

Aug. 4, 1959

A. F. M. BLANCHET ET AL

2,898,002

APPARATUS FOR METERING AND DISPENSING LIQUID MIXTURES

Filed March 6, 1957

2 Sheets-Sheet 1

FIG. 1

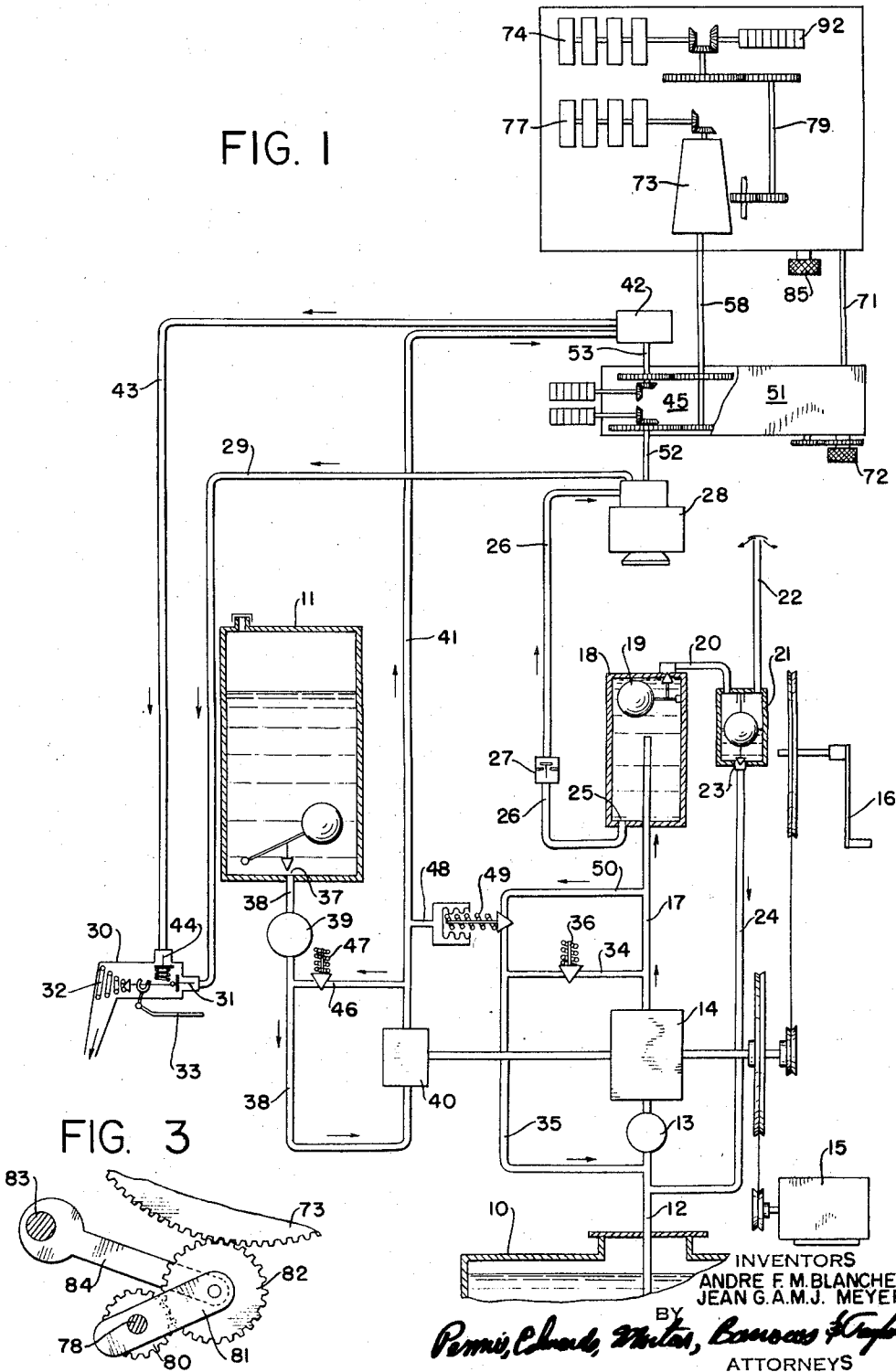


FIG. 3

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APPARATUS FOR METERING AND DISPENSING LIQUID MIXTURES

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Application March 6, 1957, Serial No. 644,352

