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 [31] **39024/66**

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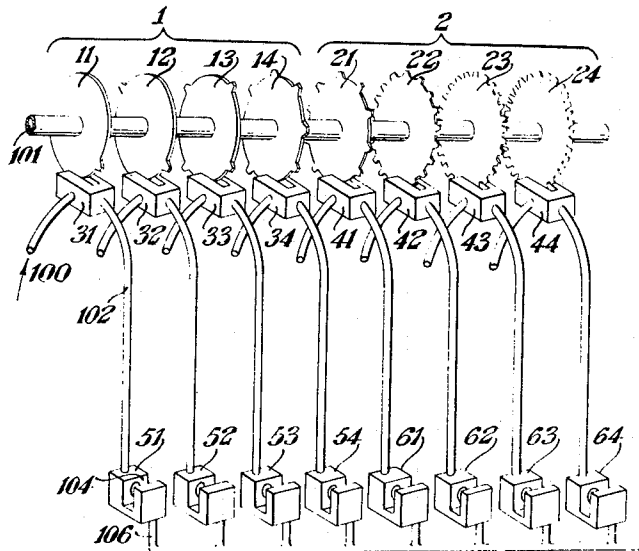
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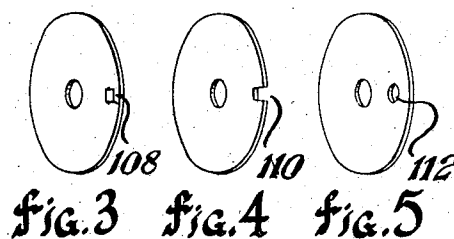
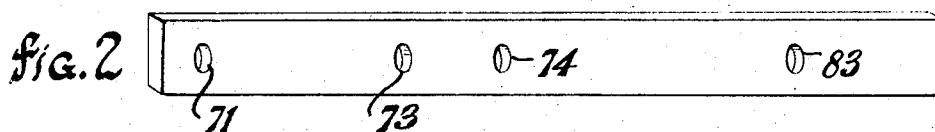
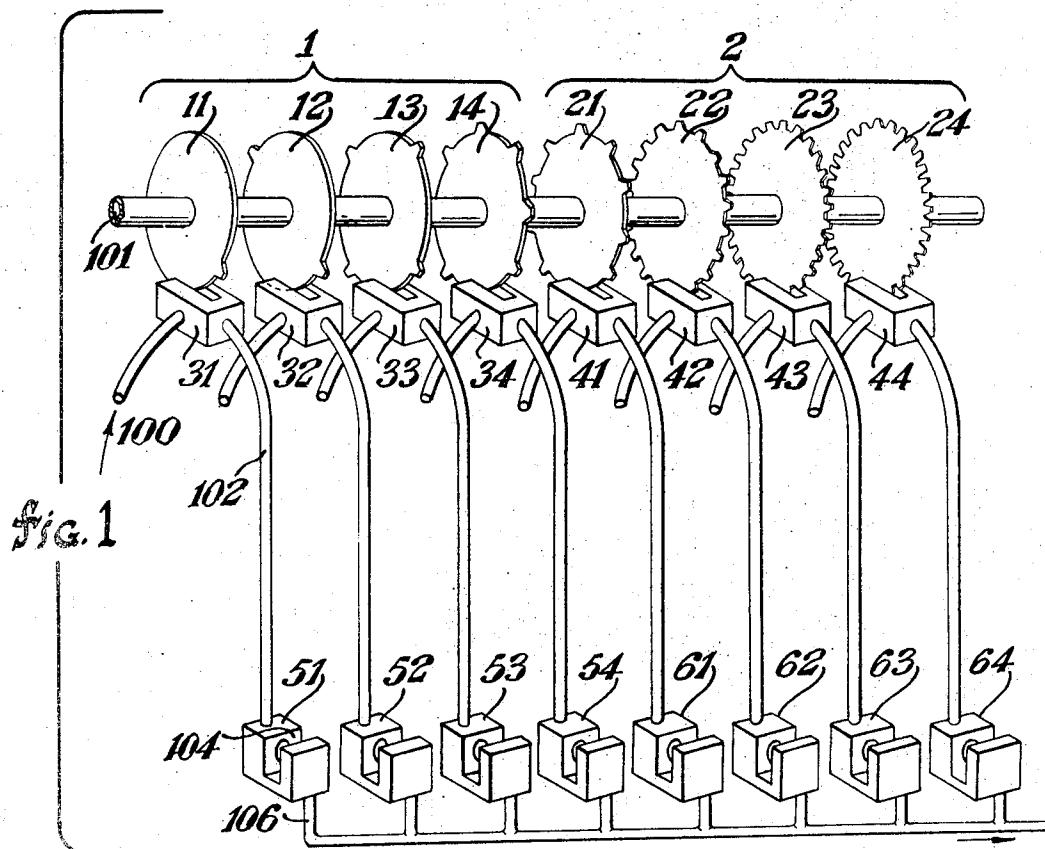
[54] **COMPUTING DEVICE**
33 Claims, 9 Drawing Figs.

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 [50] Field of Search..... 222/23, 40,
 71; 235/92, 94.1, 151.34; 340/357, 358

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ABSTRACT: A computing device for a gasoline dispensing pump for indexing a cost counter of the pump for registering the cost of fuel dispensed. The computing device includes a plurality of pulse generators with coaxial rotary pulse actuators driven by the meter of the pump and detectors or switches associated with the rotary pulse actuators for generating pulses in accordance with the angular displacement of the pulse actuators. The rotary pulse actuators are adapted to provide a number of pulses for each revolution thereof in accordance with a mathematical progression and the pulse generators include inhibitors which may be selectively operated for selecting the number of generated pulses for each gallon of fuel delivered in accordance with the desired price per gallon. In the embodiments of FIGS. 1—5 the computing device provides for generating fluid pulses; in the embodiment of FIG. 6 the computing device provides for generating electrical pulses superimposed on an AC supply; and in the embodiments of FIGS. 8 and 9 the computing devices employ two and three banks of pulse generators respectively having common pulse actuators and suitable pulse dividers for proportionally reducing the number of output pulses of the additional banks.





