

[54] **GASOLINE DISPENSING SYSTEM HAVING CENTRAL CONTROL STATION AND A PLURALITY OF MULTI-GRADE GASOLINE PUMPS**

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[58] Field of Search 222/23, 26, 27, 28, 222/20, 2, 14-16, 25

[56] **References Cited**

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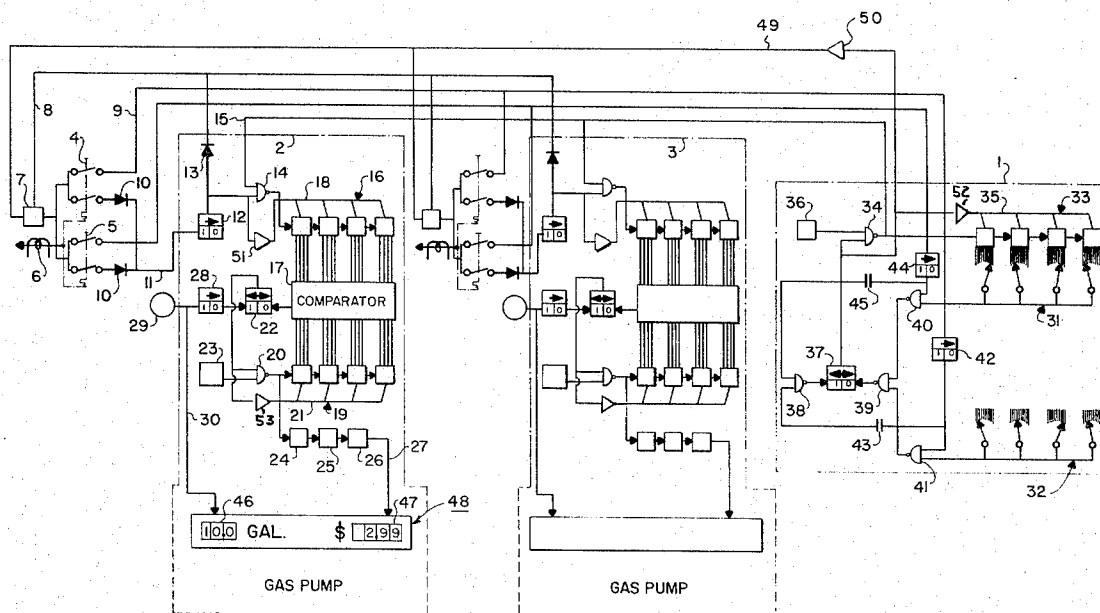
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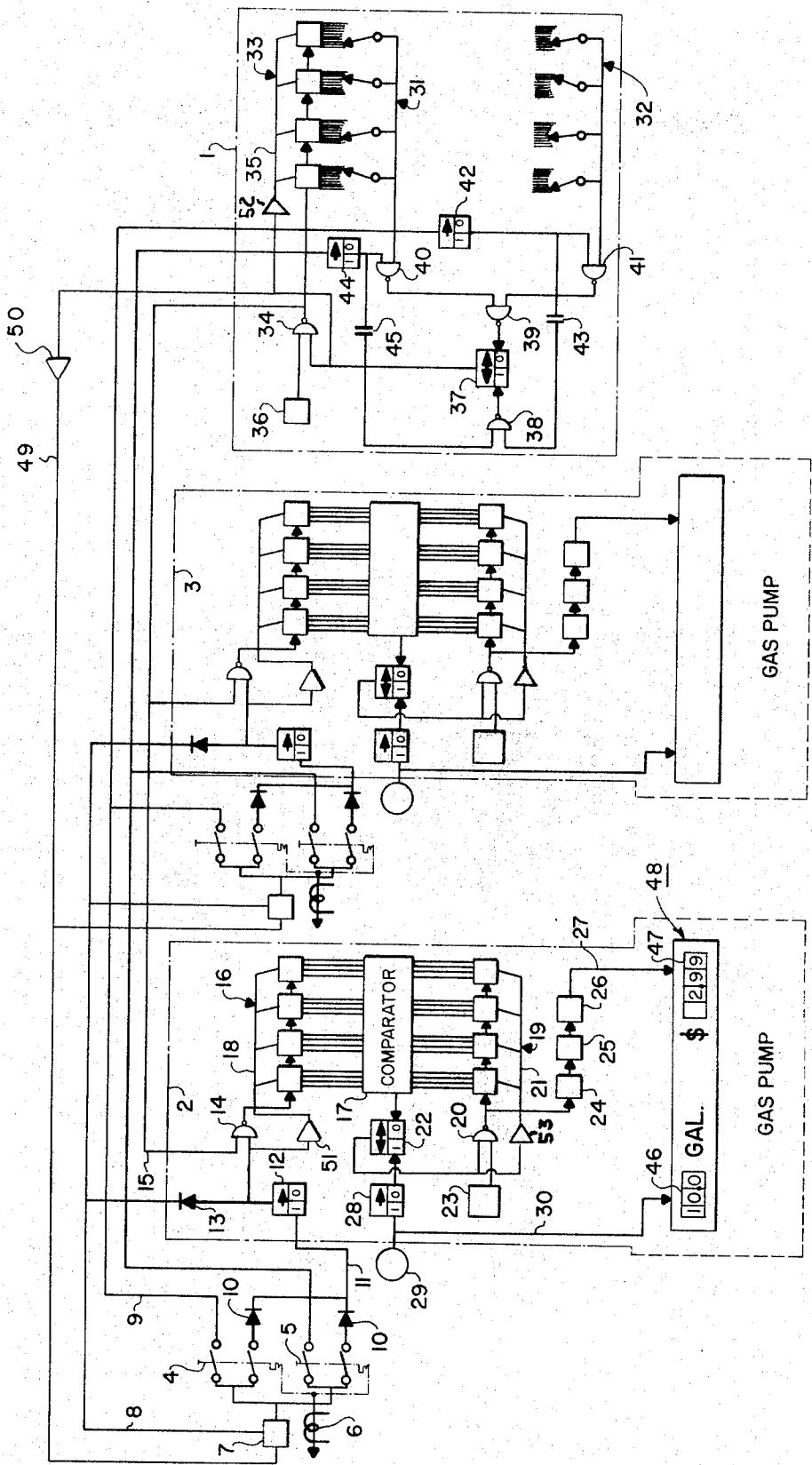
[57] **ABSTRACT**

