

Aug. 6, 1968

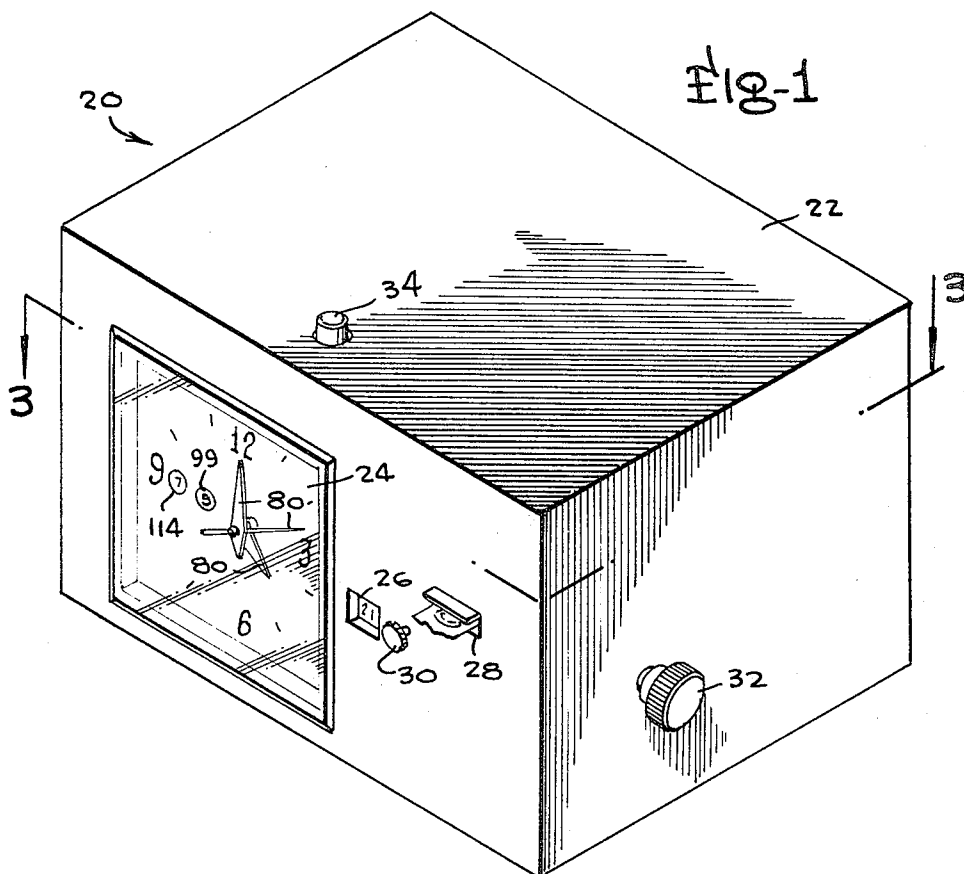
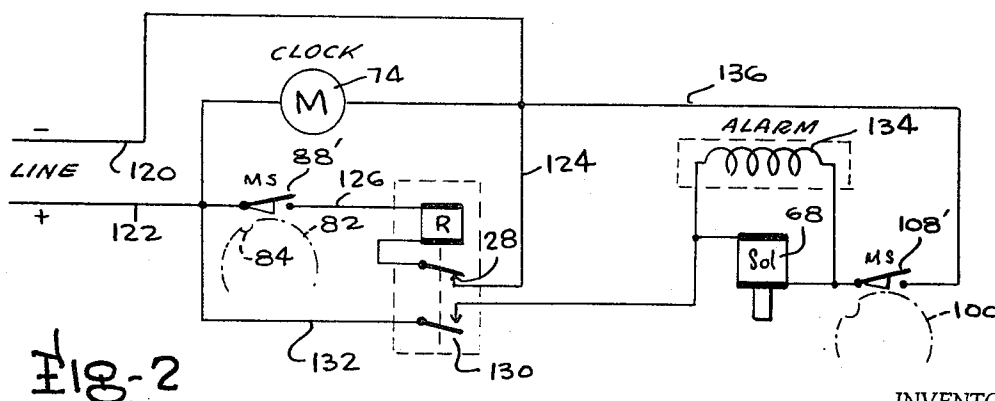
D. M. COGDELL ET AL

3,395,829

MEDICATION DISPENSING MEANS

Filed July 3, 1967

4 Sheets-Sheet 1



INVENTORS
 WILLIAM F. Mc CLURE,
 DAVID M. COGDELL &
 JOSEPH W. BAGGETT
 BY
 Mason, Fenwick & Lawrence
 ATTORNEYS