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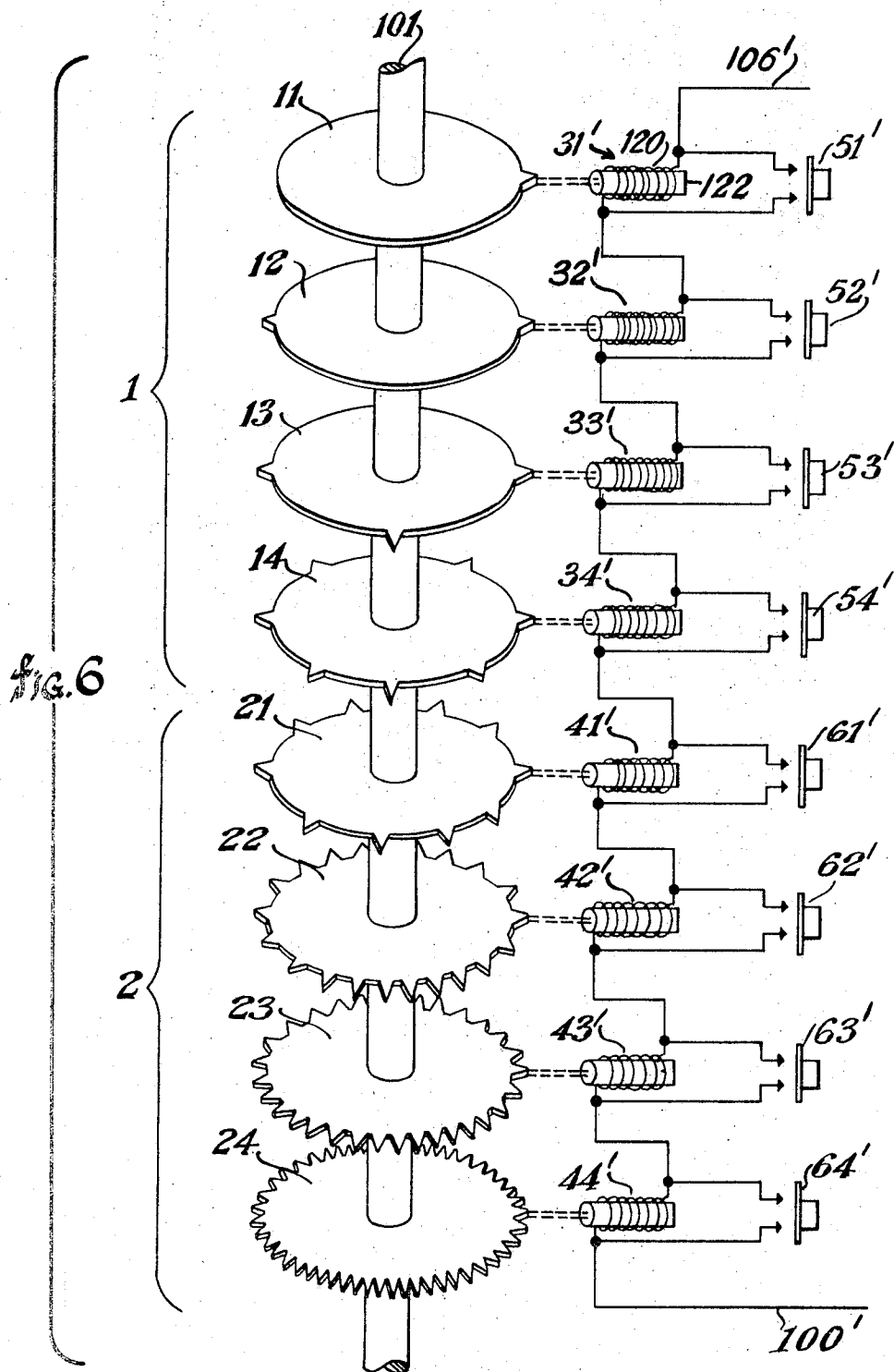