Claims priority, application France March 9, 1956

13 Claims. (Cl. 222—26)

The present invention relates to apparatus for dispensing liquids, and more particularly to an improved system and mechanism for metering and dispensing mixtures of liquids. While the invention is applicable, in principle, to the metering and dispensing of mixtures of any liquids, it is presently contemplated that the apparatus of the invention will be employed in connection with the dispensing of mixtures of gasoline and oil, or of different grades of gasoline. In the following description, therefore, specific reference will be made to an apparatus for mixing and dispensing gasoline-oil mixtures, such apparatus being illustrative of the invention.

As one of its primary features, the present invention provides an improved apparatus for metering and dispensing a mixture of liquids, which may be readily adjusted to accommodate a variety of mixture ratios, and which includes means operative to indicate the total price of the mixture dispensed, regardless of the ratio of liquid comprising the mixture. More specifically, the apparatus includes selectively operable means for varying the ratio of liquids in the mixture dispensed, the selectively operable means being further adapted automatically to condition a price indicating device to act in response to the unit price of the selected mixture. In one of its advantageous forms, the new apparatus includes normally fixed, but readily adjustable means for setting the unit prices of the various contemplated mixtures, to accommodate periodical changes in the selling prices of the various component liquids of the mixture.

One of the more specific advantageous features of the invention resides in the provision, in combination with a dispensing system for a mixture of a plurality of liquids, of a novel and improved metering and registering system whereby the relative proportions of the respective component liquids may be varied with ease and precision, and the total price and volume of the mixture dispensed is automatically registered, at any selected ratio of component liquids. In this respect, the apparatus of the invention accounts for variations in unit price between the various component liquids, compensation for such variations being made automatically, upon setting of the apparatus for delivery of a selected mixture. Advantageously, the new apparatus is so arranged that the ratio of component liquids in the mixture may be varied one or more times during the dispensing of a predetermined volume of liquid mixture, to obtain various intermediate mixture ratios, and at the same time give a precise indication of the selling price of the intermediate mixture delivered.

Another specific feature of the invention resides in the provision of a system for dispensing an accurately metered mixture of liquids, such as gasoline and oil, in which means are provided for operating separate metering devices for the liquids at predetermined, accurately related speeds, without placing excessive operating loads upon any of the meters. In this respect, it is desirable to drive one of the metering devices, such as

the oil meter, by means of a mechanical interconnection with the other metering device, such as the gasoline meter, the force imparted by the flow of gasoline through its meter being sufficient to drive the oil meter through the mechanical interconnection. In dispensing a viscous liquid such as oil, however, difficulties are often encountered in connection with the placing of excessive load upon the driving metering device. Moreover, the magnitude of the load may vary widely as the viscosity of the oil changes from time to time, due to temperature variations or other causes. Accordingly, in the apparatus of the invention, a dispensing system is provided for the oil, in which oil in the system, upstream of the oil meter, is under considerable pressure, but not to such an extent as to cause the oil meter to be operated independently of actuation of the gasoline meter. The arrangement is such, however, that upon actuation of the gasoline meter in the usual manner, the oil meter is brought into operation with a minimum of load upon the gasoline meter.

An ancillary feature of the invention resides in the provision, in a system for metering and dispensing a mixture of liquids, such as gasoline and oil, of improved means automatically preventing the delivery of one component liquid when the supply of the other is exhausted, or when, for some reason, the flow thereof is interrupted.

Further advantageous features of the invention will become apparent upon consideration of the following detailed description of a preferred embodiment of the invention, taken in connection with the accompanying

drawings, in which:

Fig. 1 is a simplified schematic representation of a system for metering and dispensing a mixture of gasoline and oil, the system incorporating the several improved features of the invention;

Fig. 2 is an enlarged cross sectional view of a combined mixture ratio changing and price registering mechanism incorporated in the system of Fig. 1, and

Fig. 3 is an enlarged fragmentary view of a gear mechanism forming a part of the mechanism of Fig. 2.