A central control station is used to provide multi-level

remote price information to a plurality of multi-grade gasoline dispensing pumps. The control station is reset to zero in coincidence with the completion of transmission of data to the individual pumps. The pumps are interconnected to prevent one pump interfering with the other pump during the transmission of information from the control station to a given pump. Each pump has a first group of decade counters to store the received price information in digital form. A multiplier circuit is provided within each pump including a fuel flowmeter which generates electrical pulses in response to the volume of dispensed fuel and a high frequency pulse generator which pulses a second group of decade counters. The information in the first group of counters is compared in a comparator circuit to the information in the second group of counters. Each time the information in the two groups of counters is identical, the comparator disables the output of the high frequency generator. No additional pulses are transmitted to the second group of counters until another pulse is received from the fuel flowmeter. The same number of pulses which are coupled to the second group of counters is coupled through a decade counter division circuit to an accumulator and read-out device, the final number in the accumulator device being the product of the fuel flow and the price per unit of fuel dispensed.

13 Claims, 1 Drawing Figure





GASOLINE DISPENSING SYSTEM HAVING CENTRAL CONTROL STATION AND A PLURALITY OF MULTI-GRADE GASOLINE PUMPS

BACKGROUND OF THE INVENTION

The present invention relates in general to apparatus for the dispensing of motor fuels, and more particularly, to apparatus for utilizing a central control station with one or more multi-grade gasoline dispensing pumps.

