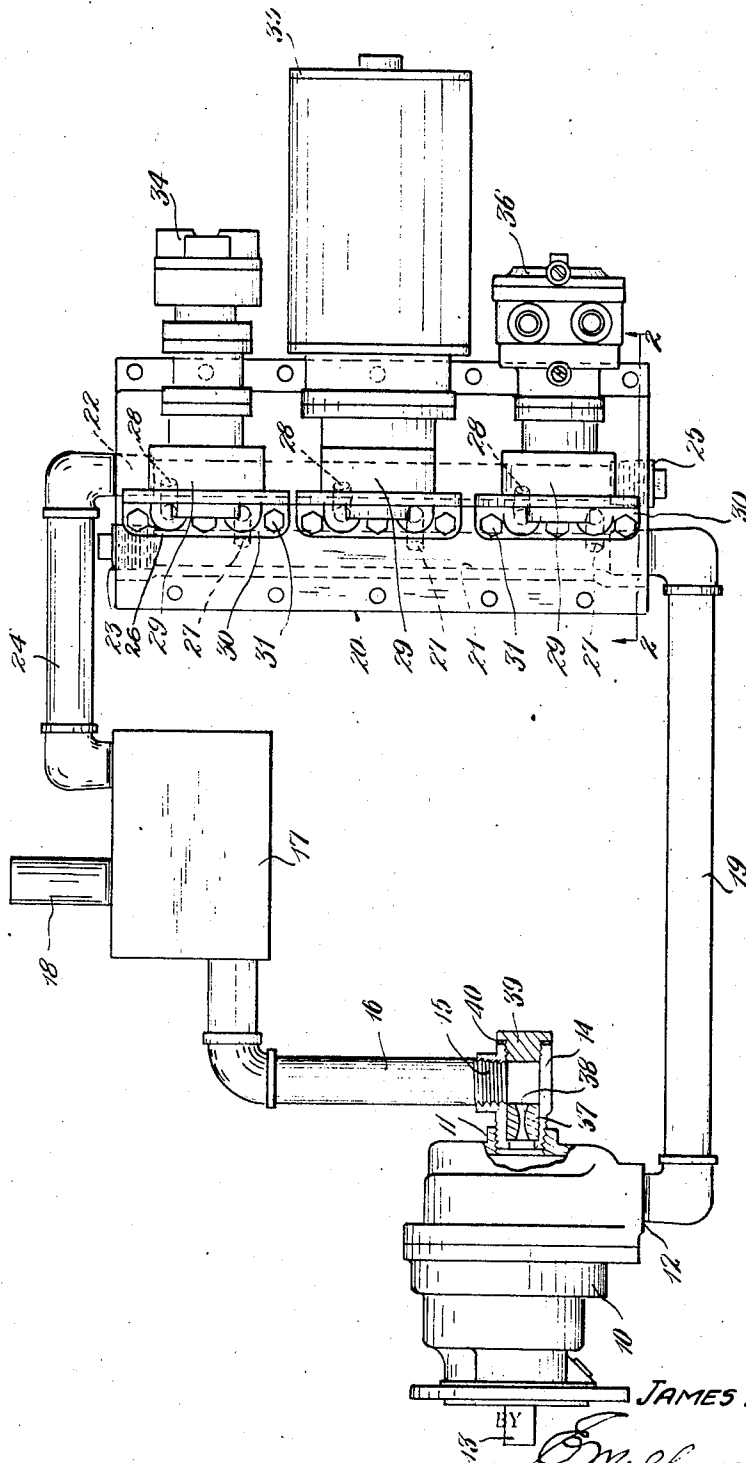


FIG. 1

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2 Sheets-Sheet 2

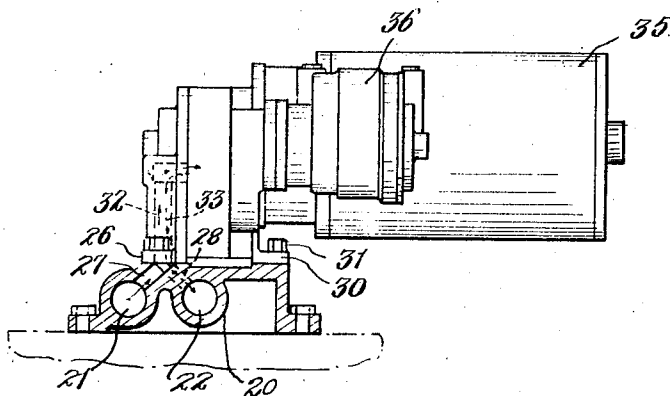


FIG. 2

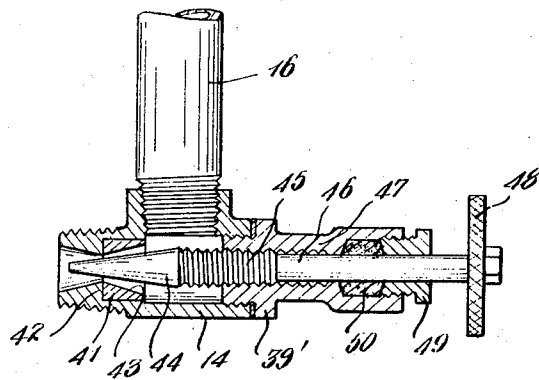


FIG. 3

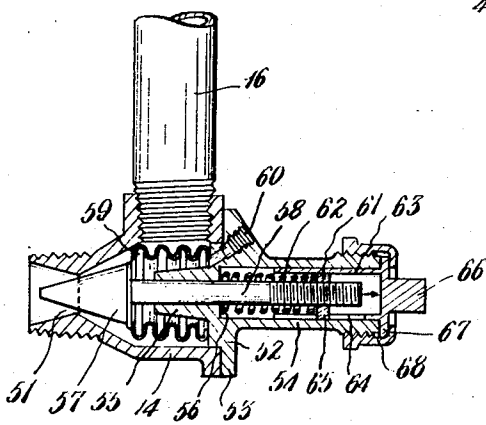


FIG. 4

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CONSTANT SPEED HYDRAULIC SYSTEM

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Application February 20, 1939, Serial No. 257,549

2 Claims. (Cl. 60—97)

This invention relates to improvements in the driving of generators, pumps, etc., and particularly as employed on aircraft although not so restricted.

At the present time it is customary to drive generators, oil pumps, vacuum pumps and the like by directly connecting these accessories with the engine or with the well known gear box having a plurality of these drives with which the accessories are directly connected. In both cases, however, the accessories are overloaded due to the higher speed at which the engine must operate particularly in drives and take-offs which has resulted in much trouble from this source.

A still further method of mounting these accessories has been the use of auxiliary engines, due to the fact that so many accessories are now mounted upon the engine, but the use of these auxiliary engines involves expense, adds to the load, and lacks efficiency.

It is therefore, one of the objects of the present invention to provide a mounting for these accessories entirely remote from the engine thereby permitting installation at the most desirable places so as to distribute the weight to the best advantage.

Another object of the present invention is to provide for hydraulic actuation of the accessories.

Another object of the present invention is to drive the accessories at approximately a predetermined speed thus eliminating the objectionable overdrive now present.

Another object of the present invention resides in the provision of individual hydraulic motors for each accessory thereby driving each accessory at the most effective speed.

A still further object of the present invention is to effect flow of the actuating medium by means of a hydraulic pump drivingly connected to the engine and to control the quantity of medium introduced into the inlet side of the pump whereby variations in the speed of the engine will have little influence upon the actuating medium.

A still further object of the present invention is the use of a manifold on which the accessories are mountable and which can be mounted upon the plane at the most advantageous location whereby the weight is properly distributed and installation difficulties overcome.

A still further object of the present invention is to provide a system and apparatus which is simple in construction and efficient in operation, and relatively inexpensive to manufacture.

