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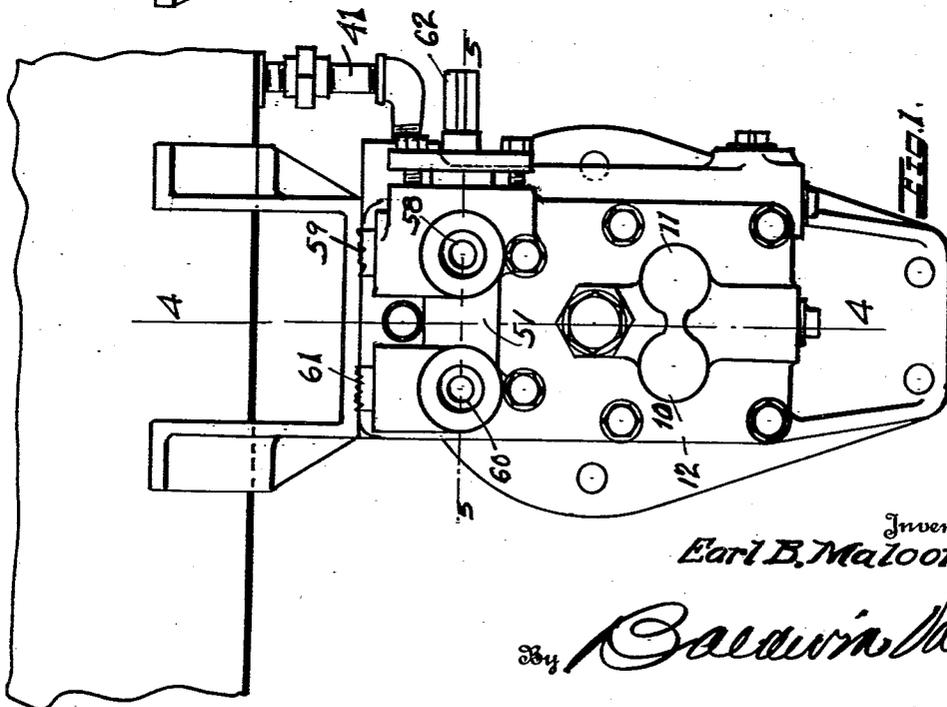
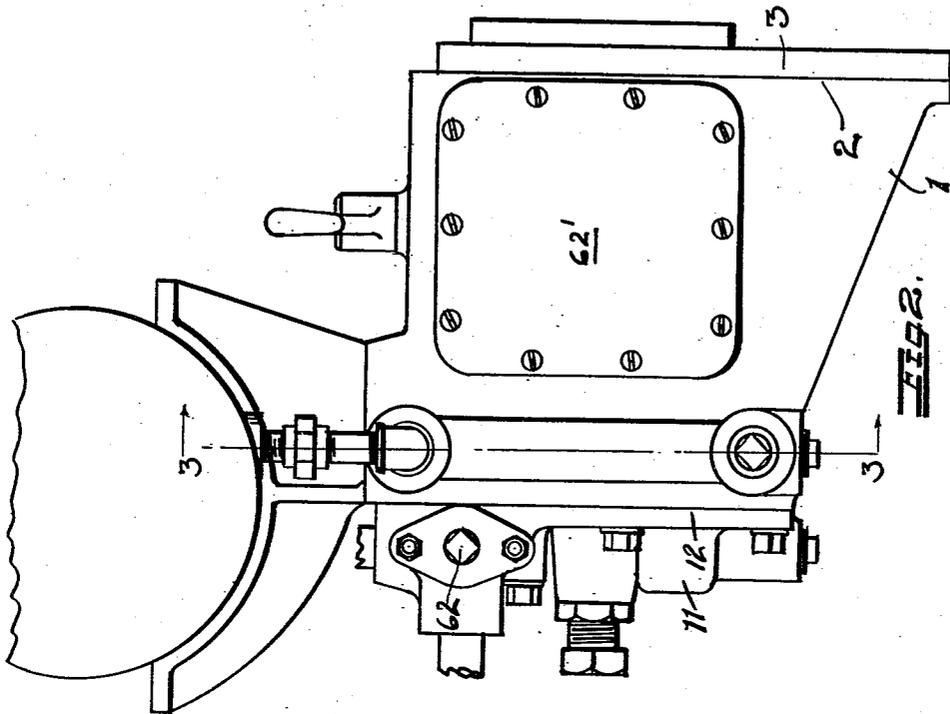
E. B. MALOON

1,908,614

HYDRAULIC APPARATUS.