fig. 7

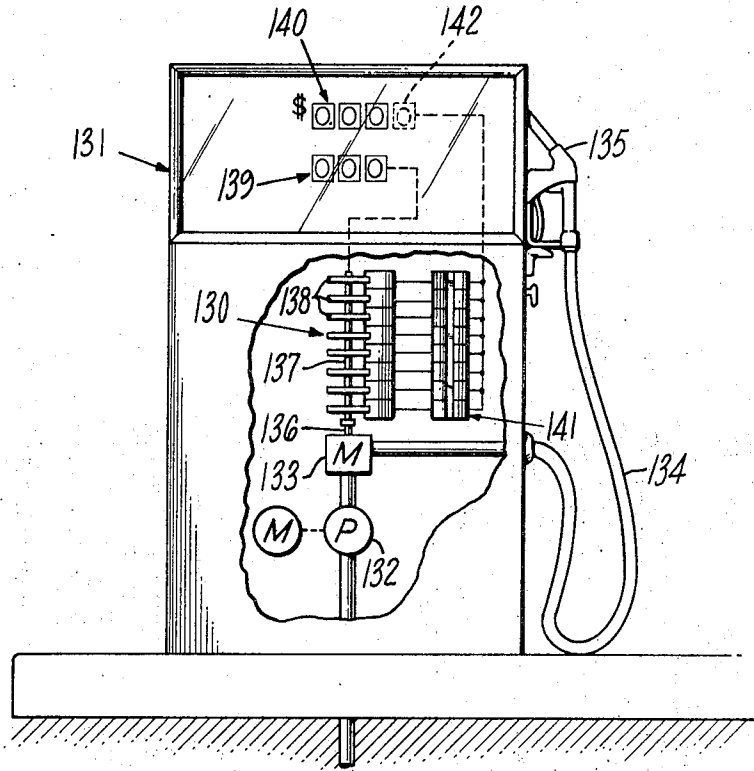


fig. 8

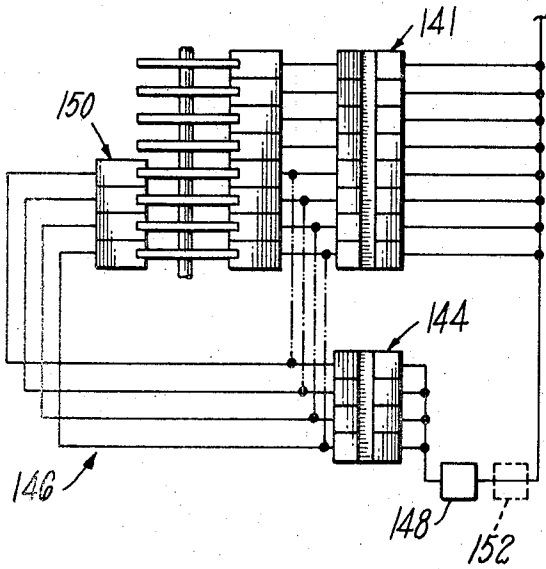
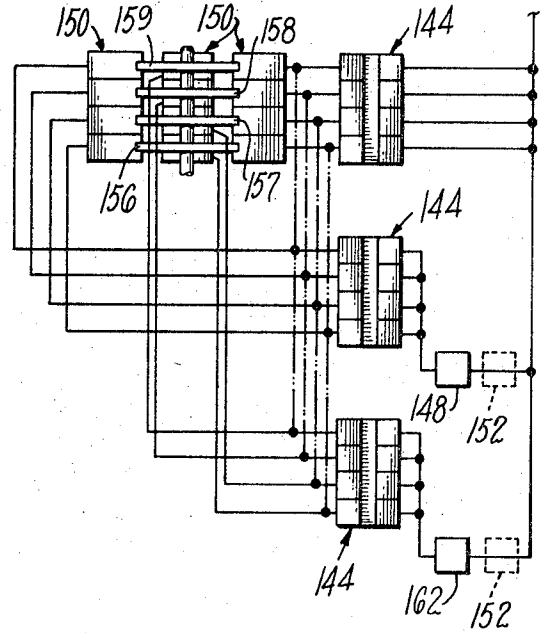


fig. 9



COMPUTING DEVICE

The right of priority of Great Britain Provisional applications No. 39024/66 filed Sept. 1, 1966 and No. 8381/67 filed Feb. 22, 1967 and of Great Britain Complete (Cognate) application No. 39024/66 (and No. 8381/67 filed Aug. 23, 1967 and based upon the aforementioned Provisional applications is claimed.

BRIEF SUMMARY OF THE INVENTION

This invention is concerned with computing devices for providing a plurality of successively generated pulses as a pulse train, the number of pulses in the train representing the product of two or more quantities, one of which quantities is represented by an input motion supplied to the computing device.

The invention has particular, but not exclusive, application to liquid dispensing apparatus such as, for example, apparatus for dispensing liquid fuel, e.g. petrol or diesel oil, wherein the pulsed output represents the product of the quantity of liquid supplied to the consumer and the price per unit volume of the liquid, and the pulsed output is used to drive a counter or register. The computing device of the invention may be employed for other purposes, however, such as, for example, to drive a comparator, or as a mechanical drive transducer for electric signals.

The invention has for its object the provision of such computing devices which provide a pulsed output representing the product of two quantities.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which is exemplified in the construction hereafter set forth, and the scope of the application of which will be indicated in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 illustrates a first embodiment of a computing device in accordance with the present invention;

FIG. 2 shows a price posting card for use with the computing device of FIG. 1;

FIGS. 3, 4 and 5 illustrate alternative forms of pulse actuators which may be employed in the computing device of FIG. 1;

FIG. 6 illustrates a record embodiment of a computing device in accordance with the present invention;

FIG. 7 illustrates a fuel dispensing system incorporating a computing device in accordance with the present invention;

FIG. 8 illustrates a third embodiment of a computing device of the present invention which may be employed in the fuel dispensing system of FIG. 7; and

FIG. 9 illustrates a fourth embodiment of a computing device of the present invention which may be employed in a fuel dispensing system of FIG. 7.

GENERAL DESCRIPTION AND DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fluid logic techniques involve the use of fluid control circuits and fluid logic elements, the operation of which may be based on a number of different physical phenomena, such as the Coanda principle of wall-attachment turbulence induced in a free fluid jet, the deflection of one jet by another, and the formation of a vortex. The circuits may employ air, water, oil, or other fluids. The fluid logic elements may comprise two main types, those having no moving parts and those having moving parts.

Electrical logic techniques involve the use of well-known electric current control circuits.

According to the invention, a computing device comprises a set of base elements or pulse actuators corresponding to a

scale of notation (which for example may be a decimal, straight binary, or binary decimal scale of notation) and mounted for movement together in response to an input motion, each base element of the set having arranged thereon one or more actuator means for pulse-energizing a detector associated with the base element for producing a single pulse as each actuator means passes the associated detector, each actuator means being so arranged and the base elements of the set so cooperating in movement, that only one detector is pulse-energized at any one time; and means for selectively inhibiting the release of pulses from the detectors so that there may be released to a common output, during one input motion of a specific duration, and integral number of pulses equal to any desired digit of the scale, or during a fraction of one input motion of specific duration, a proportionately lesser integral number of pulses.

The detectors may be fluid logic devices each arranged to release, in response to an actuator means, or individual pulse actuator fluid under pressure to a fluid output line common to all the detectors, except when such release is inhibited.

The detectors may, alternatively, be electrical pickups, for example, of a kind whose electrical conductive properties are influenced by the passage of an actuator means; or they may be of a kind capable of generating an electromotive force on the passage of an actuator means. The pickups are so connected to the common output terminal that a single electrical pulse will be released to the output terminal, if not inhibited, as each actuator means passes the associated pickup.