With the objects above indicated and other objects hereinafter explained in view, my inven-

tion consists in the construction and combination of elements hereinafter described and claimed.

Referring to the drawings,

Figure 1 is a diagrammatic plan view of the apparatus embodying the present invention.

Figure 2 is an end elevational view at the manifold end of the apparatus with the manifold shown in section to more clearly illustrate the structure and taken on line 2—2 of Figure 1.

Figure 3 is a fragmentary sectional view of a modified form of control for the inlet side of the pump.

Figure 4 is a fragmentary sectional view of a further modified form of control embodying automatic operation.

In the drawings, particularly referring to Figures 1 and 2, I have shown an apparatus embodying the present invention, the apparatus being of simplified form so that the invention may be more readily understood. A high pressure oil pump 10, preferably of the well known gear type, has an inlet opening 11 communicating with the inlet side of the pump gears and an outlet opening 12 communicating with the outlet side of the pump gears in a well known manner, whereby upon rotation of the gears in the proper direction fluid will be drawn into the inlet opening 11 and discharged under pressure from the outlet opening 12. One of the pump gears has a shaft which projects outwardly beyond the housing and is formed with an extension 13 directly connected with the engine or other source of driving power by which the pump gears are rotated. The oil pump 10 may be mounted in any of the well known manners but, in the present instance, such a mounting is not disclosed inasmuch as it forms no part of the invention.

The inlet opening 11 is interiorly screwthreaded to receive the exteriorly screwthreaded end of a T connection 14, the connection being provided with a laterally disposed interiorly screwthreaded opening 15 into which the screwthreaded end of a pipe 16 is securely fitted. The other end of the pipe 16 is sealingly connected with the lower portion of an oil supply tank 17 in a manner to permit the flow of fluid preferably oil from the tank to the inlet side of the oil pump through the pipe 16. A pipe 18 has its lower end connected with the top of the tank 17 to provide a means by which oil may be introduced into the tank and further, to function as a vent, thus placing the inside of the tank in communication with the atmosphere.

The outlet opening 12 of the oil pump is, likewise, interiorly screwthreaded to receive one end

of a pipe 19 while the opposite end of the pipe is connected to a manifold 20 in a manner to be later described. The manifold 20, in this instance, comprises a casting, of rectangular shape in plan view, having a longitudinally extending passageway 21, the opposite ends of which are interiorly screwthreaded. The manifold is further provided with a longitudinally extending passageway 22 arranged preferably in parallel spaced relation with respect to the passageway 21 and this passageway 22 likewise has its opposite ends interiorly screwthreaded. The passageways and screwthreaded ends preferably are identical so that the manifold may be used in either position of mounting and will function in the desired manner. In the present instance, as shown in Figures 1 and 2, the passageway 21 is the inlet passageway and one end is adapted for connection with the end of the pipe 19. The opposite end of the passageway 21 is closed by a removable plug 23. The passageway 22 in this instance is the outlet or exhaust passageway, and it is connected at one end with a pipe 24 which has its opposite end connected to the upper portion of the tank 17. The opposite end of the passageway 22 is closed by a removable plug 25 of the type similar to the plug 23. The upper surface of the manifold 20 is provided with mounting pads 26 which are in longitudinal alignment but spaced apart relatively, there being disclosed in Figure 1 three of such mounting pads, but it should be understood that any number may be provided depending upon the number of accessories to be mounted on the manifold. The manifold 20 is further provided with a plurality of openings 27 affording communication between the inlet passageway 21 and one side of the mounting pad 26, and further provided with a plurality of openings 28 affording communication between the outlet passageway 22 and the opposite side of the mounting pad 26.