Filed Aug. 31, 1929

3 Sheets-Sheet 1



Inventor
Earl B. Maloon

By *Baldwin*

Attorney

May 9, 1933.

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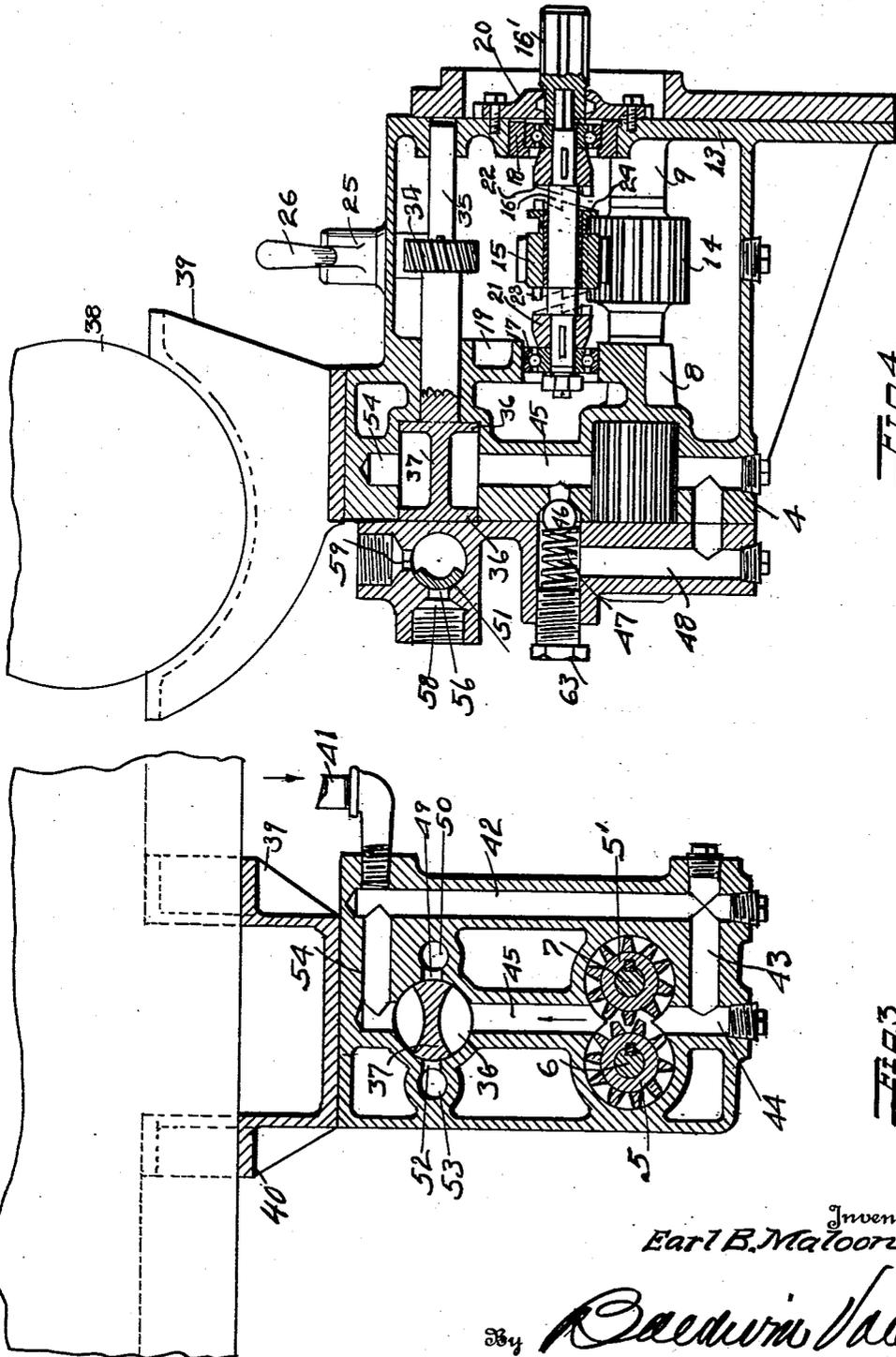


FIG. 4.

FIG. 3.

Inventor
Earl B. Maloon.

