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 APPARATUS FOR DISPENSING A MIXTURE OF TWO LIQUIDS
 IN ANY CONTINUOUSLY VARIABLE RATIO
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FIG. 1

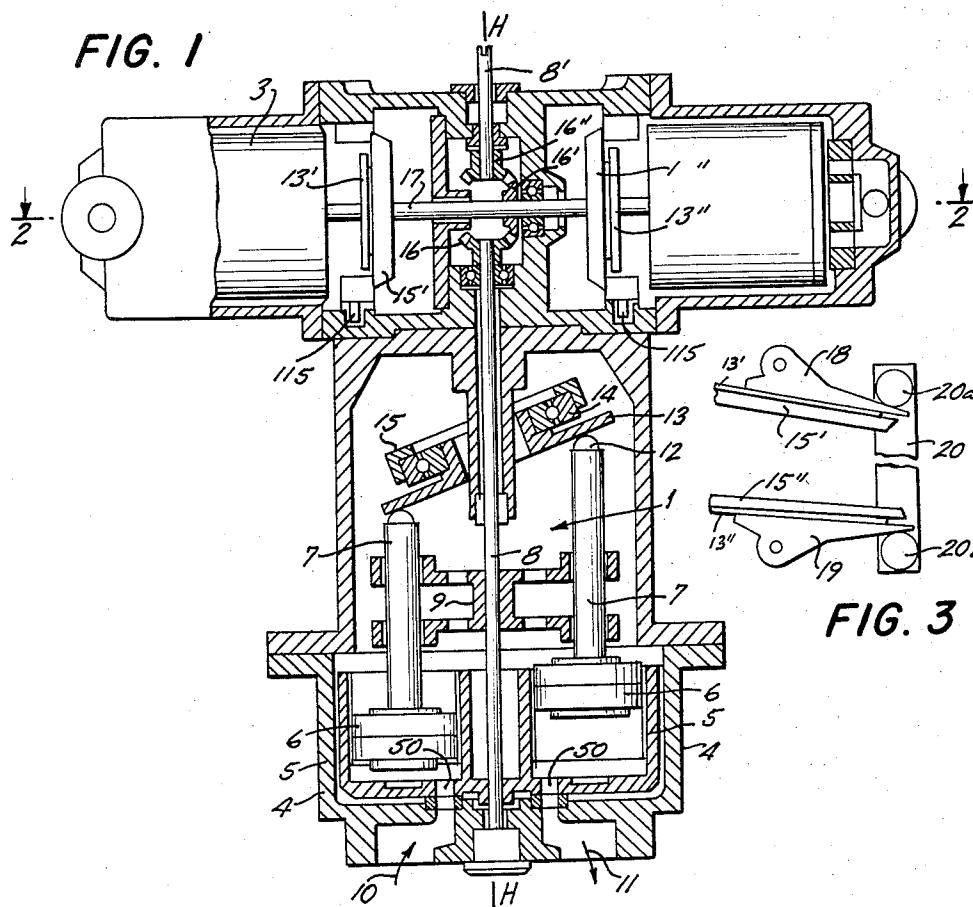


FIG. 3

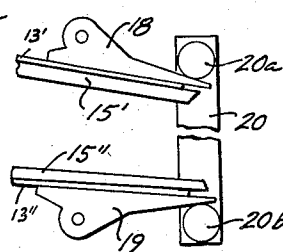
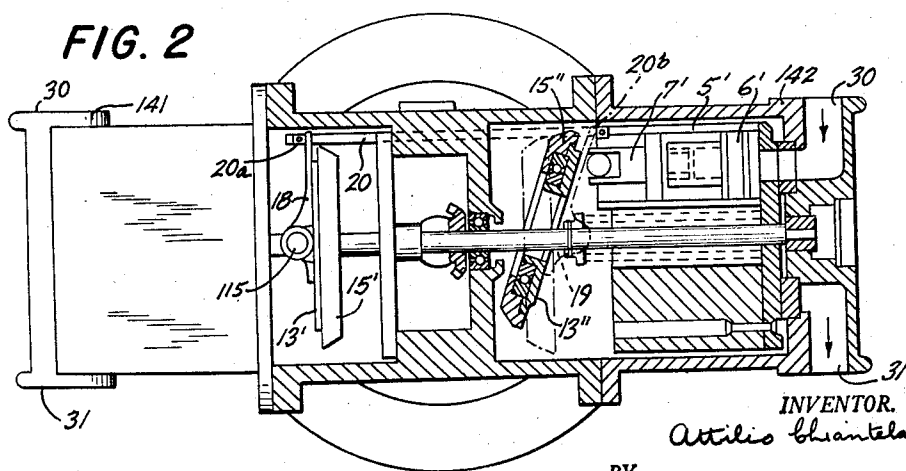


