Aug. 25, 1936. B. L. HYMAN 2,052,472

FLUID ENGINE

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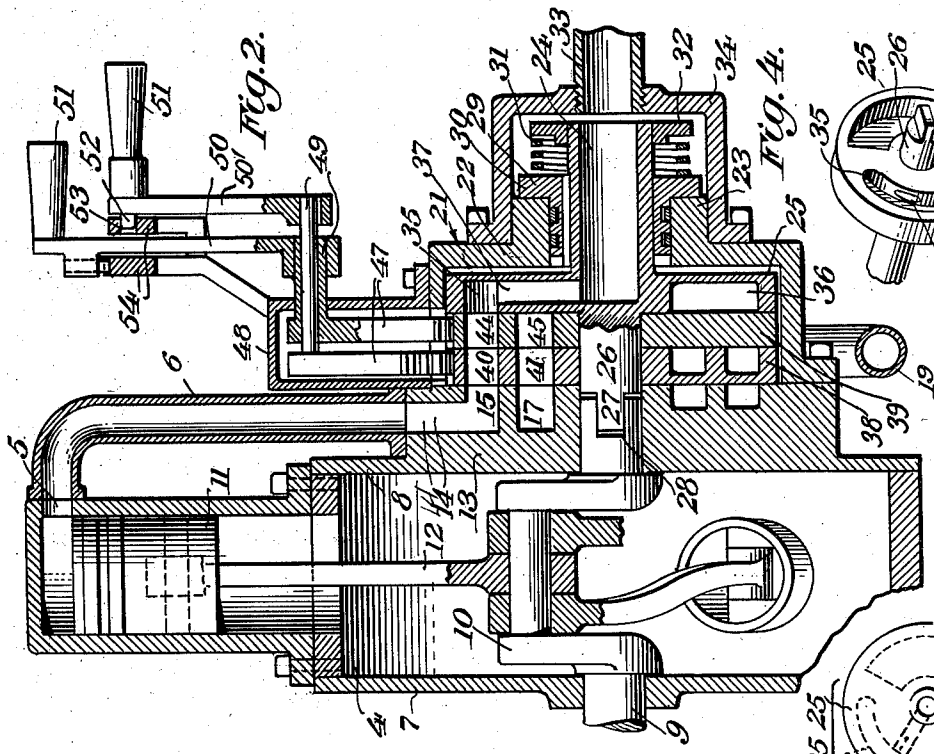


Fig. 2.

Fig. 4.

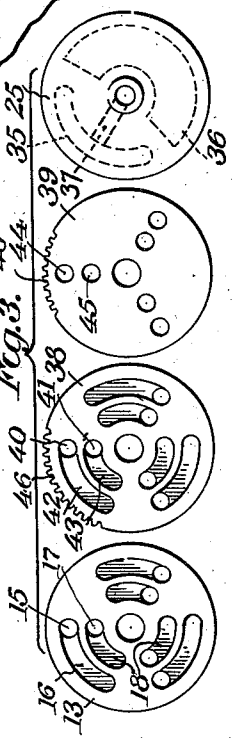


Fig. 3.

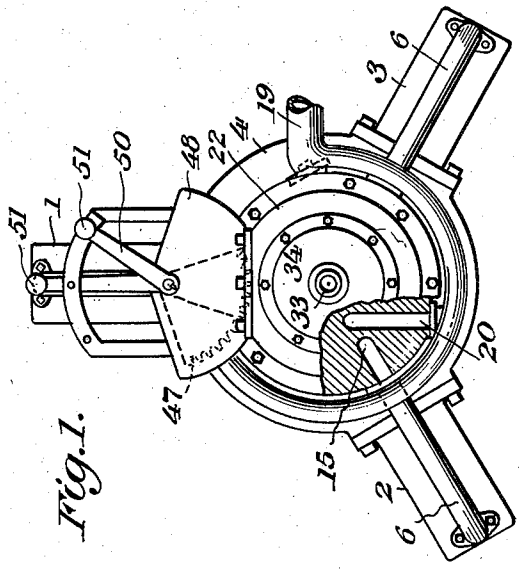


Fig. 1.

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Fig. 5.