In preferred embodiments of the invention, the computing device is employed as a variator in a dispensing apparatus for liquid fuels, and each base element or pulse actuator of the set of elements comprises a rotary member, in the form of a disc having one or more radially extending projections or teeth forming said actuator means or individual pulse actuator arranged thereon and therearound so as to constitute the periphery of the disc. The tooth or teeth are of segmental shape and, in the case of a plurality of teeth, the teeth are uniformly spaced around the disc. The input motion is a rotary motion.

Instead of projections or teeth, the actuators may have arcuately spaced notches, holes or recesses or protuberances, formed in or adjacent the periphery of each disc; other alternative arrangements will be obvious to those skilled in the art. Rotary elements other than discs may be used; they may, for example, be cup-shaped wheels having actuators of a kind already described in connection with disc-shaped elements and associated with the cup walls, instead of with the periphery of a disc.

When fluid logic is used with actuators in the form of teeth, each detector is arranged to be capable of releasing a fluid pulse to an outlet when a tooth is adjacent the detector; similar arrangements with other forms of actuators will be obvious.

When electrical techniques are used with teeth as actuators, the teeth at least of each rotary member may, for example, be conductive and/or magnetic and the pickups may comprise coils having magnetic cores. The coils may conveniently be connected together in series between an AC input terminal and the aforesaid common output terminal, so that alternating current can flow through the pickups. It will thus be appreciated that, each time a tooth passes a pickup, the inductance of the coil will be changed, a pulse will be superimposed on the output current and, in one complete revolution, there will be provided a number of pulses equal to the total number of teeth on all the discs. Switches are provided to short out each coil at will, thereby inhibiting the release of pulses by the corresponding pickup.

Electrical detectors other than those just described can be used. For example, cup-shaped rotary elements can be provided with apertures in the cup walls to serve as actuators, the detectors comprising photoresistors disposed stationary within the cups and capable of receiving, through each aperture in turn, light from a constant intensity source outside the cups. In

other arrangements, using toothed discs with electromagnetic pickups as detectors, the teeth or the pickups may have sufficient permanent magnetism to enable each pickup to generate an electromotive force each time a tooth passes it, thereby providing an output pulse without external electrical energization.

With fluid or electrical logic methods, the number of individual actuator means on each rotary element of a set is so selected that, by permitting all the detectors to release pulses, or by suitably choosing to inhibit certain rotary element detectors, it is possible to release a number of pulses for each revolution equal to any number within the available range.

It will be seen that, if the input rotary motion is made to represent a quantity numerically in terms of the number of input revolutions, the corresponding number of output pulses will represent the product of a first multiplicand, which is the numerical value of the quantity, and a second multiplicand which is represented by the rotary elements not inhibited.

While the input quantity may be represented, in analogue fashion to a desired accuracy, by a whole number of revolutions plus a fraction of a revolution, the digit can only be represented by a whole number of pulses, the number having a magnitude proportional to the selected value within the available range. It will therefore be appreciated that the accuracy of the product will be limited by the selected value.

Rotary elements corresponding to two or more scales, in ascending powers of a common base, may be fixed to a common input shaft. The second multiplicand can then have a number of digits corresponding to the number of scales provided; the accuracy of the second multiplicand will now be limited to the value of the digit of the scale of lowest base.

In the embodiments to be described in detail hereinafter, one of the multiplicands can be preset by means of fluid logic elements, in the one case, and switches in the other case; the other multiplicand (the input rotary motion applied to the rotary elements) is variable. It is, of course, also possible to arrange for the selection of the detectors to be inhibited to be varied intermittently or continuously, in response to a second variable, which may be independent of the first variable.

Obviously, the movement of the base element is not limited to a rotary movement and, therefore, the base elements need not be of disc or circular form. The base elements may be formed with their actuator means arranged thereon in lines, the base elements being moved rectilinearly instead of rotationally, the movement being imparted to the base elements by pressure fluid devices, such as fluid cylinders, or by racks and pinions, or by other driving means.

The nature of the invention will now be made clear by describing the two exemplary embodiments referred to hereinbefore, one of which employs fluid logic techniques and the other employs electrical logic techniques.

In the fluid logic arrangement of FIG. 1, there is shown a bank of pulse generators which comprises a first set 1 of four discs or pulse actuators 11, 12, 13 and 14, and a second set 2 of four discs 21, 22, 23 and 24, fixedly and sequentially mounted on a common shaft, 101, for rotation with the shaft.

The pulse generators include fluid logic elements as detectors or pickups, respectively identified by the numerals 31 to 34, and 41 to 44 in FIG. 1 which are associated with the pulse actuators respectively.

Each detector is connected to a fluid pressure line, such as 100, which terminates in a nozzle (not shown) close to and directed normal to the plane of the path of the teeth of the associated disc. The detectors also have fluid outlet lines 102 connected within each detector to the fluid pressure line adjacent the nozzle, the outlet lines leading to corresponding inhibiting fluid logic elements 51 to 54, and 61 to 64 forming part of the pulse generators. Each inhibiting element is provided with a slot, such as 104, into which the end of the corresponding outlet line opens, the inhibiting elements being arranged with their slots in line, so as to receive, for example a price posting card such as that shown in FIG. 2.

The price posting card has holes, such as 71, 73, 74 and 83, corresponding to those pulse generators which are not to be inhibited; that is, in the case of FIG. 2, to the pulse generators having detectors 31, 33, 34 and 43. Apertures (not shown) in the walls of the slots opposite the said ends of the outlet lines are arranged to receive fluid from the outlet lines, when not inhibited from so doing by the presence in the slot of a solid part of the price posting card. The said apertures are all connected to a common fluid output line 106, for adding together fluid pulse signals from the detectors and passing the resulting pulse train to a counter or register.

The embodiment described uses air as the fluid.