Referring now to the drawing, and initially to Fig. 1 thereof, the numerals 10, 11 designate, respectively, storage tanks for component liquids of a mixture. In the illustrated system, the tank 10 is intended to contain a supply of gasoline, while the tank 11 is intended to contain a supply of oil.

A conduit 12 extends into the gasoline supply tank 10 and is connected, through a suitable filter 13, to the intake of a pump 14 driven alternatively by means of a motor 15 or manually operated crank 16. A conduit 17 is connected to the outlet of the pump 14 and extends into a separator 18. The separator 18 may be of ordinary construction, and is adapted to separate vapors and gases from the liquid gasoline.

Gases and vapors are periodically let off from the separator 18, by operation of a float valve 19, and passed through a conduit 20 into a purge tank 21. The purge tank 21 has a gas outlet 22, exhausting to the atmosphere, and a float valve-controlled outlet 23 adapted periodically to discharge collected liquid gasoline into a conduit 24, to be returned to the supply tank 10.

At or adjacent the bottom of the separator 18 is an outlet 25, from which liquid gasoline is discharged into a conduit 26 leading, through a check valve 27, to the inlet of a liquid flow meter 28, advantageously of the positive displacement type. The outlet of the meter 28 is connected to a conduit 29 leading to a dispensing nozzle 30. The nozzle 30 has a valve 31, which is normally held in a closed position, as by the action of a spring 32, but which may be opened at desired times by operation of a lever 33.

When the pump 14 is in operation, gasoline may be dispensed from the nozzle 30 by appropriate operation

of the lever 33. When the lever-actuated valve 31 is closed, and the pump 14 is in operation, gasoline flows from the downstream or outlet side of the pump to the upstream or inlet side thereof through a by-pass system including conduits 34, 35 and a spring-loaded, normally closed relief valve 36.

In the illustrated form of the invention, the oil storage tank 11 has a float valve-controlled outlet 37 discharging into a conduit 38 which leads, through a suitable filter 39, to the inlet of a pump 40 mechanically connected to the gasoline pump 14 and adapted to be driven therewith, by means of the motor 15 or crank 16. The outlet of the oil pump 40 is connected to a conduit 41 leading to the inlet of a liquid metering device 42, to be further described, which is advantageously of the positive displacement type. A conduit 43 is connected to the outlet of the oil meter 42 and leads to the dispensing nozzle 30. The nozzle 30 has a spring-operated, normally closed valve 44, which is forced open by oil under pressure whereby the oil may be discharged into and from the nozzle.

In the system of the invention, the oil meter 42 is mechanically interconnected with the gasoline meter 28, by a mechanism 45 to be described, so that the oil meter is caused or permitted to operate, to pass oil, only during times when the gasoline meter 28 is in operation. Accordingly, a by-pass system, including conduit 46 and spring-loaded relief valve 47, is provided connecting the upstream and downstream sides of the oil pump 40, to prevent the build-up of excessive pressure in the system.

In accordance with one aspect of the invention, the downstream or outlet side of the oil pump 40 is connected, by means of a conduit 48 to the actuator of a pressure responsive valve 49. The valve 49 is spring urged to an open position, tending to provide a flow passage through a conduit 50 which, together with the conduit 35, forms an auxiliary by-pass system connecting the upstream and downstream sides of the gasoline pump 14. The arrangement is such that, in the absence of a predetermined fluid pressure in the oil conduit 41, the by-pass systems 50, 35 will open to prevent the flow of gasoline. Accordingly, when the supply of oil is exhausted, or for some other reason is interrupted, the flow of gasoline will also be terminated. Further, in this respect, it will be understood that the flow of oil is precluded when the supply of gasoline is exhausted or otherwise interrupted, since, as will be discussed in more detail, the oil meter cannot operate, to pass oil, in the absence of operation of the gasoline meter.

