Sept. 26, 1967 W. D. PALEY 3,343,721

DISPENSING DEVICE FOR LIQUIDS

Filed July 2, 1965

FIG. 1.

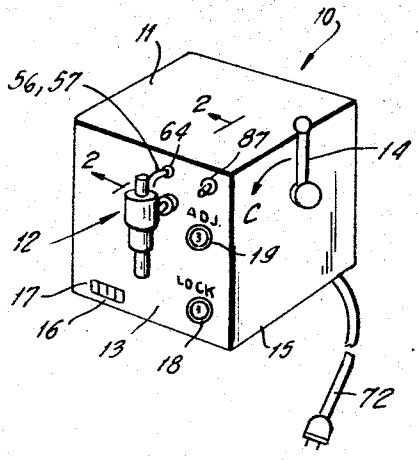


FIG. 2.

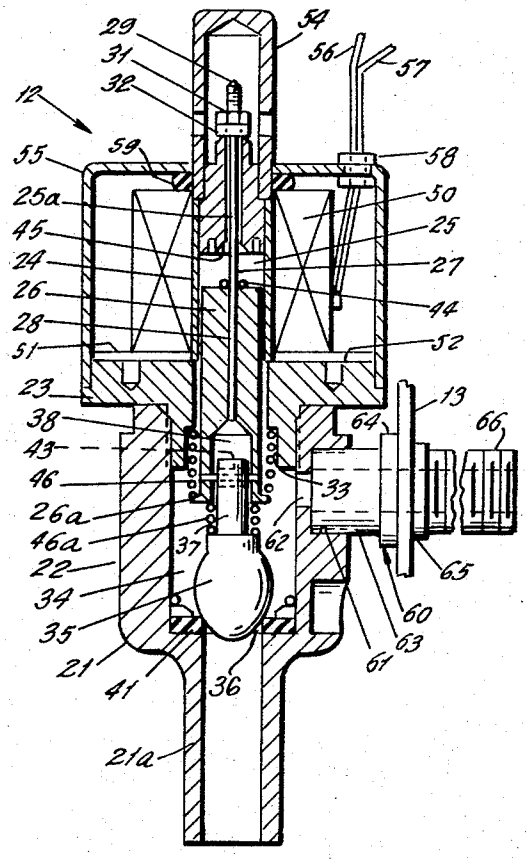
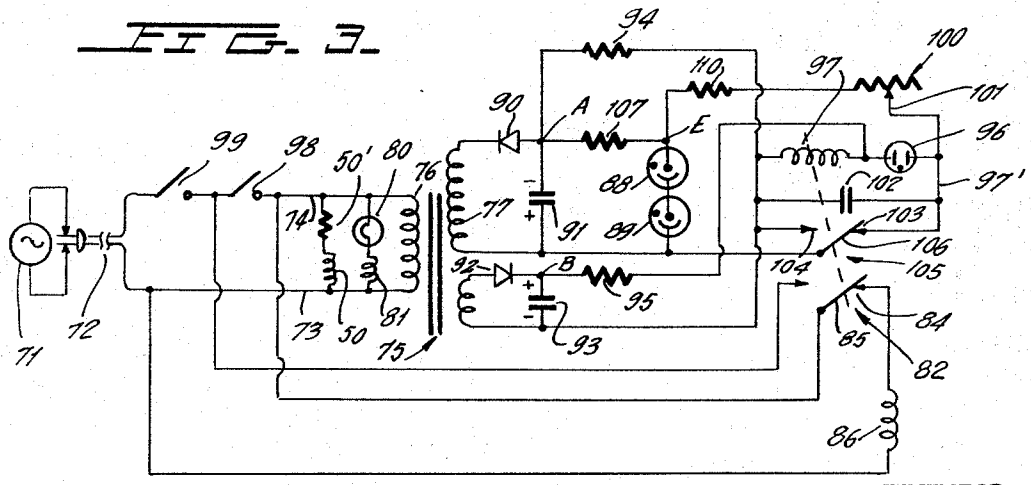


FIG. 3.



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DISPENSING DEVICE FOR LIQUIDS

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This invention relates to metering devices in general and more particularly to novel means for dispensing predetermined amounts of beer or other gas charged liquids.