The discs of the first set, 1, have respectively one, two, four and eight actuator teeth. The teeth on each of discs 12, 13 and 14 (and on each of the discs 21-24) are preferably equiangularly spaced and all of the discs 11-14 and 21-24 are arranged so that all the teeth are angularly spaced and therefore so that the pulses generated by the teeth are noncoincident and delay circuitry for spacing the pulses is unnecessary.

So long as there is no tooth opposite the nozzle of a detector, air will be discharged by the nozzle without obstruction; behind the nozzle the pressure will be low and substantially no air will be released to the corresponding outlet line. On the other hand, when a tooth obstructs the nozzle, the pressure behind the nozzle will rise and air will flow through the outlet to the corresponding inhibiting element and, providing the price posting card in place in the slots permits, a pulse of air will be released to the common output line 106.

It will be seen that, according to which of the elements 51 to 54 are placed in an inhibiting state by the price posting card, a train of noncoincident or nonoverlapping air pulses from zero to 15 will be released to the output line 106 during a complete revolution of the shaft 101. In practice a number of pulses greater than nine will not normally be chosen, so that a pulse train in the output line may represent any digit from zero to nine, that is the output will represent a scale of units to the base 10.

The discs of the second set 2, have respectively 10, 20, 40, and 80 teeth and, in a manner analogous to that just described for the first set of discs, are capable of releasing to the output line 106, during a single complete revolution of the shaft 101, any number of trains of 10 pulses from zero to nine, that is 0, 10, 20,...90 pulses. The output due to the second set of discs will thus represent a scale of 10's to the base 10.

Further sets of discs, with associated detectors and inhibiting elements, can be provided on the shaft 101, to release trains of pulses representing higher order scales to the base 10.

Furthermore, it is evident that scales to other bases may alternatively be represented, if desired. The described system provides for generating noncoincident pulses in accordance with the binary decimal system, and, of course, a straight binary system could be employed in which the number of pulses generated by each of the discs increased in accordance with a geometric progression having a common ratio of 2 as does each of the sets 1, 2 of discs in FIG. 1. Also, when employing discs for generating pulses in accordance with the straight binary system the pulse train has relatively evenly spaced pulses and each place disc would provide for generating a number of pulses which is greater than the number of pulses generated by all the lower place discs.

It will be evident that the relative angular positions of the teeth of the discs is preferably such that the generated pulses are noncoincident, i.e. for any angular position of the shaft 101, only one disc releases a pulse to the output line 106.

In using this embodiment in dispensing liquid fuel, the total number of revolutions of the shaft 101 corresponds to the quantity of fuel delivered at any one delivery operation, and the price posting card is coded according to the price per unit quantity to fuel. The total number of pulses in the pulse train released to the output line 106 then represents the value of the fuel delivered and the pulses may be counted and indicated to give the value directly in the monetary system corresponding to the coding of the price posting card.

Instead of the fluid logic detectors and/or inhibiting elements just described fluid amplifiers may be used, for example of the wall-attachment type utilizing the Coanda effect or turbulence amplifiers. The two latter devices have no moving parts, but fluid logic elements of the kind having moving parts may, if desired, be used. The former type of element is preferable because the absence of moving parts leads to a high reliability, and the elements are not generally affected by environmental conditions, such as, for example, changes in temperatures, shock, vibration or magnetism. However, because of the progress in the design of fluid logic elements with moving parts, it is not intended to limit this invention to nonmoving part fluid logic elements.

As has been stated hereinbefore, the rotary disc base elements may be provided with actuator means other than radially projecting teeth. Three exemplary alternative arrangements for the disc 11 of FIG. 1 are shown in FIGS. 3, 4 and 5. FIG. 3 shows a solid disc with, as actuator means, a raised protuberance 108, which may be formed by punching the rear surface of the disc; FIG. 4 shows a disc having 110, in its periphery; and FIG. 5 shows a disc with a hole, 112, near its periphery. In the latter two embodiments the pulse would be generated when the notch 110 or hole 112 rotates into operative alignment with the associated detector and the detector would therefore be designed to provide a pulse to the fluid outlet line 102 upon this occurrence.

An electrical device analogous to the fluid logic device of FIG. 1 is shown in FIG. 6. Two sets of toothed discs and a shaft are provided as in FIG. 1 and are identified by the same reference numerals 1, 2; the teeth are conductive and/or magnetic.

In this embodiment electromagnetic detectors, 31' to 34' and 41' to 44', respectively correspond to the fluid logic detectors 31 to 34 and 41 to 44; switches 51' to 54' and 61' to 64' correspond to the fluid logic inhibitors 51 to 54 and 61 to 64; and AC input electrical line 100' corresponds to the fluid pressure line 100; and a common electrical output line 106' corresponds to the common fluid output line 106.

The electromagnetic detectors comprise coils, such as 120, and magnetic cores such as 122, the coils being connected together in series between the AC input line 100' and the output line 106', so that alternating current can flow through the detector coils.

It will thus be appreciated that each time a tooth passes a detector, the inductance of the coil will change and a pulse will be superimposed on the output current and, in one complete revolution, there will be provided a number of pulses equal to the total number of teeth on all the discs. The inhibitor switches 51' to 54' and 61' to 64', are respectively connected to short out each coil at will, thereby inhibiting the release of pulses by the corresponding detector; the output line 106' will then provide for each revolution of the shaft, a train of pulses whose number is equal to the total number of teeth on those discs whose detectors are not inhibited. As in the embodiment of FIG. 1, the number of teeth on each disc is selected so that, by suitably choosing to inhibit certain of the detectors, it is possible to release any number of pulses, for each revolution within the available range.

The switches 51' to 54' and 61' to 64' are arranged to be operated in any suitable known manner, for example by a price posting card like that illustrated in FIG. 2. The operation of the liquid fuel dispensing device using electrical logic is analogous to that of the embodiment using fluid logic and will therefore not be described in any greater detail here.

