Feb. 23, 1960 H. R. TEAR 2,925,780

ADJUSTABLE PROPORTIONING PUMP

Filed Sept. 18, 1957

Fig. 1

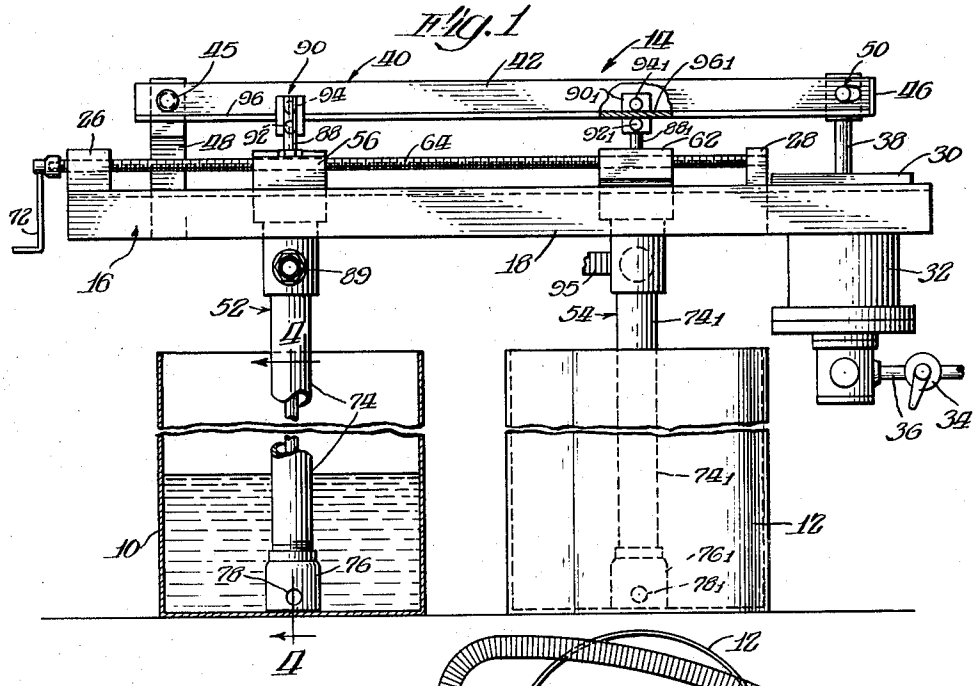


Fig. 2

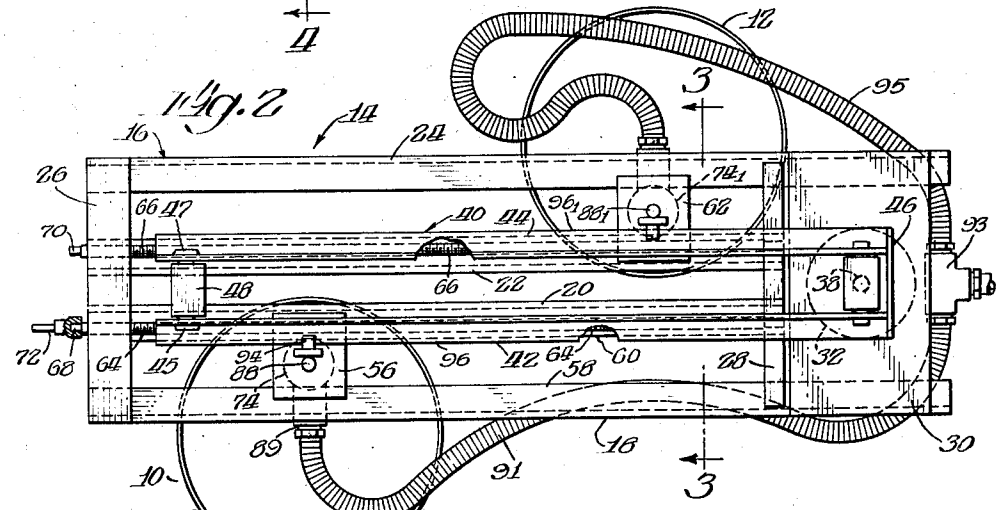


Fig. 3

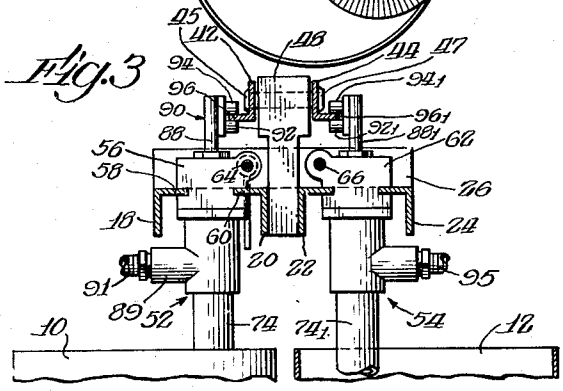
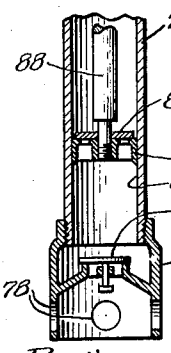


Fig. 4



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ADJUSTABLE PROPORTIONING PUMP

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3 Claims. (Cl. 103—11)

The present invention relates to apparatus for pumping two different liquids simultaneously from two separate containers.

One object of the invention is to provide improved pumping apparatus of an extremely simple, highly practical construction which is capable of pumping two different liquids simultaneously from separate containers at pumping rates for the respective fluids that can be preadjusted readily to any desired ratio to each other and positively maintained at the preadjusted ratio despite fluctuations in the back pressure on the pumping apparatus, variations in the overall pumping rate of the apparatus, changes in the viscosity of one or both liquids, differences in the height of liquid in the containers from which the liquid is pumped, and other variables which affect or tend to affect the pumping of the two liquids.

Another object of the invention is to provide improved pumping apparatus, as recited in the previous object, which is particularly well suited to pump liquids into a common outlet from two barrels, supply drums or the like.

Other objects and advantages will become apparent from the following description of the exemplary embodiment of the invention shown in the drawings, in which:

Figure 1 is a side view of pumping apparatus embodying the invention;

Fig. 2 is a plan view showing the apparatus and its fluid output connections;

Fig. 3 is a fragmentary sectional view taken along the line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary sectional view taken along the line 4—4 of Fig. 1.

Well adapted to pump two different liquids simultaneously from two adjacent, upwardly open barrels 10, 12, the adjustable proportioning pump 14 forming the exemplary embodiment of the invention illustrated comprises a narrow, horizontally elongated frame 16 adapted to extend horizontally across both barrels.