Aug. 6, 1968

D. M. COGDELL ET AL

3,395,829

MEDICATION DISPENSING MEANS

Filed July 3, 1967

4 Sheets-Sheet 2

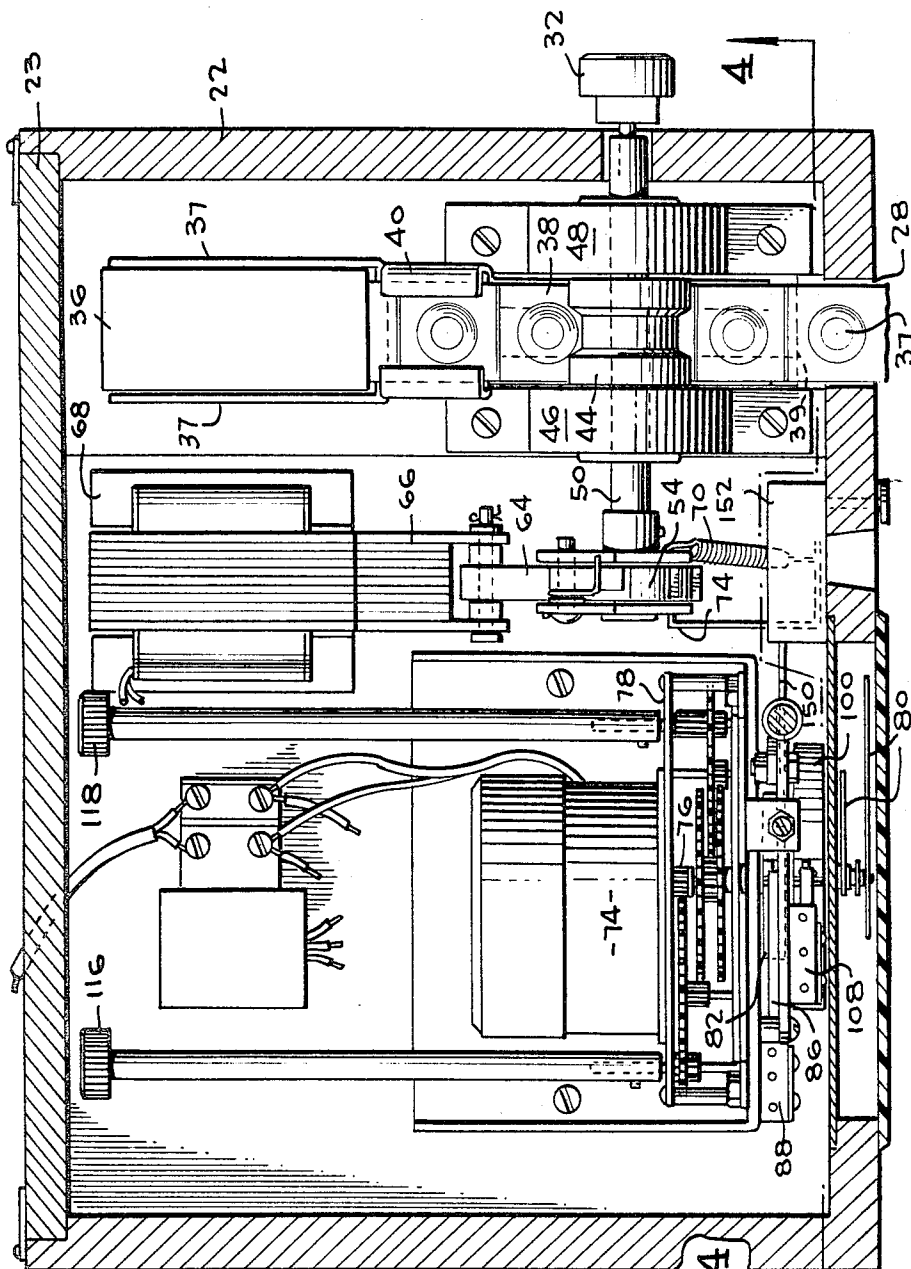


Fig-3

INVENTORS

WILLIAM F. McCLURE,
DAVID M. COGDELL &
JOSEPH W. BAGGETT

BY

Mason, Fenwick & Lawrence
ATTORNEYS

Aug. 6, 1968

D. M. COGDELL ET AL

3,395,829