Referring to FIG. 7 a computing device 130 is shown employed in a fuel delivery pump 131 having a fluid pump 132 for delivering fuel via a fluid meter 133 and hose 134 to a dispensing nozzle 135. In a conventional manner the meter output shaft 136 is driven in proportion to the amount of fuel dispensed, for example one revolution for each unit volume (i.e. the unit volume for which the fuel is priced) of fuel dispensed. The computer shaft 137 is shown directly coupled to the meter output shaft 136, and accordingly for each unit

volume of fuel dispensed the available price range provided by the range of available generated pulses is directly related to the numbers of teeth on the pulse actuators 138.

The computer shaft 137 may be suitably connected to a volume counter 139 of the fuel pump 131 to provide for registering the volume of fuel delivered, and the output of the computing device 130 is suitably connected to a cost counter 140 of the fuel pump to register the cost of fuel delivered in accordance with the selected unit price. Thus, if the computing device 130 provides for generating fluid pulses as in the embodiment of FIG. 1, the computing device may be connected to index a fluid operated cost counter. The cost counter may accordingly comprise a bank of single wheel pneumatic counters of the type disclosed in the pending application of John H. Bickford et al. Ser. No. 558,479 entitled "Fluid Operated Counting Device." Alternatively, if the computing device 130 provides for generating electrical pulses as in the embodiment of FIG. 6, the computing device may be connected (via a suitable filter or discriminator if necessary) to index an electromagnetically operated cost counter.

The price per unit volume of gasoline may be selected within the available price range provided by the computing device 130 by merely placing an appropriate price card in the slot provided in the bank 141 of pulse inhibitors. For example, with the computer shaft 137 driven to rotate one revolution for each gallon of fuel delivered, the computer 130 may be designed to provide an available price range from 00.0 cents through 51.1 cents per gallon by providing suitable pulse actuators for generating a range of from 0 through 511 pulses for each revolution of the computer shaft and by connecting the computer output to drive a suitable pulse divider (such as a "tenth cent" counterwheel 142—shown in broken lines in FIG. 7—which is reset to "zero" when the volume and cost counters 139, 140 are reset to zero between fuel deliveries) which functions to divide the number of pulses by 10 and thereby provide for indexing the cost counter 140 one count for every 10 pulses. In order to provide an available range of prices from 00.0 through 51.1 cents per gallon, pulse generators with pulse actuators having 1, 2, 4, 8, 16, 32, 64, 128 and 256 teeth respectively could be provided and the price of, for example, 34.9 cents per gallon would be selected by selecting the pulse generators with the pulse actuators having 1, 4, 8, 16, 64 and 256 teeth to provide 349 pulses for each revolution of the computer shaft.

Alternatively, the computing device could be designed to provide an available range of pulses of, for example, 000.0 through 127.9 pulses for each revolution of the computer shaft to provide a corresponding price range of 00.0 cents through 127.9 cents per unit volume of gasoline dispensed. A primary bank of pulse generators having pulse actuators with 1, 2, 4, 8, 16, 32 and 64 teeth respectively could be employed to provide a primary range of 0 through 127 pulses per revolution. The output of a secondary bank of pulse generators providing a secondary range of pulses from 0.0 through 0.9 pulses per revolution may be added to the primary output to complete the price range. The secondary bank of pulse generators may comprise, for example, a secondary computer shaft driven at one-tenth the rate of the primary shaft and having pulse actuators with 1, 2, 4 and 8 teeth. Preferably, however, the pulse actuators of both the primary and secondary banks of pulse generators are mounted on the same shaft to ensure that the noncoincident relationship of the pulse actuator teeth is maintained in which case separate pulse actuators for the primary and secondary banks may be provided or the pulse actuators of the primary bank may also be used for the secondary bank as shown in FIG. 8.

Referring to FIG. 8 more particularly, a secondary bank of inhibitors 144 is provided for selectively inhibiting the pulse generators comprising a secondary bank 146 and the output of the secondary bank of inhibitors 144 is connected to a suitable pulse divider 148 (such as a single wheel counter) that would provide an output pulse for every 10 input pulses. The secondary bank of inhibitors 144 may be connected to separate de-

tectors or pickups 150 associated with the primary pulse actuators in which case the noncoincidence of the generated pulses could be ensured. Alternatively, the secondary bank of inhibitors 144 could be connected (as shown in broken lines in FIG. 8) to be operated by the primary detectors or pickups 150, in which instance some or all of the secondary pulses may be coincident with the noninhibited pulses of the primary bank of pulse generators and a suitable delay 152 (shown in broken lines in FIG. 8) would be used to ensure noncoincidence.

The primary computer shaft could, of course, be rotated at a rate greater or less than one revolution for each unit volume of fuel delivered. For example, the primary computer shaft could be connected to be rotated 10 revolutions for each unit volume of fuel delivered and secondary and tertiary banks of pulse generators could be provided as shown in FIG. 9, in which case a stack of just four pulse actuators 156, 157, 158, 159 with 1, 2, 4 and 8 teeth respectively would be sufficient to provide a price range of 00.0 cents through 99.9 cents.

As with the embodiment of FIG. 8 each bank of pulse generators in the embodiment of FIG. 9 could have separate pulse actuators or separate detectors or pickups 150 to ensure noncoincidence of all of the generated pulses, or two or all of the banks of pulse generators could employ the same bank of detectors 150 and suitable delays 152 could be employed to ensure noncoincidence. Also, although the second place bank pulse generators would employ a pulse divider 143 capable of providing an output pulse for every 10 input pulses, the third place bank of pulse generators would employ a pulse divider 162 capable of providing an output pulse for every hundred input pulses.

Other arrangements could, of course, be readily devised in which the computer shaft is rotated at a different rate and in which the number of teeth on the pulse actuators is chosen in accordance with the rate the computer shaft is driven and in accordance with the desired price range. Also, if two or more parallel banks of pulse generators are provided as in FIGS. 8 and 9, the pulse dividers employed would be selected in accordance with the rate the computer shaft is rotated, the number of teeth on the pulse actuators, and the base of the counting system.