In accordance with another aspect of the invention, the oil meter 42 is of a positive displacement type and is of a design such that the application to the inlet side thereof of a relatively substantial fluid pressure will not cause the meter to operate, against the various functional forces acting upon the meter. To this end, the oil meter 42 may be a piston meter, in which the crank arms driven by the pistons are of short length. Similarly, the meter 42 may be a gear meter, in which the gears and gear-tooth profiles are such that fluid under pressure, at the inlet of the meter, acts upon the moving parts thereof through a low mechanical advantage, to an extent such that substantial fluid pressures at the inlet side of the meter will not operate, independently, to set the meter in motion.

The provision of an oil meter which does not operate independently even under substantial fluid pressures, is advantageous in that the oil may be maintained under substantial pressure by the pump 40, to the end that, when the oil meter is set in operation, the oil flows readily through the meter. Thus, in accordance with this aspect of the invention, the viscosity of the oil does not materially effect the operation of the system, and in addition, changes in oil viscosity, such as may occur from time to time with changing temperature conditions, etc., has relatively little effect upon the operation of the system.

Referring now to Figs. 2 and 3, there is shown an im-

proved mechanism, for interrelating the operation of the gasoline and oil meters 28, 42 and causing the selling price of the delivered mixture to be registered. The mechanism includes a housing 51 upon opposite walls of which the respective meters 28, 42 may be mounted.

Extending into the housing 51, from the gasoline meter 28, is a shaft 52, which is adapted to be rotated during operation of the meter and which has keyed thereto a plurality of gears 52a—52d. By way of example, and not of limitation, the shaft 52 may be arranged to rotate through one complete revolution in response to the passage through the meter 28 of one liter (or gallon) of gasoline, and the gears 52a—52d each may be provided with 100 teeth. Similarly, a shaft 53, adapted for rotation during operation of the oil meter 42, extends into the housing 51 and has keyed thereto a plurality of gears 53a—53d. By way of example, the shaft 53 may be arranged to make one complete revolution in response to the passage through the meter 42 of one-tenth liter (or gallon) of oil, and the gears 53a—53d each may be provided with 100 teeth.

At the ends of the meter shafts 52, 53 are sets of bevel gears 54, 55 which drive indicators 56, 57 respectively, to provide a continuous indication of the total revolutions of the respective shafts and hence of the total volumes of liquid delivered through the respective meters 28, 42.

Journaled in the housing 51, in parallel relation to the meter shafts 52, 53, is an elongated shaft 58, which may be referred to as the main shaft, and which has a portion 58a projecting out of the housing 51 and into a second housing or frame 59. Keyed to the main shaft 58 are conical sets of gears 60a—60d and 61a—61d, each set comprising four gears of graduated sizes. By way of example, the gears 60a—60d may have, respectively 96, 97, 98 and 99 teeth, while the gears 61a—61d may have, respectively, 40, 30, 20 and 10 teeth.

Adjacent the gears 60a—60d and 61a—61d of each set are levers 62a—62d and 63a—63d, each carrying an idler pinion, as indicated at 64, 65, at one end. The respective levers 62a—62d and 63a—63d are mounted for individual pivotal movement with respect to the main shaft 58, whereby the respective idler pinions carried thereby may be selectively brought into engagement with selected pairs of gears of the sets 52a—52d, 60a—60d and 53a—53d, 61a—61d. By way of example, lever 62b may be pivoted to bring pinion 64 into engagement with gears 52b, 60b, while lever 63b may be pivoted to bring pinion 65 into engagement with gears 53b, 61b, substantially as illustrated in Fig. 2.

For operating the respective levers 62a—62d, 63a—63d, there is provided a cam shaft 66, which is journaled for rotation in the housing 51 and carries sets of cams 67a—67d, 68a—68d. The arrangement is such that, upon appropriate rotation of the cam shaft 66, the "a" cams act upon the "a" levers to bring the pinions carried thereby into engagement with the "a" gears, etc. Thus, in the illustrated arrangement, the cam shaft 66 is so positioned that the cams 67b, 68b thereof are acting upon the levers 62b, 63b, to position the pinion 64 into engagement with gears 52b, 60b and the pinion 65 into engagement with gears 53b, 61b. When the gears are so engaged, rotation of the gasoline meter shaft 52 will effect rotation of the main shaft 58, which, in turn, effects or permits rotation of the oil meter shaft 53.