On each mounting pad 26 there is mounted a hydraulic motor 29, preferably of the well known gear type. Each of the hydraulic motors has an attaching flange 30 disposed upon one of the mounting pads 26 and secured by bolts 31. Each hydraulic motor is further provided with a passageway 32 communicating at its lower end with the adjacent opening 27 and at its upper end with the inlet side of the gears. A similar passageway 33 is provided on the opposite side of the hydraulic motor and has its lower end communicating with the adjacent opening 28 and its opposite end communicating with the outlet side of the gears. All of this construction is well known in connection with hydraulic motors and for that reason it is not believed necessary to illustrate the structure details of the motors. It is suffice to say that fluid under pressure is introduced into the inlet passageway 32 where it causes the gears to be rotated and the spent medium to be discharged through the outlet passageway 33, the rotation of the gears effecting rotation of a shaft, not shown, which projects outwardly of the hydraulic motor housing and is drivingly connected with the accessories which are to be operated thereby. In the present instance, an oil pump 34 is connected with one hydraulic motor, a generator 35 is connected with another hydraulic motor and a vacuum pump 36 is connected with the other hydraulic motor.

In operation, the oil pump 34 is operated from the engine causing rotation of the pump gears which draws oil from the supply tank 17 in through the inlet opening 11 due to the suction

created and discharges the fluid under pressure from the outlet opening 12 where it flows through the pipe 19 and into the inlet passageway 21 of the manifold 20. From here the oil passes through the openings 27 upwardly through the inlet passageways 32 into the inlet side of the hydraulic motors. The pressure is such as to cause rotation of the gears which in turn operates the respective accessories mounted upon each motor. The spent oil carried around by the motor gears is discharged through the outlet passageways 33 where it flows through the openings 28 and into the outlet passageway 22 of the manifold. From here the oil flows through the pipe 24 and back to the supply tank 17 where it is used over and over again.

With this arrangement, however, variations in the engine speed would create variations in the pressure of the oil which would likewise result in variations in the speeds of the hydraulic motors. In order to maintain, as nearly as possible, the actuating medium at a constant pressure, a plug 37 is disposed within the T-joint 14 and has an orifice 38 extending therethrough and of predetermined area. By introducing this restriction to the inflow of the oil, the oil pump can only take in a limited quantity of oil and thereby discharge a limited quantity irrespective of engine speed variations. This plug is mounted so as to be removable and for this reason plugs with different sizes of orifices may be substituted where different conditions exist. The end of the T-member 14 is closed by a screw-threaded plug 39 and a gasket 40 affords a sealed joint.

With this arrangement, it is further possible to employ hydraulic motors of different displacements and, therefore, to enable the selection of the proper capacity hydraulic motor for driving the particular accessory and thereby provide different driving speeds despite the fact that the actuating pressure of the medium remains constant.

In Figure 3, a modified form for varying the effective size of the inlet opening to the oil pump is shown. In this case the T-member 14 is provided with a plug 41 which is disposed on the inside of the member in abutment with a shoulder 42. The plug 41 has a tapered opening 43 extending axially therethrough with the widest part of the opening away from the inlet side of the pump and the plug 39' is interiorly screwthreaded. A tapered valve head 44 is disposed within the opening 43 and has an exteriorly screwthreaded portion 45 rotatably mounted within the screwthreaded opening in the plug 39'. A stem 46 projects centrally through a tubular extension 47 on the plug 39' and has an adjusting wheel 48 secured to its outer end by means of which the valve head 44 is axially adjusted with reference to the opening 43 in the plug 41. By adjusting the valve 44 with respect to the opening 43, it is possible to vary the quantity of oil introduced into the inlet side of the oil pump. A packing nut 49 is screwthreadedly disposed in the outer end of extension 47 and compresses a packing 50 so as to afford a fluid tight joint.

In Figure 4, a still further modified form of control valve is illustrated. In this instance, the T-member 14 has a restricted opening 51 adjacent the inlet side of the oil pump. The inlet pipe 16 is connected in the manner shown in Figure 1 and affords communication between the oil supply tank and the inlet side of the oil pump.

