United States Patent [19]

Bender

[11] **3,831,808**

[45] **Aug. 27, 1974**

[54] **PILL CARTRIDGE FOR A PILL DISPENSER**

[76] Inventor: **Louis Bender,** 4 Heather Ln., Scotch Plains, N.J. 07076

[22] Filed: **Feb. 12, 1973**

[21] Appl. No.: **331,644**

Related U.S. Application Data

[62] Division of Ser. No. 189,647, Oct. 15, 1971.

[52] **U.S. Cl.** **221/197,** 221/312, 206/42

[51] **Int. Cl.** **B65d 83/04**

[58] **Field of Search** 221/7, 8, 117, 197, 243, 221/260, 287, 312; 206/42; 116/121; 222/541

[56] **References Cited**

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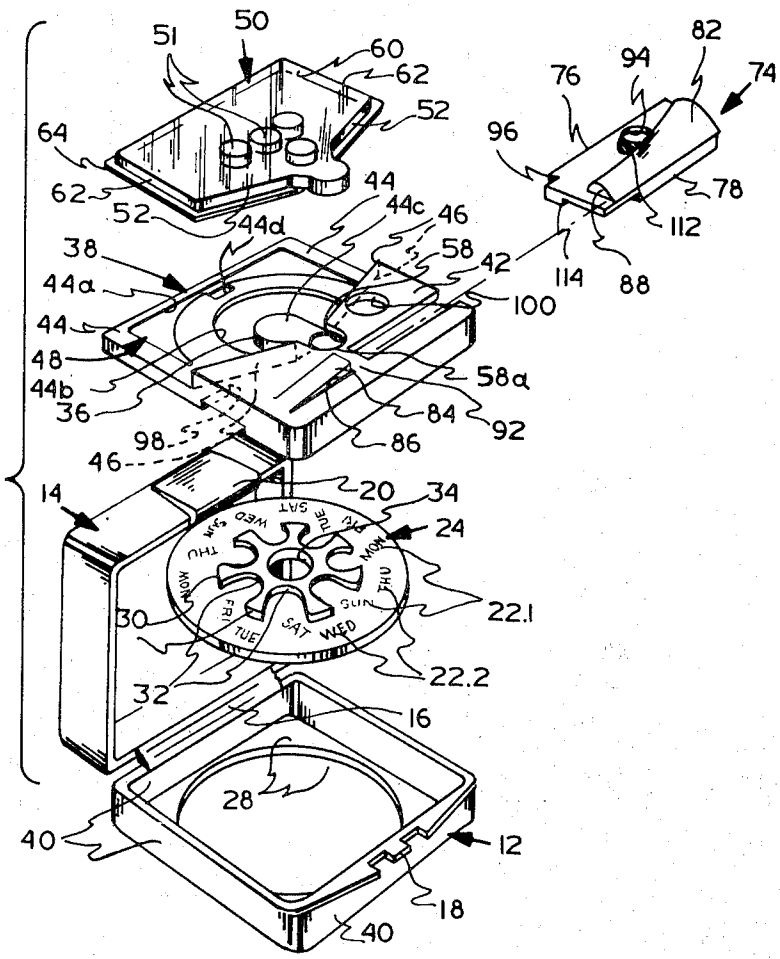
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3,332,575	7/1967	Pilot et al.	221/197 X
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Primary Examiner—Robert B. Reeves
Assistant Examiner—Joseph J. Rolla
Attorney, Agent, or Firm—St. Onge Mayers & Reens

[57] **ABSTRACT**

Mechanisms are disclosed for storing pills and dispensing them one at a time at indicated intervals. The dispenser includes a time interval read-out, and a mechanism for advancing the read-out by one pill time interval whenever a pill is withdrawn from storage. If the mechanism is operated but no pill is withdrawn, the time read-out does not advance. Replaceable pill cartridges and safety covers for the dispensing mechanism are also disclosed.

4 Claims, 34 Drawing Figures



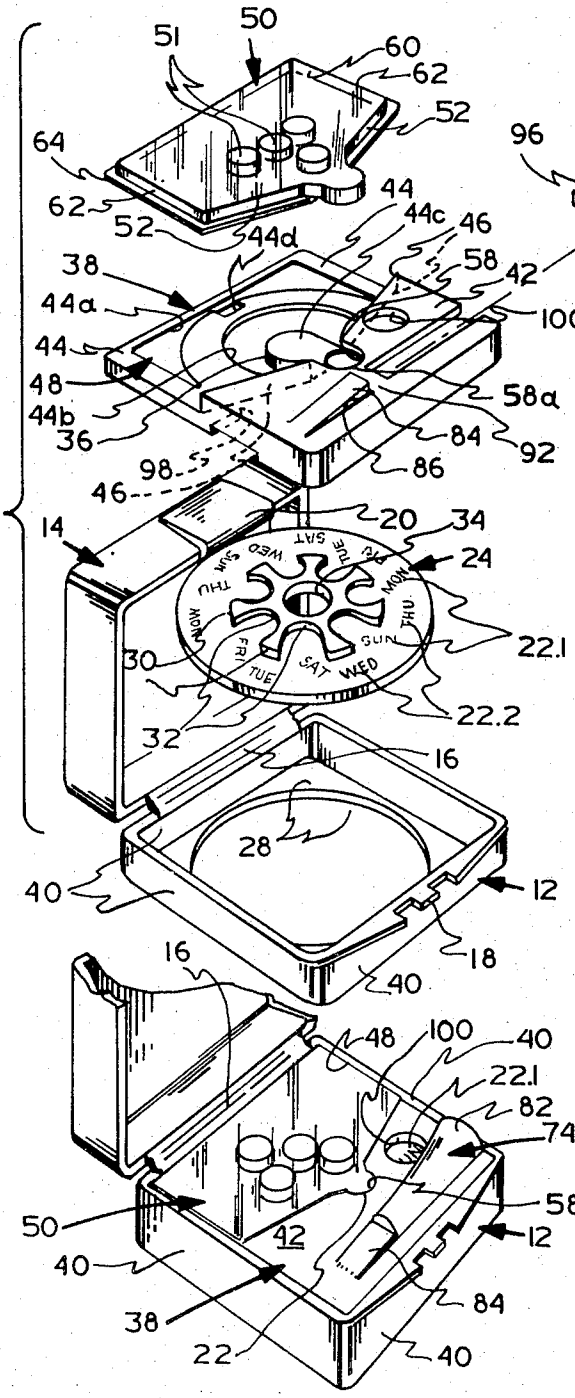


FIG. 2

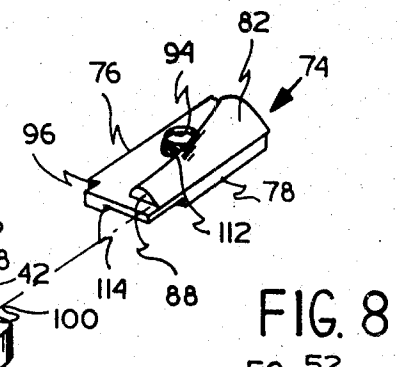


FIG. 8

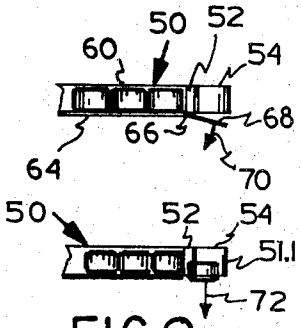


FIG. 9

FIG. 1

FIG. 3

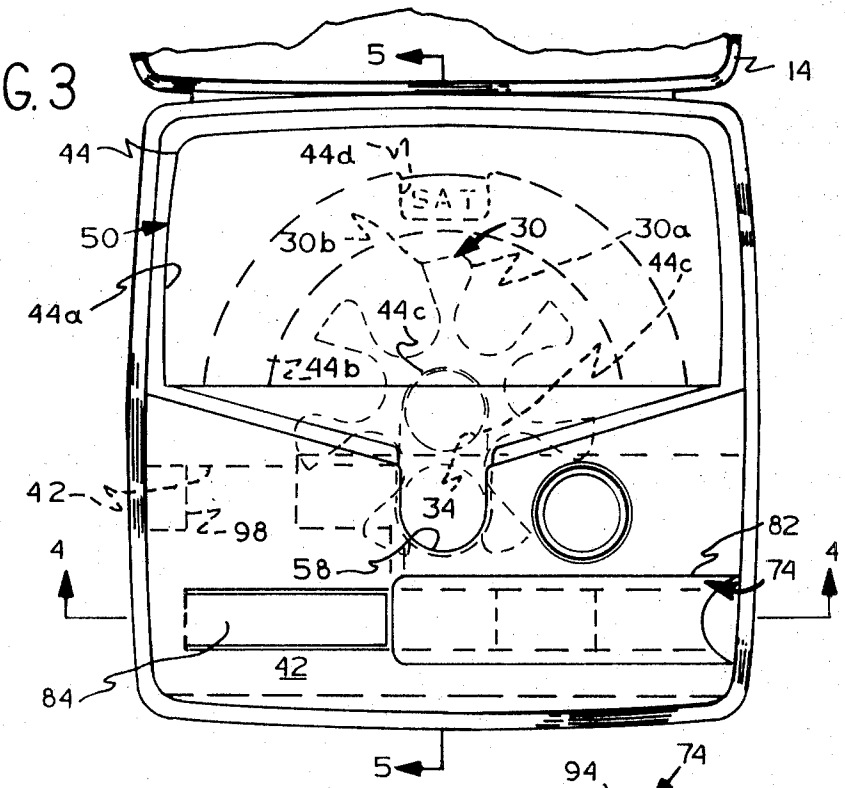
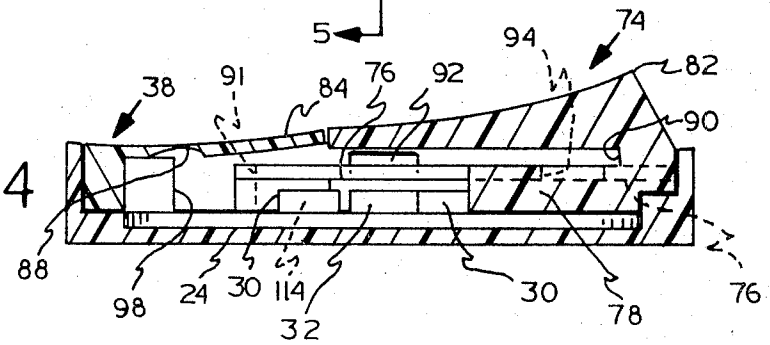