In the preferred commercial embodiment of the invention, the selection of gear ratios is such that the main shaft 58 operates through one complete revolution during the passage through the meters 28, 42 of a combined volume of one liter (or gallon). Thus the possible drive ratios between the gasoline meter shaft 52, and the main shaft 58 are 96/100, 97/100, 98/100 and 99/100, while the corresponding ratios between the main shaft and the oil meter shaft 53 are 40/100, 30/100, 20/100 and 10/100. With the apparatus arranged as illustrated in Fig. 2 the respective drive ratios are 97/100

and 30/100. Accordingly, upon the rotation of the gasoline meter shaft 52 through 97% of a revolution, during the delivery of 97% of a liter (or gallon) of gasoline, the main shaft is caused to rotate through a complete revolution. This, in turn, causes or permits rotation of the oil meter shaft through 30% of a revolution, effecting the passage through the oil meter 42 of 3% (.30×.10) of a liter (or gallon) of oil. The total fluid passed through the meters 28, 42 in one revolution of the main shaft 58, is, accordingly, 100% of the unit volume.

By setting the cam shaft 66 in its various operative positions, mixtures of gasoline and oil of various ratios may be obtained. For example, in the illustrated apparatus, ratios of gasoline to oil may be obtained in the following ratios 96-4, 97-3, 98-2, 99-1. Of course, other mixtures may be obtained by appropriate selection of gears, and the foregoing should be considered as illustrative only.

To enable the cam shaft 66 to be adjusted to any of its operative positions, a gear 69 is carried at one end thereof, in engagement with a second gear 70 secured to a manually operable shaft 71. The shaft 71, which may be referred to as the adjusting shaft, has a manually engageable knob 72 at one end, and extends through suitable bearings in the housing 51 and frame 59. A pointer or other suitable visual indicator may be carried by the adjusting shaft 71 to facilitate observation of the adjusted condition thereof at any time.

As an important feature of the invention, the main shaft 58 carries, on its projecting portion 58a a conical series 73 of gears of graduated diameter. The gears of the series 73 are keyed to the shaft 58, for rotation therewith, and are adapted to be placed selectively in driving engagement with a price indicator 74, in a manner to be described in more detail. Also keyed to the shaft 58 is a bevel gear 75 which meshes with a mating gear 76 to drive a volume indicator 77 whereby the total volume of mixture delivered through the meter 28, 42, as represented by rotations of the shaft 58, is registered.

Journaled in the frame 59, in parallel relation to the main shaft 58, are shafts 78, 79, arranged in spaced relation about the conical series 73 of gears. In the illustrated form of the invention there are four such shafts, only two being visible in Fig. 2; and, advantageously, the shafts are spaced uniformly about the conical series of gears. The shafts 78, 79 are provided with keyways extending throughout a substantial portion of their length whereby gears 80, slidably supported thereon, may be maintained in driving engagement with the shaft.

Pivotaly and slidably mounted on the shafts 78, 79 are yokes 81, which carry, at their outer ends, gears 82. The yokes 81 are generally of U shape, having their opposite legs disposed on opposite sides of the gears 80 carried by the shafts 78, 79. The gears 80, 82 are arranged for rotation about axes spaced a fixed distance from each other, and are in continuous driving engagement.

The arrangement is such that the gears 80, 82 and yokes 81 form more or less unitary assemblies, the respective assemblies being rotatable and movable axially along the shafts 78, 79, each independently of the other.

By moving the gear assemblies 80, 82 axially along the shafts 78, 79, the assemblies may be brought into aligned relation with any of the graduated gears of the conical series 73 thereof. Thereupon, by pivoting the yokes 81, the gears 82 may be brought into driving engagement with the gear of the series with which it is aligned. Accordingly, the respective shafts 78, 79 may be drivingly engaged with the main shaft in any of a variety of driving ratios, by selecting appropriate gears of the conical series 73.