Establishments which dispense draught beer are often victimized by their employees since it is difficult for management to ascertain with any degree of certainty the number of glasses of beer that can be obtained from a barrel. Because of this the employees often do not charge favored customers for all they have consumed and on other occasions the employees have been known to pocket a portion of the cash receipts. These misdeeds go undetected by management since the volume of beer in a glass may be given a deceiving appearance by controlling the head of foam.

This problem has long been recognized but efforts at a satisfactory solution in connection with dispensing draught beer have been commercially unsound in that they are either too expensive, are subject to operational difficulties and/or may readily be tampered with or fouled by the employees.

The instant invention overcomes the difficulties encountered by the prior art by providing novel means for dispensing draught beer in predetermined volumes and counting the number of predetermined volumes dispensed. At the same time, the apparatus for accomplishing this purpose is essentially tamper proof and is extremely economical.

Draught beer, prior to dispensing thereof, is maintained under controlled pressure and temperature conditions with the pressure typically in the range of from 15 to 30 p.s.i. and the temperature between 36° and 40° Fahrenheit. Recognizing this, the instant invention operates on the principle of measuring time to determine the volume dispensed.

Valves provided by the prior art for this purpose have found little difficulty in controlling the foam content of beer while the beer is flowing. However, each time flow is caused to stop there is an excessive gas buildup in the valve chamber serving to invalidate time-flow measuring concepts during the initial interval when flow is resumed.

In order to overcome the disadvantages of this phenomenon, the device of the instant invention provides novel means for controlling venting of the gas each time the valve is operated prior to opening of the main valve member. More particularly, in the device of the instant invention the valve is solenoid operated and includes a stem secured to the movable core of the solenoid. When the solenoid is energized initial movement of the stem opens a port to vent the gas formed in the valve chamber behind the main port closing member. By the time the accumulated gas has been vented the main member leaves its seat and liquid flow takes place with this flow continuing for a predetermined interval of time. The time interval during which the solenoid is energized is controlled by a novel electronic circuit actuated by the momentary closing of a manually operated mercury switch. The circuit is such that for each measured interval of time a mechanism is actuated to maintain a count on the number of volumes dispensed. A simple potentiometer adjustment determines the length of the predetermined interval during which beer is dispensed.

The unit is tamper proof in that the solenoid control circuit is provided with a key operated master switch which must be On before the manually operated switch under the control of the bartender will be effective to dispense beer.

In addition, the potentiometer setting the flow interval is accessible only after removal of a key operated cover.

As will hereinafter be shown, even though the unit is tamper proof with respect to dispensing beer, the valve is readily dismantled for cleaning thereof.

Accordingly, a primary object of the instant invention is to provide novel means for dispensing controlled volumes of gas charged liquids.

Another object is to provide a device of this type having novel valve means which enables accumulated gases to be vented prior to liquid flow.

Still another object is to provide a valve means of this type which is electrically operated.

A further object is to provide a dispensing device of this type having a novel electronic timing unit.

A still further object is to provide a dispensing device of this type which is tamper proof and at the same time permits the ready dismantling of the valve to permit cleaning thereof.

These as well as other objects of this invention will become readily apparent after reading the following description of the accompanying drawings in which:

FIGURE 1 is a perspective of a dispensing unit constructed in accordance with the teachings of the instant invention.

FIGURE 2 is a cross-section taken through line 2—2 of FIGURE 1 looking in the direction of arrows 2—2 showing the internal construction of the valve means. Since the valve means elements are, for the most part, of circular cross-section formed about an axis through which line 2—2 extends, additional sectional views are not provided, it being deemed that the single cross-section of FIGURE 2 and the following description thereof is a full and complete disclosure of the valve means structure.

FIGURE 3 is a schematic showing the electrical connections between the elements of the dispensing unit of FIGURE 1.

Now referring to the figures. Dispensing unit **10** includes rectangular sided housing **11** having valve means **12** mounted to front surface **13**, manually operable handle **14** mounted to side surface **15** and essentially all of the electrical components shown in FIGURE 3 disposed within housing **11**. Front surface **13** is provided with a rectangular opening **16** having a transparent covering through which the dials of counter mechanism **17** are viewable. Key operated lock **18**, for the control of master switch **99** (FIGURE 3), is located on front surface **13** while removable and lockable key plug **19** is also located on front surface **13**.

