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H. B. ADAMS

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VARIABLE PROPORTIONING METERING PUMP

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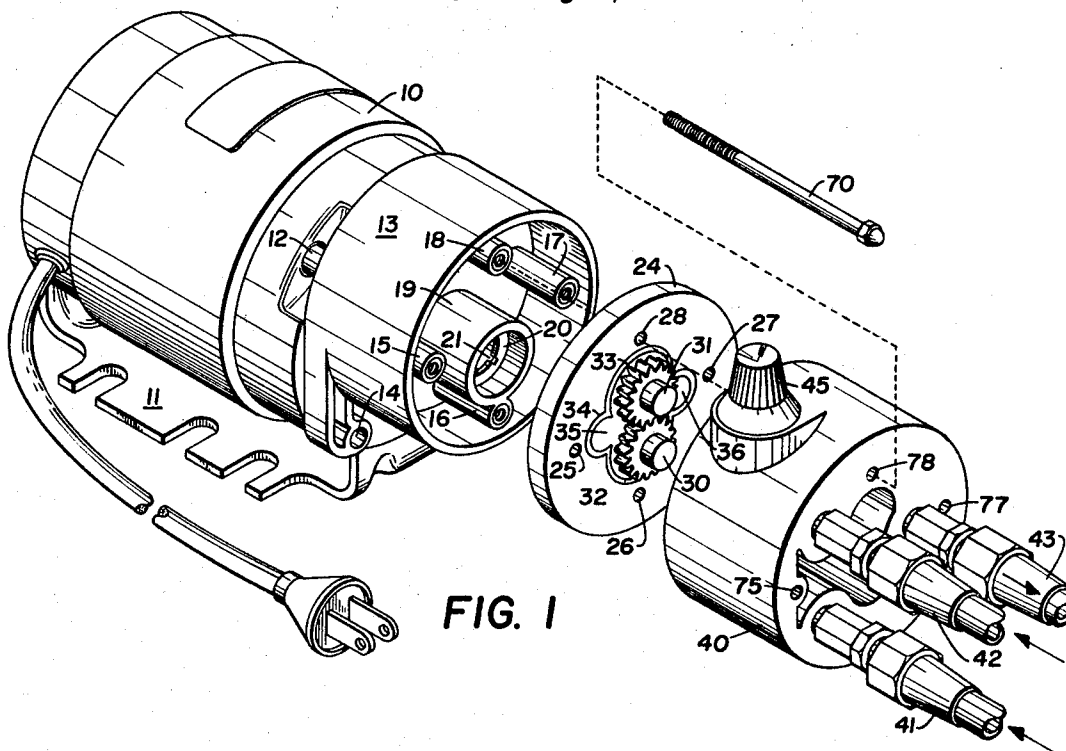


FIG. 1

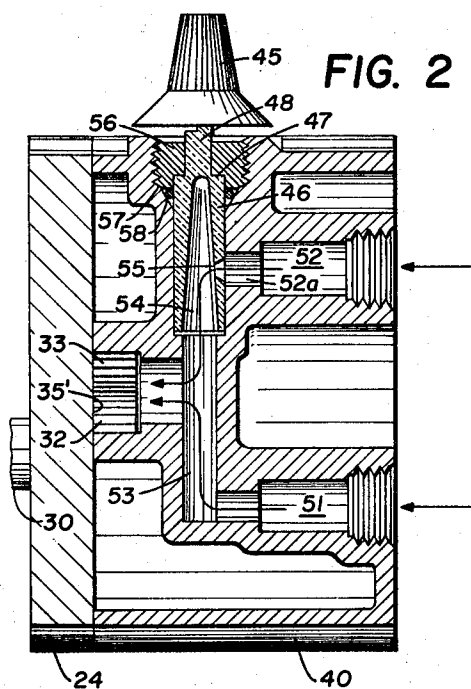


FIG. 2

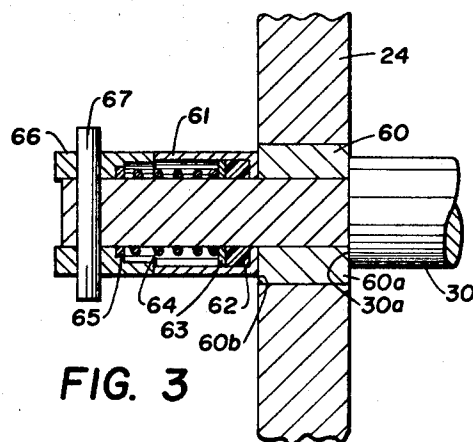


FIG. 3

INVENTOR
HOPE B. ADAMS

Richard Harris & Hubbard
ATTORNEY

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3,390,638

VARIABLE PROPORTIONING METERING PUMP
 Hope B. Adams, Dallas, Tex., assignor to Power Engineering, Inc., Dallas, Tex., a corporation of Texas
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This invention relates to a metering pump and more particularly to a pump in which the relative proportions of feed streams leading to the pump can be selectively proportioned accurately over a wide range.

