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(54) Liquid flow metering device.

(57) A device for metering liquid flow in a dispensing line (3) for a gas-pressured beverage comprising a flowmeter (1) with electrical contacts (A) pulsing as an indication of fluid flow in said line, an electrical impulse generator (5), an impulse counter (6) having multiple outputs corresponding to different counts in the counter, and an electronic calculator (4) with a preset calibrated value stored in its memory and electrically connected to said outputs for activation of respective ones of its functions, said contacts (A) being serially located in that one of the connections assigned to an addition function of said calculator (4) whereby with each pulse of said contacts (A) the total value displayed by said calculator (4) is increased by the value stored in said memory, and the maximum signal input response rate of said calculator (4) exceeds the pulsing rate of said contacts indicative of a flow of fluid with a gas content below a predetermined level and is less than the pulsing rate of said contacts (a) indicative of a flow of fluid whose gas content is above said level.

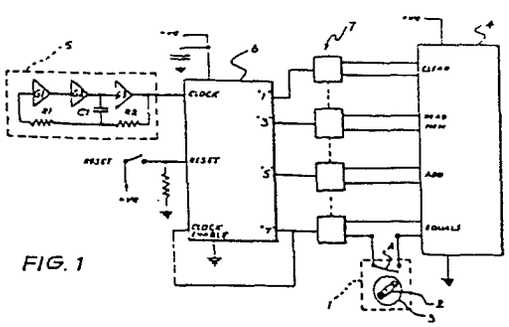

FIG. 1

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LIQUID FLOW METERING DEVICE

This invention relates to metering devices for liquids and more particularly to such devices which respond to the flow of the liquid as opposed to the volume after dispensing.

One such device is incorporated in petrol pump dispensers and comprises a rotatable turbine in the petrol dispensing line. Either directly, or magnetically, coupled counters respond to the rotation to calculate the volume and value of petrol passing through the line for dispensing. These turbine-type metering devices, however, are unsuitable for use with the dispensing of carbonated and/or pressurised beverages, such as beer. It frequently occurs that these dispensing lines contain only, or a large quantity of, froth which, while operating the turbine, is undesirable to be included in the metered volume.

On licensed premises employing staff for the dispensing of beer on tap it has been found necessary to exercise supervision to ensure that the quantity dispensed during a period of trading corresponds to the money deposited in cash registers. Flowmeter systems have been associated with the beer lines to the taps but hitherto the dispensed quantities recorded have been far from accurate due to the occurrence of froth and gas in the lines frequently during trading, for example when kegs are replaced or gas pressures are incorrectly adjusted.

It is the main object of the invention to provide a liquid-flow metering device which is efficient and accurate in operation even in the dispensing of carbonated and/or pressurised beverages.

According to the invention there is provided a liquid-flow metering device comprising a flowmeter for indicating externally of a dispensing line a liquid flow therein, an electrical impulse generator, and an electrical impulse counter driven by impulses from said generator, a fluid volume calculator, and driver means responding to said flowmeter to control the operation of said calculator, the latter having a maximum input signal rate to permit response only to signals indicative of fluid flow below a

predetermined rate.

The invention will be better understood with reference to the accompanying drawings, in which:-

FIG. 1 shows a schematic diagram of the metering device of the invention;

FIGS. 2A and 2B are a plan and a sectional view of a flowmeter utilized with the device;

FIG. 3 is a perspective view of the calculator housing of the device; and

FIG. 4 is an end elevation of said housing with the battery compartment door open.

A preferred embodiment of the invention will now be described wherein the fluid-flow metering device is utilized for the dispensing of beer with automatic indication of the quanitty of beer dispensed for each pulling operation.