By *Boedwin & Co.*

Attorney

May 9, 1933.

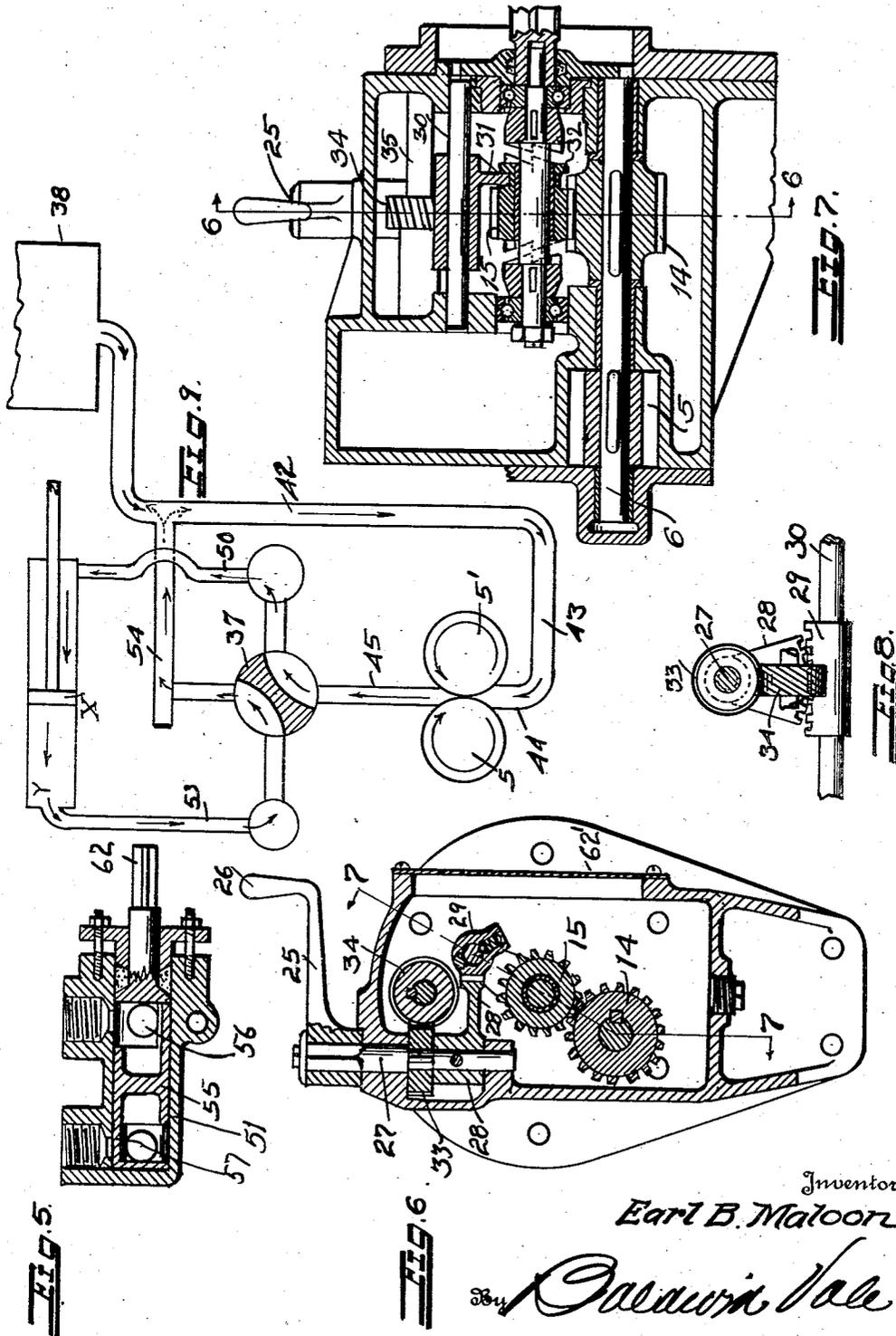
E. B. MALOON

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3 Sheets-Sheet 3



Inventor
Earl B. Maloon.

Pauline Lee

Attorney

UNITED STATES PATENT OFFICE

EARL B. MALOON, OF OAKLAND, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
AMERICAN TRACTOR EQUIPMENT CO., A CORPORATION OF NEVADA

HYDRAULIC APPARATUS

Application filed August 31, 1929. Serial No. 339,710.