In motor fuel dispensing installations, it is desirable to effect multiplication of counts each representing one factor or, respectively, the unit of quantity price and the amount of dispensed fuel, in order to obtain the price of the dispensed fuel quantity. Moreover, it is desirable to select, in a simple manner, the unit of quantity price on the basis of both the amount and the fuel type or grade, for example, between the so-called "premium" and "regular" grades of gasoline. Prior art constructions of this type are composed of mechanical relays as well as electronic circuits of an extremely comprehensive and complicated character.

The present invention has for its object the satisfaction of the above-mentioned requirements and the elimination of the shortcomings of prior art constructions.

SUMMARY OF THE INVENTION

The objects of the invention are accomplished, broadly, by the provision of a system which utilizes a central control station and one or more fuel dispensing pumps wherein the price per unit volume of fuel of a given grade is determined by selection apparatus within the central station and is transmitted to such pumps. An electrical multiplication circuit is provided within such pumps to result in the product of the price per unit volume and the volume of fuel dispensed. As an additional feature of the invention, such pumps are multi-graded and the control station price selection apparatus is multi-leveled to match the multigraded fuel. As still another feature of the invention, anticoincidence circuitry is provided to prevent undesirable interaction among the pumps and the central control station.

These and other objects, features and advantages of the present invention will be appreciated from a reading of the following detailed specification and sole FIGURE of drawing illustrating the preferred embodiment.

The embodiment illustrated in the drawing is utilized in an installation for dispensing motor fuel from one or more dispensing points (so-called Pumps) for one or more types of fuel. The installation illustrated in the drawing comprises a central control station 1 and two pump sections 2 and 3; it should be noted that only one center station 1 is required for any number of pump sections. Moreover, it is pointed out that the pump sections are exactly identical, for which reason only one pump section will be described. Although the drawing shows two pump sections in order to illustrate the connection of several pump sections to the center section 1, only the pump section 2 is described in detail.

Each pump section has a push button set comprising one push button for each fuel type dispensable by the installation. The pump section 2 has a push button set with two push buttons 4, 5. As will appear from the drawing, the push buttons 4 and 5 can be locked in depressed position and released from said depressed posi-

tion by means of a solenoid 6. One side of the push buttons 4 and 5 is connected to a blocking circuit 7, and all blocking circuits 7 are interconnected via a line 8 to prevent simultaneous depression and blocking in depressed position of two push buttons, thereby preventing confusion of pulses from the center section. The other side of said push buttons 4, 5 is connected via a line 9 on one hand to the center section 1 and, on the other hand, via a blocking diode 10 to the pump section 2. From the blocking diode 10 a line 11 passes to a monostable flip-flop 12, the output of which is connected via a diode 13 to the blocking circuit 7 and directly to one input of an AND gate 14. The other input of the AND gate 14 is connected to the center section 1 via a line 15. The output of the AND gate 14 is connected to the counting input of a reference pulse counter 16 which comprises four decades, the outputs of which are connected to a comparator 17. Moreover, a conventional zeroizing device is connected via a line 18 from an inverter 51 connected to the output of the monostable flip-flop 12 to each decade of the pulse counter 16. The pulse counter 16 is connected to one input of the comparator 17, whereas the other input of the comparator 17 is connected to the outputs of a pulse counter 19 comprising four decades. The counting input of the pulse counter 19 is connected to the output of an AND gate 20. The zeroizing inputs of the decade counters of counter 19 are connected via a line 21 through an inverter 53 to one input of the AND gate 20 and the output of a bistable flip-flop 22. The other input of the AND gate 20 is connected to a pulse generator 23 of the clock pulse generating type. Furthermore, the output of the AND gate 20 is connected to a conventional adding and digital read-out device 48 via a number of dividing circuits 24, 25, 26, each one of which produces one pulse out for a given number, for example, ten, pulses in, and the function of which will be explained hereinafter, and a line 27. One input of the bistable flip-flop 22 is connected to the output of the comparator 17 and the other input of flip-flop 22 is connected to the output of a monostable flip-flop 28, the input of which is connected to a pulse generator 29 and to the adding and read-out device 48 via a line 30.