Reference is now made to FIG. 1 showing schematically the electrical construction of the device. Any form of flowmeter 1 may be provided and preferably incorporates electrical contacts A actuated by a rotatable ceramic magnet 2, within the beer dispensing line 3 responding to the flow of beer there-through. Under normal circumstances where the dispensing line 3 is connected to a beer keg (not shown) properly supplied with pressurising gas, no foaming of the beer occurs in the flowmeter 1. It is a recognised phenomenon that most flowmeters will respond not only to the flow of liquid beer but also to the passage of beer froth in the line. This will frequently occur upon the depletion of beer in a keg and with changeover, either manually or automatically, to a fresh keg. The present invention is possible due to the realisation that both gas and froth in the dispensing line 3 traverses at a much faster rate than the fluid, in the order of 10 times the normal rate of flow of beer. Thus, it can be seen that completely inaccurate automatic calculations of dispensed volumes of beer occur with conventional flowmeters whenever froth or gas is present in the line.

Electrical contacts A, therefore, function as a magnetically sensitive reed switch which is operated by the

permanent magnet 2 connected with the measuring portion 1A of the flowmeter 1. Upon completion of one measuring cycle by the flowmeter 1 a closed condition occurs of the reed contacts. Connections from the reed switch A are made between a calculator 4 and a reset circuit consisting of three stages, viz. an oscillator (or clock) 5, a counter 6, and driver unit 7.

The clock oscillator 5 is a conventional three gate, unit, comprising gates G1, G2 and G3, whose frequency is controlled by resistors R_1 and R_2, and capacitor C_1. Its operating frequency is about 5 Hz. The counter 6 receives clock pulses from the oscillator 5 which would normally drive the counter 6 through its counting range which in this case is 0 - 9. It would repeat the cycle continuously as long as clock pulses from oscillator 5 are present were it not for its decoded output "7" being tied to the "clock enable" input. When output "7" is reached a logic high is sent to "clock enable", thereby inhibiting further counting. At this stage output "7" remains high. All other outputs from counter 6 are low.

On application of a high to the input "reset" of the counter 6, by manual, or automatic, activation of the RESET switch decoded output "7" goes low removing inhibiting and allowing the counter 6 to count through the output steps "1", "3", "5", "7" and then to stop stepping. The outputs from "1" to "7" are buffered by a quad bilateral switch 7. The drivers of switch 7 are connected directly to the electrical connections corresponding to the function keys "Clear", "Read Memory", "Add" and "Equals" of the calculator 4. Thus the outputs of the counter 6 are connected as follows:

Decoded output "1" = Clear key
Decoded output "3" = Read Memory key
Decoded output "5" = Add key
Decoded output "7" = Equals key (and this halts stepping by the counter 6).

Thus, whenever contacts A close the high from output "7" is repeatedly applied to the calculator. The effect is the same as pulsing the "equals" key, thereby

adding to the total displayed on the calculator the value entered into the memory with each pulse. The value programmed will be initially measured precisely to represent the quantity of beer dispensed for each operating cycle of the flowmeter. Each cycle will be the interval covering each successive operation of the reed switch A. It is a feature of the calculator that its speed of response to the pulsing frequency of the contacts A of the flowmeter 1 has an upper threshold which excludes response to a frequency between that derived from normal beer flow in the line 3 and that derived from the passage of gas or froth in the line 3 (being in the order of 1:10).

A special feature of the flowmeter 1, therefore, is that, if gas either continuously or intermittently flows through the meter 1, although the meter 1 pulses the "equals" key of the calculator 4 when this gas is present, it is not recorded by the calculator due to the calculator's maximum input rate being limited by its inherent design. In one form the calculator 4 incorporates the semi-conductor chip NEC 888.

The flowmeter 1 shown in FIGS. 2A and 2B is ideally suited for incorporation within the device. It is composed of a housing 8 having inlet and outlet adaptors 9 and 10 for connection within a beer line 3. A removable core 11 in the housing 8 is sealed by opposite O-rings 12 and 13 against the inner wall of the housing 8 and has a through passage occupied by a rotor 15 which oscillates with the flow of beer in the passage to rotate an axial spindle 16 and a ceramic magnet 2 carried on one end thereof. The contacts A are embedded in the housing 8 adjacent the magnet 2 to close when attracted or repelled by an appropriate pole of the magnet 2 as it passes in juxtaposition to the contacts A. This type of flowmeter 1 has a stable metering quality in service. Calibration is obtained for programming of the memory bank of the calculator by flow comparison with a previously calibrated flowmeter 1.