FIG. 4



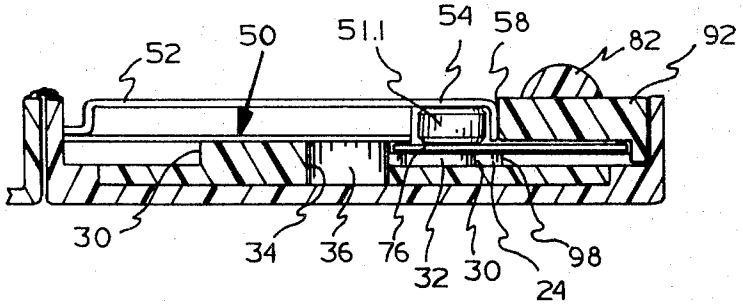
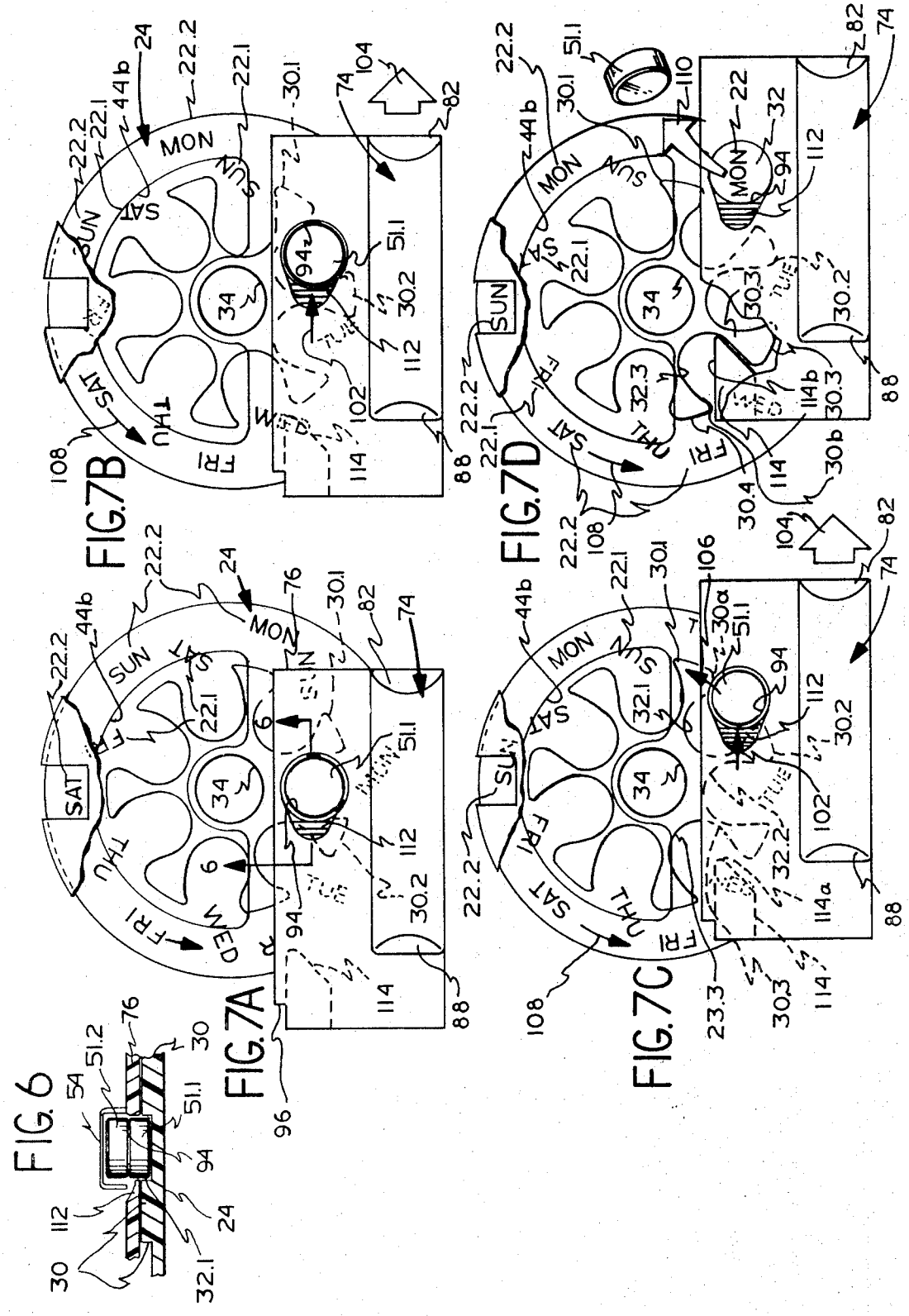


FIG. 5


FIG. 6
FIG. 7A
FIG. 7B
FIG. 7C
FIG. 7D
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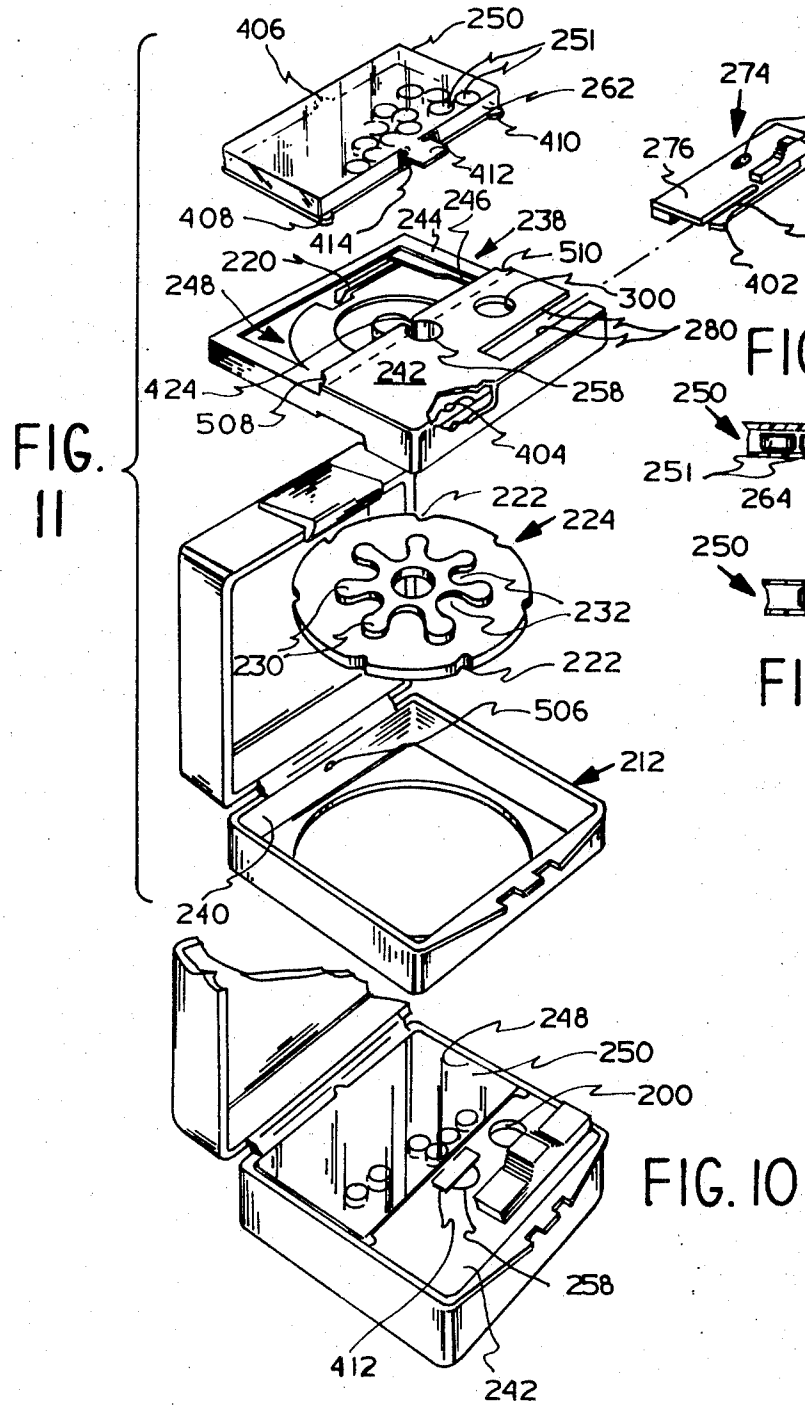