MEDICATION DISPENSING MEANS

Filed July 3, 1967

4 Sheets-Sheet 3

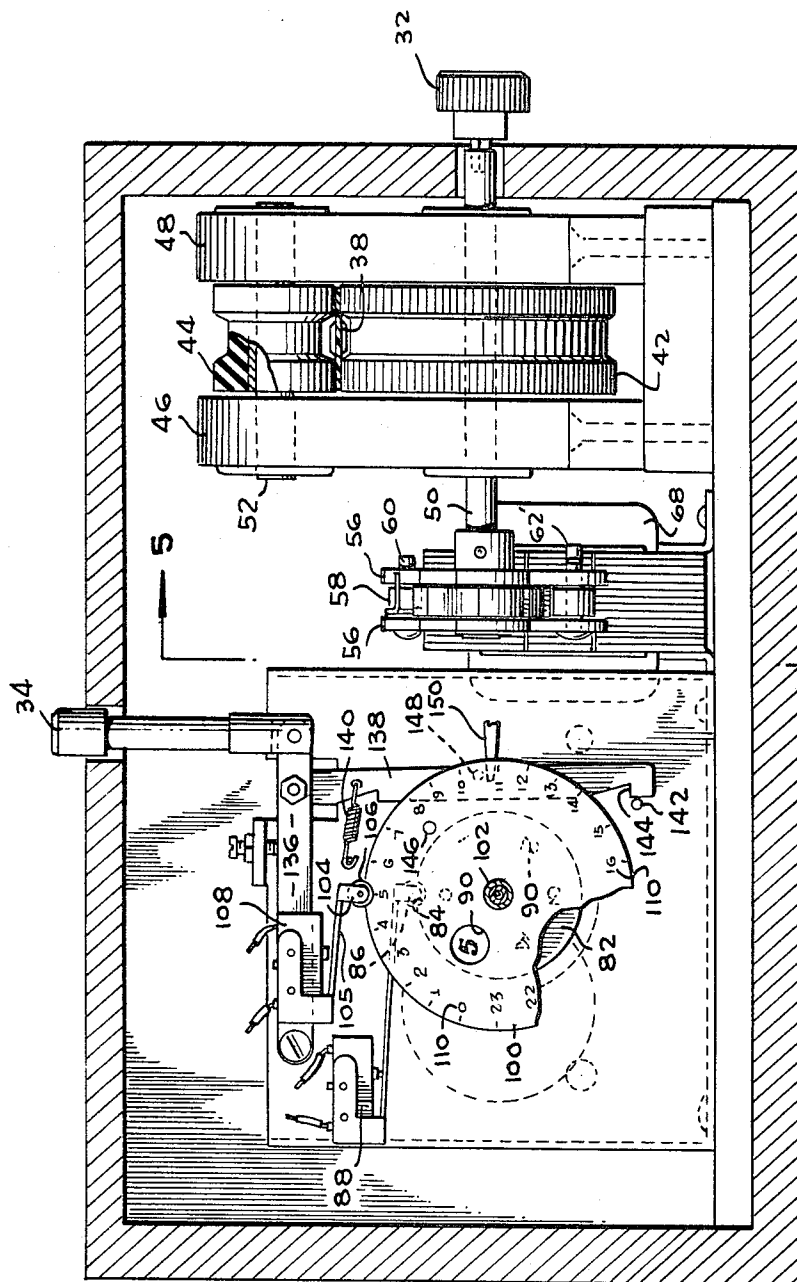


Fig. 4

INVENTORS

WILLIAM F. MCCLURE,
DAVID M. COGDELL &
JOSEPH W. BAGGETT

BY
Mason, Fenwick & Lawrence
ATTORNEYS

Aug. 6, 1968

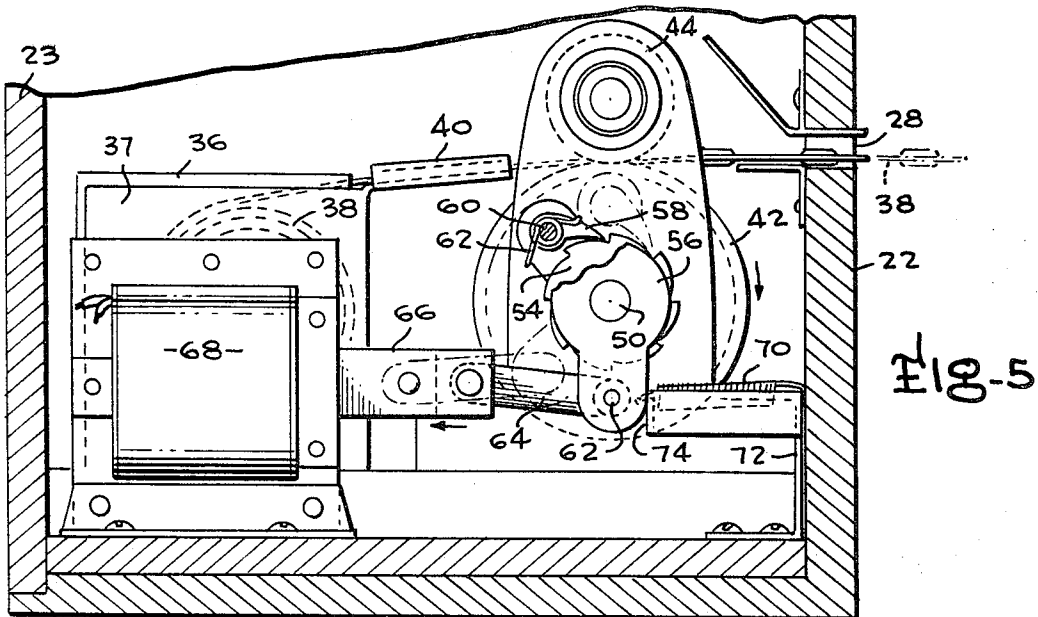
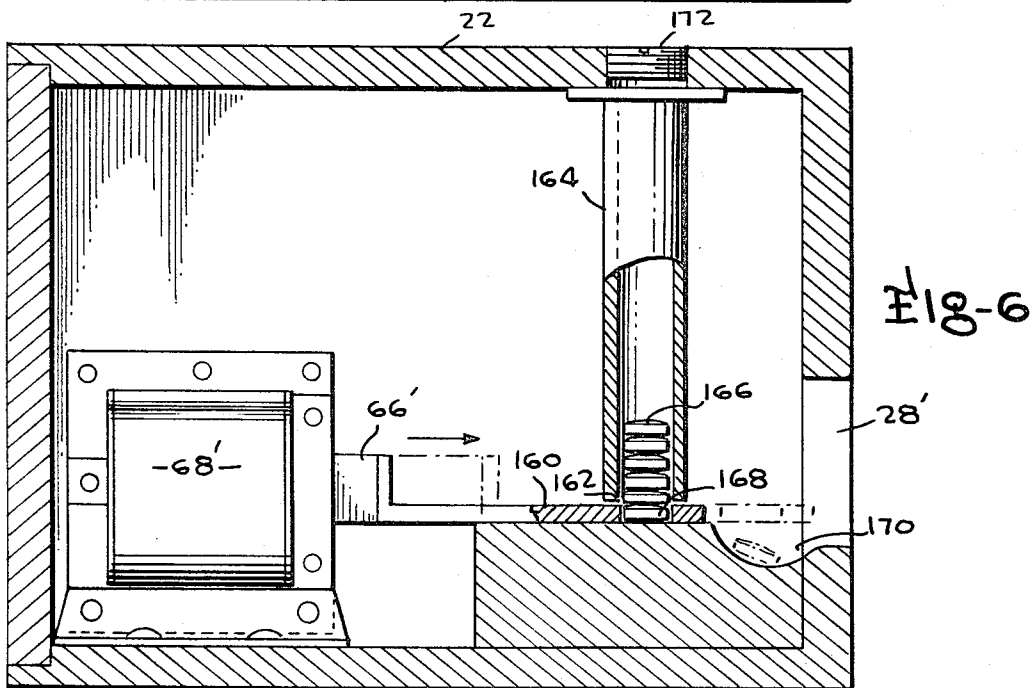
D. M. COGDELL ET AL