In the application of the liquid-flow metering device of this invention in licensed clubs or other premises where beer is dispensed from a plurality of taps and by

various employees, it will be customary for each employee to be assigned an individual tap and cash register. A record of cash transactions over a trading period will be maintained by conventional means associated with the register, while a record of the quantity of beer dispensed will be displayed upon the calculator 4 (FIGS. 3 and 4) corresponding to the assigned beer tap. The calculator 4 preferably is located together with other calculators 4, related to the remaining taps, at a recording location remote from the beer taps.

FIGS. 3 and 4 show one such calculator 4 enclosed within a securable case 18 provided with a cylinder lock 19 and key 20 on a hinged front cover 24. The calculator 4 is mounted above a printed circuit board 21 containing the electronic components shown in FIG. 1. A battery compartment 22 is located beneath the baord 21 and an end wall 23 of the case 18 is hinged to provide access to the compartment 22. The hinged front cover 24 has a viewing window 25 over the display 26 of the calculator 4 and also is provided with a second cylinder lock 27 and key 28 which through cam 29 effects actuation of the switch 30 mounted upon an end of the board 21. The switch 30 is the switch RESET of FIG. 1 and is operated by the supervisor's key 28 to cancel the total displayed on the calculator 4 before trading commences.

A reading of the calculator's displayed total beer volume will be made at the end of trading before the customary flushing of the beer pipes. At the supervisor's convenience this record is later checked with the cash total recorded by the register. Due to the different rate of charge for beer depending upon the volume served, appropriate keys and record will be provided by the register for indicating volume per service which traditionally is one of merely three or four different volumes.

Whereas a preferred embodiment has been described by the foregoing it should be appreciated that other forms are feasible within the scope of the invention.

CLAIMS

LIQUID FLOW METERING DEVICE

1. A liquid-flow metering device comprising a flow meter (1) for indicating externally of a dispensing line (3) a liquid flow therein, and being characterized by an electrical impulse generator (5), and an electrical impulse counter (6) driven by impulses from said generator, a fluid volume calculator (4), and driver means (7) responding to said flowmeter to control the operation of said calculator, the latter having a maximum input signal rate to permit response only to signals indicative of fluid flow below a predetermined rate.

2. A liquid-flow metering device according to claim 1, characterized in that said driver means has three sections providing output signals for activating respectively a display clear function, a memory recall function, and an addition function for said calculator.

3. A liquid-flow metering device according to claim 2, characterized in that said fluid volume calculator is an electronic calculator, and said impulse counter is a recycling counter arrested by an inhibiting circuit at a predetermined count to provide at an output a control signal for the driver means for activating the addition function of said calculator.

4. A liquid-flow metering device according to claim 3, characterized in that said flowmeter includes electrical contacts (A) repeatedly operated to indicate said liquid flow, and said contacts repeatedly apply said output signal corresponding to said addition function to increase by the same amount with each repetition the total displayed by the calculator.

5. A liquid-flow metering device according to claim 4, characterized in that said same amount corresponds to the value stored in the calculator's memory and being indicative of a metered quantity of liquid dispensed.

6. A liquid-flow metering device according to claim 3, 4 or 5, characterized in that said impulse counter has a reset provision which when operated causes said counter to recycle, and wherein sequential outputs of said counter

cause activation in turn of the calculator's display clear function.

7. A liquid-flow metering device according to any one of the preceding claims characterized in that said calculator is housed within a securable tamper-proof case (18).

8. A liquid-flow metering device according to claim 7, characterized in that said calculator's case has two key locks (19 and 27) whereby two manually operable keys (20 and 28) facilitate respectively resetting of said counter and access to said calculator.

9. A liquid-flow metering device according to any one of the preceding claims, characterized in that said flowmeter comprises a rotatable impeller (1A) driven by fluid flow in said dispensing line and carrying a permanent magnet (2) for operation intermittently of electrical contacts external of said dispensing line.