The central section 1 comprises a conventional switching set for each fuel type and thus for each of the push buttons 4 and 5 in the pump section 2. The switching sets 31, 32 are illustrated by means of a plurality of contact points and a plurality of setting arms, the number of which corresponds to the desired number of decades or the exactitude of the unit price. In the preferred embodiment, there are four decades within a given switch, for example, switch 32, or one decade for 0-9 hundredths of a dollar, one decade for 0-9 tenths of a dollar, one decade for 0-9 dollars, and one decade for 0-9 "tens" of dollars. All switching sets 31, 32 are associated with a single pulse counter 33 which comprises four decades and the counting result of which is preset by means of the switching sets 31, 32. The counting input of the pulse counter 33 is connected to the output of an AND gate 34. The output of the AND gate 34 is connected to the line 15 which is in connection with one input of the AND gate 14 of the pump sections. The other input of the AND gate 34 is connected to a pulse generator 36 of the clock pulse generating type. The other input of the AND gate 34 is connected to the output of a bistable flip-flop 37. The output of flip-flop 37 is connected through an inverter 52 to the reset or

zeroizing line 35 associated with the counter 33 and also through an inverter 50 by line 49 to the blocking circuits 7 in the gasoline pumps 2 and 3. One input of flip-flop 37 is connected to the output of an OR gate 38, while the other input of the flip-flop 37 is connected to the output of an OR gate 39. One input of the OR gate 39 is connected to the output of an AND gate 40, and the other input of the OR gate 39 is connected to the output of an AND gate 41. One input of the AND gate 41 is connected to the setting arms of the switching sets 32 and the other input of the AND gate 41 is connected to the output of a monostable flip-flop 42 and to one input of the OR gate 38 via a capacitor 43. The input of the flip-flop 42 is connected to the line 9 and thus to one side of the push button 4. The push button 5 of all pump sections is connected to the monostable flip-flop 44 of the switching set 31. The output of the monostable flip-flop 44 is connected to one input of the AND gate 40 and, via a capacitor 45, to the other input of the OR gate 38. The other input of the AND gate 40 is connected to the setting arms of the switching set 31.

The mode of operation of this embodiment will now be described in detail. When it is desired to dispense from the pump section 2 a motor fuel of the type represented by the push button 4, for example, "regular" gasoline, the push button 4 is pressed so that it is locked in depressed position. A resetting signal maintaining the flip-flops 12 and 42, respectively, in the state wherein a signal occurs on the output, is then applied to the flip-flop 12 of the pump section 2 and the flip-flop 42 of the center section 1. A blocking signal from the flip-flop 12 passes through the diode 13 to the line 8 and thus to the blocking means 7. The signal from the flip-flop 12 also occurs on one input of the AND gate 14. On the output of the flip-flop 42 there occurs a signal which passes via the capacitor 43 to one input of the OR gate 38 and to one input of the AND gate 41. When a signal occurs on either input of the OR gate 38, the bistable flip-flop 37 is reset to a state which opens the AND gate 34 as soon as a signal occurs on its other input from the pulse generator 36. Furthermore, the zeroizing of the pulse counter 33 is interrupted in response to the logic 1 appearing at the output of flip-flop 37. The AND gate 34 transmits the output of the pulse generator 36 into the pulse counter 33 which is advanced to the count determined by the switching set 32. As soon as the count in the counter 33 corresponds to the setting of the switching set 32, there occurs a signal on the other input of the AND gate 41, which is thus opened and, via the OR gate 39, resets the bistable flip-flop 37 to its other state (0 logic) in which the AND gate 34 is closed. The pulse counter 33 now contains the count corresponding to the setting of the switching set 32 and thus to the unit price of the fuel type selected by means of the push button 4.