In order to manipulate the gear assemblies 80-82 in the manner described, mechanisms of the type described in French Patent No. 842,413, filed February 16, 1939,

may be employed. The preferred mechanism comprises threaded shafts 83, journaled at their ends in the frame 59 for rotation about axes eccentric to their geometric axes. The shafts 83 threadedly engage links 84, at the outer ends thereof, the inner ends of the links being pivotally attached to the U-shaped brackets 81 of the gear assemblies 80-82, advantageously at points coaxial with the gears 82. The shafts 83 are disposed along axes parallel to generatrices of the conical envelope of the gear series 73, as shown in Fig. 2.

Rotation of the shafts 83, which is accomplished by manual manipulation of knobs 85, causes the links to be oscillated in a transverse direction, as well as advanced longitudinally, one way or the other, along the threaded shafts. Advantageously, the threads of the shafts 83 are such that a complete revolution thereof will cause the links 84, and the gear assemblies associated therewith, to be advanced longitudinally a distance equal to the spacing between gears of the conical series 73.

During the rotation of one of the shafts 83 the eccentric movement of the shaft will cause the link 84 to be moved transversely (see Fig. 3), which, in turn, causes the yoke 81 to be pivoted about the axis of its supporting shaft 78, to disengage the gear 82 from the adjacent gear of the series 73. Rotation of the shaft 83 also moves the link 84, and hence the gear assembly 80-82, longitudinally of the supporting shaft 78, and subsequently causes the yoke 81 to be pivoted back toward the conical gear series 73. The skewed relationship between the threaded shaft 83 and the supporting shaft 78 causes the yoke 81 to assume different angular positions at different longitudinal points along the supporting shaft 78, and, hence, the gear 82 is brought into meshing engagement with each gear of the series 73 notwithstanding the graduated diameters of the gears.

It is contemplated that the several gears of the series 73 thereof will be selected to correspond to the various unit prices of a unit volume of mixture. Accordingly, as a general rule, each of the four threaded shafts 85 will be adjusted so that the gear assembly associated therewith is engaged with a gear of the series 73 corresponding to the price of a unit volume of mixture composed of respective component liquids in the proportions determined by the various operative settings of the adjusting shaft 71. The different mixtures will, generally, have different unit prices; and, once the appropriate adjustment of the threaded shafts 83 is made to reflect such prices, the adjusted settings are not altered unless and until a change in the price of a unit volume is effected.

As shown in Fig. 2, each of the shafts 78, 79 carries a gear 86 at its end, and, advantageously, the gears of the respective shafts are offset axially from each other. When the system is in operation, the four shafts 78, 79 rotate simultaneously, each at a speed determined by the gear of the series 73 with which it is engaged.

A gear 87, slidably keyed to a shaft 88, is adapted selectively to be brought into engagement with any one of the several gears 86, so that rotation may be imparted to the shaft 88 in accordance with a selected unit price. Rotation of the shaft 88 is imparted, by means of bevel gears 89-91 to price indicator 74, which is preferably of a type adapted periodically to be reset to zero, and to a totalizer 92 adapted to indicate a cumulative total price of all liquids dispensed from the system.

Manipulation of the gear 87, whereby the gear is drivingly connected to a selected one of the gears 86, is effected by means of a bell crank lever 93, which is pivoted upon a shaft 94 and has one arm engaging a grooved hub 87a provided on the gear 87. The other arm of the crank 93 is disposed in operative relation to cams 95a-95d carried by the adjusting shaft 71. Accordingly, upon rotation of the shaft 71 to any of its operative adjusted positions, to effect a predetermined driv-

ing ratio between the gasoline and oil meters 28, 42, the bell crank 93 is simultaneously actuated to move the gear 87 into engagement with that one of the gears 86 which corresponds to the unit price of the selected mixtures.

Summary of operation

As an initial operation, the several threaded shafts are adjusted, by manipulation of knobs 85, until the gear assemblies 80-82 associated therewith are engaged with appropriate gears of the series 73 corresponding to the respective unit prices of the several liquid mixtures which may be dispensed. This adjustment, once having been made, is not altered, except upon a change in the base or unit selling price of the mixtures.

Prior to the initiating of a dispensing operation, the adjusting shaft 71 is manipulated, by means of knob 72, to one of its operative positions, wherein a selected set of "a," "b," "c" or "d" gears is properly entrained and the respective meters 28, 42 are thereby mechanically interconnected to operate at a predetermined ratio, to deliver a desired mixture of liquids. Setting of the adjusting shaft 71 simultaneously and automatically effects the engagement of the gear 87 with the proper one of the gears 86 to correspond with the unit price of the selected mixture.