10. A device for metering liquid flow in a dispensing line (3) of a gas-pressured beverage having a gas content below a predetermined level, comprising a flowmeter (1) with electrical contacts (A) pulsing as an indication of fluid flow in said line, and being characterized by an electrical impulse generator (5), a recycling counter (6) for impulses from said generator having multiple sequential outputs ("1", "3", "5" and "7") corresponding to different counts in the counter, a count inhibit circuit activated from the output ("7") corresponding to maximum count and a reset circuit (RESET) for deactivating said inhibit circuit, and an electronic calculator (4) with a preset calibrated value stored in its memory and electrically connected to said outputs for activation of respective ones of its functions, said contacts being serially located in that one of the connections assigned to an addition function of said calculator whereby with each pulse of said contacts the total value displayed by said calculator is increased by the value stored in said memory, and the maximum signal input response rate of said calculator exceeds the pulsing rate of said contacts indicative of a flow of liquid with a gas content below said predetermined level and is less than the pulsing rate of said contacts indicative of a flow of fluid whose

gas content is above said level.

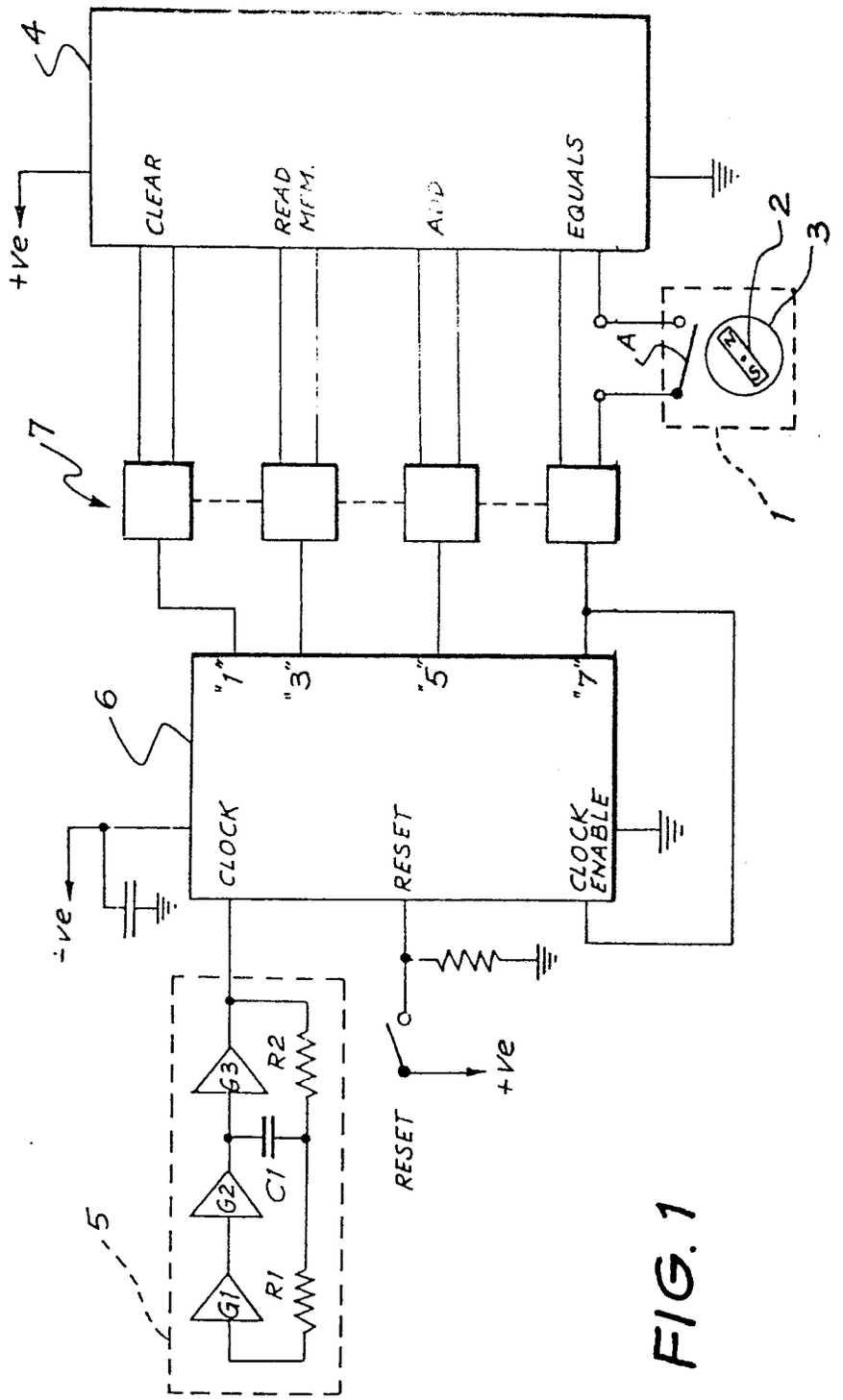
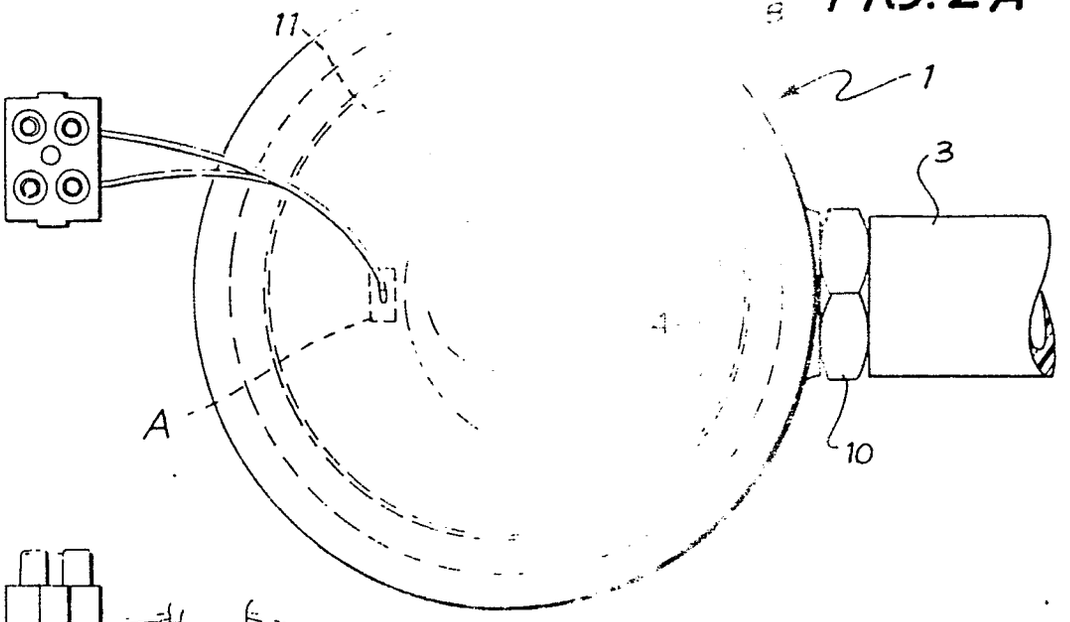

4
CLEAR
READ MEM.
ADD
EQUALS
+Ve
2
3
A
N
S
1
7
6
"1"
"3"
"5"
"7"
CLOCK
RESET
CLOCK ENABLE
-ve
+Ve
RESET
5
G3
R2
C1
G2
R1
G1