The basic structure of the frame 16 is formed by four parallel angle irons 18, 20, 22, and 24 spaced horizontally from each other. At one end of the frame 16, all four angle irons 18, 20, 22, and 24 are welded or otherwise fixed to the underside of a transverse journal block 26. At the other end of the frame, all four angle irons are welded to the underside to a second journal block 28 extending transversely across the frame. The two outermost angle irons 18, 24 project beyond the second journal block 28 to underlie a horizontal actuator plate 30 which is welded to the projecting irons.

A reciprocating air motor 32 is fixed to the underside of the plate 30 to extend vertically downward from the frame 16. The motor 32 is operated by compressed air supplied to the lower end of the motor through a control valve 34 in an air supply line 36 from a compressed air supply source (not shown).

A reciprocating output plunger 38 on the motor 32 projects upwardly through the plate 30 to connect with one end of a straight rocker 40 extending along nearly

the full length of the frame 16. As shown, the rocker 40 is formed by a pair of parallel angle irons 42, 44 spaced horizontally from each other and connected together at the plunger end of the rocker by a suitable spacer 46. At the other end of the rocker 40, the two rocker irons 42, 44 are swingably supported on pivots 45, 47 projecting from opposite sides of a vertical standard 48 located a short distance horizontally inward from the journal block 26. The lower end of the standard 48 is welded between the two inner angle irons 20, 22 of the frame 16.

Reciprocating movement of the plunger 38 is transmitted to the rocker 40 through a pin-and-slot connection 50 with the adjacent end of the rocker which allows the rocker to swing about its pivotal support while the plunger is moving vertically. Vertical swinging movement of the rocker 40 toward and away from the frame 16 is used to proportionally actuate two positive displacement pumping units 52, 54 in synchronized relation to each other.

The two pumping units 52, 54 are separately supported on the frame 16 for independent translation longitudinally on the frame to any position of adjustment within an extensive range of adjustment extending horizontally from the transverse journal block 28 back to the rocker pivots 45, 47.