The teeth of each of the pulse actuators are preferably equiangularly spaced to provide an even angular interval between the pulses generated by each actuator. And where the number of teeth on the pulse actuators is in accordance with a geometric progression having a common ratio of 2, the actuators are preferably angularly positioned on the computer shaft so that the pulses generated by all of the pulse generators are at substantially even angular intervals. It can be seen, however, that since the number of teeth on the highest order actuator is one more than the total number of teeth on the remaining actuators (when the number of teeth on the actuators follow the geometric progression 1, 2, 4, 8,....) the angular interval between two (and just two) of the pulses will be substantially twice the angular interval between the remaining pulses. Also, depending upon which of the pulse generators are inhibited and which of the pulse generators are not inhibited, there may be a number of angular "gaps" between successive pulses. Thus, the accuracy of the computing device is affected by the irregular spacing of the pulses, but this inaccuracy can be suitably reduced by appropriate design of the computing device, for example so that it will compute to the nearest 1/10 or 1/2cent.

Also the inaccuracy, due to irregularly spaced pulses may be decreased by rotating the computer shaft at a higher rate (for example at 4 revolutions for each unit volume of gasoline delivered), and by providing a suitable pulse divider for dividing the number of output pulses by the same multiple the computer shaft rotation is increased (i.e., 4). A computing device may therefore be designed for computing the cost of gasoline dispensed within any degree of accuracy desired.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above-described

will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. In a fluid dispensing system having a register operable for registering the monetary amount of fluid dispensed and a settable variator connected for operating the register in accordance with the volumetric amount of fluid dispensed and a multiple place unit volume price established by the variator setting, the improvement wherein the variator comprises a rotary pulse actuating device adapted to be rotated in accordance with the volumetric amount of fluid dispensed and having a plurality of pulse actuators arranged in a plurality of separate pulse actuator circles coaxial with the axis of the pulse actuating device to provide a plurality of coaxial pulse actuator sets, a plurality of separate pulse generating means for the multiple places respectively of the multiple place unit volume price each mounted for cooperation with all the pulse actuator sets for generating a separate output pulse train for the respective place of the multiple place price as the pulse actuating device rotates, each separate pulse generating means comprising control means for selectively setting the number of pulses in its output pulse train for a revolution of the rotary pulse actuating device by selectively deactivating the cooperating pulse actuator sets with respect thereto for thereby setting the numerical amount of the respective place of the multiple place price, and connecting means for connecting the separate output pulse trains for operating the register in accordance with the relative values of the corresponding places respectively of the multiple place price.

2. In a fluid dispensing system according to claim 1 wherein each of said separate pulse generating means comprises a bank of pulse generators cooperable with the rotary pulse actuating device for generating noncoincident pulses as the pulse actuating device rotates and connected for providing the respective output pulse train, and control means for selectively deactivating the respective pulse generators for setting the number of pulses in the respective output pulse train.

3. In a fluid dispensing system according to claim 1 wherein said plurality of separate pulse generating means are angularly spaced about the axis of the rotary pulse actuating device to provide separate output pulse trains with noncoincident pulses.

4. In a fluid dispensing system according to claim 1 wherein the connecting means comprises pulse dividing means operated by at least the pulses of the output pulse trains corresponding to the lower order places of the multiple place price for operating the register with the output pulse trains in accordance with the respective relative values of the corresponding places of the multiple place price.

5. In a fluid dispensing system according to claim 4 wherein the dividing means comprises decade counting means.

6. In a fluid dispensing system according to claim 1 wherein said means cooperable with the rotary pulse actuator comprises a bank of generators each cooperable with the rotary pulse actuator for generating an intermediate series of a fixed number of pulses for a revolution of the rotary actuator, and wherein the control means is operable for selectively combining the intermediate series of pulses for establishing each of said separate output pulse trains with a preselected number of pulses for a revolution of the pulse actuator.

7. In a fluid dispensing system having a register adapted to be indexed for registering the monetary amount of fluid dispensed and a cost computing device driven in accordance with the volumetric amount of fluid dispensed, adjustable to select the price per unit volume of fluid and connected for indexing the register in accordance with the selected price, the improvement wherein the computing device comprises at least two banks of pulse generators of ascending order each having a plurality of pulse generators adapted to provide a different number of pulses respectively for each unit volume of fluid dispensed, the pulse generators having control means for selective deactivation thereof for varying the total number of

pulses generated by the bank of pulse generators in accordance with the selected price, and connecting means for connecting the banks of pulse generators to the register to index the register in accordance with the number of generated pulses, the banks of pulse generators of ascending order comprising a common bank of coaxial rotary pulse actuator sets rotated in accordance with the amount of fluid dispensed, and a single detector for each of the coaxial pulse actuator sets for generating pulses in accordance with the angular displacement of the respective pulse actuator set, all of the banks of pulse generators excepting one comprising time delay means for delaying its pulse with respect to the generated pulses of said one bank to provide a train of noncoincident pulses.

8. A computing device comprising a rotatable pulse actuating device having an integral rotor with a plurality of pulse actuators arranged in a plurality of separate pulse actuator circles coaxial with the axis of the pulse actuating device to provide a plurality of coaxial pulse actuator sets rotatable at the same angular velocity, a plurality of separate pulse generating means mounted in angularly spaced relationship about the axis of the rotor for cooperation with the pulse actuator sets with each pulse generating means mounted for cooperation with a plurality of pulse actuator sets, each pulse generating means being adapted to be operated by each pulse actuator of each pulse actuator set cooperating therewith as the pulse actuating device rotates to generate a corresponding train of noncoincident output pulses and comprising control means operable for selectively controlling its output pulse train by selectively deactivating each cooperating pulse actuator set with respect thereto, and a counting device connected to be operated by all of the output pulse trains for counting the product of a multiplier, established in accordance with the operation of the control means of the plurality of separate pulse generating means, and an amount proportional to the rotation of the pulse actuating device.

9. A computing device according to claim 8 wherein said separate pulse generating means is provided for each place of multiple place multiplier for establishing the amount thereof.