FIG. 11

FIG. 12

FIG. 13

FIG. 10

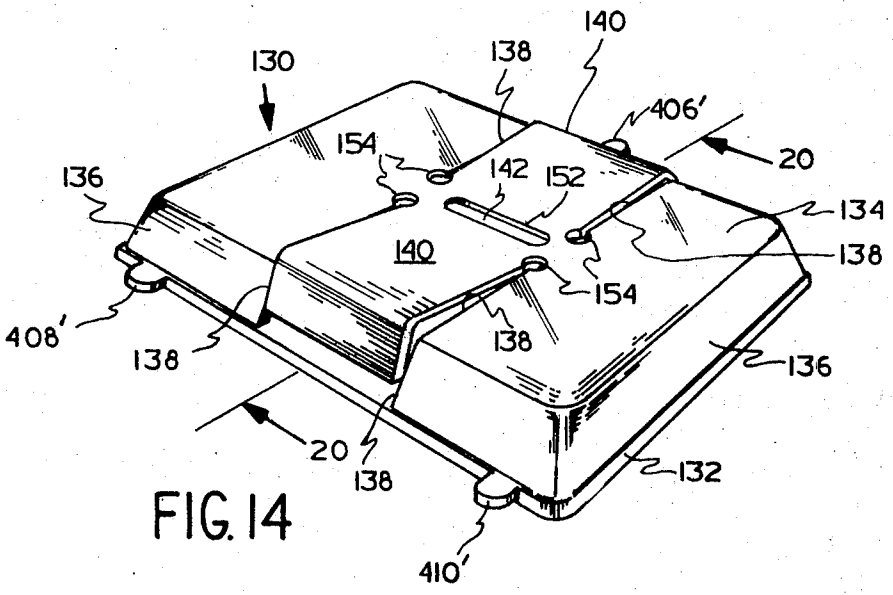


FIG. 14

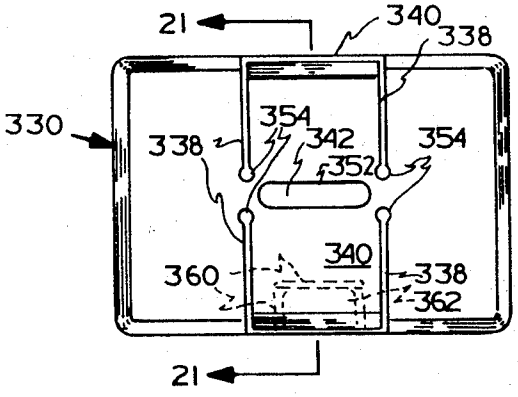


FIG. 19

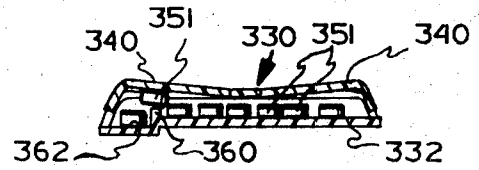


FIG. 21

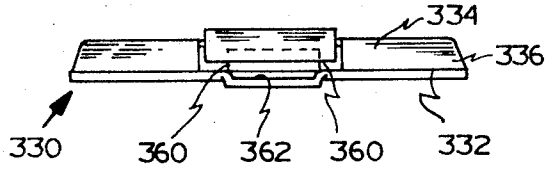


FIG. 20

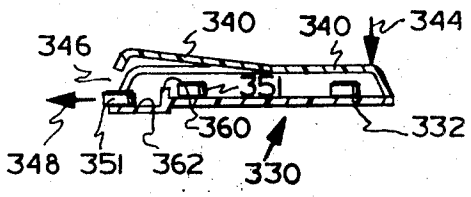


FIG. 22

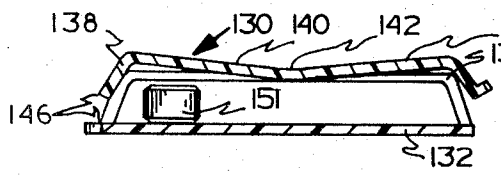


FIG. 15

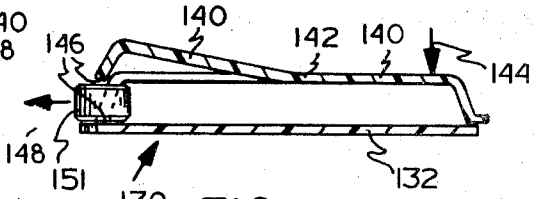


FIG. 16

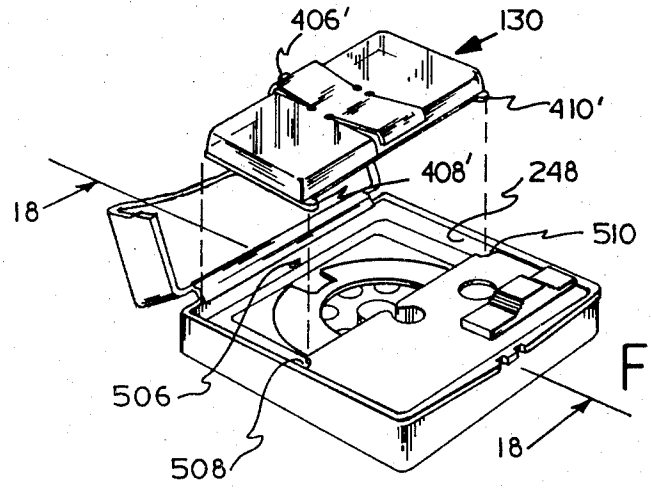


FIG. 17

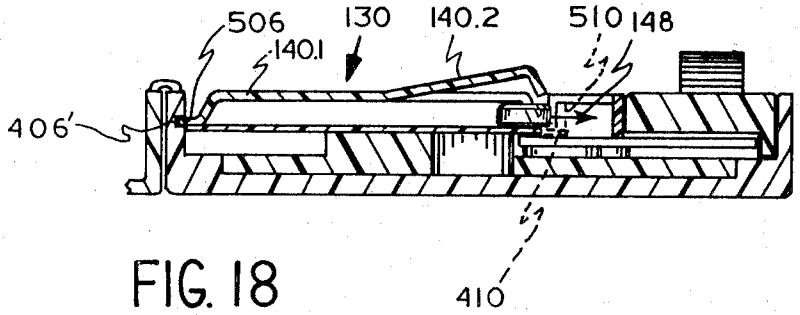


FIG. 18

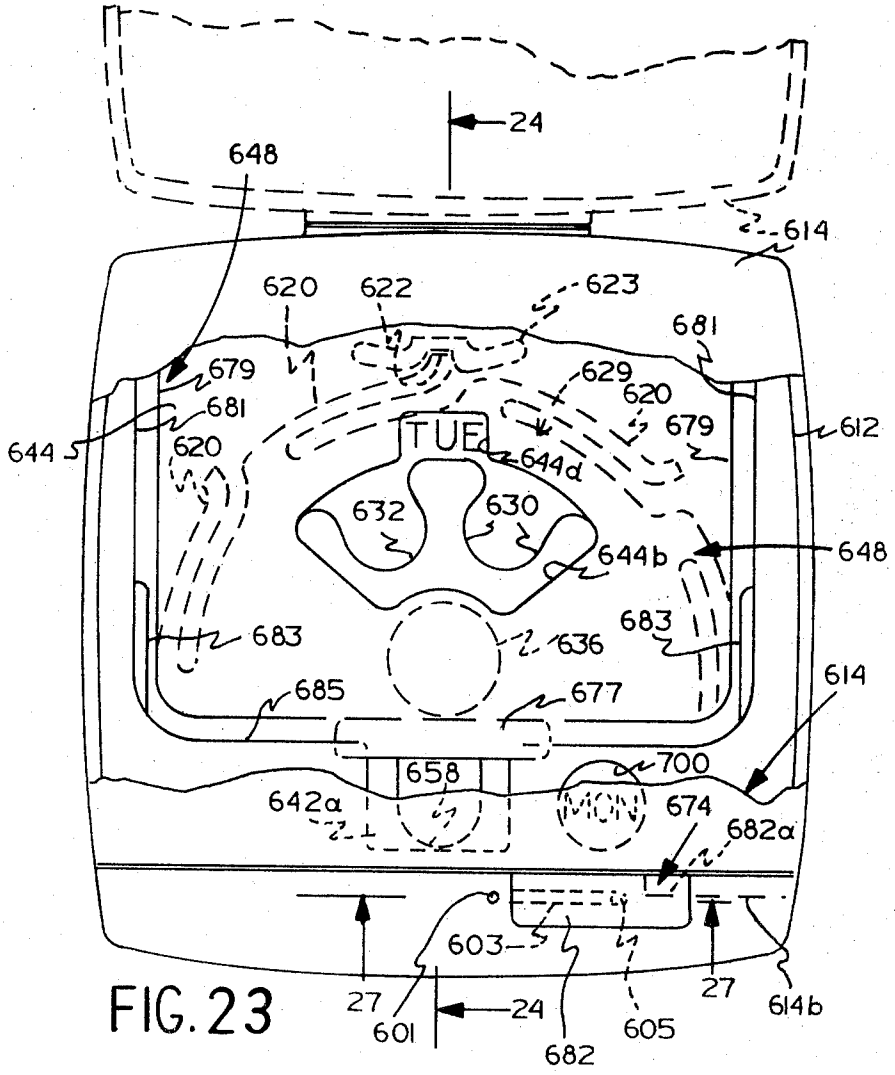


FIG. 23

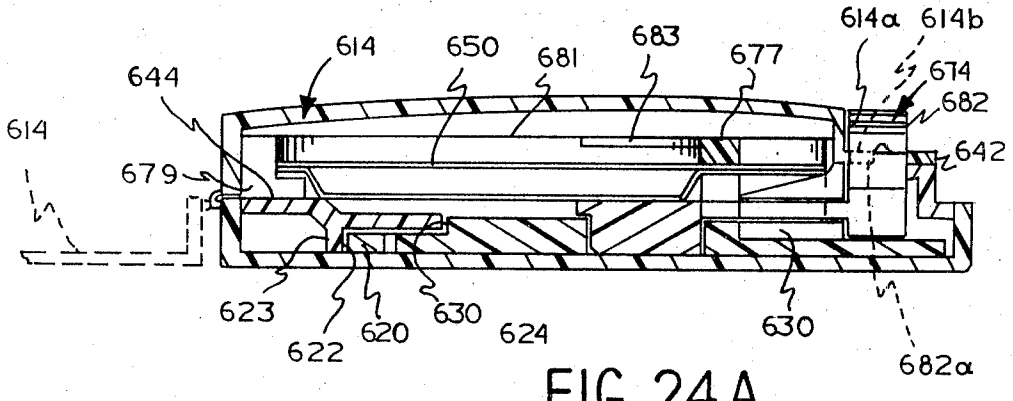


FIG. 24A

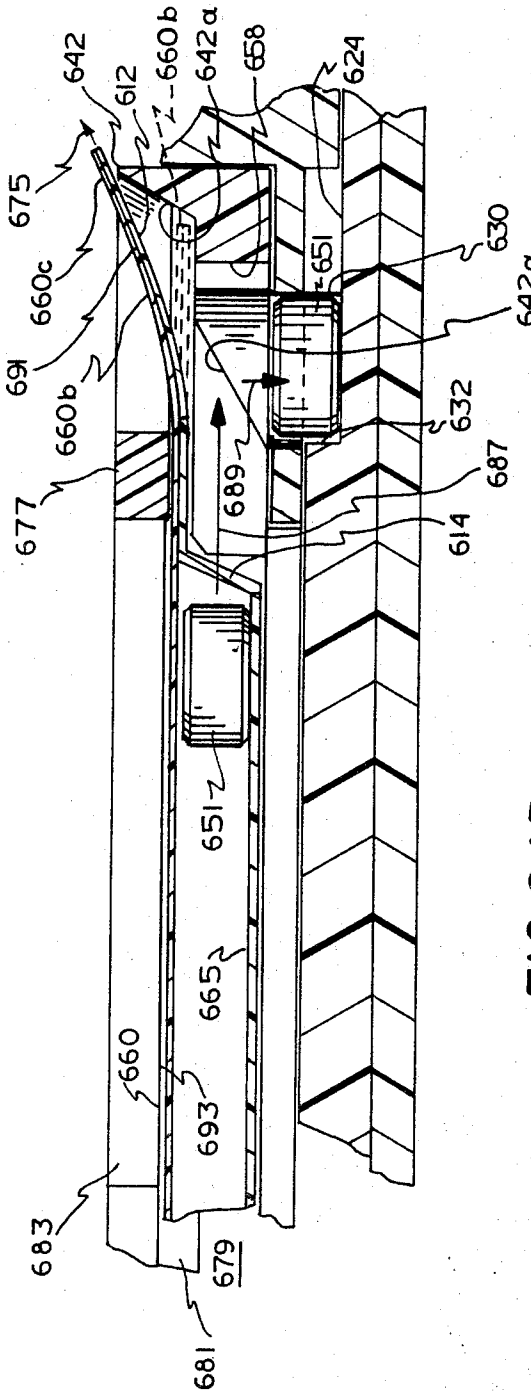

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FIG. 24B

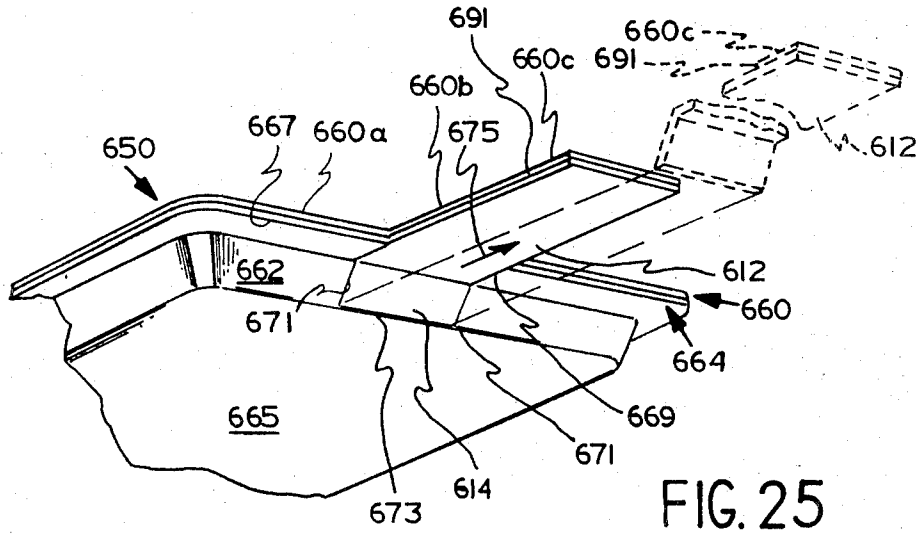


FIG. 25

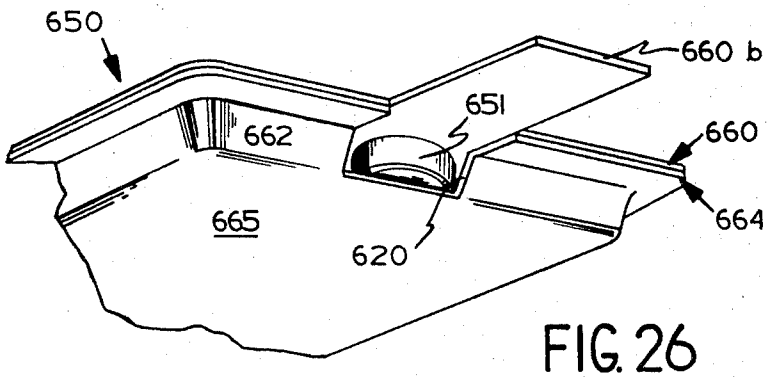


FIG. 26

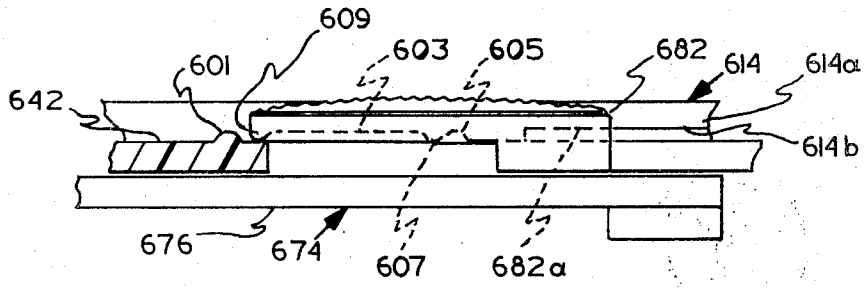


FIG. 27

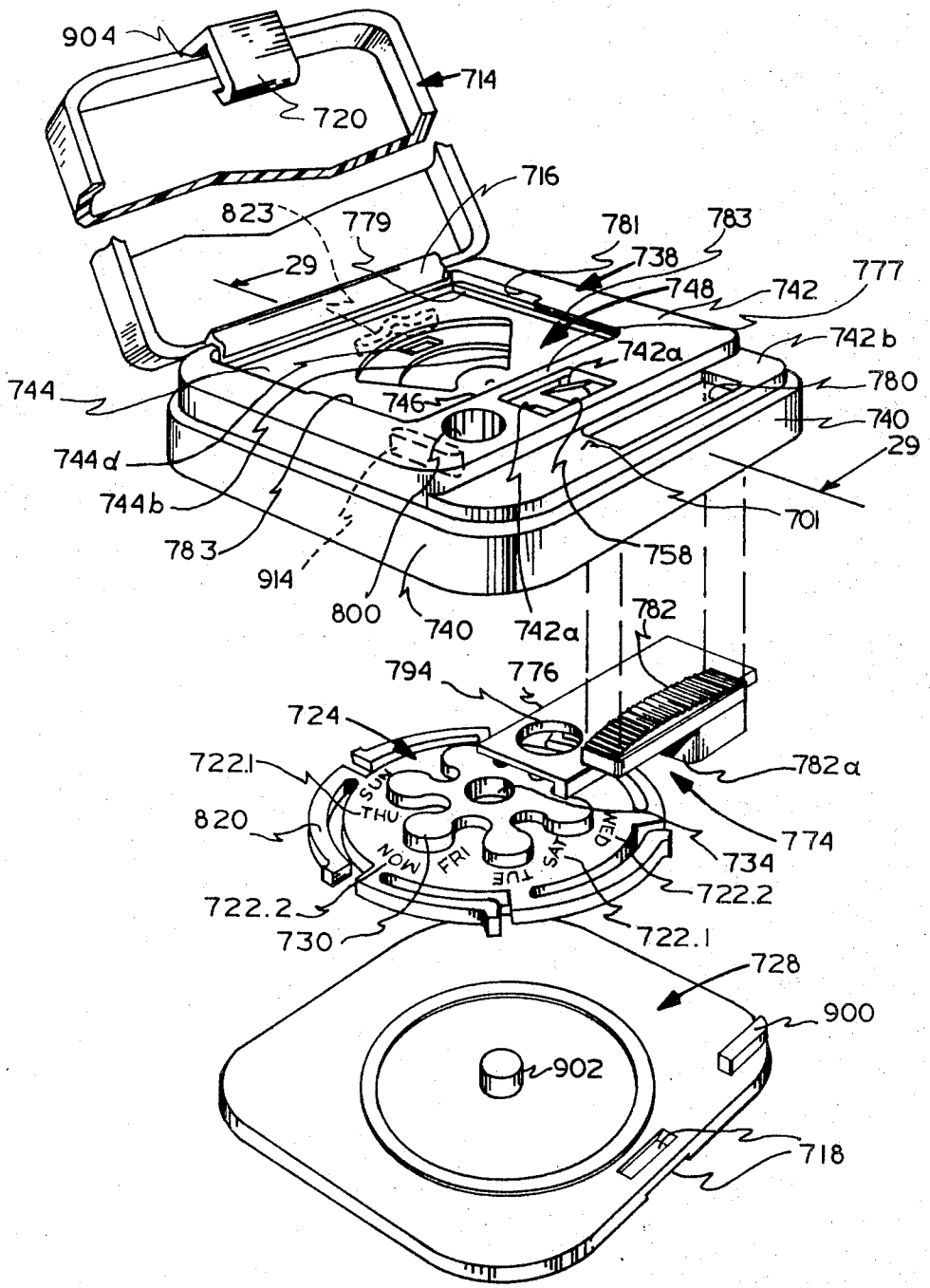

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FIG. 28

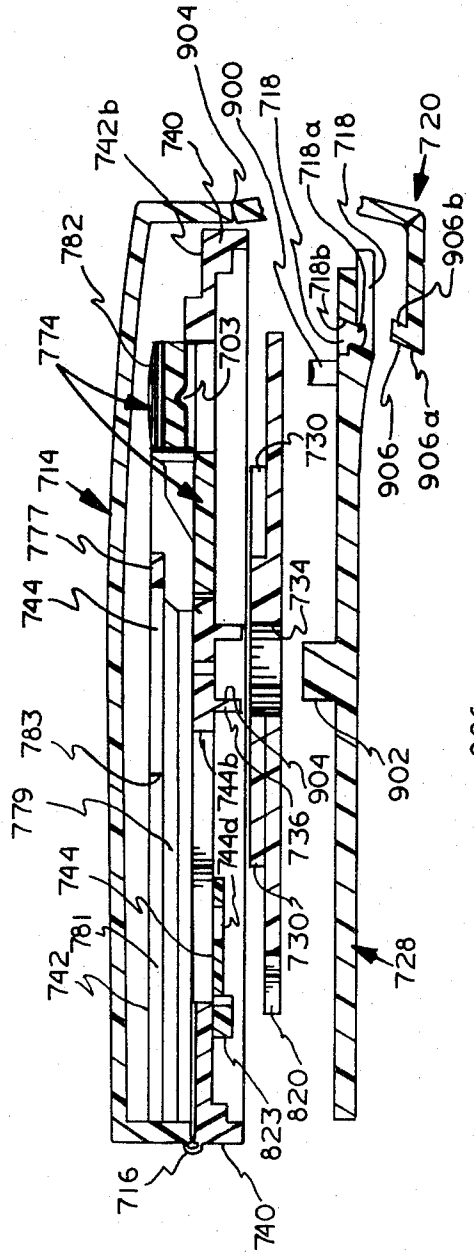

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FIG. 29

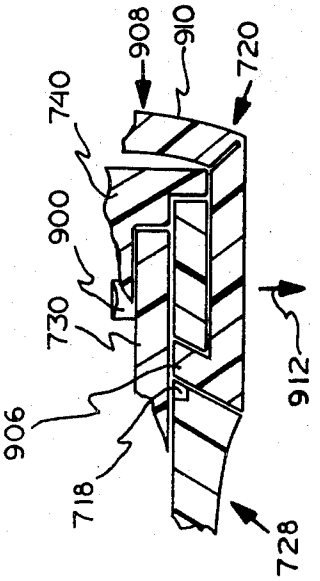

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FIG. 30

PILL CARTRIDGE FOR A PILL DISPENSER

This application is a division of patent application for PILL TIMING DISPENSER AND REPLACEABLE CARTRIDGE THEREFOR filed by LOUIS BENDER on Oct. 15, 1971, bearing Ser. No. 189,647.

FIELD OF THE INVENTION

This invention relates to pill carrying and dispensing devices, particularly those of the kind which indicate the time of the last and/or next dose.

BACKGROUND

Large numbers of mechanisms are known to the prior art for storing and dispensing medication in various dosage forms, particularly tablets or pills, while simultaneously keeping a running record of the time at which the patient took the last dose and/or is scheduled to take the next dose. Many types of medication are normally prescribed by doctors to be taken at regular intervals, such as once every four hours, once a day, or the like. An example of such medication is female hormone pills for birth or fertility control. A woman normally takes one of these pills a day for a period of several consecutive weeks. It is quite important that those who are on such a regimen not to wander too far from the prescribed schedule; yet lapses of memory have been something of a problem with some of the many women who employ this medication.

A number of prior art pill-timing dispensers are equipped with date-indicating discs, as for example, Barton U.S. Pat. No. 3,402,850 and Wagner U.S. Pat. No. 3,143,207. In some such mechanisms, the date wheel automatically rotates through an angular increment equivalent to one day (or other pill-taking interval) in response to operation of the pill dispensing mechanism. See, for example, U.S. Pat. Nos. 3,332,575 of Pilot, No. 3,227,127 of Gayle, No. 3,410,450 of Fortenberry, No. 3,344,951 of Gervais, and No. 3,511,409 of Huck. These mechanisms are designed so that the date wheels are read through an aperture or window formed in the side of the pill dispenser case.

The last-mentioned patent, Huck, is of particular interest in that the date wheel is formed with radial vanes which define pill-receiving recesses therebetween. The wheel picks up a single pill between a pair of vanes and rotates to move the pill from a storage reservoir to an output port. Another device with a similar pill-delivery wheel is seen in Gadenne U.S. Pat. No. 3,204,834.

The Huck patent is also of interest here in that the pill reservoir employed thereby is a removable and replaceable cartridge. The same is true of the Pilot patent cited above.

The pill-delivery wheel of Gadenne and the date wheel of Pilot are each equipped with an anti-reverse ratchet which, in the first case, prevents a pill from being moved back to the storage reservoir, and in the second case, prevents the date wheel from being rotated in the wrong direction relative to the calendar thereon.

The principal difficulty with such prior art devices resides in the fact that the date-indicating mechanisms thereof can be advanced to the next date (or whatever is the relevant time interval) by actuation of the pill-delivery mechanism, even if no pill is delivered thereby. In the Huck device particularly, where the date wheel is itself the pill-delivery mechanism, the date advances whenever the pill-delivery mechanism is operated, even if no pill is present. No prior art mechinism is known in which the date-indicating mechanism is not advanced unless a pill is actually delivered.

SUMMARY OF THE INVENTION

The present invention comprises a pill storage and dispensing device of the type having an automatically advancing pill-timing interval indication of the general type just discussed; but it represents an improvement over prior art devices of this type in that the pill-delivery mechanism is incapable of advancing the timing indication unless it actually delivers a pill. In addition, reverse motion of the pill-delivery mechanism cannot drive the time read-out out of synchronism with the actual dosage schedule. Thus synchronism is strictly maintained under all circumstances.

In a preferred embodiment of the invention, the pill itself forms a mechanical drive coupling between the pill-delivery mechanism and the pill timing read-out. The preferred form of the invention also employs a novel type of replaceable pill cartridge which inserts one pill at a time into mechanical driving position, and controls initial setting of the date read-out mechanism.

In carrying out the invention, there is provided a dispenser having pill storage means, and means for extracting one pill at a time and delivering it to the user. The pill-transport means has a receptacle to contain a pill during the transport operation. In addition, there is a pill timing interval read-out which is responsive to a pill contained in the receptacle to effect a one interval read-out advance during pill transport. The read-out, however, is not coupled to the pill-transport means when there is no pill in the receptacle.