This invention relates to improvements in hydraulic apparatus and more particularly to pumps combined with other apparatus for operating and controlling hydraulic machinery.

Among the objects of the invention are to so construct and arrange the pumping mechanism that it may be automatically stopped and started synchronously with the intermittent operation of the machinery controlled thereby.

Another object is to economize the power required to operate the pump and prolong the effective life of the pump by limiting its operation to necessary periods only.

A further object is to combine the pump clutch control with the operating lever of the hydraulically operated mechanism.

Other objects and advantages will appear as the description progresses.

In this specification and the accompanying drawings the invention is disclosed in its preferred form, but it is to be understood that it is not limited to this form, because it may be embodied in other forms. It is also to be understood that in and by the claim following the description, it is desired to cover the invention in whatsoever form it may be embodied.

In the accompanying three sheets of drawings:

Figure 1 is an end elevation of a hydraulic pump and control, constructed in accordance with this invention.

Figure 2 is a side elevation of the same.

Figure 3 is a cross section of the same, taken on the line 3—3 Figure 2.

Figure 4 is a longitudinal section of the same taken on the line 4—4 Figure 1.

Figure 5 is a detail of the three-way selective valve, in longitudinal section on the line 5—5 Figure 1.

Figure 6 is a cross section of the assembly on the line 6—6 Figure 7.

Figure 7 is a longitudinal section of the same on the line 7—7 Figure 6.

Figure 8 is a fragmentary detail of the pump clutch control.

Figure 9 is a diagrammatic view, illustrating the circulation of the hydraulic fluid.

In detail, the construction illustrated in the drawings, referring to Figures 1 and 2, consists of the enclosing case 1. This case has the flange 2, or other means for attaching it to the adapter plate 3, adapted to be fixed to the end of the motor of a tractor or other prime mover from which the pump derives its power.

The end 4 of the case is counterbored to form the pump case for the intermeshed pump gears 5—5', see Figure 3. The gears 5—5' are mounted on the driven shaft 6, and the stud shaft 7 respectively, which rotate in bearings 8—9 in the pump case, and 10—11 in the cover plate 12. (See Figures 1—2.)

The shaft 6 extends forward into the bearing 9 in the front 13 of the case 1. (See Figure 4). The driven gear 14 is fixed on this shaft between the bearings 8—9.

The sliding gear 15 is enmeshed with the gear 14 to drive the same. This sliding gear is free on the shaft 16, which is journaled in the anti-friction bearings 17—18, mounted in the bracket 19 and the end 13 of the case 1.

This shaft has the splined head 16' fixed thereon and adapted to engage a suitable hub fixed upon the end of the prime mover not shown. The oil gland 20 surrounds this shaft and is fixed to the end 13 to arrest the escape of lubricant from the case 1.

The clutch dogs 21—22 are fixed on the shaft 16 on opposite sides of the gear 15, which has corresponding clutch jaws 23—24 thereon to engage said dogs.

The control lever 25 having the handle 26, is fixed on the vertical shaft 27, which is rotatably mounted on the case 1. (See Figure 6.)

The segmental gear 28 is fixed on the shaft 27 and enmeshed with the rack 29 splined on the shaft 30. (See Fig. 8.) This shaft is fixed in the end 13 and the bracket 19 in the case 1. (See Figure 7.)

This rack 29 has a yoke 31 engaging the annular groove in the hub 32 of the sliding gear 15 (see Figures 4, 6 and 7) whereby the swing of the handle 26 slides the gear 15 into and out of engagement with the dogs 21—22.

The spiral gear 33 is also fixed on the shaft

27 and enmeshed with the similar gear 34 fixed on the valve stem 35.

This valve stem 35 is oscillatable in the end 13 of the case 1 and the bracket 19. It has the enlarged head 36 oscillatable in a recess bored in the end 4 of the case 1. (See Figures 3 and 4.) It has the transverse gate 37 to act as a valve in said recess. The gear ratio is such that about 50 degrees of swing of the handle 26 causes this gate to act as a two way valve to divert the flow from the pump, to reverse the hydraulic mechanism.

The flow to the pump originates in the gravity tank 38 mounted in the saddle brackets 39—40, which may be located on the top of the case 1, or elsewhere, as convenience may require.

From this tank the hydraulic liquid, such as oil, flows through the pipe 41 to the internal passage 42 cored in the side of the case 1. From this passage it passes through the passage 43 to the intake 44, around the gears 5—5'; into the passage 45 cored in the case 1, which leads to the reverse valve 37. (See Figure 3.)