FIG. 2



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APPARATUS FOR DISPENSING A MIXTURE OF TWO LIQUIDS IN ANY CONTINUOUSLY VARIABLE RATIO

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7 Claims. (Cl. 222—134)

The present invention relates to an apparatus for dispensing a mixture of two liquids in any continuously variable ratio.

Numerous types of apparatus of this kind are already known which dispense a mixture of two liquids, for example those which are used for dispensing a mixture of oil and petrol for motor scooters, but such apparatus are subject to appreciable errors in measurement, or are of complicated construction and hence delicate in operation, especially those apparatus which dispense the sum of two separate amounts.

The invention aims to avoid these disadvantages.

According to the invention the apparatus comprises three grouped pumps, one of which has a large delivery of constant capacity for the basic liquid and the other two having a small capacity, one of them operating on the basic liquid and the other on additive liquid. The two last-mentioned pumps are coupled together so as to have capacities which are variable individually, but provide a constant total capacity.

In order that the invention may be clearly understood, an example of it for dispensing a mixture of petrol (gasoline) as the basic liquid and oil as added liquid, will now be described with reference to the accompanying drawing, in which:

Fig. 1 is a vertical sectional elevation of the principal pump arrangement,

Fig. 2 is a horizontal sectional elevation on the line A—A in Fig. 1 and

Fig. 3 is a diagrammatic view of a device for regulating the low capacity pumps which are operatively coupled together.

In the example shown, the three pumps are of the same type and are formed of a group of rotating pistons actuated by an adjustable control plate member.

1 indicates the basic liquid main pump of large and constant capacity, 2 is a basic liquid control pump of small capacity and 3 an additive liquid control pump of small capacity.

The pumps 2 and 3 are operatively coupled together as hereinafter described.

The pump 1 comprises a housing 4, within which there are arranged five cylinders 5 with pistons 6 having piston rods 7.

The group of cylinders 5 can rotate around the axis H—H formed by a drive shaft 8, on which there is fixed a perforated plate 9, through which the rods 7 pass.

During their rotation, the openings 50 of the cylinders 5 alternatively pass in front of an inlet 10 and outlet 11 for the basic liquid gasoline.

The rods 7 terminate in balls 12 acting on an inclined plate 13 which is secured to shaft 8 and rotates in bearings 14 on an inclined control plate 15 which is fixed to the housing of the meters by pivot means, not shown, located forwardly and rearwardly of shaft 8 in Fig. 1 so

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that control plate 15 is adjustable to about an axis perpendicular to the motor axis.

The pumps 2 and 3 are substantially constructed as pump 1 and comprise a series of cylinders 5' with pistons 6', the rods 7' of which bear against plates 13' and 13'' of variable inclination which are turnably supported on control plates 15', 15'' mounted on pivot means 115.

The inclination of the respective plate 15', 15'' determines the strokes of the individual pistons and hence the amounts of liquid dispensed.

The whole is contained in housings 141 and 142 to form units similar to that described in connection with the pump 1. Inlets 30 and outlets 31 are provided in housings 141, 142. One inlet 30 is connected to an oil reservoir, and the other inlet to a gasoline reservoir to which inlet 10 in housing 4 is also connected. Outlets 31 and outlet 11 are connected to a dispensing hose, not shown.

An input shaft 8' drives through bevel gears 16'' and 16' and shaft 17. By means of an ordinary set of bevel gears 16 and 16', the shaft 8 rotates shaft 17 to which are keyed the cylinders 5' of the pistons 6' and the rotary plates 13', 13''.