The system is readied for operation by energization of the motor 15 (or crank 16) to operate the pumps 14, 40, in the gasoline and oil systems, respectively. The pump 14 is, of course, ineffective to create pressure in the gasoline system until a predetermined pressure is established in the oil system, by reason of the pressure responsive valve 49, which maintains by-pass 50, 35 open unless the desired oil pressure is reached at the outlet or downstream side of the oil pump.

When the pumps 14, 40 are properly in operation, but liquids are not being dispensed from the system, the build-up of excessive pressures is avoided by the relief valves 36, 46.

Although the liquids, under pressure, act upon the respective meters, 28, 42, no flow through the meters takes place, since the valve 31, at the dispensing nozzle, blocks fluid flow through the gasoline system, and the oil system is so designed, as heretofore described, that the oil, even under substantial pressure, is ineffective to overcome the friction of the meter 42 and associated mechanism. This is an advantageous feature of the system in that the oil may be maintained under considerable pressure, to facilitate the flow of relatively viscous oils, and to minimize the effect of changes in viscosity due to temperature changes, etc.

To dispense liquids from the system, the lever 33, at the nozzle 30, is operated to open the valve 31. This permits the gasoline under pressure to flow through the meter 28, and effects the rotation of the meter shaft 52 and main shaft 58 in proportion to the volume of gasoline passing through the meter. Rotation of the main shaft causes or permits the oil meter 42 to operate, whereby oil under pressure passes therethrough in proportion to the flow of gasoline, as determined by the setting of the adjusting shaft 71. The oil passing through the system enters the dispensing nozzle through the valve 44 and is mixed and dispensed with the gasoline.

In respect of the flow of liquids through the system, it is to be noted that the maintenance of the oil under considerable pressure greatly reduces the mechanical load upon the gasoline meter required to entrain the oil meter. Thus, the oil meter, once caused or permitted to operate, by operation of the gas meter, is powered largely by the force of the oil under pressure.

During the dispensing of a liquid mixture from the system, the main shaft is caused to rotate at a constant rate relative to the unit volume of mixture dispensed, regardless of the relative percentages of the component liquids of which the mixture is comprised. Rotation of

the main shaft 58 effects the operation of volume and price indicators 77, 74, respectively, which indicators are, as a general rule, reset to zero prior to each dispensing operation. The volume indicator 77, being driven directly from the main shaft 58, indicates the volume of mixture dispensed, regardless of the relative percentages of the component liquids thereof. The price indicator 74, which is also driven from the shaft 58, is also operated in proportion to the volume of mixture dispensed, but is arranged automatically to reflect the unit price of the particular mixture dispensed, regard being had in this latter instance for the relative proportions and respective unit prices of the component liquids.

It should be understood that the foregoing description is intended to be illustrative only, as certain changes may be made in the specific apparatus disclosed herein without departing from the clear teachings of the invention. By way of example and not of limitation, the apparatus and system is not limited to the dispensing of a gasoline-oil mixture, but is equally applicable to the dispensing of various liquid mixtures, including mixtures of two or more different grades of gasoline, in any desired proportion. Accordingly, reference should be made to the appended claims in determining the full scope of the invention.

We claim:

1. In a system for metering and dispensing a mixture of liquids and including a first metering device for a first liquid, a second metering device for a second liquid, variable drive means interconnecting the first and second metering devices, selectively operable means for adjusting the variable drive means to vary the proportions of the mixture of said first and second liquids, and means associated with said metering devices for registering the total price of the mixture delivered; an improved price registering means comprising input means operable in proportion to the volume of mixture metered, transmission means operated by said input means, said transmission means including a plurality of output elements independently adjustable thereto, a price indicator operable by said output elements, and means including said selectively operable means for selectively rendering one of said output elements at a time effective to operate said price indicator, the arrangement being such that the output element rendered effective by said selectively operable means reflects the predetermined unit price of the liquid mixture selected by operation of said selectively operable means, said predetermined unit price being arbitrarily determinable independently of the proportions of the mixture.