3,395,829

MEDICATION DISPENSING MEANS

Filed July 3, 1967

4 Sheets-Sheet 4



INVENTORS
WILLIAM F. McCLURE,
DAVID M. COGDELL &
JOSEPH W. BAGGETT
BY
Mason, Fenwick & Lawrence
ATTORNEYS

1

3,395,829

MEDICATION DISPENSING MEANS

David M. Cogdell, 2827 Skye Drive, Fayetteville, N.C. 28303, William F. McClure, Raleigh, N.C., and Joseph W. Baggett, 365 Valley Road, Fayetteville, N.C. 28305; said McClure assignor of eleven and two-thirds percent to said Cogdell and eleven and two-thirds percent to said Baggett

Filed July 3, 1967, Ser. No. 650,731

10 Claims. (Cl. 221-15)

ABSTRACT OF THE DISCLOSURE

A pill dispensing device having a clock driven cam actuated microswitch for actuating a control relay after passage of an initial time period of substantial duration to partially close an electrical circuit for enabling other clock driven cam actuated switch means to actuate a second relay at periodic intervals of fairly short duration to consequently actuate pill dispensing means for dispensing pills from the device.

Background of the invention

This invention relates to the field of dispensing, and more particularly, to the field of dispensing capsules or tablets at desired time intervals.

Numerous devices have been provided for the purpose of dispensing discreet articles at desired time intervals. Examples of such devices are found in U.S. Patents No. 985,125, for dispensing index cards, 2,941,536 for dispensing coins and 2,953,280 for dispensing cigarettes. Many other dispensing devices for dispensing a wide variety of objects have also been provided by the prior art; however, the prior art devices, while generally satisfactory for their intended purpose, have not been satisfactory for automatically initiating the dispensing of items after the passage of a time period of considerable duration and continuing to dispense the items cyclically at time intervals of much smaller duration.

More specifically, one of the great problems facing physicians is their inability to insure that patients will take a required proper dosage of medicine at regular prescribed time intervals. Failure to take the required dosage at the required time intervals greatly diminishes the effectiveness of medication and often completely eliminates medicinal effectiveness. Consequently, it is of grave importance that medication be taken in the required dosage at the required time in order that its desired benefits may be achieved.

While the need for correct dosage at the prescribed time is extremely important with all medications, it is all the more important in the case of contraceptive pills. This is true because failure to take the pills regularly may result in unplanned ovulation and consequently placing the woman in danger of pregnancy if other factors are present. Secondly, failure to take the pills at the regularly prescribed intervals can result in an irregular menstrual cycle which is undesirable for a number of reasons. Therefore, it is of paramount importance that contraceptive pills be taken at the prescribed time and in the prescribed dosage in order that they may be effective for their intended purpose.

Since contraceptive pills are not taken every day of the woman's cycle, a simple dispensing means for dispensing a pill at a given time every day would not be satisfactory for dispensing such contraceptive pills. It is the normal practice for the first pill to be taken approximately five days after the beginning of the menstrual cycle. A single pill is taken every day thereafter. None of the prior art devices have provided means which will

2

satisfactorily dispense pills beginning on the fifth day as required when dispensing contraceptive pills.

Summary of the invention

Therefore, it is a primary object of this invention to provide a new and unobvious dispensing means for dispensing medication.

Yet another object of this invention is the provision of a new and unobvious medication dispensing means which does not begin dispensing until a considerable time period has elapsed after the initial setting of the device but which proceeds to dispense items at shorter time intervals of much less duration after the dispensing cycle has begun.