Valve means **12**, as best seen in FIGURE 2, includes hollow body **21** formed of lower section **22** and upper section **23** threadably joined to one another so as to be separable for purposes of cleaning valve means **12**. Upper body section **23** includes upwardly projecting hollow stem **24** having a central bore with the lower portion **25** of this bore being considerably larger than upper portion **25***a* thereof. Disposed within lower bore portion **25** is solenoid armature **26** of elongated cylindrical shape. Relatively small diameter rod **27**, force fitted in bore **28** positioned at the central axis of armature **26**, projects upwardly from the upper end of armature **26**. Threaded portion **29** at the upper end of rod **27** projects above the upper end of stem **24** and threadably mounts adjusting nut **31**. Resilient washer **32** is mounted to rod **27** being interposed between adjusting nut **31** and the upper end of armature **26**.

With armature **26** in its downward position as shown, washer **32** is seated on the upper surface of stem **24** to seal off the upper exit port **33** of valve chamber **34** from the atmosphere. The lower end of armature bore **28** is enlarged at **38** and accommodates the rod portion **37** extending upwardly from the closure member **35** for lower

exit port 36 of valve chamber 34. Washer 31, disposed within chamber 34, surrounds the mouth of exit 36 and provides a seat for member 35. Cylindrical hollow elongated downward extension 21*a* of lower housing section 21 constitutes a spout extending from lower exit port 36.

Pin 42, positioned transverse to the axis of armature 26, is fixedly secured to armature 26 and extends through lower bore section 38 as well as through transverse aperture 43 of rod 37. Aperture 43 is of considerably larger diameter than the diameter of pin 42 thereby providing a lost motion connection between member 35 and armature 26. That is, initial upward movement of armature 26 from the position of FIGURE 2 does not cause movement of member 35 with movement of member 35 being delayed until pin 42 engages the upper boundary of aperture 43.

Mounted to the upper end of armature 26 and surrounding rod 27 is resilient washer 44. Upon upward movement of armature 26 washer 44 engages inclined seat 45 surrounding the entrance to reduced bore section 25*a* of stem 24 to close off the upper exit port 33 of chamber 34 from atmosphere.

Coiled compression spring 46 surrounds the bottom portion of armature 26 with one end bearing against flange 26*a* at the bottom of armature 26 and the upper end bearing against an interior shoulder of upper body section 23. This shoulder is in a surface defining an aperture constituting the lower extension of stem bore 25, 25*a*. Coiled compression spring 46*a* is mounted to rod 37 and bears against armature 26 and member 35, biasing the latter downward. Spring 46*a* is of much lower strength than spring 46 and for some constructions spring 46*a* may be omitted and gravity relied upon to bias member 35 downward with respect to armature 26. Solenoid operating coil 50 surrounds the lower portion of stem 24 and rests upon magnetic plate 51. The latter is seated upon the horizontal upper surface 52 of upper body section 23. The lower end of stem 24 is fixedly secured to surface 52 by brazing.

Vented cylindrical cap 54, covering the top of stem 24, extends through a central aperture in the upper wall of coil cap 55 with the latter being seated upon a step at the periphery of surface 52. Caps 54 and 55 are held in place either by gravity, friction and/or any other suitable means (not shown) which will permit their ready removal. Electrical leads 56, 57, connected to opposite ends of coil 50, extend through grommet 58 surrounding an aperture in the upper wall of cap 50. Resilient washer 59 is interposed between the upper end of coil 50 and the inner surface of cap 55 to stabilize coil 50 against undue vibration.

Fitting 60 extends into depression 61 in the outer surface of the lower housing section 26 with depression 61 being positioned to the rear of entrance port 62 to valve chamber 34. Brazing bead 63 provides a rigid fluid tight connection between fitting 60 and lower housing section 22. Radial shoulder 64 of fitting 60 abuts the front surface of housing 11 to position valve means 12 while nut 65 mounted to the threaded rear portion of fitting 60 abuts the inner surface of the housing front wall to secure valve means 12 in place. Suitable keying means (not shown) fixes the angular position of fitting 60 relative to housing 11. The rear threaded section 66 of fitting 60 extends entirely through housing 11 emerging at the rear thereof for connection to a supply of gas charged liquid. The axial bore of fitting 60 provides a conduit for conducting liquid into chamber 34 through entrance port 36.