FIG. 1

FIG. 2A



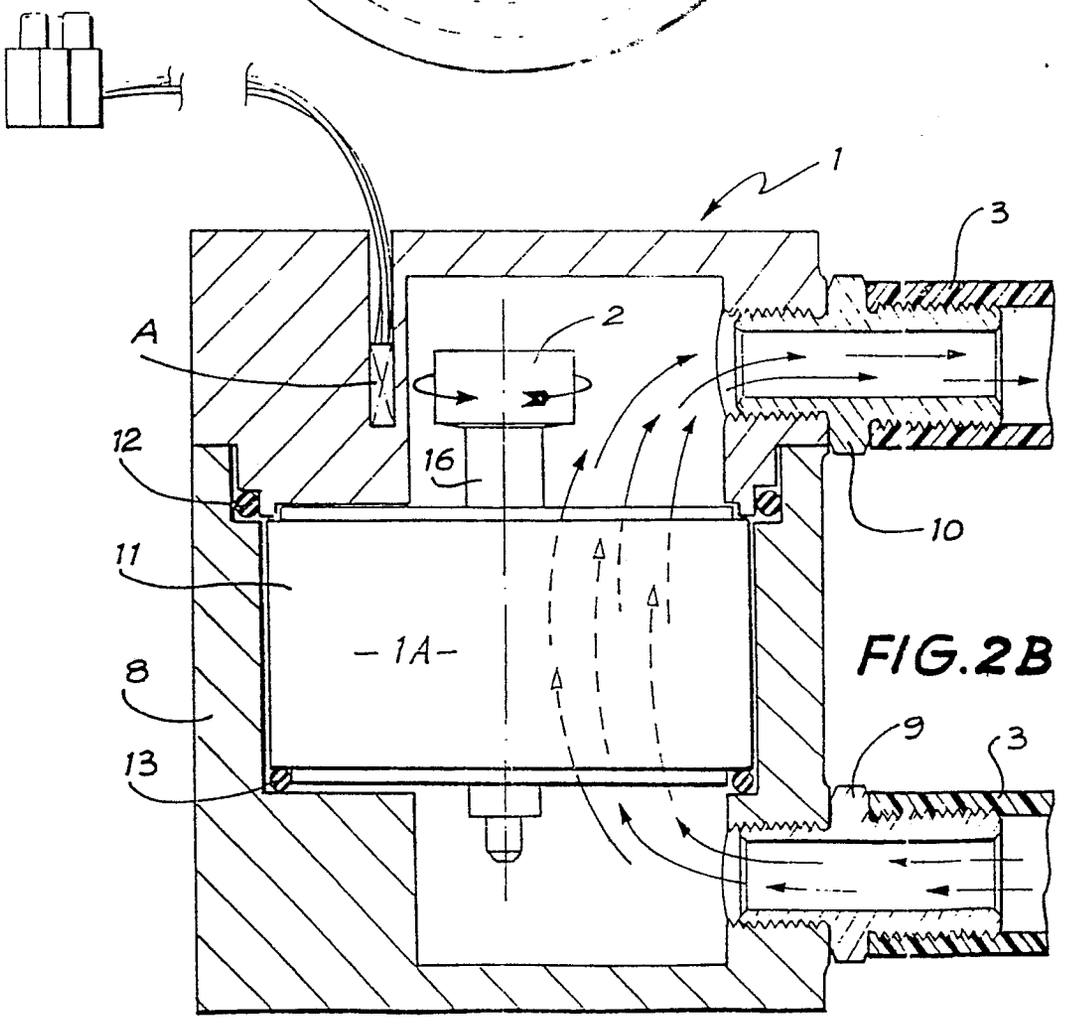


FIG. 2B