The two control plates 15', 15'' of variable inclination of pumps 2 and 3 of small capacity are connected together by the linkage device shown in Figs. 2 and 3, formed of two levers 18 and 19 joined by a link 20, members 20a, 20b, movements of which cause angular displacement of levers 18, 19 and consequently a variation in inclination of the plates 15', 15'' and 13', 13'' connected to them, with consequent variations in the strokes of the pistons of the two groups. These variations in the stroke of the pistons of the two groups are equal but opposite in sense. The fluid pressure in cylinders 5' urges levers 18, 19 against members 20a, 20b.

The arrangement is such that pump 1 dispenses an amount equal to, say, 80% whilst the sum of the amounts of the pumps 2 and 3 is equal to the remaining 20%.

The amounts of these last two pumps are in phase opposition. If for example pump 2 dispenses an amount of 12%, pump 3 will deliver the amount of 8%, so that altogether there will be a mixture consisting of 92% gasoline and 8% of oil.

By actuating the link 20, it is possible to vary these percentages, that of the gasoline becoming, for example, 90% and that of the oil 10% since the piston strokes of pumps 2, 3 vary corresponding to the inclinations of the simultaneously adjusted plates, 13', 13''.

The apparatus is simple and reliable, there being no necessity for an integrating apparatus, which measures the individual amounts of the two liquids and then gives the total amount.

The total amount is always constant, the proportion of the two liquids being varied at will simply by adjusting a lever.

A summing device mounted on the shaft 8' actuating an indicator can indicate the total quantity of liquid delivered.

If desired, the quantity of oil can be reckoned separately, either by means of a variable ratio drive take-off or a small liquid delivery meter, for example of the capsule type.

If it is desired to go outside the range of ratios of mixtures employed, it is merely necessary to change the bevel gears 16' and 16.

By means of simple devices of a purely mechanical character, the apparatus may distribute only one of the two liquids concerned.

What I claim is:

1. Apparatus for dispensing a mixture of two fluids in a variable ratio comprising, in combination, a main pump of large capacity for pumping a constant amount of a first fluid; a pair of control pumps for pumping said first fluid and a second fluid, respectively, said control pumps having equal capacity substantially smaller than the capacity of said main pump, each control pump including a movable control member adjustable between a plurality of positions for varying the amount of fluid pumped by the respective control pump; and control means connecting said control members of said control pumps for simultaneous adjustment of the positions of said control members in opposite sense for increasing the amount of fluid pumped by any one control pump and for simultaneously decreasing the amount of fluid pumped by the respective other control pump to the same extent, whereby a constant total amount of said first and second fluids is discharged by said pumps while the ratio between the amounts of pumped first and second fluids can be varied for producing a mixture of said first and second fluids having a selected ratio.

2. Apparatus for dispensing a mixture of two fluids in a variable ratio comprising, in combination, a main pump of large capacity for pumping a constant amount of a first fluid; a pair of control pumps for pumping said first fluid and a second fluid, respectively, said control pumps having equal capacity substantially smaller than the capacity of said main pump, each control pump including a set of cylinders revoluble about a central axis common to both control pumps, and pistons in said cylinders, each control pump including a control plate member inclined to said central axis and operatively connected to the respective pistons for actuating said pistons while said cylinders revolve about said central axis, each control member being adjustable about an axis perpendicular to said central axis, between a plurality of positions for varying the amount of fluid pumped by the respective control pump; and control means connecting said control plate members of said control pumps for simultaneous adjustment of the positions of said control plate members in opposite sense by turning the same about said perpendicular axes for increasing the amount of fluid pumped by any one control pump and for simultaneously decreasing the amount of fluid pumped by the respective other control pump to the same extent, whereby a constant total amount of said first and second fluids is discharged by said pumps while the ratio between the amounts of pumped first and second fluids can be varied for producing a mixture of said first and second fluids having a selected ratio.

3. An apparatus as set forth in claim 2, and including piston rods secured to each of said pistons and projecting from said cylinders; and wherein each of said control plate members includes a control plate adjustable about the respective perpendicular axis and connected to said control means, and a rotary plate turnably mounted on said control plate for turning movement about said central axis and connected to said cylinders for turning movement with the same, said rotary plate engaging said piston rods of the associated pistons for actuating said pistons.