In operation, the energization of solenoid coil 50 is effective to cause upward movement of armature 26 from the position shown in FIGURE 2 to a position in which washer 44 engages seat 45. During the initial portion of this movement washer 31 is lifted from the upper end of stem 24 thereby opening the upper exit port and permitting free gas accumulated in chamber 34 to be vented. Continued upward movement of armature 26 raises member 36 from seating washer 41 thereby opening the lower exit port 36 permitting gas charged liquid to flow from chamber 34 through spout 21*a* with this flow continuing until such time as member 35 is again seated on washer 41.

At the upper limit of movement for armature 26, washer 44 engages seat 45 and upper exit port 33 is closed thereby preventing liquid from emerging through upper exit port 33. In a manner to be described, under ordinary circumstances solenoid coil 50 will remain energized for a predetermined interval of time during which a measured amount of liquid will flow from spout 21*a*.

Now referring more particularly to FIGURE 3. Dispensing unit 10 is connected to 110 volt. A.C. source 71 through line cord 72 one side of which is connected directly to line 73 and the other side connected through normally open master switch 99 and series connected normally open pour switch 98 to line 74. Pour switch 98 is a single pole mercury device operated by external handle 14. Solenoid coil 50 and resistor 50′ form a series circuit connected in parallel with the primary winding 76 of transformer 75 with this parallel combination being connected between lines 73 and 74. Also connected between lines 73 and 74 is a series combination of lamp 80 and current limiting resistor 81. Lamp 80 provides continuous illumination for voltage regulator tubes 88, 89 so that operation thereof is not adversely affected by the dark current effect.

Coil 97 is the operating means for a double pole double throw relay having switching sections 82, 105. Movable contact arm 85 of relay section 82 is connected directly to line 74 while one contact 83 of relay section 82 is connected to the junction of switches 98 and 99 and the other contact 84 of section 82 is connected to one end of coil 86 whose other end is connected directly to line 73. Coil 86 is the operating means for counter 17 which is of a construction type well known to the art including a pawl and ratchet means (not shown) stepping a group of coordinated number wheels.

Transformer 75 is provided with two secondary windings 77, 78. Winding 77 feeds the half wave rectifier consisting of diode 90 and filter condenser 91 to produce approximately minus 300 volts at point A. The other winding 78 feeds the half wave rectifier consisting of diode 92 and filter condenser 93 to produce approximately plus 150 volts at point B. The negative side of condenser 93 is connected through resistor 94 to point A while point B is connected through current limiting resistor 95 to the junction between glow diode 96 and relay coil 97. The other end of coil 97 is connected to the junction between resistor 94 and condenser 93 while the other end of glow diode 96 is connected to line 97′ joining the adjustable arm 101 of potentiometer 100 with one end of condenser 102 and contact 103 of relay section 105. The other end of condenser 102 and the other contact 104 of relay section 105 are connected directly to the juncture between resistor 94 and condenser 93 while movable arm 106 of relay 105 is connected to the positive side of condenser 91. A series circuit extends from point A through resistor 107 and voltage regulator tubes 88, 89 to the positive side of condenser 91. The resistance portion of potentiometer 100 is connected through resistor 110 to the juncture between resistor 107 and voltage regulator tube 88.

Operation of the circuitry shown in FIGURE 3 takes place in the following manner. Key operated lock 18 is moved to a position which closes master switch 99. Thereafter handle 14 is moved forward (direction of arrow C in FIGURE 1) toward a horizontal position thereby closing pour switch 98. This energizes solenoid 50 and valve means 12 is operated in the manner previously described. At the same time counter coil 86 is energized to advance the dial of counter 17 one pouring indication. Energization of transformer primary 76 causes condenser 102 to charge toward 350 volts through resistor 94, contact 103 and arm 106. After approximately 75 milliseconds the potential across trigger diode 96 reaches its firing point of

125 volts. Diode **96** now provides a low impedance path for discharge of condenser **102** through relay coil **97** thereby providing sufficient energy to operate arms **106** and **85** to the left. Thereafter the 150 volts appearing at point B and applied through resistor **95**, is sufficient to latch, or hold, arms **85** and **106** in engagement with contacts **83** and **104**, respectively.