Additional features of the invention concern safety closures to keep medicines out of unauthorized hands, and pill cartridges adapted to be removable and replaceable in the dispenser. Some embodiments of the pill cartridge permit opening of the cartridge after its insertion into the dispenser, and one of them is also adaptable for use as a free-standing pill package.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a pill-timing dispenser and replaceable cartridge in accordance with this invention, which are housed within a "compact" type of case, shown with its cover open.

FIG. **2** is an exploded perspective view of the same pill dispenser, cartridge and compact assembly.

FIG. **3** is a top plan view of the pill dispenser, compact and cartridge assembly, shown with the cover open.

FIG. **4** is a sectional view of the same assembly taken along the lines **4—4** of FIG. **3**, looking in the direction of the arrows.

FIG. **5** is a sectional view of the same assembly taken along the lines **5—5** of FIG. **3** looking in the direction of the arrows.

FIG. **6** is a fragmentary sectional view of the same assembly taken along the lines **6—6** of FIG. **7A** looking in the direction of the arrows.

FIGS. **7A** through **7D** are a sequence of fragmentary top plan views showing successive steps in the operation of the pill transport and timing interval read-out mechanisms of the device of the preceding figures, with other parts removed for clarity of illustration.

FIGS. 8 and 9 are side elevational view of the replaceable pill cartridge of the preceding figures, seen before and during pill delivery respectively.

FIGS. 10 and 11 are perspective and exploded perspective views, respectively, of an alternative embodiment of a pill timing dispenser and replaceable cartridge in accordance with this invention. The cartridge is of the type which can be opened after insertion into the dispenser.

FIGS. 12 and 13 are vertical sections of the replaceable cartridge of FIGS. 10 and 11, seen respectively before and after the cartridge is opened.

FIG. 14 is a perspective view of another embodiment of a replaceable pill cartridge in accordance with this invention, of the type which is adapted to be opened after insertion into the pill dispenser of FIGS. 10 and 11.

FIG. 15 is a section taken along the lines 20—20 of FIG. 14, looking in the direction of the arrows.

FIG. 16 is a section similar to FIG. 15, but shows the pill cartridge in its open condition, in contrast to the closed condition illustrated in FIGS. 14 and 15.

FIG. 17 is an exploded perspective view of the cartridge of FIGS. 14–16 in combination with the dispenser of FIGS. 10–11, illustrating insertion of the cartridge into the dispenser.

FIG. 18 is a sectional view of the same dispenser, with the cartridge inserted therein, taken along the lines 18—18 of FIG. 17, looking in the direction of the arrows.

FIG. 19 is a top view of a free-standing pill package in accordance with this invention, which is similar to the replaceable cartridge of FIGS. 14–18.

FIG. 20 is a front elevation of the pill package of FIG. 19.

FIG. 21 is a section taken along the lines 21—21 of FIG. 19, looking in the direction of the arrows.

FIG. 22 is a similar section, but shows the pill package in its open condition, in contrast to the closed condition illustrated by FIGS. 19–21.

FIG. 23 is a top plan view of another alternative embodiment of a pill timing dispenser in accordance with this invention, with parts broken away and the replaceable pill cartridge removed for clarity of illustration.

FIG. 24A is a section taken along the lines 24—24 of FIG. 23, looking in the direction of the arrows; and includes another alternative embodiment of a replaceable pill cartridge in accordance with this invention as it would appear when inserted in place in the dispenser, and opened. The dispenser cover is seen closed.

FIG. 24B is a section identical to FIG. 24A except that it is an enlarged and fragmentary view, the cartridge is closed, and the dispenser cover is open.

FIG. 25 is a perspective view of the underside of the cartridge of FIG. 24, seen prior to opening and prior to insertion in the dispenser.

FIG. 26 is similar view of the same cartridge, seen after opening and after removal from the dispenser.

FIG. 27 is a fragmentary section taken along the lines 27—27 of FIG. 23, looking in the direction of the arrows.

FIG. 28 is an exploded perspective of still another alternative embodiment of a pill timing dispenser in accordance with this invention, having a latching cover.

FIG. 29 is an exploded section taken along lines 29—29 of FIG. 28 looking in the direction of the arrows, with the cover closed but unlatched.

And FIG. 30 is a fragmentary section similar to FIG. 29, but showing the dispenser assembled and the latch closed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As seen in FIG. 1, a pill storage and dispensing device in accordance with this invention includes a housing 10 designed to simulate a lady's cosmetic compact. The housing includes a lower half, or base member, 12 and an upper half, or cover, 14. The pill-storing, dispensing and time-interval read-out mechanisms are all mounted within the lower case half 12, and completely concealed by the cover 14 when the latter is closed. This permits a woman to carry about birth control pills in the device of this invention, while maintaining a degree of privacy. Anyone seeing the casing 10 in a woman's purse would ordinarily assume that it is a conventional cosmetic compact, rather than a pill dispenser.