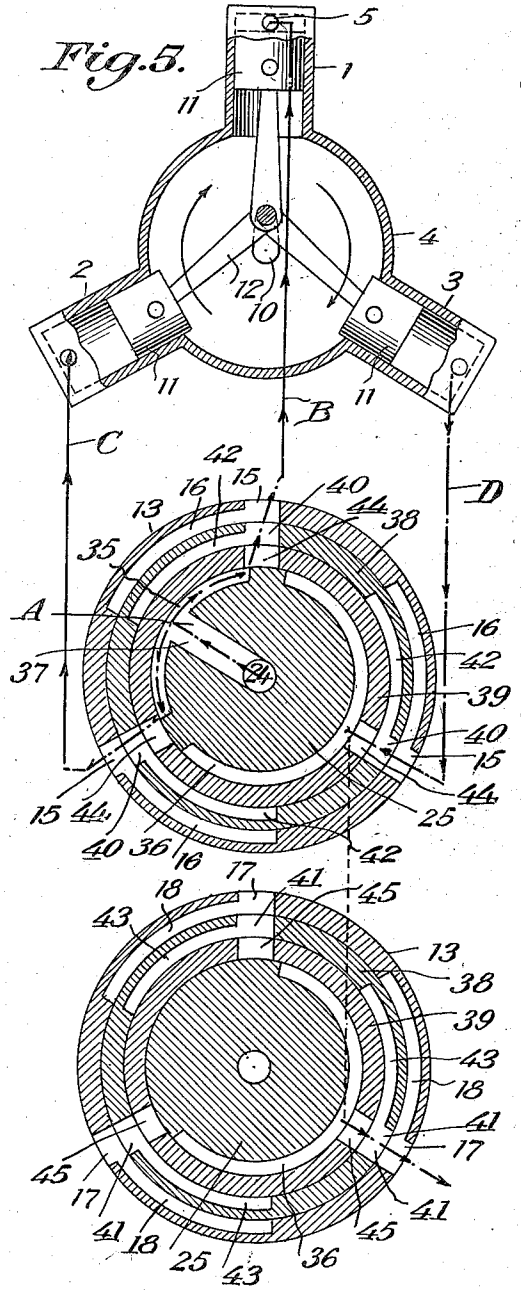
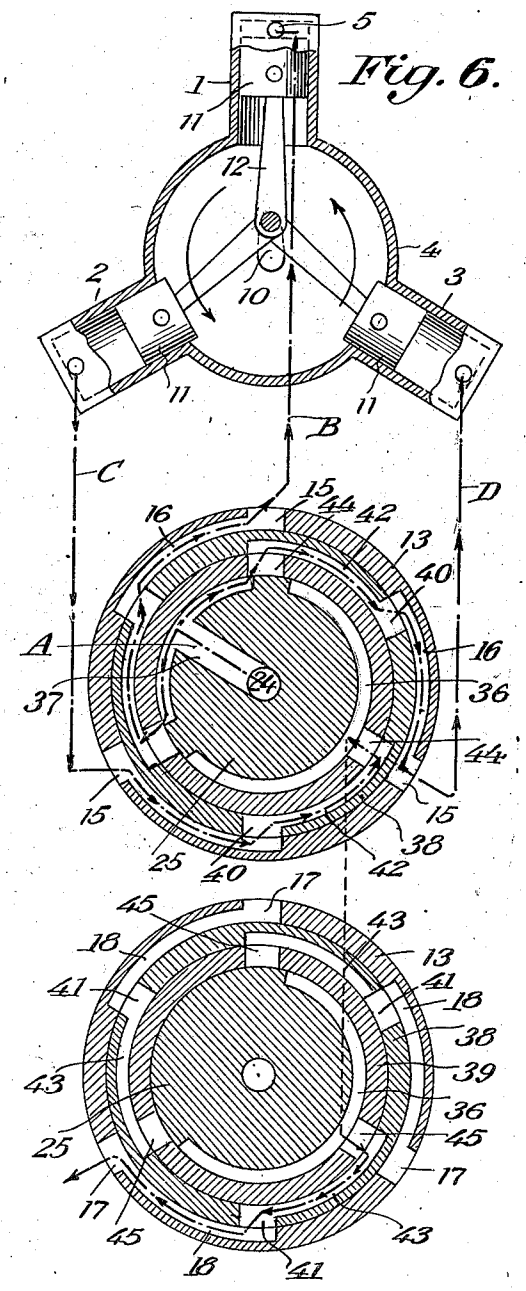


Fig. 6.



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UNITED STATES PATENT OFFICE

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FLUID ENGINE

Bert L. Hyman, Savannah, Ga., assignor of one-half to Jack Moody, Savannah, Ga.