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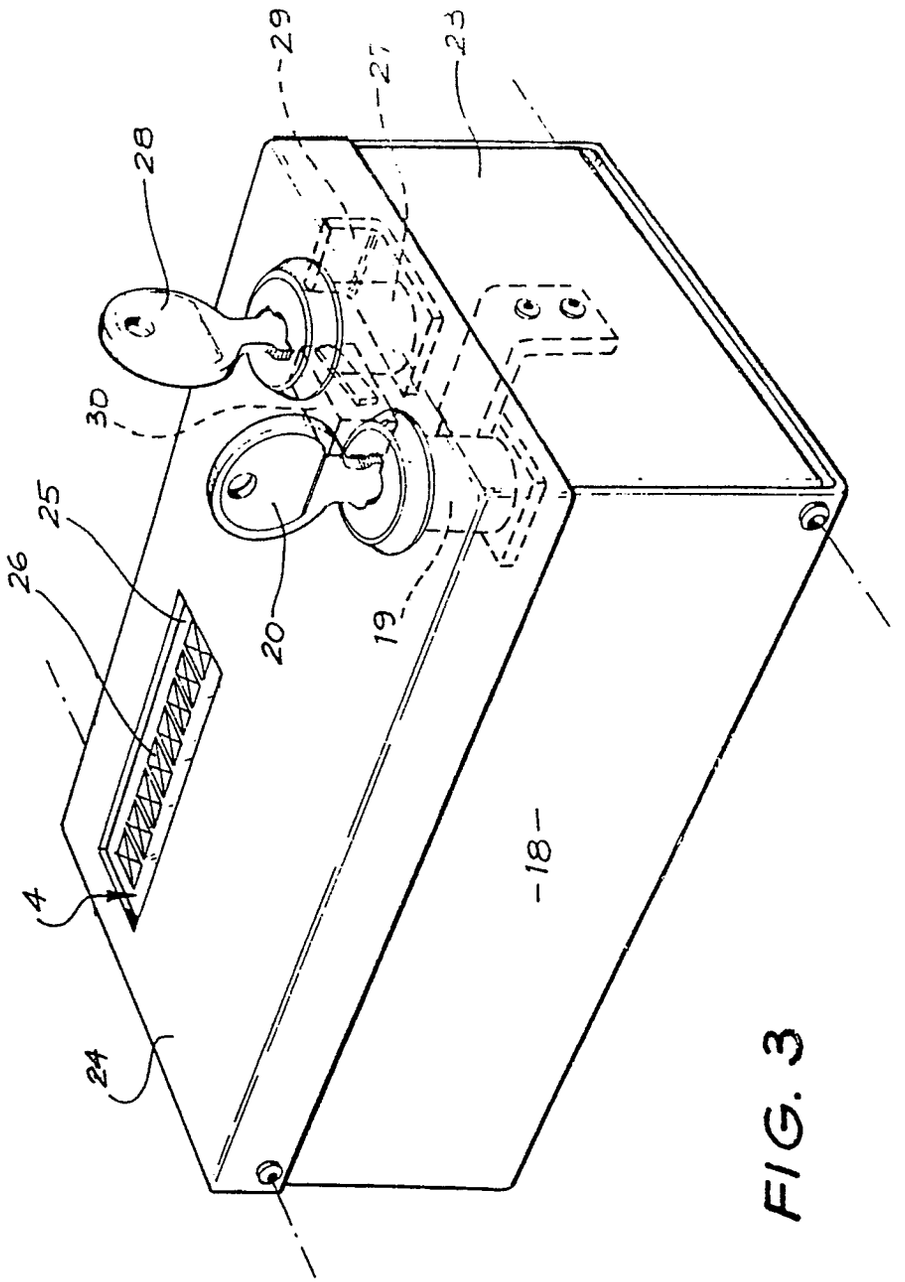