The two halves of the compact 12 and 14 may be integrally molded of a conventional fatigue-resistant plastic material such as polypropylene, and formed with an integrally molded flexible hinge webbing 16. Conventional interlocking snap elements 18 and 20 are formed at the front of the base member 12 and cover member 14 respectively, and serve to latch the compact in closed condition.

Briefly stated, this dispenser incorporates a pill-storage hopper, means for transporting one pill at a time from the hopper, and a pill timing interval read-out which is advanced only in response to motion of a pill carried in a receptable formed on the pill transport means. As seen in FIG. 2, the pill timing interval read-out comprises markings 22 borne by a read-out disc 24 molded of conventional plastic material. The markings may be printed on the disc 24, or integrally embossed or engraved thereupon during the process of molding the disc 24, or may take the form of one or more adhesive labels. In this instance, the markings 22 represent the seven days of a week, and are designed for taking one-a-day pills. It will be readily appreciated, however, that the markings 22 could readily be altered to correspond to any other convenient time interval, such as one pill every few hours during the course of a day.

The read-out disc 24 is rotatably journaled within a circular depression 26 formed on the interior surface of the bottom wall 28 of the base member 12. A plurality of read-out drive vanes 30 are integrally embossed upon the upper surface of the disc 24, and are oriented substantially radially with respect to the axis of rotation of the disc. The vanes 30 are spaced circumferentially from each other to define therebetween a plurality of (in this case, specifically seven) circumferentially distributed pill-receiving recesses 32. Each such recess 32, which consists of the gap between the confronting surfaces of any two consecutive vanes 30, has a circumferential dimension sufficient to receive easily a pill or tablet of the size for which the dispenser is designed to be used. A circumferentially directed force which is exerted against any one of the vanes 30, as for example by a pill resting within the adjacent recess 32, is effective to rotate the read-out disc 22 within its circular depression 26.

A molded plastic platform member **38** of generally rectangular configuration overlies the read-out disc **24** and drive vanes **30,** and is received within a generally rectangular recess defined by four upstanding side walls **40** which are part of the base member **12.** The platform **38** has an upper level **42** generally forming the front half thereof, and a lower level **44** generally forming the rear half thereof. The lower level is formed with cut-outs **44***a* and **44***b*, and a projection **44***c* extending into the cut-out **44***b*. The projection **44***c* is formed with a downwardly extending circular boss which is received within a circular opening **34** formed in the center of the read-out disc **24,** and helps to journal the disc for date-advancing rotation.

A step **46** separates the upper level **42** from the lower level **44.** The pill storage hopper of this dispenser comprises a shallow depression **48** bounded below by the lower level **44,** and bounded peripherally by the step surface **46** and the adjacent portions of the upstanding side walls **40.** For the purposes of this patent application, the term "hopper" is used to designate a pill storage space, whether or not the pills stored therein are packaged in a removable, replaceable cartridge. In this case, no upper confining wall is required for the hopper **48,** since the pills **51** stored therein are preferably contained with a removable and replaceable plastic molded cartridge **50** which is designed to be inserted within the hopper as seen in FIG. **1.** Alternatively the pills could be placed directly in the hopper **48** without any such additional envelope; but the cartridge approach is preferred for reasons of pharmaceutical quality control and packaging convenience.

The boundaries of the hopper **48** are generally rectangular, so far as they are defined by the lower platform level **44** and the upstanding walls **40.** But the step surfaces **46** are inclined forwardly in such manner that they converge toward the central region of the platform **38.** The replaceable cartridge **50** is also generally rectangular in configuration, but includes a pair of inclined walls **52** which converge towards the front and center, and fit within the hopper outline defined by the inclined step surfaces **46.** Consequently, when the dispenser of this invention is tipped forwardly, the pills **51** contained within the replaceable cartridge **50** and the hopper **58** are gravitationally funneled toward the front, central region thereof.

At the point of convergence of the inclined cartridge walls **52,** the cartridge **50** is integrally formed with a forwardly projecting nozzle **54** having a substantially semi-circular front wall **54***a*. This nozzle is in communication with the interior of the cartridge **50** at that point to which all the pills **51** are funneled by the inclined walls **52,** and is sized to receive only one pill at a time. A rectangular hopper exit opening **56** is formed in the platform step surfaces **46** at the point of convergence thereof, to permit the pill cartridge nozzle **54** to project forwardly of the step surfaces **46** to a position below the upper platform level **42** when the cartridge **50** is installed within the hopper **48.**

The cartridge **50,** as seen in FIGS. **2, 8,** and **9,** includes a transparent molded plastic top wall **60** integrally formed with side walls **62** which are secured, preferably by a conventional heat-sealing process, to an opaque bottom wall **64.** The transparent top wall **60** permits the user to this pill dispenser to determine visually the number of pills **51** remaining in the cartridge **50** at any time, even when the cartridge is mounted in the dispenser hopper **48.** Suitable forward projections of the walls **60, 62,** and **64** define the inclined pill funneling surfaces **52** and the pill delivery nozzle **54.** A portion of the bottom wall **64** is separable, by a manual tearing action, from the walls **62** of pill delivery nozzle **64,** and is also scored along a tear line **66** for separation from bottom wall **64,** to define a tear flap **68** which is entirely removable from the cartridge as indicated by arrow **70** to open the bottom of the pill delivery nozzle **54.** As a result, any pill which is gravitationally fed by the funnel walls **52** into the nozzle **54** after the tear flap **68** has been removed, it then permitted to fall vertically out of the nozzle **54** as indicated by pill **51.1** and arrow **72** in FIG. **9.**

After the tear panel **68** has been removed and the pill cartridge **50** has been inserted into the hopper **48,** the pill delivery nozzle **54** extends forwardly through the hopper exit opening **56.** Then, when the dispenser is tipped forwardly, one pill **51.1** will enter the nozzle **54** and will be gravitationally biased downwardly from the nozzle. One of the pill-receiving recesses **32** is located directly below the nozzle **54** to catch the pill **51.1** when it falls. But the pill is normally prevented from entering the pill-receiving recess by means of a molded plastic pill-transport member **74** having an integral flange **76** which is interposed horizontally between the pill-delivery nozzle **54** and the plane of rotation of the pill-receiving recesses **32,** as illustrated in FIG. **5.**

The pill transport member **74** also includes an integrally molded block **78** which is slidably received with a channel **80** extending transversely about halfway across the upper platform level **42** so as to mount the entire pill transport member **74** for left-right sliding movement thereacross. The flange **76** extends from the slide block **78** rearwardly toward the cartridge **50,** below the level of the upper platform level **42,** so as normally to block the downward exit of a pill **51** from the nozzle **54.** Projecting upwardly from the slide block **78** is an integrally molded actuator button **82** which is accessible to the user of this pill dispenser from above the platform **38** for sliding the pill transport member **74.**

A flexible, integrally molded step pawl **84** is struck upwardly at a shallow angle from the upper platform level **42,** leaving a rectangular pawl-receiving window **i6** formed in the platform directly below the pawl. The pawl **84** engages surface **88** of the actuator button **82** as seen in FIG. **1,** thus preventing the pill transport member **74** from sliding to the left, and keeping the flange **76** in position to block egress of a pill **51** from nozzle **54.** When, however, it is decided to move the pill transport member **74** to the left, the stop pawl **84** is easily flexed downwardly into its receiving window **86,** permitting the pill transport member **74** to ride over the pawl. The transport member **74** then keeps pawl **84** depressed during the entire time that the transport member is displaced in that direction. Note in FIG. **4** that the stop pawl **84** is preferably designed with a thinner cross sectional region **88** at the place where it merges into the platform **38,** to facilitate such downward flexing.

The pill transport member **74** is formed with a horizontal kerf **90** extending between the actuator button **82** and the slide block **78,** to receive a connecting web **92** which is an integral part of the platform **38.** This web **92** connects the portions of the platform **38** on either side of the slide channel **80** and the pawl-receiving

window **86**, thus strengthening the platform member **38**. It also supports and guides the pill transport member **74** in its left-right sliding motion.

The sliding pill transport member **74** is formed with a pill transport receptacle in the form of an aperture **94** extending vertically through the flange **76**. The leftward extreme of the sliding motion of pill transport member **74** (illustrated in FIG. 7A) is reached when a stop ledge **96** cut into one corner of the flange **76** strikes against a limiting surface **98** (FIGS. **2**, **4**, and **5**) formed at the underside of the platform **38**. In this leftward limiting position of the pill transport member **74**, the pill transport aperture **94** lines up with the pill delivery nozzle **54** and one of the pill-receiving recesses **32** directly below it, and allows one pill **51.1**, as seen in FIG. **6**, to drop downwardly out of the nozzle **54**, and thus to enter the transport aperture **94** and receiving recess **32**. A window **58** is cut through the platform upper level **42**, permitting the user to look through that window and through the transparent upper surface **60** of nozzle **54** to determine that a pill has actually dropped into aperture **94** before attempting to operate the transport member **74**.

If the dispenser is inclined at the time pill **51.1** drops into aperture **94**, another pill **51.2** will enter the nozzle **54** directly above the pill **51.1**, but all vertical dimensions are so chosen that the second pill **51.2** is prevented by the first pill **51.1** from also dropping downwardly out of the nozzle. Thus, the two pills rest one above the other as seen in FIG. **6**.

The platform upper level **42** is formed with a pill output port **100** extending vertically therethrough. After pill **51.1** drops vertically from the nozzle **54** into the pill-transport aperture **94**, the pill transport member **74** is slid to the right, using the actuator button **82** for that purpose. When the transport member reaches the rightmost extreme of its motion (illustrated in FIG. 7D), which is determined by contact with the adjacent upstanding wall **40**, the transport aperture **94** is aligned directly below the output port **100**. Once the pill is thus delivered to a position directly below the output port **100**, it is only necessary for the user to invert the dispenser mechanism, and the pill **51** will tumble out of the aperture **94**, through the port **100**, and into the waiting hand of the user. When the pill transport member **74** returns to its right hand limiting position, it allows the pawl **84** to spring back into blocking position.

Once the pill **51** is removed from the openings **32**, **94**, and **100**, the surface of the read-out disc **24** becomes visible therethrough. Thus, the pill output port **100** serves as a reading index for a first one of two groups of indicia on the disc **24**, each comprising seven day markings indicating Sunday through Saturday. The markings **22.1** of the first group are located adjacent to corresponding pill-receiving recesses **32**, and arranged to be readable through port **100** as seen in FIG. **1**. These markings **22.1** indicate the day on which the last pill **51.1**, i.e. the one just removed from port **100**, was taken. To avoid confusion, the first series of markings **22.1** is not visible anywhere else on the disc **24** because they are masked by that portion of platform lower level **44** which is situated between cut-outs **44***a* and **44***b*, and by upper level **42**.

As best seen in FIG. **5**, the flange **75** of the pill transport member **74** slides back and forth between its left and right extremes of motion across the top surface of the read-out drive vanes **30**. Consequently, there is normally no driving connection between the drive vanes **30** of the read-out disc **24** and the pill transport member **74** as the latter slides between its pill pickup position at the left, and its pill delivery position at the right. As a result, motion of the pill-transport member **74** which does not involve the actual transport of a pill **51** from one of the pill-receiving recesses **32** to the pill output port **100** cannot be effective to drive the read-out disc **24**.

On the other hand, when there is a pill **51** resting in one of the receiving recesses **32**, that pill forms a mechanical driving connection between the aperture **94** of the pill transport member **74** and the drive vanes **30** of the read-out disc **24** forms disc **24**. With reference to FIG. **6**, it is seen that the read-out disc **24** forms the bottom surface of the pill-receiving recesses **32** between each pair of adjacent drive vanes **30**. The depth of these recesses is shallow in relation to the vertical thickness of the pill **51** resting therein. As a result, when a pill is in, for example, recess **32.1**, the upper part of the pill extends upwardly into the pill-transport aperture **94** of flange **76**, and thus is fully engaged with both the aperture **94** and drive vane **30.1**. Accordingly, when the pill-transport member **74** moves to the right from the initial position of FIG. 7A through those of FIG. 7B and then FIG. 7C, the left edge of the aperture **94** exerts a pill-transporting force to the right against the pill **51.1** as indicated by arrows **102**. The resulting motion of the pill **51.1** then exerts a circumferential force, indicated by arrows **106** in FIGS. 7B and 7C, against vane **30.1** immediately to the right of the pill. The pill is constrained by the sliding transport member **74** to move in a straight line to the right, while the driven vane **30.1** moves to the right and, at the same time, also swings upwardly to take part in the rotation of read-out disc **24**. But as the vane rotates, the direction of the force exerted thereon (arrow **106**) remains circumferential. Thus, the linear motion of slide **74** imparts an angular read-out-advancing motion to the read-out disc **24**, in the counter-clockwise direction as indicated by arrows **108**.