Application February 4, 1935, Serial No. 4,956

3 Claims. (Cl. 121—121)

This invention relates to a fluid engine of the reciprocating type and which may be conveniently converted into a compressor when desired and has for the primary object the provision of a device of this character which will develop maximum power with a minimum consumption of fluid pressure and will reduce vibration to a minimum.

Another object of this invention is the provision of an engine of the above stated character which will deliver power continuously to the crank shaft thereof during each revolution of the latter.

With these and other objects in view, this invention consists in certain novel features of construction, combination and arrangement of parts to be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which

Figure 1 is an end elevation, partly in section, illustrating a fluid engine constructed in accordance with my invention.

Figure 2 is a vertical sectional view illustrating the same.

Figure 3 is a plan view showing the elements of the control valve.

Figure 4 is a fragmentary perspective view illustrating one of the elements of the control valve.

Figure 5 is a diagrammatical sectional view showing the fluid pressure flow to a pair of cylinders and the exhausting of a third cylinder during the rotation of the engine in one direction.

Figure 6 is a view similar to Figure 5 showing a reverse rotation of the engine, the flow lines showing the passing of fluid pressure to a pair of cylinders and the exhausting of the third cylinder to the atmosphere.

Referring in detail to the drawings, the numerals 1, 2, and 3 indicate cylinders mounted to a crank case 4 and each cylinder adjacent its closed end is provided with a port 5 in communication with a manifold 6. Opposite walls 7 and 8 of the crank case 4 have journals rotatably supporting a crank shaft 9, the latter having a single crank 10 operable within the crank case. Reciprocally mounted in the cylinders are pistons 11 all connected to the crank 10 of the crank shaft 9 by connecting rods 12. The wall 8 of the crank case is of an increased thickness over the thickness of the wall 7 to form a valve mounting 13 in which are formed intake manifold passages 14 communicative with the manifolds 6 and opening outwardly through one face of the mounting 13 to form intake ports 15 communicative with arcuately curved grooves 16. Exhaust ports 17 are arranged adjacent the intake ports 15 and have in communication therewith arcuate-shaped grooves 18. The grooves 16 and 18 as well as the ports 15 and 17 are grouped in pairs on one face of the valve mounting. The exhaust ports 17 are communicative with a common exhaust manifold 19 by passages 20, the latter being formed in the valve mounting. The intake and exhaust ports 15 and 17 and the grooves 16 and 18 form one face of the valve mounting 13 into a fixed valve head of a valve mechanism, indicated by the character 21 in entirety.

A valve housing 22 is removably secured to the valve mounting 13 and encloses the fixed valve head which forms an integral part of the valve mounting and is provided with a journal 23 for rotatably supporting a tubular shaft 24 forming an integral part of a rotatable valve head 25, the latter being located within the valve chamber defined by the valve housing 22. Also integral with the rotatable valve head 25 is a shaft 26 having a tongue 27 to fit in a notch 28 formed in one end of the crank shaft 9 whereby the rotatable valve head is caused to rotate with the crank shaft and may be detached therefrom when desired. Arranged between the journal 23 and the tubular shaft 24 is a packing sleeve 29 including a flange 30 held in abutting engagement with the end of the journal 23 by a coil spring 31. The spring seats on a collar 32 secured to the tubular shaft 24. The shafts 24 and 26 are in alignment and the shaft 24 is in alignment with a fluid supply pipe 33, the latter being mounted to a cap 34 removably secured to the valve casing 22. The supply pipe 33 establishes communication between the tubular shaft 24 and a fluid pressure supply (not shown). Also the fluid pressure fills the space within the cap 34 and acts on the flange 30 to seat the latter against the journal 23. The abutting faces of the flange and journal are preferably of a ground fit.

One face of the rotatable valve head 25 has formed therein intake and exhaust grooves 35 and 36 each of arcuate formation and one of a greater width and length than the other, as shown in Figure 4. The intake groove 35 is in communication with the tubular shaft 24 by a passage 37.