FIG. 3

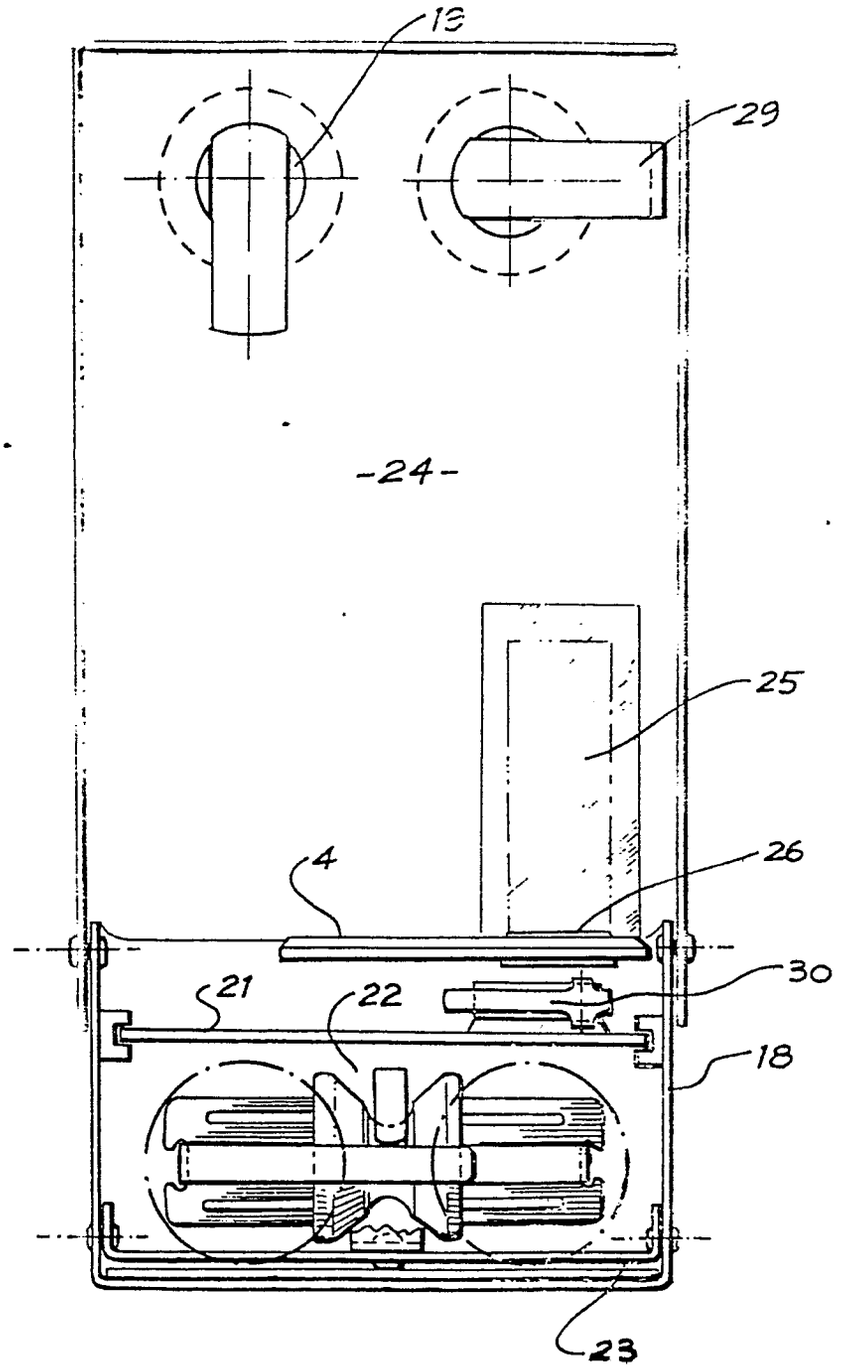

FIG. 4

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EUROPEAN SEARCH REPORT

0013134
Application number

EP 79 30 2974

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	FR - A - 2 282 401 (I. DEKAN) * Figure 5; page 6, lines 2-13 *	1,4,10
	DE - A - 2 230 836 (I. DEKAN * Page 2, lines 12-24 *	1,10
	US - A - 3 857 282 (R.B. DOORLEY et al.) * Figure 4 *	4,9
	US - A - 3 429 182 (W.A. WEMYSS) * Figures 1,6 *	4,9

CLASSIFICATION OF THE APPLICATION (Int Cl)

B 67 [illegible] 1/08

TECHNICAL FIELDS SEARCHED (Int Cl)

B 67 D 1/00
1/08
G 01 F 13/00
1/115

CATEGORY OF CITED DOCUMENTS

X. particularly relevant
A technological background
O: non-written disclosure
P: intermediate document
T theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L citation for other reasons

& member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21-03-1980	THIBO

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