4. Apparatus for dispensing a mixture of two fluids in a variable ratio comprising, in combination, a main pump of large capacity for pumping a constant amount of a first fluid and including a first drive shaft; a pair of control pumps for pumping said first fluid and a second fluid, respectively, said control pumps having equal capacity substantially smaller than the capacity of said main pump, each control pump including a movable control member adjustable between a plurality of positions for varying the amount of fluid pumped by the respective control pump, said control pumps having a common second drive shaft; transmission means connecting said first drive shaft with said second drive shaft so that said main pump and said control pumps are simultaneously operated; and control means connecting said control members of said

control pumps for simultaneous adjustment of the positions of said control members in opposite sense for increasing the amount of fluid pumped by any one control pump and for simultaneously decreasing the amount of fluid pumped by the respective other control pump to the same extent, whereby a constant total amount of said first and second fluids is discharged by said pumps while the ratio between the amounts of pumped first and second fluids can be varied for producing a mixture of said first and second fluids having a selected ratio.

5. Apparatus for dispensing a mixture of two fluids in a variable ratio comprising, in combination, a main pump of large capacity for pumping a constant amount of a first fluid and including a first drive shaft; a pair of control pumps for pumping said first fluid and a second fluid, respectively, said control pumps having equal capacity substantially smaller than the capacity of said main pump, each control pump including a set of cylinders revoluble about a central axis common to both control pumps, and pistons in said cylinders, each control pump including a control plate member inclined to said central axis and operatively connected to the respective pistons for actuating said pistons while said cylinders revolve about said central axis, each control member being adjustable about an axis perpendicular to said central axis, between a plurality of positions for varying the amount of fluid pumped by the respective control pump, said control pumps having a common second drive shaft secured to said set of cylinders of each control pump; transmission means connecting said first drive shaft with said second drive shaft so that said main pump and said control pumps are simultaneously operated; and control means connecting said control plate members of said control pumps for simultaneous adjustment of the positions of said control plate members in opposite sense by turning the same about said perpendicular axes for increasing the amount of fluid pumped by any one control pump and for simultaneously decreasing the amount of fluid pumped by the respective other control pump to the same extent, whereby a constant total amount of said first and second fluids is discharged by said pumps while the ratio between the amounts of pumped first and second fluids can be varied for producing a mixture of said first and second fluids having a selected ratio.

6. An apparatus as set forth in claim 5, wherein said main pump includes a set of cylinders arranged in a circle and secured to said first drive shaft for rotation therewith, a set of pistons in said cylinders, piston rods projecting from said pistons, and a control plate member having a face inclined to the axis of said first drive shaft and engaging the ends of said piston rods for actuating said pistons during rotation of said first drive shaft.

7. Apparatus for dispensing a mixture of two fluids in a variable ratio comprising, in combination, a pair of control pumps for pumping a first fluid and a second fluid, respectively, and having equal capacity, each control pump including a set of cylinders revoluble about a central axis common to both control pumps, a set of pistons in said cylinders, piston rods secured to each piston and projecting from said cylinders, and a control member in engagement with the respective associated piston rods and having a face inclined to said central axis and engaging said piston rods for actuating said pistons while said cylinders revolve about said central axis, each control member being adjustable about an axis parallel to the corresponding axis of the other control member and perpendicular to said central axis, said control pumps having a common drive shaft secured to said set of cylinders of each control pump; control means including an articulated linkage connecting said plate control members of said control pumps for simultaneous adjustment of the positions of said plate control members in opposite sense by turning the same about said perpendicular axes for increasing the amount of fluid pumped by any one control pump and for simultaneously decreasing the amount of

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fluid pumped by the respective other control pump to the same extent, whereby a constant total amount of said first and second fluids is discharged by said control pumps while the ratio between the amount of pumped first and second fluids can be varied for producing a mixture of said first and second fluids having a selected ratio; and a main pump for pumping said first fluid and having a substantially greater capacity than the total capacity of said control pumps so that when the first fluid discharged by said main pump is added to said mixture, another mixture

having a desired ratio of said first and second fluids is formed.

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