Since the output of AND gate 34 is connected to the input of AND gate 14 in the pump section 2, the same count which is fed to the counter 33 is fed to the pulse counter 16 via the AND gate 14. The result in the pulse counter 16 thus will correspond to the result in the pulse counter 33 and thus to the setting of the switching set 32 or the unit price of the fuel type here concerned. Simultaneously as the AND gate 34 is closed, the counter 33 will be zeroized by the inverted output of flip-flop 37. The inverted output of flip-flop 37 is also connected by line 49 to the blocking circuits 7 to thus

disable such circuits, whereby the circuits 7 no longer prevent the push buttons 4 and 5 from being depressed in either of the pumps 2 and 3.

The pulse generator 29 is connected to the through-flow meter (not illustrated) of the dispensing pump 2 and in this instance produces 100 pulses per dispensed gallon of fuel. Each pulse from the pulse generator 29 causes a resetting of the monostable flip-flop 28 to the state in which it causes resetting of the bistable flip-flop 22 whereby there occurs on the output of the flip-flop 22 a signal which is applied to one input of the AND gate 20, whereby the AND gate 20 is opened and allows pulses from the pulse generator 23 to pass via the AND gate 20 to the pulse counter 19 and, via the dividing circuits 24, 25, 26 and the line 27, to the adding device 48. As soon as the count in the pulse counter 19 corresponds to the count in the pulse counter 16, the comparator 17 supplies an output signal to the flip-flop 22 which thus is reset to close the gate 20. This also zeroizes the counter 19. For each pulse from the pulse generator 29, the count fed into the counter 16 will thus be fed through the dividing circuits 24, 25, 26 to the adding counter 47 in the device 48. Depending upon the selection of the dividing circuits, the counter is thus able to indicate the product of the count in the counter 16 and the count from the pulse generator 29 in dollars and cents. The pulses from the pulse generator 29 are supplied via a line 30 to a further adding device 46 which indicates the number of gallons of fuel dispensed.

By way of a specific example to illustrate the operation of the system according to the present invention, assume that "regular" gasoline is to be dispensed from pump 2 and that the operator has thus depressed the push button 4. Furthermore, assume that the operator in the center control station has set the price on the corresponding switch 32 to 29.90 cents/gallon. Thus causes the number 2990 to be entered from the clock generator 36 (which can be of any convenient frequency, for example, 30,000 Hertz) into the counter 33 and thus into the counter 16 as previously described. The counter 33 is immediately reset coincident with the entry of this number into the counter 16, the whole operation requiring approximately 100 milliseconds. By using a gasoline dispensing pump which dispenses at the rate of 6 gallons per minute (or 0.1 gallons per second) and using a flowmeter 29 which produces one pulse for each 0.01 gallon, it is seen that the flowmeter produces 10 pulses per second. The clock generator should be of a frequency at least as high as the product of highest number which could be entered in the counter 16 and the pulse repetition rate of the flowmeter 29. For this embodiment, using four decades in counter 16, the highest number of 9999 (corresponding to 99.99 cents/gallon), or approximately 10,000. Multiplying this number by 10 pulses per second, the frequency of the clock generator should be at least one hundred thousand Hertz. Thus, each time the flowmeter 29 produces one pulse, 299 pulses are transmitted from generator 23 through AND gate 20 to the decade counters 24, 25 and 26. Acting as a division circuit, the counter 26 produces one pulse out for each 1,000 pulses into the counter 24. If 10 gallons are dispensed, this means that flowmeter 29 has produced 1,000 pulses and that 299,000 pulses have thus been transmitted to counter 24 and 299 to the accumulator and read-

out device 47. This is illustrated as "2.99" on the read-out indicator.