Engagement of contact **83** and arm **85** shorts pour switch **98** so that after coil **97** operates relay sections **82**, **105**. The opening of switch **98** will not deenergize coil **50** until the pouring operation is complete. With contact **104** and arm **106** engaged, the charging path for condenser **102** is of reversed polarity extending through potentiometer **100**, resistor **110**, contact **104** and arm **106** so that condenser **102** now charges toward the regulated voltage of approximately 260 volts appearing at point E. After a selected time interval the potential across trigger diode **96** reaches its firing point of 125 volts. Substantially instantaneously a low impedance discharge path is provided for condenser **102** through relay coil **97**. This discharge energy supplied by condenser **102** is opposite in polarity to the holding energy supplied by condenser **93** and is of sufficient magnitude to overcome the latching voltage for relay coil **97** thereby permitting biasing means (not shown) to return contact arms **85** and **106** to their positions shown in FIGURE 3 at essentially the instant trigger diode **93** breaks down.

The time interval between the closing of pour switch **98** and the separation of arm **85** from contact **83** may be accurately adjusted by means of potentiometer **100**. For a typical construction an interval of 3.5 seconds is required to fill a seven ounce oval glass typically used at neighborhood bars. It is noted that potentiometer adjusting arm **101** is accessible only after removal of lockable plug **19** and that valve means **12** is entirely inoperable unless lock **18** is operated to close master switch **99**.

For continuous pouring, handle **14** is maintained in its forward position thereby keeping switch **98** closed. However, each time the discharge of condenser **102** brings about a deenergization of relay coil **97** with switch **98** closed, contact arm **85** in engaging contact **84** closes the energizing circuit for counter coil **86** and the counter **17** is advanced to indicate that a predetermined volume of liquid has been poured.

Typical parameters for the circuit elements of FIGURE 2 are listed below.

Resistors

50'	ohms	50
81	do	250,000
94	do	330,000
95	do	135,000
100	megohms	5
107	ohms	250,000
110	megohm	1

Condensers

91	0.25 mfd. 400 v.
93	0.47 mfd. 200 v.
102	1.0 mfd. 150 v.

Relays, voltage regulators, etc.

80	Pilot neon Type NE–2.
88	Glow diode, VR, breakdown at 130 v.
89	Glow diode, VR, breakdown at 130 v.
96	Glow diode, trigger, breakdown at 125 v.
97	Relay, DPDT, 5000 ohm coil, pull in at 22 v.; drop out at 4 v.

Thus, this invention provides a novel, inexpensive and reliable means for dispensing predetermined amounts of gas charged liquids. The construction is such that installation in an existing system is extremely simple and the unit is essentially tamper proof. Further, the valve means may readily be dismantled for cleaning thereof.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosure herein, but only by the appended claims.

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

1. A valve means comprising a hollow body defining a chamber having an entrance, a first exit and a second exit, a solenoid including an operating coil and an armature movable in response to energization of said coil; said entrance being continuously open to said chamber; so long as said first exit is open, said chamber providing a direct open passage between said entrance and said first exit to the exterior of said valve means; first and second means secured to said armature for operation thereby; biasing means normally maintaining said first exit closed by said first means and normally maintaining said second exit closed by said second means; energization of said coil being effective to move said armature through a stroke during which said first and second means operate in sequence to open said second exit, then open said first exit while said second exit remains open and thereafter close said second exit while said first exit remains open.

2. A valve means as set forth in claim **1** in which there is a lost motion connection between said first means and said armature.

3. A valve means as set forth in claim **2** in which said biasing means urges said armature downward and said armature moves upward during said stroke.

4. A valve means set forth in claim **3** in which the first exit is positioned below said second exit.

5. A valve means as set forth in claim **3** in which the body includes a lower section and an upper section separable from said lower section; said upper section including a vertical stem having an axial passage for guiding movement of said armature.

6. A valve means as set forth in claim **5** in which said coil surrounds said stem; said stem including said second exit wtih the latter positioned at a point above said coil.

7. A valve means as set forth in claim **6** in which there is a clearance space between said armature and the boundaries of said axial passage; said space constituting a gas passage connecting said chamber and said second exit.

8. A valve mean as set forth in claim **7** in which said biasing means includes a coiled compression spring surrounding a portion of said armature and bearing against said armature and said upper section.

9. A valve means as set forth in claim **8** in which there is a spout leading from said first exit.

10. Apparatus for dispensing gas charged liquids including a valve means comprising a hollow body defining a chamber having an entrance, a first exit and a second exit; conduit means extending from said entrance for connecting said apparatus to a supply of gas charged liquid; a solenoid including an operating coil and an armature movable in response to energization of said coil; first and second means secured to said armature for operation thereby; biasing means normally maintaining said first exit closed by said first means and normally maintaining said second exit closed by said second means; energization of said coil being effective to move said armature through a stroke during which said first and second means operate in sequence to open said second exit and then open said first exit; said conduit means providing a passage in communication with said chamber through said entrance while said coil is energized; said first exit po-

sitioned below said second exit; and a device including a switch means and a timing means connected to said switch means for operation thereof; said switch means connected in an energizing circuit for said solenoid; said switch means when in said first position normally completing said circuit and when in a second position interrupting said circuit; said timing means automatically interrupting said circuit a predetermined interval of time after said switch means is operated to said first position and then back to said second position within said interval.