A longitudinal support track for the pumping unit 52 is formed by the two angle irons 18, 20 on one longitudinal side of the frame 16. A support head 56 on the upper end of the pumping unit 52 is notched on opposite sides to slidably receive two flanges 58, 60 on the respective angle irons 18, 20, which project toward each other. A support head 62 on the upper end of the other pumping unit 54 is supported in the same manner on a separate support track formed by the angle irons 22, 24 on the opposite longitudinal side of the frame 16.

Thus supported, the two pumping units 52, 54 are independently adjusted along the frame 16 by two parallel adjusting screws 64, 66 threaded respectively through the pumping unit support heads 56 and 62 and journaled at opposite ends in the journal blocks 26 and 28. Both screws 64, 66 project beyond the journal block 26 to form rotary drivers 68, 70 shaped to fit alternatively into a detachable hand crank 72 used to rotate either screw.

The two pumping units 52, 54 are identical in construction. As supported in the frame 16, they are turned back-to-back and spaced from each other laterally across the frame. Hence, a description of one will suffice for both.

As shown in Figs. 1 and 4, the pumping unit 52 includes a hollow barrel or casing 74 of cylindrical shape extending vertically downward from the support head 56 into the container 10. The lower end of the barrel 74 terminates in a foot valve 76, which defines fluid intake openings 78 communicating with the interior of the barrel 74 through an inlet check valve 80.

The space in the barrel 74 between the inlet valve 80 and an overlying piston 82 slidably mounted in the barrel forms a pumping chamber 84, which is alternately compressed and expanded by reciprocation of the piston. Fluid is discharged from the chamber 84 through an outlet check valve 86 in the piston 82. From the valve 86, the fluid moves up through the upper end of the barrel 74 to an outlet 89 in the lower end of the supporting head 56.

The outlet 89 connects with a flexible conduit 91 leading to a fluid output manifold 93. In the manifold 93 the output from the pumping unit 52 merges with the output from the pumping unit 54, which is connected to the manifold 93 by a flexible conduit 95.

The piston 82 of the pumping unit 52 is reciprocated by vertical actuator 88 connected to the piston and

extending through the support head 56 to project above the support head as shown in Figs. 1 and 3. The actuator 88 is reciprocated by the rocker 40 through a connection 90 between the upper end of the actuator and the immediately adjacent portion of the rocker, which constrains the actuator to follow vertical movement of the adjacent portion of the rocker and at the same time provides for unrestricted translation of the actuator along the rocker. Preferably, the connection 90 is made between the actuator 88 and the rocker 40 by two vertically spaced rollers 92, 94 rotatably mounted on the actuator 88 and embracing a horizontal flange 96 of the rocker angle iron 42, which projects toward the actuator.

The reciprocable actuator 88_1 of the pumping unit 54 is similarly connected to a horizontal flange 96_1 of the other angle iron 44 of the rocker 40. Structural elements of the pumping unit 54 corresponding to structural elements of the pumping unit 52 specifically mentioned in the previous description are designated with the same reference numerals but with the addition of the subscript "1." The barrel 74_1 of the pumping unit 54 extends down into the barrel 12 as shown.

The extent to which any longitudinal portion of the rocker 40 is moved toward and away from the frame 16 by vertical swinging of the rocker is directly proportional to its spacing from the rocker pivots 45, 47. Thus, the stroke 88 for the pumping unit 52 has its maximum value when the pumping unit is translated on the frame 16 up to the bearing block 28 adjacent the actuator 32. Translation of the pumping unit 52 in the opposite direction to place the connecting rollers 92, 94 in vertical alignment with the rocker pivots 45, 47 reduces the stroke of the actuator 88 to a zero value.

Between these two extreme positions on the frame 16, the pumping unit 52 can be translated to any intermediate position and held in place by the coacting adjusting screw 64. In this manner, the stroke of the actuator 88 can be adjusted to any desired fraction of its maximum value for any given angular displacement of the rocker 40.

The stroke of the actuator 88_1 of the other pumping unit 54 is similarly adjustable between a zero value and its maximum value, which is the same as that for the actuator 88. This is achieved by translation of the pumping unit 54 on the frame 14 by its adjusting screw 66.

Since the stroke, and hence the output, of each pumping unit is infinitely adjustable between a zero value and its maximum value independently of the adjustment of the other pumping unit, the two pumping units can be adjusted in relation to each other to provide any desired ratio between the volumetric pumping rates of the two units.