Regardless of the number of pump sections, there is thus required only one central control section, and for each motor fuel type there is required only one push button in one or each pump section as well as a single switching set for each grade of fuel within the central control section. The center section 1 is occupied only during the time it takes to introduce the count into the counter 33 and thus the counter 16. After this period of time has expired, the blocking circuits 7 are themselves disabled, and the center section can be utilized by another pump section.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A system for dispensing fuel, comprising:
 - a central control station having means for generating a predetermining number of electrical pulses which number bears a relationship to the price per unit volume of fuel to be dispensed;
 - a fuel dispensing pump remote from said central station having electrical connections to said control station and storage means within said pump for storing said predetermined number of electrical pulses;
 - first means within said pump to generate electrical pulses indicative of the volume of fuel dispensed;
 - second means within said pump to generate electrical pulses at a given frequency which is at least as high as the product of the highest number expected to be stored in said storage means and the pulse repetition rate of said first means;
 - counter means and addition means within said pump gated by the pulses from said first means to receive pulses from said second means;
 - comparison means within said pump to compare the number of pulses within said counter with the number of pulses in said storage means;
 - means connected to the output of said comparison means to interrupt the transmission of pulses from said second means to said counter means and said addition means each time the number of pulses within said counter equals the number of pulses in said storage means, whereby the number in said addition means at any given time is indicative of the product of the volume of fluid dispensed and the price per unit volume.
2. The system according to claim 1 wherein said means within said central control station for generating a predetermined number of electrical pulses comprises a clock pulse generator and a counter within said station to receive said electrical pulses from said clock pulse generator gated to disable the output of said clock pulse generator whenever the number of pulses within said counter equals said predetermined number.
3. The system according to claim 2, including in addition thereto, means for clearing the counter in said control station in coincidence with the completion of the transfer of the predetermined number of pulses to the storage means within said pump.
4. A system for dispensing fuel, comprising:
 - a central control station having means for generating two different predetermining numbers of electrical pulses wherein such numbers bear a relationship to the price per unit volume of fuel to be dispensed;

a fuel dispensing pump having means for dispensing two grades of fuel remote from said central station having electrical connections to said control station and storage means within said pump for storing either of said predetermined numbers of electrical pulses and having means within said pump for controlling which of said numbers is generated by said central control station;

first means within said pump to generate electrical pulses indicative of the volume of fuel dispensed;

second means within said pump to generate electrical pulses at a given frequency which is at least as high as the product of the highest number expected to be stored in said storage means and the pulse repetition rate of said first means;

counter means and addition means within said pump gated by the pulses from said first means to receive pulses from said second means;

comparison means within said pump to compare the number of pulses within said counter with the number of pulses in said storage means;

means connected to the output of said comparison means to interrupt the transmission of pulses from said second means to said counter means and said addition means each time the number of pulses within said counter equals the number of pulses in said storage means, whereby the number in said addition means at any given time is indicative of the product of the volume of fluid dispensed and the price per unit volume.

5. A system for dispensing fuel, comprising:

- a central control station having means for generating a predetermining number of electrical pulses which number bears a relationship to the price per unit volume of fuel to be dispensed;

- first and second fuel dispensing pumps remote from said central station each having electrical connections to said control station and storage means within each of said pumps for storing said predetermined number of electrical pulses;

- means interconnecting said pumps and said central control station to prevent the activation of one of said pumps while the other of said pumps is receiving said predetermined number of pulses from said central control station;

- first means within each of said pumps to generate electrical pulses indicative of the volume of fuel dispensed from a given one of said pumps;

- second means within each of said pumps to generate electrical pulses at a given frequency which is at least as high as the product of the highest number expected to be stored in said storage means and the pulse repetition rate of said first means within a given one of said pumps;

- counter means and addition means within each of said pumps gated by the pulses from said first means to receive pulses from said means within a given one of said pumps;

- comparison means within each of said pumps to compare the number of pulses within said counter with the number of pulses in said storage means within a given one of said pumps; and

- means connected to the output of said comparison means to interrupt the transmission of pulses from said second means to said counter means and said addition means each time the number of pulses within said counter equals the number of pulses in

said storage means, whereby the number in said addition means within a given one of said pumps at any given time is indicative of the product of the volume of fluid dispensed by said one pump and the price per unit volume.