Journaled on the shaft 26 between the fixed and rotatable valve heads is a reversing disc 38 and a timing disc 39. The discs 38 and 39 have ground

fits with each other and with the valve heads to prevent leakage. The reversing disc 38 is provided with intake and exhaust ports 40 and 41 which are in communication with intake and exhaust grooves 42 and 43. The intake and exhaust ports and intake and exhaust grooves of the reversing disc are arranged similarly to the intake and exhaust ports 15 and 17 and the grooves 16 and 18 of the fixed valve head. The timing disc 39 is provided with intake and exhaust ports 44 and 45 arranged similar to the intake and exhaust ports 40 and 41 of the reversing disc and also the ports 15 and 17 of the fixed valve head. Teeth 46 are formed on the periphery of the discs 38 and 39 to mesh with segmental gears 47 located in the gear housing 33 and mounted on the valve housing 22. The segmental gears are secured to operating shafts 49, one journaled in the other and one journaled to the gear housing. A control lever 50 is secured to one of the shafts 49 and the other shaft 49 has a control lever 50' secured thereto. The control levers have handles 51 equipped with suitable latch elements 52 to engage openings 53 of brackets 54 whereby the control levers may be releasably secured in several positions. The timing disc may be adjusted by the lever 50 and the reversing disc adjusted by the control lever 50'. These discs may be adjusted in either direction through the movement of the respective levers. By varying the position of the reversing disc with respect to the valve heads and timing disc will bring about a reverse operation of the engine. By varying the position of the timing disc with respect to the reversing disc and the movable valve head, the timed admission of fluid pressure to the cylinders may be advanced and retarded as to the working strokes of the pistons.

The gear housing 48 and valve casing 22 are in communication so that the segmental gears 47 may mesh with the teeth on the reversing and timing discs and the fluid pressure is prevented from entering the gear housing by the packing sleeve 29, the latter being equipped with suitable packing rings.

The fluid pressure from the supply pipe 33 acts to move the tubular shaft 24 endwise in the direction of the crank shaft 10, causing the rotatable head 25 to bear against the timing disc 39 and timing disc to bear against the reversing disc 38 and the latter to bear against the fixed disc valve head to prevent the fluid pressure from leaking past these parts. However, to prevent said parts from binding and causing undue wear thereon, the spring 31 is provided. The spring is of a selected strength and acts on the flange 32 of the tubular shaft in opposition to the fluid pressure on said tubular shaft for offsetting some of the force of the fluid pressure on the rotatable valve head, timing disc, reversing disc and fixed valve head, so that said parts will not be unduly worn and still there will be sufficient force to prevent leakage of fluid pressure thereby. The arrangement described also eliminates the use of a stuffing box between the tubular shaft and the supply pipe 33.

The operation of the fluid engine is as follows: The fluid pressure source (not shown) is open to the tubular shaft 24, filling the latter and the space within the cap 34 with fluid under pressure. The pressure of the fluid within the cap 34 acts on the flange 30 of the sleeve to seat said flange against the journal and thereby prevent escape of fluid about the shaft 24 and the valve housing 22. The fluid pressure passes from the shaft 24 to groove 35 of the rotatable valve head 25 by way of the passage 37, as indicated by flow line A in Figures 5 and 6. The levers 50 and 50' are actuated to adjust the timing and reversing discs so that one group of ports 44 and 40 thereof communicate with port 15 connected to cylinder 1 and as the rotatable head 25 rotates, the groove 35 thereof communicates with said last-named port 40 so that the flow of fluid pressure will be to cylinder 1, as shown by flow line B of Figure 5, acting on the piston thereof which is starting on its working stroke. The foregoing describes how the fluid pressure reaches cylinder 1 and acts upon the piston thereof when said piston is beginning on its working stroke. However, when the engine is in operation and the fluid pressure is reaching cylinder 1 by the flow line B, fluid pressure is also reaching cylinder 2 by the flow line C, the piston of cylinder 2 is nearing the limit of its working stroke. Consequently, it will be observed that there is a power overlap to the crank shaft 10 during the time of one piston starting on its working stroke and another piston nearing the limit of its working stroke. During this cycle of operation described, cylinder 3 is open to the atmosphere by a third group of ports 15, 40 and 44, as indicated by the flow line D in Figure 5. The flow lines A, B, C, and D in Figure 5 clearly illustrate the overlap power impulses to the crank shaft and the exhausting of one cylinder to the atmosphere while the other cylinders are taking in fluid pressure. In Figure 6 the position of the reversing disc is shifted for the purpose of reversing the direction of rotation of the engine or the crank shaft thereof. In the illustration of Figure 6, cylinders 1 and 3 are intaking while cylinder 2 is exhausting, the flow lines A, B, C, and D of this view clearly illustrate how the fluid pressure reaches cylinders 1 and 3 and the fluid pressure from cylinder 2 reaches the atmosphere. By varying the position of the timing disc, the ports 44 thereof will be changed with respect to the grooves 42 and the groove 35 of the rotatable head 25 so as to advance or retard the admittance of fluid pressure to the pistons when on their working strokes. The operation described by the valve mechanism provides a continuous driving force to the crank shaft on every revolution thereof with an overlap of driving force at certain positions of the crank of the crank shaft which prevents the crank from stopping on dead center and permits the engine to develop greater horse power from a given amount of fluid pressure with vibration reduced to a minimum. The valve arrangement providing the overlapping of the power impulses to this engine brings about a condition wherein the fluid supply is always in communication with a cylinder with no interruption during the time the engine is in operation, consequently reducing vibration to a minimum and providing a smoother operating engine.