The slide flange **76**, as seen in FIG. **6**, has a thickness such that, in removing the lower pill **51.1**, the trailing portion of the flange slides under the upper pill **51.2** to prevent the latter pill from falling downwardly from the nozzle **54** and thereby blocking the return of flange **76**. In order to allow for small variations in the vertical thickness of the pills **51**, however, the flange **76** is provided with a chamfered surface **112** sloping down toward the pill-transport aperture **94** from the left. This permits the flange **76** reliably to cam under the second pill **51.2**, without danger of its becoming jammed against the pill. Such jamming would interfere with the smooth operation of the dispenser, and possibly damage the second pill **51.2**.

Thereafter, the trailing portion of the flange **76** remains below the next pill **51.2**, to prevent it from dropping vertically down out of the nozzle **54**. Then, when it is time to take the next pill, the user slides the pill transport member **74** back to the left, and the pill transport aperture **94** comes back into alignment with the nozzle **54**, allowing the next pill **51.2** to drop into the aperture for transport to the output port **100** as described above.

The mechanical coupling between the sliding pill **51.1** and the adjacent drive vane **30.1** terminates

shortly after the position illustrated in FIG. 7C, as the pill passes a corner **30***a* of the vane, which is rounded to allow the pill to slip by. The dispenser is designed so that this decoupling occurs before the final position seen in FIG. 7D is reached, to avoid the risk of jamming the pill between the vane **30.1** and transport aperture **94.**

Some other provision must then be made for rectifying the read-out disc **24,** i.e. driving it fully to its next incremental angular position. This is necessary in order to indicate the next successive pill-taking time unambiguously, and to align the next successive pill-receiving recess **32.2** accurately with the pill-delivery nozzle **54** so that the next pill **51.2** will fall properly into place. The lower surface of the slide flange **76** is therefore provided with a rectifying pawl **114** which has a generally triangular configuration including a vertex **114***a* pointed in the direction of pill-delivery motion, i.e. to the right as seen in FIG. **7.** FIG. **4** reveals that the rectifying pawl **114** projects downwardly below the bottom of flange **76** and into the plane of the read-out drive vanes **30.** Before the pill **51.1** decouples from vane **30.1,** the triangular nose **114***a* of the rectifying pawl enters pill-receiving recess **32.3** (see FIG. 7C). Then after decoupling occurs, pawl **114** engages drive vane **30.3.** Thereafter, as the pill transport member **74** moves to its final position, pawl **114** moves vane **30.3** and read-out disc **24** all the way to its next incremental read-out position; i.e., Monday replaces Sunday as the day indication visible through the aperture **94** in FIG. **7D.** The rear surface **114***b* of the rectifying pawl is positioned so that it then engages a somewhat pointed corner **30***b* of vane **30.4** to prevent read-out disc **24** from over-shooting its final position. For this purpose, the corners **30***a* and **30***b* of each vane are dissimilarly shaped; i.e. each vane **30** is asymmetrical about its center line. Each vane has one corner **30***a* which is rounded for ease of pill disengagement and an opposite corner **30***b* which is distinctly more pointed to engage the rectifying pawl surface **114***b* at the proper time.

In the position of FIG. **7D,** the vane **30.4** which engages pawl surface **114***b* is not interposed in the path of leftward movement of pawl **114,** and thus does not block subsequent return of the pill transport member **74** to withdraw the next pill **51.2.** When leftward return of the pill transport member **74** occurs, the transport member is decoupled from the read-out disc **24,** provided the delivered pill **51.1** has been removed from aperture **94;** and thus the day indication **22.1** is not turned back from Monday to Sunday. On the other hand, if the patient changes her mind about taking the pill **51.1** just then, or for any other reason returns the transport member **94** to the left while the pill **51.1** is still in the aperture **94,** then the transport member remains coupled to the read-out disc **24,** and therefore properly returns the day indication **22.1** from Monday to Sunday as the member **74** returns the pill **51.1** to the position of FIG. **7A.** Thus, whether the pill is withdrawn or not, under both circumstances the day indication adheres to the actual dosage withdrawn from the dispenser.

For initial setting of the read-out disc **24,** there must not be a pill in the aperture **94.** The user first withdraws pill transport member **74** to the left, so that rectifying pawl **114** is decoupled from the nearest vane **30.4** (see FIG. **7D**). Then the user may reach through the cut-out **44***b* which is provided for that purpose, and manually engage the drive vanes **30** to rotate the disc **24.** Note that this operation can only be performed before the cartridge **50** is inserted into the hopper **48,** and thus before any pills are dispensed. Therefore, the setting operation takes place at a time when dosage synchronism cannot be manually altered. After the read-out is set to an initial position and the cartridge **50** inserted, as seen in FIGS. **1** and **3,** the cartridge blocks access to the disc **24** through cut-out **44***b*, so that subsequent read-out changes can occur only by disposing a pill for each time interval advance. Thus dosage synchronism is preserved.

In addition to the first group of markings **22.1,** a second identical group of seven day markings **22.2** is located on the readout disc **24** radially outwardly of the first group **22.1.** These markings **22.2** are also masked by platform levels **42** and **44,** and are visible (as seen in FIGS. **1** and **7**) only through a window **44***d* which is an inlet of cut-out **44***a*. Thus, the window **44***d* serves as a reading index for the second group of day markings **22.2.** The markings **22.2** are so synchronized with markings **22.1** as always to indicate the day upon which the next pill **51** is to be taken, and are only visible before the cartridge **50** is inserted. Thus they are used only for initially setting the read-out disc **24** to indicate the day when the first pill is to be taken. Afterward the markings **22.2** are hidden by the opaque bottom wall **64** of cartridge **50** (see FIGS. **1** and **3**), and therefore cannot be confused with the pill indicia **22.1.**

The discussion which follows, concerning the alternative pill dispenser embodiments illustrated in FIGS. **14–30,** is for the most part keyed to the preceding discussion of FIGS. **1–13** by using reference numerals the last two digits of which match the last two digits of the reference numerals applied to elements performing corresponding functions in previously described embodiments.

The alternative pill dispenser embodiment of FIGS. **10** and **11** is similar in most respects to the embodiment just described, but exhibits certain differences which will now be described. The locking pawl **84** of the previous embodiment is omitted, and in its place the pill transport member **274** of the present embodiment is provided with a flexible detenting pawl **400** formed with a tooth **402** which cooperates with a detenting recess **404** formed on the platform member **238** below the upper deck **242** thereof. The pawl tooth **402** engages the recess **404** to detain the pill transport member **274** releasably in its right-hand limiting position.

In addition, the step surface **246** is straight rather than converging, giving the pill hopper **248** a generally rectangular shape, and allowing it to accept a generally rectangular cartridge **250** comprising a transparent top wall **260** and non-transparent bottom wall **264** joined by four vertical walls **262.** The cartridge **250** snaps into place within the hopper **248** when a plurality of projections **406, 408,** and **410** are frictionally received respectively within recess **506** (formed on the back wall **240** of the base member **212**), and recesses **508** and **510** (formed on the step surface **246**).

The cartridge **250** is olded of a fracturable plastic material and has a break-off tab **412** formed as an integral forward extension of the top wall **260.** When the cartridge **250** is snapped into place within the hopper **248,** the break-off tab overlies the upper deck **242** as seen in FIG. **10,** and thus is accessible for breaking off after the cartridge has been loaded into the dispenser

of FIGS. **10** and **11**. A central gate portion **414** (see FIGS. **11** and **12**) of the cartridge front wall **262** is entirely separate from the remainder of the front wall **262** (i.e., is divided therefrom at the lateral edges of the gate panel **414**), and also is separate from the bottom wall **264** (i.e. is divided therefrom along the bottom edge of gate panel **414**). The gate is integrally connected to, and thus held in place by, only the break-off tab **412** and a reinforcing rib **416** (FIGS. **12**) which connects the two.

The cartridge **250** of FIGS. **10–13** has an advantage over the cartridge **50** of FIGS. **1** through **9** in that it can be loaded into the hopper **248** while the gate **414** is in place. Thus pills **251** are thereby positively retained inside the cartridge during loading. Then, after loading, the cartridge **250** can be opened in place by pulling up on the tab **412** which is accessible from above the upper deck **242** (see arrow **418** in FIG. **12**), to break off the tab **412** and its attached gate panel **414**. These parts are thus severed from the top wall **260**, and discarded. The removal of the gate then leaves a one-pill-wide and one-pill-high portal **420** (FIG. **13**) or opening in the front wall **262** through which pills **251** drop one at a time out of the cartridge **250** (see arrow **422**, FIG. **13**) and then slide over the flange **276** and fall into the aperture **294** of pill transport member **274** and one of the pill-receiving recesses **232** of the date wheel **224**.

During break-off, the reinforcing rib exerts an upward force on the gate panel **414** to assure its removal along with the tab **412**. A suitable kerf **424** is cut just rearwardly of pill-viewing window **258** to accommodate the rib **416**.

The dispenser of FIGS. **10** and **11** also differs in another respect from that of the preceding figures. As previously noted, someone might attempt to return the pill transport member while the delivered pill is still in the pill transport aperture. Even though this cannot disturb the synchronism between read-out and dosage schedule, it might be advisable to provide an anti-reverse mechanism for the read-out disc **224**. This takes the form of a flexible pawl **220** molded integrally with the lower platform level **244**, and projecting into the cut-out **244***a* thereof. The anti-reverse pawl **220** is formed with a tooth which projects radially inwardly (relative to read-out disc **224**) into successive engagement with seven detent notches **222**, one for each read-out position, formed at spaced locations around the circumference of the disc **224**. As seen in FIG. **11**, the notches **222** are asymmetrical, and the tooth of pawl **220** is shaped to cooperate therewith in a manner that permits forward but not reverse angular motion of the read-out disc. As a result, the pawl **220** is able to yield flexibly and ride out of the detent notches **222** when the disc is rotated in the forward direction, but locks against the detent notches when an attempt is made to rotate the disc the wrong way.

Consequently, even if the delivered pill is left in the transport aperture **294**, the read-out disc **224** cannot be driven in the reverse direction. If one attempts to drive it in the reverse direction by means of the pill transport member **274**, the pill transport member cannot be moved. Thus, once a pill **251** becomes available at the output port **200**, the read-out unalterably reflects that fact.

Another advantage of the anti-reverse mechanism **220, 222** resides in the fact that it also accomplishes final rectification of the read-out disc **224**. The pill transport member **274** need only rotate the read-out disc **224** for enough for one of the detent notches **222** to capture the anti-reverse pawl **220**, and thereafter the pawl automatically rectifies the disc as it settles into the bottom of that particular detent notch. After it bottoms in the detent notch, the pawl holds the disc **224** precisely in the rectified position. The pill transport member **274** need not, and does not, drive the disc all the way to its rectified position, which eliminates the danger that it will cause the disc **224** to over-shoot the desired stopping point. As a result, it is unnecessary in this embodiment to make the vanes **230** asymmetrical in order to avoid overshooting (see the discussion of corners **30***a* and **30***b* above).

Another type of removable and replaceable pill cartridge which is designed to fit in the dispenser of FIGS. **10** and **11**, and to be opened after the cartridge is loaded into the dispenser, is illustrated in FIGS. **14** through **18**. This cartridge, which is generally designed to fit in the dispenser of FIGS. **10** and **11**, and to be opened after the cartridge is loaded into the dispenser, is illustrated in FIGS. **14** through **18**. This cartridge, which is generally designated **130**, comprises a generally rectangular enclosure molded of a flexible plastic material, and includes a floor panel **132**, roof panel **134**, and side panels **136**. The top panel **134** and two opposing side panels **136** are slit at locations **138**, however, to form a pair of rocker panels **140** at opposite sides of the cartridge **130**. The panels **140** are molded in such an attitude that they both slant upwardly and outwardly from a central region **142**, and thereby rise above the level of the top panel **134** as seen in FIGS. **14** and **15**. The central region **142** is the only location at which the opposed panels **140** are attached to the top panel **134**, or indeed to the remainder of the cartridge **130**.

The material of the top panel **134** permits a certain degree or torsional deflection. As a result, if one of the rocker panels **140** is depressed as indicated by arrow **144** in FIG. **16**, central region **142** twists about its longitudinal axis and causes the opposite rocker panel **140** to rise see-saw fashion, thus enlarging the space **146** between the raised panel **140** and the floor panel **132** immediately below it. In order to appreciate this fact, compare the size of space **146** in FIG. **15**, where both panels **140** are in their normal positions, and the same space **146** as seen in FIG. **16** where one of the panels **140** is depressed and the other is correspondingly elevated.