6. A system for dispensing fuel, comprising:

a central control station having means for generating two different predetermining numbers of electrical pulses wherein such numbers bear a relationship to the price per unit volume of fuel to be dispensed; first and second fuel dispensing pumps each having means for dispensing two grades of fuel remote from said central station and each having electrical connections to said control station and storage means within each of said pumps for storing either of said predetermined numbers of electrical pulses and having means within each of said pumps for controlling which of said means is generated by said central control station;

means interconnecting said pumps and said central control station to prevent the activation of one of said pumps while the other of said pumps is receiving said predetermined number of pulses from said central control station;

first means within each of said pumps to generate electrical pulses indicative of the volume of fuel dispensed from a given one of said pumps;

second means within each of said pumps to generate electrical pulses at a given frequency which is at least as high as the product of the highest number expected to be stored in said storage means and the pulse repetition rate of said first means within a given one of said pumps;

counter means and addition means within each of said pumps gated by the pulses from said first means to receive pulses from said second means within a given one of said pumps;

comparison means within each of said pumps to compare the number of pulses within said counter with the number of pulses in said storage means within a given one of said pumps; and

means connected to the output of said comparison means to interrupt the transmission of pulses from said second means to said counter means and said addition means each time the number of pulses within said counter equals the number of pulses in said storage means, whereby the number in said addition means within a given one of said pumps at any given time is indicative of the product of the volume of fluid dispensed by said one pump and the price per unit volume.

7. The system according to claim 6 wherein said means within said control station for generating two

different predetermined numbers of electrical pulses comprises a clock pulse generator and a counter within said station to receive said electrical pulses from said clock pulse generator gated to disable the output of said clock pulse generator whenever the number of pulses within said counter equals a preset one of said predetermined numbers.

8. The system according to claim 7, including in addition thereto, means for clearing the counter in said control station in coincidence with the completion of the transfer of the predetermined number of pulses to the storage means within a preset one of said pumps.

9. In a system for dispensing fuel having a central control station and a fuel pumping station remote from said control station, the improvement comprising means within said control station to generate a number of electrical pulses for transmission to said pump and means within said pump for varying said number of electrical pulses transmitted by said control station.

10. In a system for dispensing fuel having a central control station and a multi-grade fuel pump remote from said control station for dispensing multi-grade fuel at corresponding multi-level prices, the improvement comprising means within said control station to generate at least two predetermined numbers of electrical pulses for transmission to said pump, said numbers being indicative of price per unit volume of fuel dispensed, and means within said pump for controlling which of said at least two numbers is transmitted to said pump.

11. In a system for dispensing fuel having a central control station and a plurality of multi-grade fuel pumps remote from said control station for dispensing multi-grade fuel at corresponding multi-level prices, the improvement comprising means within said control station to generate at least two predetermined numbers of electrical pulses for transmission to said pumps, said numbers being indicative of price per unit volume of fuel dispensed, and means within each of said pumps for controlling which of said at least two numbers is transmitted to a given one of said pumps.

12. The system according to claim 11, being further characterized as including blocking means within said system whereby only one of said pumps is in control at any given time.

13. The system according to claim 11, being further characterized as including blocking means within said system whereby only a given grade section of only a given one of said pumps is in control of the number of pulses generated and transmitted by the center control station at any given time.

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(5/69)UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTIONPatent No. 3,782,597 Dated January 1, 1974Inventor(s) Bonde Knut Hansen and Leif Gunnar Persson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 5, column 6, line 57, after "said" and before

"means, insert --second--.

Claim 6, column 7, line 18, change "means" to "numbers".

Signed and sealed this 9th day of April 1974.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

G. MARSHALL DANN
Commissioner of Patents