The opposite end of the T-member 14 is closed by a member 52 having a laterally extending flange 53 by which the member 52 is detachably connected. The member 52 has a tubular extension 54 which projects axially outwardly therefrom and a tapered extension 55 which projects inwardly therefrom and is provided with an axial opening of smaller size than the inside of the extension 54 so as to provide an abutment or shoulder 56. A valve member has a tapered valve head 57 which is disposed within the opening 51 and a stem 58 which projects outwardly therefrom and is slidably disposed within the opening in the extension 55. A flexible bellows 59 is disposed within the member 14 and has one end sealingly connected to the valve head and its other end sealingly connected to the member 52, in such a manner as not to interfere with the communication between the pipe 16 and the inlet side of the pump. The member 52 has an opening 60 affording communication with the interior of the bellows, the outer end being interiorly screw-threaded and adapted for connection with a pressure or vacuum actuating device. The stem 58 is exteriorly screwthreaded and has adjustably mounted thereon a collar 61 which functions as an abutment for one end of a coiled spring 62 disposed axially within the tubular extension 54 and having its other end in abutment with the shoulder 56. In this manner, the valve head is normally urged away from the opening 51 and is moved in the opposite direction by the suction at the inlet opening of the oil pump. The tension of the spring 62 may be adjusted by movement of the collar 61 and a simple means resides in providing a sleeve 63 which is rotatably disposed on the inside of the tubular extension 54 projecting inwardly at least as far as the end of the rod is threaded. The sleeve is, likewise, disposed over the collar 61 and has a slot 64 to slidably receive a lug 65 formed on the collar 61. An extension 66 projects outwardly beyond the sleeve and affords a means by which the sleeve may be rotated which in turn varies the position of the collar 61 upon the screwthreaded end of the stem. The sleeve 63 is provided with a laterally extending flange 67 which abuts the end of the tubular extension 54, and a nut 68 is removably connected to the outer end of the tubular extension. When the nut 68 is secured in place the flange 67 is rigidly clamped so as to maintain the spring in its adjusted position.

While I have described the preferred embodiment of the invention it is to be understood that I am not to be limited thereto inasmuch as changes and modifications may be resorted to without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. In a fluid pressure delivery and discharge manifold assembly, an elongated manifold member having formed therein a pair of longitudinally extending separated passages having threaded terminal portions, a first one of said passages having one end thereof closed by a threaded closure plug and the other end thereof adapted to be connected with the threaded terminal of a conduit leading from a source of fluid under pressure, said other passage having its terminal located adjacent said plug being adapted to receive a complementary terminal portion of a return conduit leading back to said fluid pressure source, and a second threaded plug closing the other end of said last named passage, a plurality of pairs of generally aligned ports formed in the upper surface of said casting, a first port of each of said pair of ports being in communication with said first passage and the remaining port of each pair of ports being in communication with said other passage, a plurality of separate fluid motors each formed with an inlet opening and a discharge opening, and separate adaptor means for mounting said motors on said manifold member effective to place said motor inlets in communication with said first ports and the motor outlets in communication with said remaining ports, and means for readily assembling in attached relation said adaptors, motors, and manifold member.

2. In a fluid delivery and discharge manifold assembly, an elongated casting of generally rectangular cross-section, said casting being formed with a pair of generally parallel separated longitudinally passages extending from one end to the other thereof and having threaded terminal portions, a first one of said passages having one end thereof closed by a complementary threaded closure plug and the other end thereof adapted to be connected with the threaded terminal portion of a conduit leading from a source of fluid pressure, said other passage having the portion thereof adjacent the said plug adapted to receive the threaded terminal portion of a return conduit leading back to said fluid pressure source, and a second threaded plug received in the other end of said last named passage, a plurality of pairs of generally aligned ports formed in the upper portion of said casting, and separate adaptor means associated with each pair of said ports effective to support a fluid motor and to place the inlet of each of said motors in communication with a first one of said ports and the discharge side of said fluid motors with said second one of said ports, and means for readily attaching and detaching said adaptor means to said casting and said motors to said adaptors.

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