The raising of one panel **140** by depressing the opposite panel enables space **146** to be opened and closed so that it functions as a controllable pill portal. The dimensions of the cartridge **130** are chosen so that the pills **151** contained within the cartridge are too large vertically to pass through the spaces **146** on either side of the cartridge, when neither of the panels **140** is displaced. But the space **146** does open wide enough in the vertical direction to admit the passage of a pill **151**, as indicated by arrow **148** in FIG. **16**, when the opposite panel **140** is sufficiently depressed in the manner illustrated.

In order to permit the cartridge **132** to withstand the degree of flexure required by this operating mode, the central region **142** of the top panel has a reduced thickness in a roughly oval indicated by a line **152**. In addition, in order to relieve strains in the top panel **134**, cir-

cular openings **154** are formed at the terminations of the severance lines **138** which divide the elevated panels **140** from the remainder of the top panel **134.**

In order to retain the cartridge **130** in place in the dispenser of FIGS. **10** and **11,** it is formed with three tabs **406', 408'** and **410'**. These correspond to the tabs **406, 408,** and **410** of the cartridge illustrated in FIGS. **10** through **13,** and are similarly positioned to cooperate with recesses **506, 508,** and **510** to retain the cartridge in the dispenser. FIG. **17** illustrates the way in which the cartridge **130** is inserted into the dispenser. FIG. **18** shows the cartridge **130** received within the storage hopper of the dispenser, and shows the tabs frictionally engaged within their cooperating recesses. Also in FIG. **18** it is clearly seen that cartridge tab **406'** and its cooperating dispenser recess **506** not only assist the other cartridge tabs **408', 410'** and the dispenser recesses **508, 510** in retaining the cartridge **130** in place within the dispenser, but also retain the rear rocker panel **140.1** in depressed position, so that the front rocker panel **140.2** is raised, permitting tablets **151** to be released from the cartridge **130** and delivered by the pill transport mechanism of the dispenser. It will therefore be appreciated that the cartridge **130** can be inserted in place within the dispenser hopper **248** before depressing one of the rocker panels **140** to open the cartridge. Then, as the cartridge is pressed into place in the hopper, and the rear rocker panel **140.1** is depressed sufficiently to engage tab **406'** in recess **506,** the front rocker panel **140.2** is raised sufficiently to open the cartridge and permit the exit of pills **151** (see arrow **148** in FIG. **18**).

In order to fill cartridges **130** with pills **151** at production speeds, the cartridges may be formed in two separate parts. The first part is a top member comprising the top panel **134,** side panels **136,** rocker panels **140,** and the tab **406'**. The other part comprises the bottom panel **132** and the tabs **408'** and **410'**. Prior to assembly of the two parts, the top member **134,** etc. is inverted to serve as a pill-receiving dish, and the appropriate number of pills **151** are dropped in. Then, while the top member **134** etc. is still in its inverted position and the pills **151** are contained therein, the other member **136** etc. is assembled therewith and secured in place, as for example by ultrasonic or solvent welding.

Because of the fact that it recloses upon release of the rocker panel pressure represented by arrow **144** in FIG. **16,** the type of cartridge illustrated in FIGS. **14** through **18** is also useful as a free-standing pill package (i.e. one which is used apart from a dispenser.) Thus, FIGS. **19–22** show a free-standing pill package **330** which is basically similar in construction to the cartridge **130** of FIGS. **14–18.** It includes a bottom panel **332,** a top panel **334** and side panels **336.** The top panel is divided along lines **338** into elevated panels **340** which rock in see-saw fashion about a central region **342.** The rocking action is aided by circular openings **354** and a reduced thickness in the area indicated by line **352.** The opening and closing action of the package **330** is entirely similar to that of cartridge **130** described above. Thus, FIG. **21** shows panels **340** at equal height, leaving the pill cartridge in closed condition; while in FIG. **22** it is seen that pressure represented by an arrow **344** depresses one of the panels **340** and raises the other one high enough to permit pills **351** to exit through an opening **346** as indicated by arrow **348.**

Package **330** differs from cartridge **130,** however, in that it lacks the tabs **406', 408'** and **410'** for cooperation with a dispenser as indicated in FIGS. **17** and **18.** This is because the package **330** is intended to be used as a free-standing pill package, without any automatic date indicating or advancing features. For example, it is particularly useful as an inexpensive aspirin tablet package. When the pressure represented by arrow **344** of FIG. **22** is released, the package **330** spontaneously returns to the closed condition illustrated by FIG. **21.** Thus, the user can carry the pill package **330** about in a purse or pocket, confident that the pills **351** will not escape. Yet when the need for a pill arises, simple pressure on one of the panels **340** is enough to raise the opposite panel **340** and open the portal **346** wide enough for a pill **351** to escape.

In a preferred embodiment of the pill-package **330,** provision is made to prevent more than one or two pills **351** from passing through the portal **356** at a given time. This consists of a pill barrier **360** which surrounds on three sides a pill trap in the form of a depressed pocket **362** formed in the bottom panel **332.** The height of the barrier **360** is such that each one of the pills **351** has sufficient clearance to pass between the barrier and the adjacent rocker panel **340** when the latter is in its normal (i.e. closed) position as illustrated in FIG. **21.** The user manually inverts and jostles pill package **330** so that one or more pills **351** are thrown over the barrier **360.** Once the pocket **362** is filled, however, no more pills **351** can enter it. The pocket **362** is made large enough to hold a predetermined number of pills, which depends upon the type of medication. If the package **330** is used for aspirin, which is normally taken in double dosage, the recess **360** would be large enough to hold two tablets. Once the trap **360, 362** is filled with the appropriate number of pills, then the portal **346** can be opened as illustrated in FIG. **22,** and the pill package **330** inclined so that all the pills **351** which are within the packet **362** will fall out. But the pill barrier **360** will prevent any other pills **351** from reaching the open portal **346** at that time.

FIGS. **23, 24, 24A** and **27** illustrate still another embodiment of a pill dispenser in accordance with this invention, which is generally similar to the preceding embodiments except for the following features. First, an anti-reverse mechanism in this embodiment comprises a plurality of flexible, tangentially oriented pawls **620** which are molded integrally with the read-out disc **624,** and cooperate with a single detent notch **622** formed in a ridge **623** integrally molded on the bottom surface of the lower deck **644.** FIG. **23** illustrates one of the anti-reverse pawls engaged in the detent notch to prevent retrograde motion of the disc **624.** Since anti-reverse mechanisms inherently accomplish rectification as well, the vanes **630** of disc **624** are symmetrical.

A second distinctive feature of this embodiment relates to its cooperation with another type of pill cartridge **650** designed to be opened after insertion into the dispenser. As seen in FIGS. **25** and **26,** this cartridge comprises a bottoom sheet **664** of molded plastic material. The bottom layer is formed into a dish shape to define a shallow rectangular pill receptacle **665,** and a peripheral flange **667.** A top plastic sheet **660** overlies the receptacle and flange, and the portion **660*a*** thereof

which covers flange 667 is heat-sealed thereto in order to form a closed pill package.

To facilitate opening of the cartridge 650, the front edge of the flange 667 of bottom layer 664 is extended forwardly to define a tear tab 612. This tab is scored for removal from the remainder of flange 667 along lines 669. These lines are extended across the front wall 662 of receptacle 665 as indicated by score lines 671. The latter lines are joined by a transverse score line 673 which cooperates therewith to define a removable gate panel 614 which is joined to the tear tab 612 along an unscored fold line 673. Thus the tear tab 612 can be pulled forwardly as indicated by arrow 675 to remove the gate panel 614. The latter then separates entirely from the pill receptacle 665 along score lines 671 and 673, leaving an open portal 620 (FIG. 26) formed in the front wall 662, through which pills 651 can emerge.

The present cartridge, like those of FIGS. 10 through 18, can be opened after insertion into the appropriate dispenser. Referring to FIGS. 23, 24 and 24A, the upper deck 642 of the dispenser illustrated therein is formed with a curved surface 642*a* which cams the tear tab 612 upwardly upon cartridge insertion. The curvature, and its camming action in relation to tab 612, are illustrated in FIG. 24A. The camming surface 642*a* surrounds the pill-viewing window 658 formed in deck 642, and is directly behind a transverse bridge member 677. Side surfaces 679 at a lowermost level of the hopper 648 are laterally spaced apart the right distance to receive the lower pill receptacle portion 665 of cartridge 650. The upper flanges 667, 660*a* are received between more widely spaced upper surfaces 681 of the hopper 648. In addition, the cartridge flanges slide underneath a pair of lips 683 which are undercut at 693 (FIG. 24A) to receive the flanges and thereby retain the cartridge to the dispenser. When the cartridge 650 is fully inserted, the front edge of the flange strikes against the front surface 685 of hopper 648. The forwardly projecting tear tab 612, however, slides under the bridge 677 and is cammed upwardly through window 658 by curved surface 642*a*. This makes the tear tab 612 accessible from above surface 642, so that it can be pulled off as indicated by arrow 675 to open the cartridge after insertion in the dispenser. Pills 651 can then move forwardly out of the cartridge 650 as indicated by arrow 687, and fall downwardly into one of the pill receptacles 632 as indicated by arrow 689.

In order to keep dirt out and the pills 651 in, a "lid" is provided to block the window 658 after opening the cartridge 650. The lid consists of a tab 660*b* integral with the cartridge upper layer 660. This tab, plus an extension 660*c*, projects forwardly from the cartridge and is initially coextensive with the tear tab 612 therebelow. The extension 660*c* is heat-sealed to the tear tab 612 in order to keep cartridge 650 closed until the time comes to open it, and in order to make elements 660*c*, 660*b* and 612 act as a unit when cammed upwardly by curved surface 642*a*. Lid 660*b*, however, is separable from its extension 660*c* along a score line 691, and is not heat-sealed to the removable tear tab 612. Consequently, as seen in FIGS. 25 and 26, the tear tab 612 and extension 660*c* are removed together, and leave behind the lid 660*b* to close off window 658. Plastic layer 660 is transparent, however, so that the user can look through it to verify that a pill 651 has entered the receptacle 632 when using the dispenser.

Note in FIG. 24A that lid 660*b* and its extension 660*c* together are long enough to extend above the surface of deck 642 for ease of grasping before the cartridge 650 is opened, but afterward the shorter length of the remaining lid portion 660*b* causes it to fall below the surface of the deck 642 (as indicated by the dashed lines) where it is out of the way.

A third distinctive feature of the dispenser of FIGS. 23, 24 and 27 relates to detecting means for establishing two distinct operating positions for the pill transport member 674. With reference to FIGS. 23 and 27, a rounded boss 610 is integrally molded on the upper surface of deck 642, and protrudes into the path of slide button 682 during pill delivery (i.e. leftward) movement of the transport member 674. In order to move out of its rest position and deliver a pill, the slide button 682 must ride over the boss 601. A groove 603 is formed in the underside of the button, and a dimple 605 is also formed therein near the end of the groove. An unrelieved space between dimple 605 and the trailing end of groove 603 defines, in effect, a ridge 607. At the leading end of groove 603 a similar unrelieved space defines, in effect, a ridge 609.

When the transport member 674 is moved to the left for pill delivery purposes, boss 601 snaps under ridge 609, after which it rides within the groove 603. At the end of the pill delivery travel of member 674, boss 601 snaps under ridge 607, and the pill transport member 674 comes to rest with the boss received in dimple 605, thus precisely defining the leftward extreme of pill transport motion. When the pill transport member is returned to the right, boss 601 snaps under ridge 607, travels through groove 603 in the opposite direction, and finally snaps under the ridge 609. The final position, illustrated in FIG. 27 precisely defines the rightward extreme of member 674.

Another distinctive feature of this embodiment relates to locking the cover 614 so that a child finding the dispenser would have difficulty in reaching the pill cartridge 650 inside. As best seen in FIGS. 23 and 24, the dispenser cover 614 terminates at a front edge 614*a* which falls just behind the slide button 682 when the cover 614 is closed. In addition, as seen in FIGS. 23, 24 and 27, the front edge 614*a* is formed with a forwardly projecting flange 614*b* at the right hand side of the cover 614. A corresponding slot 682*a* is formed in the rear surface of slide button 682 at the right hand side thereof, and is appropriately sized to receive the cover flange 614*b* in sliding engagement therewith. When the cover 614 is closed (as shown by the solid lines), and pill transport member 674 is moved to the right to its rest position, slot 682*a* slides into engagement with flange 614*b*. The resulting engagement causes button 682 to retain cover 614 in its closed position. The cover then can not be raised to its open position (shown by dashed lines) unless the pill transport member 674 is first moved far enough to the left to release the slot 682*a* from flange 614*b*.