Metering pumps in general are well known. However, heretofore, the convenient control of relative proportions of two input feed streams while maintaining a constant output volume has not been readily available.

The present invention is directed to a system in which the output of a metering pump is maintained constant while the relative proportions of a pair of input streams can be varied.

More particularly, in accordance with the invention, driven pump gears located in a pump chamber deliver fluid from an inlet port leading to said chamber to an outlet port. Two inlet flow lines lead to the inlet port with a selectively variable valve in one of the flow lines. The flow lines, ports, and the gear chamber are all formed in a unitary block with the proportioning valve in one of the flow lines formed in the block.

In a more specific aspect a metering pump is provided wherein a pair of enmeshed gears are mounted on a sealing plate. A distributor unit having one face adapted to mate with the sealing plate has a chamber of configuration to receive the gears and to journal shafts for the gears. An inlet port and an outlet port lead to the chamber adjacent to the zone in which the gears are enmeshed. One flow path leads through the distributor directly to the inlet port. A second flow path leads to the inlet port for comingling of fluids from the second path with fluids from the first path. The second path includes a valve element rotatable to vary the cross-sectional area of the second flow path at one point for varying the relative proportions of fluids delivered to the chamber. The distributor and sealing plate are each unitary bodies with a sealing gasket extending around the periphery of the chamber to seal the juncture between the confronting faces of the distributor and sealing plate.

For a more complete understanding of the present invention and for further objects and advantages thereof, reference may now be had to the following descriptions taken in conjunction with the accompanying drawings in which:

FIGURE 1 is an exploded view of a pump embodying the present invention;

FIGURE 2 is a longitudinal sectional view of the distributor unit of FIGURE 1 taken along a vertical plane passing through the axis of the control valve; and

FIGURE 3 is an enlarged sectional view of a portion of the pump seal plate.

Referring now to FIGURE 1, a pump motor 10 has been illustrated as having a bracket 11 for mounting on a suitable base. The pump is provided with a central shaft 12. A pump mounting bracket 13 of generally cylindrical shape is positioned adjacent to the pump 10 and is secured to pump 10 by means of bolts extending through holes such as the hole 14. The pump mounting bracket 13 is a hollow cylindrical unit having four cylinders 15-18 which are secured at one end within the bracket 13 and extend parallel to the axis of motor 10. A central extension 19 is also provided which includes an element 20 having a central aperture therein and two radially extending slots, one of which, the slot 20-21,

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is seen in FIGURE 1. The element 20 is keyed to the shaft 12 and is driven thereby.

A pump seal plate 24 is positioned adjacent to the pump mounting bracket and is adapted to be secured thereto by means of bolts which pass through holes 25-28. A pump drive shaft 30 and an adler shaft 31 are journaled in the plate 24. A driver gear 32 is mounted on shaft 30 and an idler gear 33 is mounted on shaft 31. Gears 32 and 33 are enmeshed with one another and serve as the pump impeller system. A gasket 34 is mounted in a groove in the face of plate 24 and circumscribes a pump chamber having recesses in which the gears 32 and 33 operate. The pump chamber has a pump inlet port zone 35 and a pump outlet zone 36.

Shafts 30 and 31 are also journaled in a distributor 40 which has recesses therein conforming with the outline of gasket 34 to a depth equal to the thickness of the gears 31 and 32 thus forming a pump chamber (not seen in FIGURE 1).

A pair of input lines 41 and 42 lead to the distributor 40 and a single output line 43 leads therefrom. Flow from lines 41 and 42 is comingled to feed the input port in the distributor 40 at the location represented by the zone 35. A channel in distributor 40 coupled to line 41 leads directly to the input port. A channel in distributor 40 coupled to line 42 leads through a selectively controllable valve beyond which the flow from line 42 is comingled with flow from line 41. The valve is controlled by a control knob 45. By rotating the knob 45, the relative proportion of the flow from line 42 may be controlled from zero to 100% with highly accurate calibration while maintaining the flow in output line 43 constant.

The proportioning control valve is shown in FIGURE 2 wherein the valve control element 45 is mounted on a valve stem 46. The valve stem is a hollow cylinder closed at the top and slotted in the side wall. The flow line 41 leads to the input port 51. The flow line 42 leads to the input port 52. Fluid flow through port 51 follows the course of arrow 53. Similarly, flow from port 52 follows the arrow 54. Both arrows 53 and 54 lead to the pump inlet port or chamber 35'.

The arrow 54 leads through a metering slot 55 in valve stem 46. The valve stem 46 is positioned in a vertical bore in distributor 40 and is an elongated hollow cylindrical member having a shoulder 47 and a stem 48. A screw cap 56 is served into a threaded opening 57 in the distributor 40 to maintain the valve element 46 in position. The cap 56 has a reentrant opening therein conforming with the shape of the upper end of the valve element 46. An O-ring 58 is positioned in a conical shaped portion of the valve chamber and is maintained under compression by the lower end of the screw cap 56.