Should the pressure rise above a predetermined pressure with the pump running, the pressure between the valve and the gears 5—5', would unseat the ball valve 46, governed by the adjustable spring 47 and flow through the passage 48 back to the intake 44. This "safety valve" takes care of overloads or obstruction on the circulating system.

If the valve 37 is rotated about 50 degrees by the handle 26 contra-clockwise, it uncovers the port 49 into the passage 50, which leads outward through the selective valve 51, Figures 1—4.

If the valve 37 is rotated clockwise it uncovers the port 52 into the passage 53 which leads to the opposite side of the valve 51.

When the port 49 is uncovered on the lower side of the gate 37, the port 52 is open on the upper side thereof and vice versa. The purpose of this is to give a positive action on either side of a double acting piston X in a cylinder Y (see Figure 9), through the medium of hydraulic rams, or the like, as in raising and lowering plows, scrapers, and other attachments to tractors.

The fluid passing through the port 49 operates on one side of the piston, while the fluid on the opposite side of the piston flows back through the port 52 into the passage 54 and back into circulation through the intake 44. The speed of operation is regulated by the extent of the opening of the ports by the gate 37.

The selective valve 51 is transverse to the valve 37 and consists of a rotatable plug 55. (See Figure 5.) This plug has two gates such as 56—57 on its opposite ends, set at 180 degrees to each other and adapted to open and close the ports 58—59 at one end or 60—61 at the other. This plug has the squared end 62 to receive an operating handle.

It is the function of the selective valve to select which of a plurality of attachments shall be operated by the pump as described. For instance, the tractor may have a "bulldozer" or push scraper in front, operated through the ports 58—61, and a drag scraper behind operated through the ports 60—59. The selection is made by uncovering the desired port by turning the plug 55, so that the desired hydraulic mechanism is cut into the liquid circulated by the pump and the other such mechanism cut out of operation. By an obvious modification of this valve a multiplicity of such mechanisms may be served by the same pump 5—5'.

To permit lateral access to the mechanisms within the case 1, it is provided with the removable plate 62'. The whole interior of this case may be packed with a proper gear case lubricant.

Should the hydraulic driven mechanisms fail to operate or become obstructed and cause undue pressure on the pump, this pressure will be relieved through the relief valve 46, the tension of which may be regulated by the screw plug 63.

This invention operates substantially as follows:

When it is desired to hydraulically operate any of the suggested attachments, the operator swings the handle 26 in the proper direction, which synchronously swings the valve 36 to divert the flow from the pump and slides the gear 15 into engagement with the adjacent clutch 21 or 22, to start the pump.

Throwing the handle 26 into neutral position, as illustrated, stops the pump. De-clutching the pump in this manner, as compared with a constantly running pump, has proved in practice to save about six hours operating time during an eight hour shift, on a grading tractor equipped with hydraulically actuated bulldozer and drag scraper, thus saving not only needless wear and tear on the pumping mechanism, but also the power to run same, reducing the load on the prime mover, often grossly overloaded with its other duties.

Having thus described this invention, what I claim and desire to secure by Letter Patent is:

An apparatus of the character described comprising a casing, a pump embodied within the casing, a drive shaft for said pump, a driving shaft in parallelism with said pump drive shaft, a gear fixed on the pump drive shaft, a gear rotatably and slidably mounted on the driving shaft, clutch means at opposite ends of said rotatable gear whereby axial shifting of the gear in either direction will connect said rotatable gear to the driving shaft and impart a drive to the pump drive shaft, a control lever connected with said rotatable gear for shifting the same,

said casing being formed with passageways leading to the pump and from the pump, said casing being formed with other passageways leading from said passageway from the pump, a two-way control valve interposed between the passageway leading from the pump and said other passageways and capable of closing said passageway from the pump or of directing fluid to either of the other passageways, a connection between said valve and said control lever whereby shifting of said rotatable gear to connect the same to the driving shaft will be accompanied by operation of the valve, said valve being disposed so that when the same closes the passageway from the pump said rotatable gear will be in neutral, and when said gear is shifted in opposite directions said valve will be positioned to divert the flow to one or the other of said other passageways.

In testimony whereof I have hereunto set my hand this 14th day of August, A. D. 1929.

EARL B. MALOON.

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