FIGS. 28 through 30 illustrate still another embodiment of a pill dispenser in accordance with this invention, which is generally similar to the embodiment of FIGS. 23 and 24, but differs in two important respects, one pertaining to the molding of the dispenser, and the other to a latching closure for the cover of the dispenser.

The embodiment of FIGS. 28 thorugh 30 is advantageously molded of only four separate parts: one which

includes the case cover **714,** the side walls **740** of the lower half of the case and the plastic platform **738**; a second which comprises the pill transport member **774**; a third which comprises the read-out disc **724**; and a fourth which comprises a bottom panel **728.**

The cover member **714** is integrally formed with an L-shaped clasp **720** designed to mate with a latching recess **718** formed on the bottom panel **728.** The cover **714,** is connected to the platform **738** by an integrally molded hinge web **716.** The platform **738** is stepped to define the upper level **742** and lower level **744.** The pill cartridge, which is preferably of the type illustrated in FIGS. **24** through **26,** fits into a hopper or receptacle **748** which is defined by the platform lower level **744** and terraced side surfaces **779** and **781.** Undercut lips **783** are provided for guiding and retaining the pill cartridge. A large window **744***b* is provided for setting the time read-out disc **724** and a smaller window **744***d* is provided for reading the day indications on the disc during setting. A ridge **823** formed on the underside of the lower platform surface **744** is shaped to provide a detent recess **822.** A circular boss **736** depends from the lower surface of the deck **744** to provide a hub for journaling the read-out disc **724.**

The upper platform level **742** is formed with a pill observation window **758** surrounding which are curved surfaces **742***a* for camming the tear tab of the pill cartridge up above the level of surface **742,** and a bridge member **747** which guides the tear tab against the camming surface **742***a* upon initial insertion of the pill cartridge. A pill delivery window **800** is also formed in the platform level **742.** In this instance it is located to the left of the viewing window **758.**

The forward region of the upper platform level **742** is stepped downwardly to provide a running surface **742***b* for the slide button **782** of the pill transport member **774.** Since in this embodiment the platform **738** is molded integrally with the side walls **740,** the channel **780** in which the pill transport member **774** reciprocates does not open through to the side of the platform **738.** Consequently, the pill transport member **774** and platform **738** are assembled by inserting the slide button upwardly through the open bottom of the platform **738** and through the slide channel **780.** Once the slide button **782** is inserted up above the level of the step **742***b*, then it is able to move to the left across the step **742***b* and ride over the detenting boss **701.**

The second of the four plastic molded parts, the pill transport member **774,** comprises the slide button **782** and a flange **776** which is formed with a pill transport aperture **794** and a downwardly extending pawl **814** which partially accomplishes rectification of the read-out disc **724.** The rectification function performed by the pawl **814** is only partial since final rectification is accomplished by the flexible detenting pawls **820** of read-out disc **724,** in cooperation with the detenting notch **822** on the underside of platform level **744.**

The step level **742***b* is only able to support transport member **774** vertically when the transport member is moved to the left, riding over the detent boss **701.** When the transport member **774** is in the right position, it can become disassembled downwardly from the step level **742***b*, because the slide button **782** passes downwardly through the slide channel **780** as easily as it passes upwardly during initial assembly. Therefore the bottom of panel **728** is formed with a raised rectangular supporting boss **900** located at the front right hand corner thereof, where it is directly below a heel **782***a* formed below slide button **782.** This boss **900** engages heel **782***a* to support the pill transport member **774** from underneath when all the parts are assembled and the pill transport member is moved to its far right position.

In addition to the flexible detent pawls **820,** the read-out disc **724** has integrally molded thereon the vanes **730** which cooperate with a pill to form part of the mechanical coupling from the transport member **774.** The two series of day indicia **722.1** and **722.2** appear on the read-out disc **724** and are intended to be read through windows **800** and **744***d* respectively. A central opening **734** permits the read-out disc to be journaled upon a circular boss **736** extending downwardly from the lower surface of platform level **744.** In the assembly of this dispenser, the read-out disc **724** is inserted upwardly through the open bottom of member **738** after the pill transport member **774** is put in place.

It will now be understood that the advantage of molding this embodiment of the dispenser in four parts, and making the side walls **740** integral with the platform **738** rather than with the bottom panel **728,** is that assembly of the dispenser after molding is considerably more convenient. In order to prevent cyrstallization of the flexiable hinge web **716** between cover **714** and shelf **738,** the hinge must be flexed a couple of times soon after molding. Then after the flexing of the hinge webbing **716** is accomplished, ease of handing of the molded units dictates that the cover **714** be left in the closed position illustrated in FIG. **729** while the molded part **714, 738** is shipped to the next station for assembly with the other molded parts **774, 724** and **728.** To avoid the necessity for reopening the cover **714** to permit such assembly, the unit is designed for assembly from below so that the cover **714** can remain closed. Thus the pill transport member **774** is inserted from below, passing the slide button **782** through the slide channel **780**; then the read-out disc **724** is inserted, passing the circular boss **736** downwardly through the journal opening **734,** and finally the bottom panel **728** is inserted in the bottom opening. The fact that assembly can be accomplished without the need for reopening the case cover **714** makes it easier for the assembly operation to be automated, and thereby decreases the production cost of the pill dispenser unit.

After insertion of the bottom panel **728** upwardly into the open bottom of member **738,** the panel **748** is secured in place by heat-sealing, ultrasonic or solvent welding, or other conventional assembly methods commonly used with plastic materials. In the alternative the parts may be adapted for a snap fit to permit subsequent disassembly should that be desired. In addition to the supporting boss **900** which retains the pill transport member **774** in place under conditions described above, the bottom panel **728** is formed with an upwardly extending circular boss **902** which passes through the central aperture **734** of the read-out disc **724** and is received within a cooperating central recess **904** (see FIG. **29**) on the underside of platform boss **736.** The bottom panel **728** is also formed with an oddly shaped aperture **718** which cooperates with the clasp **720** formed on the case cover **714.**

The clasp **720** is an L-shaped member connected at one end to the case cover **714** by a flexible integrally molded hinge webbing **904.** At its other end the clasp **720** is formed with a latching dog **906** having slanted

surfaces **906***a* and **906***b* which cooperate with similarly slanted surfaces **718***a* and **718***b* respectively of the recess **718** formed in the bottom panel **728.** In order to latch the case cover **714** in its closed position, the L-shaped clasp **720** is swung downwardly and the latching dog **906** is pressed upwardly into the recess **718** so that surfaces **906***a* and **906***b* mate with surfaces **718***a* and **718***b* respectively as seen in FIG. **30.**

When the latch is in this closed position illustrated by FIG. **30,** it restrains opening of the cover **714** because upward pressure on the cover would merely serve to bind surfaCe **906***b* against surface **718***b* owing to the re-entrant angles of those surfaces. Thus the latch mechanism of this embodiment serves to prevent unauthorized access to the medication contained in the pill dispenser, by defeating the apparent logical procedure for opening the cover **714,** i.e. pulling upwardly thereon.

The way to open the cover **714** is to push rearwardly, as illustrated by arrow **908** in FIG. **30,** against a rounded belly **910** of the clasp **720,** which is spaced somewhat away from the adjacent wall **740.** The belly **910** is flexible enough to deform toward the wall **740** in response to the pressure represented by arrow **908.** At the same time, surface **906***a* cams against surface **718***a* and, because of the angle of these surfaces, cams the latching dog **906** downwardly out of the recess **718** as indicated by arrow **912.** This releases the latching engagement between dog **906** and recess **718,** and then permits the cover **714** to be opened by the normal upward motion.

The operation of all previously discussed dispenser embodiments is such that when the pill transport member, e.g. element **74** in FIGS. **1** through **7,** is in its rest position (i.e. to the right, as seen in FIG. 7D) the first pill **51.1** to enter nozzle **54** rests on flange **76,** and cannot then enter the transport aperture **94.** Subsequently the first, or leftward, movement of the transport member **74** brings the aperture **94** into pill-receiving position, after which the second, or return, movement of the transport member to the right causes that pill **51.1** to rotate the read-out disc **24** counter-clockwise. After its return to the right, the transport member is again in its rest position, and the next pill **51.2** to enter nozzle **54** again rests on flange **76.**

In the alternative embodiment of FIGS. **28** through **30** the positions of the transport aperture and rectifying pawl are reversed relative to FIGS. **1** through **7;** i.e. the aperture **794** is at the left side of flange **776** and the pawl **814** is at the right. When the transport member **774** is in its rest position the first pill is able to enter the transport aperture **794** immediately. Rotation of the read-out disc **724** (in the clockwise direction, in contrast to the preceding embodiments) then takes place on the first, or leftward, stroke of the pill transport member **774.** Then when the pill transport member **774** is returned to the right to its rest position, the next pill immediately reloads the aperture **794** and remains there until the next operating cycle.

The first (i.e. leftward) stroke of the pill transport member **774** is effective, not only to rotate the date disc **724,** but also to deliver the pill to the output port **800.** Later, the return (rightward) stroke of transport member **774** causes it to vacate the output port. Therefore, if the user were, for some reason, to drop the pill into the output port **800** after the trnasport member **774** is returned to the right, the pill might then slip out from under the port **800** and slide around loose under the platform **742,** making retrieval difficult. In order to prevent such escape of the pill under these circumstances, a boss **914** (FIG. **28**) is integrally formed on the underside of platform **742,** just to the left of the pill output port **800.** As a result, if anyone should return a pill to the output port **800** after returning transport member **774** to the right, the pill would be caged on all four sides, i.e. on the left by the depending boss **914,** on the right by the left shoulder of transport member **774,** in the rear by the adjacent one of the disc drive vanes **730,** and in the front by the vertical step which divides the lower platform level **742***b* from the rest of platform **742.** The pill is also supported from below by the date disc **724.** As a result, it cannot escape, but must remain directly below the output port **800,** a position from which it is easily retrieved.

CONCLUSION

It will now be appreciated that the pill storage and dispensing device of this invention is designed for uncompromising synchronism between the dosage schedule and the pill interval read-out. The mechanism which transports each pill from the storage hopper to the output port is not normally coupled to advance the read-out a full increment (although there may be a momentary connection between them which moves the read-out less than a full increment for the limited purpose of rectification). The only time that the pill transport mechanism can advance the read-out one full increment is when the two are coupled together by a pill in the process of delivery. The mechanism is designed so that even if reverse motion of the time read-out is possible, such motion is unable to introduce asynchronism between the dosage schedule and the read-out. Auxiliary time indications are provided, for use in the initial setting of the read-out. But this auxiliary read-out is only visible, and indeed the process of initial read-out setting is only possible, prior to the insertion of a pill cartridge, and hence prior to the start of a dosage schedule.

The cartridge is a removable and replaceable pill container which may have provision for opening after insertion into the dispenser, and may also be usable as a free-standing pill package apart from the dispensing mechanism. The dispenser preferably has a cover, and provision may be made for locking the cover to prevent unauthorized access to the medication.

Since the foregoing description and drawings are merely illustrative, the scope of protection of the invention has been more broadly stated in the following claims; and these should be liberally interpreted so as to obtain the benefit of all equivalents to which the invention is fairly entitled.

What is claimed is:

1. A pill cartridge for insertion in a pill dispenser comprising a sealed enclosure having upper and lower walls the upper wall having a transparent segment to enable viewing of retained pills, side panels connecting said walls, the height of pills oriented in side by side flat relationship in the enclosure, one of said side panels being scored to define a removable pill gate panel, and a removable tab integrally attached to said gate panel and extending outwardly from said package for ease of removal of said gate panel to form a pill exit port, said upper wall being formed with an extension overlying said tab to shelter said pill exit port after tab removal

and after the pill cartridge is inserted in the pill dispenser.

2. A pill cartridge for a pill dispenser comprising an enclosure having a pill exit and formed with a plurality of walls, one wall being divided at a plurality of separate locations to form a pair of rocker panels which are pivotally joined to said one wall, said rocker panels being located relative to each other for see-saw motion with respect to one another, one of said rocker panels being depressible to raise the other rocker panel, and means located adjacent a rocker panel and in fixed relationship with the enclosure to normally obstruct said pill exit while enabling passage of a pill from said pill exit when the adjacent rocker panel is depressed.

3. The pill cartridge as claimed in claim **2** wherein said walls and rocker panels are integrally molded of a plastic material which is sufficiently resilient to restore both said rocker panels substantially to their original positions to reclose said pill exit when depression of said one rocker panel terminates.

4. The pill cartridge as claimed in claim **3** wherein said means further comprises a bottom wall and a raised barrier on said bottom wall enclosing an area adjacent said pill exit and being sized to permit a pill to clear said barrier only when said one rocker panel is depressed.

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