11. Apparatus as set forth in claim **12** in which the timing means includes an adjustable element for selecting the length of said predetermined interval.

12. Apparatus as set forth in claim **11** also including a housing; said timing means, including said element, mounted within said housing; said valve means mounted to said housing and positioned externally thereof; manually operated handle for operating said switch means, said handle mounted externally of said housing; and lockable means for preventing unauthorized personnel from adjusting said element.

13. Apparatus as set forth in claim **12** further including a master switch connected in said circuit, said lockable means also preventing unauthorized personnel from operating said master switch.

14. A timing means including a condenser, a first and a second charging circuit for said condenser, energizing means for said charging circuits, a relay unit including contact means operable from a first to a second position and biasing means urging said contact means to said first position; said contact means when in said first position connecting said first charging circuit to said condenser for applying a charge of a first polarity to the latter; said contact means when in said second position connecting said second charging circuit to said condenser for applying a charge of reverse polarity to the latter; said relay means including an operating coil, an electronic breakdown device connected in circuit with said coil and forming a discharge path for said condenser, with said relay means in said first position and said condenser having attained a charge sufficient to cause breakdown of said device a current component flows through said coil in sufficient magnitude to operate said contact means to said second position, a source of holding energy connected in circuit with said coil, said holding energy applied to said coil being of the same polarity as energy supplied to said coil by said condenser when the latter is charged to said first polarity, with said contact means in said second position and said condenser having attained a charge of sufficient polarity to cause breakdown of said device, said condenser discharging through said coil to overcome said holding energy and permit said biasing means to return said contact means to said first position.

15. A timing means as set forth in claim **14** in which the holding energy is of insufficient magnitude to operate said contact means to said second position but being of sufficient magnitude in the absence of discharge from said condenser when said contact means is in said second position.

16. A timing means as set forth in claim **14** in which said second circuit includes an adjustable impedance element, voltage regulating means connecting said second circuit to said energizing means so that a regulated voltage is applied to said condenser when said contact means is in said second position.

17. A timing means as set forth in claim **14** including

an actuating circuit for said energizing means; said actuating circuit including a manually operable switch; said contact means including a section shorting said switch when said contact means is in said second position.

18. A timing means as set forth in claim **17** in combination with a counting device; said contact means including a section operable to energize said counting means when said contact means is in said first position and said switch is closed.

19. The combination of a timing means and counting device as set forth in claim **18** in which the holding energy is of insufficient magnitude to operate said contact means to said second position but being of sufficient magnitude in the absence of discharge from said condenser when said contact means is in said second position; said second circuit including an adjustable impedance element, voltage regulating means connecting said second circuit to said energizing means so that a regulated voltage is applied to said condenser when said contact means is in said second position.

20. A valve means comprising a hollow body defining a chamber having an entrance, a first exit and a second exit, a solenoid including an operating coil and an armature movable in response to energization of said coil; first and second means secured to said armature for operation thereby; biasing means normally maintaining said first exit closed by said first means and normally maintaining said second exit closed by said second means; energization of said coil being effective to move said armature through a stroke during which said first and second means operate in sequence to open said second exit, then open said first exit while said second exit remains open and thereafter close said second exit while said first exit remains open; said timing means including an adjustable element for selecting the length of said predetermined interval; a housing; said timing means, including said element, mounted within said housing; said valve means mounted to said housing and positioned externally thereof; manually operated handle for operating said switch means, said handle mounted externally of said housing; and lockable means for preventing unauthorized personnel from adjusting said element; a master switch connected in said circuit, said lockable means also preventing unauthorized personnel from operating said master switch; said lockable means including a first and a second part; a key operated switch constituted by said master switch and said first part, said element including an electrical impedance unit having an adjusting portion, said housing having an operable portion lockable in place by said second part of said lockable means, said adjusting portion positioned so as to operable only when said operable portion is opened.

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