The foregoing objects are achieved by the provision of a solenoid actuated dispensing means which, when actuated, dispenses a single pill or capsule. An electric clock drive system is provided for driving a plurality of cams for actuating microswitches forming a part of the control circuit for the dispensing solenoid. The control circuit for the solenoid includes two series connected switches; consequently, before the solenoid can be actuated, it is necessary that both switches be closed. One of the switches is actuated by a latched relay controlled by a clock driven cam operated microswitch. Closure of the cam operated microswitch causes the relay to be actuated to close one of the series connected switches in the dispensing solenoid circuit. This contact is closed after the elapse of a considerable time period after the initial setting of the device, such as, for example, five days in the case of contraceptives. The microswitch in the dispensing solenoid circuit is actuated every twenty-four hours so that a pill is dispensed every twenty-four hours after the first switch has been initially closed. This result is achieved by virtue of the fact that the first switch remains closed by the latched relay which, when actuated, is not reactivated until reset. Therefore, pills will continue to be dispensed at twenty-four hour time intervals until the device is reset.

Another feature of the invention resides in the use of an attractive case enclosing the entire structure and having the clock dial mechanism easily visible for determining the time of day and for also indicating the number of dosages that have been dispensed. Alternative embodiments of the invention are provided for dispensing medication either in single pill form or in the form of a laminated strip having sanitarily packaged capsules sealed between the laminations along its length.

Description of the drawings

FIGURE 1 is a perspective view of a preferred embodiment of the invention;

FIGURE 2 is a schematic of the electrical circuit of the preferred embodiment;

FIGURE 3 is a sectional view taken along lines 3-3 of FIGURE 1;

FIGURE 4 is a sectional view taken along lines 4-4 of FIGURE 3;

FIGURE 5 is a sectional view taken along lines 5-5 of FIGURE 4; and

FIGURE 6 is a sectional view similar to FIGURE 5 but illustrating an alternative form of pill dispensing means per se.

Description of the preferred embodiment

FIGURES 1, 3, 4 and 5 illustrate the preferred embodiment of this invention which is generally designated 20 and which comprises a generally rectangular case or housing 22 enclosing the operative invention. Access to the components is provided by a removable rear panel 23. A clock dial 24 is provided on the face of housing 22 which is also provided with a counter window 26 for enabling viewing a counter indicative of the total number

of pills dispensed from the device and a pill dispensing slot 28. A counter reset knob 30 for resetting the counter to zero position at the termination of a medication cycle extends from the forward face of the housing and a manual dispenser control knob 32 extends from a side wall of the housing and a reset button 34 extends through the top wall of the housing.

Pills or capsules to be dispensed are stored in a box or retainer 36 which is maintained in position by retainer plates 37 (FIGS. 3 and 5) on the interior of housing 22. A coiled strip 38 is stored within container 36 and consists of elongated laminated plastic elements encasing discrete capsules 37 at regular intervals along its length. A line of perforations 39 is formed between each capsule to enable easy tearing of the strip to separate the capsules. Strip 38 is a conventional mode of packaging capsules or pills and forms no part of this invention. The strip passes from box 36 through a guide channel 40, between a driven feed roller 42 and an idler feed roller 44 out through dispensing slot 28 as best illustrated in FIGURE 5. First and second support brackets 46 and 48 (FIG. 4) provide support for rollers 42 and 44 which are respectively mounted on shafts 50 and 52. Driven roller 42 is keyed to its mounting shaft 50 which also has manual dispensing control knob 32 keyed to its outer end as shown in FIGURE 4. Rotation of the driven feed roller 42 causes the strip 38 to be dispensed through opening 28 in an obvious manner. Rollers 42 and 44 are preferably constructed of elastomeric material such as rubber which provides adequate frictional engagement with strip 38 to enable feeding of the strip. However, metal feed pins can be positioned about the periphery of roller 42 to provide a more positive strip engagement if desired.

Driven feed roller 42 is rotated by ratchet wheel 54 (FIG. 5) keyed to shaft 50 and a pair of oscillating pivot levers 56 one of which is on each side of ratchet wheel 54 as shown in FIGURE 4. A pawl 58 is mounted for rotation on a pivot shaft 60 extending between pivot levers 56 and is biased in a clockwise direction by a coil spring 62 so that its outer extremity always engages ratchet wheel 54. A second pivot shaft 62' extends between the lowermost portions of pivot levers 56 as shown in FIGURES 4 and 5, and has a link 64 connected thereto. The other end of link 64 is connected to the armature 66 of a dispensing solenoid 68. A coil spring 70 (FIG. 3) is also connected to pivot shaft 62 on one end and is connected to a retainer bracket 72 passing through the housing on its other end. Spring 70 causes the pivot levers 56 to be biased to their counter-clockwise position illustrated in solid lines in FIGURE 5. The extent of counter-clockwise movement possible for the pivot levers is determined by the location of an abutment 74 against which the lower legs of the pivot levers are biased by spring 70. Actuation of solenoid 68 causes armature 66 to move to the rear to pivot levers 56 to their dotted line position illustrated in FIGURE 5. Consequently, the pawl 58 engages ratchet wheel 54 to rotate the ratchet wheel through a desired angle. Since ratchet wheel 54 is keyed to shaft 50, the rotation of the ratchet wheel provides a like amount of rotation of driven feed roller 42 which causes the strip 38 to move a distance sufficient to dispense a length of strip 38 containing a capsule. The dispensed capsule is removed from the strip by tearing at the line of perforations 39. The solenoid is then de-actuated so that spring 70 causes the parts to return to their full line position of FIGURE 5.