10. A computing device according to claim 9 wherein the plurality of pulse actuator sets cooperating with each separate pulse generating means have different numbers of pulse actuators such that by selective deactivation of the cooperating pulse actuator sets with respect to the pulse generating means the number of pulses in its output pulse train for each revolution of the pulse actuating device may be selected to equal any number in an arithmetical progression of 0, 1a, 2a, 3a, 4a—9a.

11. A computing device according to claim 8 wherein there are four pulse actuator sets cooperating with each said separate pulse generating means having numbers of pulse actuators in accordance with a geometrical progression having a common factor of 2.

12. A computing device according to claim 8 wherein each said separate pulse generating means is mounted for cooperation with all of said plurality of pulse actuator sets.

13. A computing device according to claim 8 wherein there are four pulse actuator sets cooperating with each said separate pulse generating means.

14. A computing device according to claim 8 wherein each said separate pulse generating means comprises a plurality of separate detectors mounted for cooperation with different pulse actuator sets respectively.

15. A computing device according to claim 8 wherein the plurality of pulse actuator sets have different numbers of pulse actuators in accordance with a geometrical progression.

16. A computing device according to claim 15 wherein the plurality of pulse actuator sets have numbers of pulse actuators in accordance with a geometrical progression of a, 2a, 4a,...

17. A computing device according to claim 8 wherein the pulse actuating device comprises a plurality of coaxial discs each having at least one set of pulse actuators.

18. A computing device according to claim 8 wherein the plurality of separate pulse generating means and the plurality

of separate pulse generating means and the plurality of pulse actuators are oriented to provide a plurality of output pulse trains with noncoincident pulses.

19. A computing device according to claim 18 further comprising a common output line connecting the counting device to the plurality of separate pulse generating means for being operated by said plurality of output pulse trains.

20. A computing device according to claim 8 wherein the plurality of separate pulse generating means comprises electrical pulse generators for generating electrical pulses.

21. A computing device according to claim 20 wherein the plurality of separate pulse generator means comprise inductive pickups.

22. A computing device according to claim 8 wherein the plurality of separate pulse generator means comprise fluid pulse generator for generating fluid pulses.

23. A computing device comprising a rotatable pulse actuating device having a plurality of pulse actuators arranged in a plurality of separate pulse actuator circles coaxial with the axis of the pulse actuating device to provide a plurality of coaxial pulse actuator sets, a plurality of separate pickup means mounted for cooperation with the pulse actuator sets, each pickup means being adapted to be operated by each pulse actuator of each pulse actuator set cooperating therewith as the pulse actuating device rotates to generate a corresponding intermediate train of noncoincident pulses, the plurality of pickup means and plurality of pulse actuators cooperating to generate intermediate pulse trains having different numbers of noncoincident pulses for each revolution of the pulse actuating device, a plurality of separate control means each connected to a predetermined combination of the pickup means for generating a separate output pulse train, each separate control means being selectively operable to set the number of pulses in its output pulse train for a revolution of the rotary pulse actuating device by selectively eliminating therefrom the intermediate pulse trains of the pickup means connected thereto, and a counting device connected to be operated by all of the output pulse trains.

24. A computing device for computing the product of an amount proportional to a rotational input and a multiple place multiplier comprising a rotatable pulse actuating device having a rotary input and a plurality of rotatable pulse apertures arranged in a plurality of separate pulse aperture circles, each coaxial with its axis of rotation, to form a plurality of separate pulse aperture sets, a plurality of pulse generating means for the multiple places respectively of the multiple place multiplier mounted for cooperation with the pulse aperture sets, each pulse generating means being adapted to be operated by each pulse aperture of each pulse aperture set cooperating therewith as it is rotated by the rotary input to generate a corresponding train of output pulses, and selector means operable for selectively controlling the output pulse trains of the plurality of pulse generating means by selectively activating and deactivating each pulse aperture set with respect to the cooperating pulse generating means, the selector means comprising a selector portion for each pulse generating means having activating apertures of activating selected pulse aperture sets with respect to the respective pulse generating means and masking portions for deactivating selected pulse aperture sets with respect to the respective pulse generating means, and a counting device connected to be operated by all of the output pulse trains for computing the product of a multiplier, established in accordance with the operation of the selector means and an amount proportional to the rotation of said rotary input.

25. A computing device according to claim 24 wherein the pulse actuating device comprises a plurality of rotatable computer sections for the multiple places respectively of the multiple place multiplier and connected to the rotary input for being rotated thereby, each computer section comprising a plurality of pulse aperture sets and wherein each pulse generating means is mounted for cooperation with the pulse aperture sets of the respective computer section.

26. A computing device according to claim 25 wherein each computer section comprises rotary disc means connected to be rotated by the rotary input and having a plurality of coaxial pulse aperture sets.

27. A computing device according to claim 26 wherein each rotary disc means has a plurality of pulse aperture sets with numbers of pulse apertures such that by selective activation and deactivation of the pulse aperture sets with respect to the cooperating pulse generating means the number of pulses in its output pulse train for each revolution of the rotary input may be selected to equal any number in an arithmetical progression of 0, 1, 2a, 3a, 4a—9a wherein the constant a is a whole number.

28. A computing device according to claim 27 wherein the constants of the arithmetical progressions of pulses adapted to be provided by the plurality of disc means for each revolution of the rotary input vary between disc means by a factor of 10.

29. A computing device according to claim 26 wherein each disc means has four pulse aperture sets.

30. A computing device according to claim 26 wherein each disc means comprises a plurality of coaxial discs each having at least one set of pulse apertures.

31. A computing device according to claim 24 wherein each pulse generating means comprises a plurality of separate detectors mounted for cooperation with different pulse aperture sets respectively.

32. A computing device according to claim 24 further comprising a common output line connecting the counting device to the plurality of separate pulse generating means for being operated by their output pulse trains.

33. A computing device according to claim 24 wherein the selector means comprises aperture plate means with apertures for selectively activating the pulse aperture sets.

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