Once this ratio between the volumetic pumping rates of the two units 52, 54 has been set by preadjustment of the pumping units along the frame 16, it is undisturbed by changing conditions which affect or tend to affect the pumping rates of the two units. Since both pumping units 52, 54 are actuated by the rocker 40, variations in the speed or stroke of the actuating motor 32 do not disturb the liquid output rates of the two pumping units relative to each other. The positive displacement characteristics of the pumping units 52, 54 prevents the output rate of either unit from being disturbed by changes in the viscosity of the liquid being pumped, variations in the liquid level in the container from which the liquid is pumped, or changes in the back pressure on the pumping apparatus.

While I have shown a preferred embodiment of my invention, it will be apparent that variations and modifications thereof may be made without departing from the underlying principles and scope of the invention. I therefore desire, by the following claims, to include all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. For simultaneously pumping two different fluids from separate containers at pumping rates for the respective fluids which can be adjusted to and positively stabilized at any desired ratio to each other, the combination of a horizontally elongated frame including means defining two substantially parallel tracks extending longitudinally between opposite ends of the frame in transversely spaced relation to each other, two positive displacement reciprocable pumping units spaced from each other transversely with respect to said frame and supported on said respective tracks for translation independently of each other on said tracks between opposite ends of said frame, each pumping unit depending a substantial distance below the supporting track therefor and defining a fluid intake opening at the lower end thereof, each pumping unit defining a fluid outlet therefrom, each of said pumping units including a reciprocable actuator therefor, an actuating rocker pivoted to said frame adjacent one end thereof and extending therealong toward the other end thereof for swinging movement in relation to said frame above the pumping units, means on each pumping unit translatable therewith along said supporting track therefor and forming a driving connection between the pumping unit actuator and the portion of the rocker registering therewith along said frame, and a reciprocable motor suspended from the tracks including a vertically reciprocable plunger connected to the free end of the rocker for swinging the rocker up and down.

2. For simultaneously pumping two different fluids from separate containers at pumping rates for the respective fluids which can be adjusted to and positively stabilized at any desired ratio to each other, the combination of a horizontally elongated frame including means defining two substantially parallel tracks extending longitudinally between opposite ends of the frame in transversely spaced relation to each other, two positive displacement reciprocable pumping units spaced from each other transversely with respect to said frame and supported on said respective tracks for translation independently of each other on said tracks between opposite ends of said frame, each pumping unit depending a substantial distance below the supporting track therefor and defining a fluid intake opening at the lower end thereof, each pumping unit defining a fluid outlet therefrom, each of said pumping units including a reciprocable actuator therefor, an actuating rocker pivoted to said frame adjacent one end thereof and extending therealong toward the other end thereof for swinging movement in relation to said frame above the pumping units, each pumping unit actuator including thereon a driving connection comprising two spaced rollers embracing the adjacent portion of the rocker to constrain the pumping unit actuator to follow the movements of the rocker toward and away from the frame while remaining free to move longitudinally with respect to the rocker, and a reciprocable motor suspended from the tracks including a vertically reciprocable plunger connected to the free end of the rocker for swinging the rocker up and down.

3. For simultaneously pumping two different fluids from separate containers at pumping rates for the respective fluids which can be adjusted to and positively stabilized at any desired ratio to each other, the combination of a horizontally elongated frame including means defining two substantially parallel tracks extending longitudinally between opposite ends of the frame in transversely spaced relation to each other, two positive displacement reciprocable pumping units spaced from each other transversely with respect to said frame and supported on said respective tracks for translation independently of each other on said tracks between opposite ends of said frame, each pumping unit depending a substantial distance below the supporting track therefor and defining a fluid intake opening at the lower end thereof,

each pumping unit defining a fluid outlet therefrom, each of said pumping units including a reciprocable actuator therefor, an actuating rocker pivoted to said frame adjacent one end thereof and extending therealong toward the other end thereof for swinging movement in relation to said frame above the pumping units, means on each pumping unit translatable therewith along said supporting track therefor and forming a driving connection between the pumping unit actuator and the portion of the

rocker registering therewith along said frame, a reciprocable motor suspended from the tracks including a vertically reciprocable plunger extending upwardly beyond the tracks, and a pin and slot driving connection for the rocker and motor plunger.

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