As was noted previously, the dispensing of medication requires that such must be dispensed at precise times. Apparatus for controlling the above-discussed dispensing solenoid, etc. so that it is actuated at desired times will now be discussed in detail.

Attention is initially invited to FIGURE 3 which illustrates an electrical clock motor 74 of conventional design which has an output gear 76 driven at a constant

rotational speed. A plurality of coaxial hollow tubular output shafts are provided coaxially located with gears 76 and are rotated by the clockwork gears mounted in frame 78 to give the desired output shaft rotation speed in accordance with the desired characteristics of the particular elements driven by the particular shafts. For example, three of the coaxial shafts respectively mount the three hands 80 of the clock. The gearing connected to the respective shafts is selected so that the hands rotate in a desired proper speed to always indicate the correct time. A pre-cycling timing cam 82 is mounted on a shaft that is driven at an extremely slow rate of speed through conventional clockwork friction drive means so that it requires five days for each complete revolution. A detent 84, see FIGURE 4, is provided on the circumference of pre-cycling cam 82 and a cam follower rider 86 extending from a micro-switch 88 is biased against the outer periphery of pre-cycling cam 82 at all times. When detent 84 arrives at the twelve o'clock position adjacent follower 86, follower 86 drops into the detent and closes the contacts 88' (FIG. 2) in switch 88. A plurality of indicia 90 are provided on the front face of cam 82 and are positioned so that when they are viewable through a window 99 in casing 22, the particular indicia in view shows the number of days before detent 84 will be positioned to actuate switch 88.

A dispensing cam 100 is mounted on tubular shaft 102 for rotation at a much faster rate than the shaft mounting precycling cam 84. For example, cam 100 would normally be rotated one revolution each twenty-four hours. A detent 104 is provided in the periphery of cam 100 and a spring plate switch actuator 105 of a microswitch 108 supports a follower 106 which rides on the outer periphery of cam 100 to eventually drop into detent 104. Cam 100 is provided on its front face with a plurality of indicia 110 which pass behind a second window 114 in the clock face (FIG. 1). When any particular indicia 110 is behind window 114, the particular indicia indicates the number of hours remaining before detent 104 will be positioned in engagement with follower 106 to close the contacts 108' (FIG. 2) of switch 108. Since dispensing cam 100 is located between pre-cycling cam 82 and its window 99, it is necessary that cam 100 be constructed of clear plastic material or the like in order that indicia 90 can be viewed through window 99. The respective shaft upon which cams 82 and 100 are mounted are driven through a friction drive arrangement and is conventional in settable clock driven devices so that manually operable knobs 116 and 118 are respectively connected to the respective shafts of the cams 82 and 100 so that the respective cams can be rotatably set at any desired position by rotation of the particular knobs 116 and 118.

The electrical circuitry associated with switches 88 and 108 is best illustrated in FIGURE 2 and reference is made thereto. Power is provided through power lines 120 and 122 from a conventional power source. Clock M is connected across lines 120 and 122 so that it is constantly driven. A conventional latch relay R is connected across lines 120 and 122 by lines 124 and 126. The contacts 88' of switch 88 are located in line 126 and a set of relay contacts 128 which are normally closed are connected in line 124. Relay R opens contact 128 when actuated and closes a second pair of relay contacts 130 upon actuation. Contacts 130 are connected in a line 132 connected to power line 122 and to one terminal of a coil 134 of a verbal means such as a buzzer or bell of conventional design and also to one terminal of dispensing solenoid 68. The other terminals of solenoid 68 and coil 134 are connected through contacts 108' of switch 108 to a line 136 which is connected to power line 120.

The alarm coil 134 can be associated with a buzzer, bell, vibration means or other signal source of any type. Similarly, a light can also be wired in parallel with coil 134 to provide a visual indication that the pill has been dispensed.

Obviously, it is not desirable that the alarm coil 134 remain activated after the person taking the medication has become aware of its activation. Therefore, reset button 34 is provided for opening the contacts in switch 108 to deactivate the alarm. This result is accomplished by virtue of the fact that reset button 34 is connected to a pivot lever 136 (FIG. 4) upon which switch 108 is mounted. Spring plate arm 105 normally biases pivot lever 136 to its upward position illustrated in FIGURE 4. A pivotable latch lever 138 is pivoted to lever 136 and is biased in a clockwise direction by spring 140 as shown in FIGURE 4. A pin 142 limits the extent of clockwise movement of latch 138. Depressing reset button 34 causes an abutment 144 on the lower end of the latch lever to engage pin 142 to retain the elements 136, 138, 34 etc. in a lower latched position. The depression of reset button 34 causes lever 136 to pivot downwardly and consequently, open the contacts 108' of switch 108 mounted on lever 136. The contacts will remain open until latch lever 138 is unlatched from pin 142. Such unlatching is accomplished by an unlatch pin 146 extending from the rear face of dispensing cam 100. Continued rotation of cam 100 causes pin 146 to eventually engage the side of latch lever 138 to pivot the latch lever outwardly so that abutment 144 no longer engages pin 142. The biasing action of spring plate 105 and spring 140 causes the latch plate 138, pivot lever 136 and reset button 34 to consequently return to their solid line position illustrated in FIGURE 4. Switch contacts 108' then remain open until the next engagement of detent 104 with follower 106.