2. The system of claim 1, in which said input means is a shaft rotatable through a predetermined angle in response to the delivery of a predetermined quantity of mixture regardless of the proportions thereof.

3. The system of claim 1, in which said transmission means comprises a plurality of gears of graduated sizes rotated in unison by said shaft, and said output elements are selectively engageable with said gears.

4. The system of claim 1, in which said output elements comprise drive gears, said price indicator has an input gear connected to its input, said drive gears are selectively engageable with said input gear, and said selectively operable means are operable to move said drive and input gears into and out of engagement in accordance with the proportions of the liquid mixture determined by the setting of said selectively operable means.

5. The system of claim 1, in which said input means comprises a shaft rotatable through a predetermined angle in response to the delivery of a predetermined quantity of mixture regardless of the proportions thereof, and the variable drive means interconnecting the first and second metering devices comprises first and second sets of proportioning gears carried in fixed relation to said shaft, first and second sets of transmitting gears carried by the respective metering devices, and means including

said selectively operable means for operatively engaging selected proportioning and transmitting gears of the respective sets.

6. The system of claim 5, in which said shaft is rotated by one of said metering devices and the other metering device is operated by rotation of said shaft.

7. The system of claim 6, in which the respective sets of proportioning and transmitting gears are so arranged that in all operative conditions of said selectively operable means the total quantity of liquid passing through said first and second metering devices is related in the same proportion to rotary movement of said shaft.

8. In a system for metering and dispensing a mixture of liquids and including a first metering device for a first liquid, a second metering device for a second liquid, drive means interconnecting the first and second metering devices, first pressure means to supply said first liquid under pressure to said first metering device, second pressure means to supply said second liquid under pressure to said second metering device, and dispensing means for discharging liquids passed through said metering devices, the improvement characterized by said first metering device being of a type adapted to be operated in response to a liquid pressure differential between the inlet and the outlet sides thereof, said second metering device being of a type which is non-operable in response to a substantial liquid pressure differential between the inlet and outlet sides thereof, said second pressure means being adapted to effect the application of substantial liquid pressure at the inlet of said second metering device, and a dispensing valve on the outlet side of said first metering device for controlling the flow of said first liquid therethrough, the arrangement being such that upon the opening of said valve said first liquid is caused to flow through and operate said metering device, the operation of said first metering device thus effected enabling the operation of said second metering device in relation to said first metering device as determined by said drive means, said second meter, upon initiation of operation thereof, being driven in part by said second liquid and in part by said drive means.

9. The system of claim 8, in which said first pressure means includes a valve normally tending to render the first pressure means ineffective and operable in response to the proper operation of said second pressure means to render said first pressure means effective.

10. The system of claim 9, in which said first and second pressure means comprise first and second pumps, and said valve is a pressure responsive valve operable in response to a predetermined pressure at the outlet side of said second pump to render said first pump effective.

11. The system of claim 8, in which said second pressure means includes a relief valve to limit the pressure under which said second liquid is maintained.

12. A system for metering and dispensing a mixture of liquids, comprising a first liquid system including first pressure means to maintain a first liquid under pressure, a second liquid system including second pressure means to maintain a second liquid under pressure, means to dispense a mixture of said first and second liquids from said systems, valve means in one of said liquid systems normally rendering said one system ineffective for the delivery of liquid, and valve controlling means in the other of said liquid systems operative when said other system is conditioned for liquid delivery to actuate said valve means to a condition rendering said one system effective for the delivery of liquid.

13. In a system for metering and dispensing a mixture of liquids and comprising a first liquid system including first pressure means to maintain a first liquid under pressure, a second liquid system including second pressure means to maintain a second liquid under pressure, and means to dispense a mixture of said first and second liquids from said systems, the improvement which comprises control means operative in response to the failure of one of said pressure means to operate properly to render the other of said pressure means ineffective, said first and second pressure means comprising pumps arranged in tandem, and said control means comprising a pressure responsive valve operable in response to predetermined pressure created by one of said pumps to render effective for liquid delivery the system supplied by the other of said pumps.

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