Having described the invention, I claim:

1. A fluid pressure engine comprising cylinders each having a port, reciprocating pistons in said cylinders, a crank shaft journaled to the base and having a crank, means connecting said pistons to the crank of the crank shaft, a valve mounting providing a fixed valve head formed on said base and having intake and exhaust ports, a valve housing secured to said mounting, a rotatable valve head located in the housing and slidably secured to the crank shaft and having an exhaust port and an intake port, a tubular shaft formed on said rotatable valve head, and located

in and communicating with said housing and with the intake port of the rotatable valve head, packing means between the housing and the tubular shaft and held seated by fluid pressure in the housing, means connecting said housing to a fluid pressure supply whereby the fluid pressure may fill the tubular shaft and act to urge the latter and the rotatable valve head in the direction of the valve mounting, reversing and timing elements having intake and exhaust ports located in the housing between the rotatable valve head and the valve mounting and held seated against each other and against said rotatable valve head and the valve mounting by the fluid pressure acting on the tubular shaft, and control means for said timing and reversing elements.

2. A fluid pressure engine comprising cylinders each having a port, reciprocating pistons in said cylinders, a crank shaft journaled to the base and having a crank, means connecting said pistons to the crank of the crank shaft, a valve mounting providing a fixed valve head formed on said base and having intake and exhaust ports, a valve housing secured to said mounting, a rotatable valve head located in the housing and slidably secured to the crank shaft and having an exhaust port and an intake port, a tubular shaft formed on said rotatable valve head and located in and communicating with said housing and with the intake port of the rotatable valve head, packing means between the housing and the tubular shaft and held seated by fluid pressure in the housing, means connecting said housing to a fluid pressure supply whereby the fluid pressure may fill the tubular shaft and act to urge the latter and the rotatable valve head in the direction of the valve mounting, reversing and timing elements having intake and exhaust ports located in the housing between the rotatable valve head in the direction of the valve mounting, reversing and timing elements having intake and exhaust ports located in the housing between the rotatable valve head and the valve mounting and held seated against each other and against said rotatable valve head and the valve mounting by the fluid pressure acting on the tubular shaft, control means for said timing and reversing elements, and a spring means of a selected strength acting on the tubular shaft in opposition to the fluid pressure.

3. A fluid pressure engine comprising cylinders each having a port, reciprocating pistons in said cylinders, a crank shaft journaled to the base and having a crank, means connecting said pistons to the crank of the crank shaft, a valve mounting providing a fixed valve head formed on said base and having intake and exhaust ports, a valve housing secured to said mounting, a rotatable valve head located in the housing and slidably secured to the crank shaft and having an exhaust port and an intake port, a tubular shaft formed on said rotatable valve head and located in and communicating with said housing and with the intake port of the rotatable valve head, packing means between the housing and the tubular shaft and held seated by fluid pressure in the housing, means connecting said housing to a fluid pressure supply whereby the fluid pressure may fill the tubular shaft and act to urge the latter and the rotatable valve head in the direction of the valve mounting, reversing and timing elements having intake and exhaust ports located in the housing between the rotatable valve head and the valve mounting and held seated against each other and against said rotatable valve head and the valve mounting by the fluid pressure acting on the tubular shaft, control means for said timing and reversing elements, a spring means of a selected strength acting on the tubular shaft in opposition to the fluid pressure, said intake and exhaust ports of the fixed valve head, the timing and reversing elements being arranged in pairs with the exhaust port of each pair arranged inwardly of the intake port and said intake and exhaust port of the reversing element and the fixed valve head being in communication with grooves formed in the faces of said reversing element and the fixed valve head.

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