A counter actuating pin 148 extends from latch lever 138 and upon depression of button 34, engages a counter actuating lever 150 of a counter 152 which is viewable through a counter window 26 illustrated in FIGURE 1. Engagement of pin 148 with lever 150 causes the counter to advance one numeral to indicate the total dispensing operations that have been accomplished.

FIGURE 6 illustrates a modified version of the dispensing means per se. The modified version is for dispensing single capsules and differs from the previously discussed preferred embodiment solely in the manner of dispensing and storing the capsules as illustrated in FIGURE 6. A dispensing solenoid 68' is provided with a reciprocable feed plate 160 connected to an armature 66'. A feed aperture 162 is formed in plate 160 and the plate is movable from the solid line position of FIGURE 6 to the dashed line position of FIGURE 6 upon actuation of solenoid 68'. Aperture 162 is normally positioned beneath a tubular magazine 164 which contains a stack of pills 166 as shown. Actuation of solenoid 68' causes the lowermost pill 168 to be carried from beneath tube magazine 164 to fall from feed aperture 162 into a pill deposit recess 170 which is accessible through an enlarged dispensing opening 28' to enable manual removal of the pill from recess 170. A removable cover 172 is provided over the magazine to protect pills 166 from contamination. The pills 166 stacked within the magazine can either be stacked as shown or can be inserted in the magazine while remaining in the usual form of elongated cylindrical plastic pill container by merely removing the top of the container and inverting same into the magazine to remain therein until the supply of pills is exhausted. It should be noted that solenoid 68' contains an internal spring for returning armature 66' to its solid line position after deactivation of the solenoid. The control circuit for the embodiment of FIGURE 6 is identical with the circuit employed with the previously discussed embodiment of FIGURE 5, etc.

A complete cycle of operation will now be discussed with reference being made to the first embodiment. However, it should be understood that the operation of the embodiment of FIGURE 6 would be identical with the exception that solenoid 68' would be actuated for dispensing rather than solenoid 68 of the first embodiment.

A complete dispensing cycle of operation begins with the initial setting of the dispensing device and in the case of birth control pills is assumed to be at the beginning of

the woman's menstrual cycle. Since the first contraceptive pill should be taken five days after the beginning of the cycle, the pre-cycle setting knob 116 is adjusted to present designator 5 adjacent window 114. The positioning of designator 5 means that it will be five days before the pre-cycling timing cam 182 rotates into position wherein its detent 84 will cause follower 86 to be lowered to close contacts 88' of switch 88. The operator then notes the current time of day and sets the dispensing cycle cam setting knob 118 so that a numeral appearing through window 100 will indicate the number of hours subsequent to the current time (time of setting) at which it is desired that a pill will be dispensed every day following the initial five day time period. For example, if it is 9 a.m. when the dispensing device is being set, and the operator desires to take her daily pill at 2 p.m., she will adjust knob 118 so that a numeral 5 will appear in window 100. This setting indicates that the pill will be dispensed on each day at a time five hours subsequent to the setting time of the device. After the device is set, contacts 88' are open, contacts 128 are closed, contacts 130 are open and contacts 108' are open. Contacts 108' will be closed once every twenty-four hours by the complete rotation of cam 100 every twenty-four hours. However, the initial closings of contacts 108' will not cause solenoid 68 or alarm coil 134 to be actuated since contact 130 will remain open due to the fact that relay R will not be actuated and a circuit cannot be completed through solenoid 68 and coil 134. After the passage of five days, however, cam 82 will rotate to a position to close contacts 88' of microswitch 88. The closing of contacts 88' immediately actuates relay R to cause the relay to move to its latched position. Movement of the relay to its latched position causes contact 130 to close and causes contacts 128 to open. Opening of contacts 128 interrupts the current flowing to the relay; however, the relay remains actuated since it is latched and contacts 130 remain in their closed condition. Since contacts 128 remain open the subsequent actuation of microswitch 88 at five day intervals will have no further effect upon the relay until the relay is reset to its original position since current cannot flow through the relay until contacts 128 are closed. The next subsequent closing of contacts 108' by cam 100 after the actuation of relay R will result in the completion of a circuit through line 122, line 132, contacts 130, solenoid 68 and alarm coil 134, contacts 108', line 136 and line 120. Consequently, the alarm system will be activated simultaneously with the dispensing solenoid 68 for dispensing a single capsule. When the user hears the alarm, or alternatively sees a warning light, she removes the dispensed pill and depresses the reset button 34. Depression of the reset button 34 causes pivot lever 136 to pivot downwardly to close contacts 108' of switch 108 and also causes the system to be latched in its lower position by virtue of engagement of abutment 144 with pin 142. The reset system remains in this position until unlatched pin 146 rotates into position engaging the side of latch 138 to release the latch. At the time of release, detent 104 will have also rotated a sufficient distance to clear follower 106 so that the unlatching action will not result in a closure of the contact switch 108. It should be noted that the depression of reset button 34 actuates the counter 52 in the manner previously discussed so that the user will be informed of the number of dosages taken and can discontinue the pills after the required dosage has been taken. In some instances, the pills will be continued until the menstrual cycle begins at which time the device will be reset in the manner initially discussed above. However, it should be understood that the device does not necessarily always have to be reset at the beginning of the menstrual cycle and can actually be reset at any desired time after completion of the dosage cycle.