The metering slot 55 is a transverse slot in the wall of the valve stem 46. Slot 55 is positioned for registration with a reduced diameter bore 52a of the chamber 52. The valve control element 45 may thus be rotated to vary the proportion of the slot 55 exposed in the bore 52a. By this structure, positive control for metering the amount of flow along the course of arrow 54 may be maintained. The flange 45a on knob 45 preferably is calibrated in terms of flow through slot 55.

The gears 32 and 33 are enmeshed with only portions thereof being seen from the input port 35.

The pump seal plate 24 with drive shaft 30 has been shown, enlarged, in FIGURE 3. A bearing 60 is mounted in the plate 24 with the shaft 30 passing therethrough. The shaft 30 is of reduced size where it passes through bearing 60. Thus, a shoulder 30a bears against one face 60a of the bearing 60. A cup 61 bears against the face 60b of bearing 60. A gasket 62 is mounted in the bottom of cup 61 along with a pressure plate 63. A spring 64 en-

compasses the shaft 30 inside the cup 61 and bears against a pressure plate 65. The pressure plate 65 is mounted inside of a drive cup 66 which is mounted on shaft 30 by a pin 67. The drive cup 66 has a serrated or toothed periphery which mates with a serrated or toothed periphery of the cup 61. Thus the cup 61 is maintained firmly against the face 60b of the bearing 60 to effect a seal. The gasket 62 provides a seal around the shaft so that the pump chamber effectively is maintained fluid-tight. The drive coupling to the shaft 30 is by way of the pin 67 which registers in the slots 21 shown in FIGURE 1.

Bolts, such as bolt 70, pass through holes 75-78 and 25-28 and are served into holes in cylinders 15-18 to assemble the mount 13, plate 24 and distributor 40 into a unitary structure.

It will be recognized that bracket 11 may take forms other than the U-shape shown in FIGURE 1. Further, some installations may dictate the use of a belt drive in which case suitable pulleys will be coupled to rotate shaft 30 in response to a belt drive.

Having described the invention in connection with certain specific embodiments thereof, it is to be understood that further modifications may now suggest themselves to those skilled in the art and it is intended to cover such modifications as fall within the scope of the appended claims.

What is claimed is:

1. A metering pump which comprises:

- (a) a pair of enmeshed gears at least one of which is driven and which are mounted on a sealing plate,
- (b) a distributor unit having one face adapted to mate with said sealing plate and having a chamber in said face of configuration to receive said gears and having an inlet portion and an outlet portion adjacent to the enmeshed zone of said gears,
- (c) a first flow path leading through said distributor directly to said inlet portion, and
- (d) a second flow path leading to said inlet portion for comingling with fluids in said second path with fluids from said first path, said second path including a portion of a cylindrical well in said distributor and in which a hollow cylinder is rotatably positioned, said well having an opening in the wall thereof which is exposed to flow in said second path in an area which varies with rotation of said cylinder.

2. The combination set forth in claim 1 wherein said distributor and said plate are each unitary bodies and wherein a sealing gasket extending around the periphery of said chamber seals the juncture between the confronting faces of said distributor and plate.

3. The combination set forth in claim 1 in which said hollow cylinder has a shaft of reduced diameter positioned in said well with means to vary flow from said second path and wherein a hollow cap is served onto said shaft

of reduced diameter and effects a resilient seal around said cylinder.

4. The combination set forth in claim 1 wherein the shaft of one of said gears extends through said plate and a driving connection is provided thereon on the side of said plate opposite to said gears.

5. A metering pump which comprises:

- (a) a pair of enmeshed gears at least one of which is driven and both of which are mounted on shafts journaled at one end in a sealing plate,
- (b) a distributor having one face adapted to mate with said sealing plate with a chamber in said face of configuration to receive said gears and to journal the other ends of said shafts and having an inlet port and an outlet port on opposite sides of the enmeshed zone of said gears,
- (c) a flow path passing through said distributor directly to said inlet port,
- (d) a second flow path passing through said distributor having a lateral intersection with a cylindrical well in said distributor and extending from the bottom of said well to said inlet port for comingling with fluids in said second path with fluids from said first path, and
- (e) a hollow cylinder in said well which cylinder is closed at the top and slotted in the side wall thereof at a location registrable with said intersection and rotatable to vary the cross-sectional area of said second flow path at said intersection for varying the relative proportions of fluids from the two paths delivered to said chamber.

6. The combination set forth in claim 5 wherein said distributor and said plate are each unitary bodies and wherein a sealing gasket extending around the periphery of said chamber seals the juncture between the confronting faces of said distributor and plate.

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DONLEY J. STOCKING, *Primary Examiner*.

W. J. KRAUSS, *Assistant Examiner*.