Relay R is reset in any conventional manner at the beginning of a dosage cycle, such as by actuation of a conventional unlatch microswitch relay circuit, for unlatching the relay to return it to its original position wherein contacts 128 are closed and contacts 130 are open.

If the device should fail to function for any reason, knob 32 can be actuated to manually dispense a required dosage through slot 28. In a similar manner, with respect to the embodiment of FIGURE 6, feed plate 160 can be easily grasped through opening 28' for manual reciproca-
tion to deposit a dosage in recess 170.

While only preferred embodiments have been illustrated herein, it will be readily apparent to those skilled in the art that many modifications can be made without departing from the spirit and scope of this invention. For example, certain forms of medication require that dosages should be dispensed more often than once each day as is the case with contraceptive pills. Consequently, dispensing cam 100 could be provided with a plurality of depressions 104 so as to actuate the dispensing solenoid a desired number of times during each twenty-four hour period. Alternatively, plural dispensing cams could be employed for controlling plural dispensing solenoids for dispensing a plurality of forms of medication. In cases where no preliminary time period of substantial duration is required, the pre-cycling timing cam 82 will be set at "0" so that contacts 88' are initially closed to cause relay R to be latched.

Should it be desired to use the device merely as a clock when there is no need for dispensing medication, an on-off switch can be incorporated in line 136 to completely disconnect the dispensing solenoid and alarm system so that such will not be actuated until such time as it is desired to resume use of the device for dispensing.

The afore-discussed possible modifications are merely exemplary and should not be considered to encompass all possible modifications which will occur to those skilled in the art. In is, therefore, to be understood, that the invention is defined solely by the claims and may be practiced otherwise than as specifically described in the specific embodiments described herein.

We claim:

1. A dispensing device for initiating the cycle dispensing of articles at given time intervals after a first time interval has elapsed, said dispensing device comprising:

electrically operable dispensing means for dispensing one of said objects upon actuation of said dispensing means;

enabling means operably coupled to said dispensing means for enabling said dispensing means to be operable when said enabling means is actuated but for preventing said dispensing means from being operable when said enabling means is unactuated;

switch means connected between said enabling means and dispensing means when said enabling means is simultaneously actuated; and

settable control means for actuating said enabling mean after said first time interval has elapsed subsequent to the setting of said settable control means and for actuating said switch means at said dispensing time intervals.

2. The device of claim 1 wherein said electrically operable dispensing means includes a solenoid actuated article dispensing means.

3. The device of claim 2 wherein said dispensing means includes a feed roller mounted for rotation:

intermittent drive means connected between said sole-

noid and said feed roller so that actuation of said solenoid causes said feed roller to rotate a given amount;

a backup roller mounted in contact with said feed roller; and

a laminated strip containing capsule ingredients at equal spaced intervals along its length fed between said rollers so that actuation of said solenoid causes a given length of said strip to be fed from said dispensing device.

4. The device of claim 2 wherein a feed plate having an aperture of given dimension is attached to said solenoid for reciprocal movement upon actuation of said solenoid; and including a storage tube magazine having a discharge end adjacent said feed plate so that a lowermost article carried within said tube is discharged into said aperture in said feed plate upon the movement of said aperture to a position adjacent the end of said tube whereby actuation of said solenoid causes said opening to move to an article discharge position to enable said object to fall from said aperture into an article receiving means.

5. Capsule dispensing means comprising dispensing means including an electrically operated dispensing solenoid which when actuated dispenses a single item from said means;

a settable timing and control means for actuating said solenoid after the passage of a given time interval subsequent to the setting of said settable means and for subsequently continuing to actuate said solenoid at a given time interval different from said first time interval.

6. The device of claim 5 wherein said settable control means includes clock driven means for actuating first and second switch means.

7. The device of claim 6 wherein said clock driven means includes rotatable cam means for actuating said first and second switch means.

8. The device of claim 7 wherein said first switch means is connected to a second solenoid which when actuated, closes a third switch so that subsequent closing of said second switch completes a circuit to said dispensing solenoid.

9. The device of claim 8 wherein said dispensing solenoid means is connected to feed roller means for rotating said feed roller means a given amount to dispense a given amount of an article containing strip from said device upon each actuation of said dispensing solenoid means.

10. The device of claim 8 wherein said dispensing solenoid is connected to a feed plate having a feed aperture for dispensing a single given item upon actuation of said solenoid and additionally including storage magazine means for storing subsequent items to be dispensed from said device.

References Cited

UNITED STATES PATENTS

1,802,674	4/1931	Schuyler	221—3 X
2,870,937	1/1959	Telly	221—15 X
3,129,845	4/1964	Musser	221—15

STANLEY H. TOLLBERG, *Primary Examiner.*