ABSTRACT OF THE DISCLOSURE

This invention relates to a timed dispenser apparatus and more particularly to a timed medication dispenser device for dispensing at pre-selected time intervals, any desired dosage, such dispensing action being accomplished by providing a delivery station communicable with and normally isolated from a storage means for holding a plurality of doses and utilizing a timer to actuate control means which provide communication at selected intervals and sensing means responsive to the passage of a dose to the delivery station to deactivate the timer and thereupon to reactivate the timer when the dose is removed from the delivery station.

This invention further relates to a timed medication dispenser device wherein a supply of a drug or like medication is maintained in such manner that the patient cannot gain access thereto except at certain selected intervals. At such intervals, the desired dosage, in a separate container, is automatically fed from the apparatus to a delivery station. It is a feature of the invention that the timer apparatus is deactivated in response to the feeding of a dosage to a delivery station and reactivated in response to the removal of the dosage from the delivery station. By this means, a patient is positively prevented from inadvertently obtaining excessive dosages within an unduly short period of time.

In contrast, a dispensing apparatus which merely deposits the desired dosage at the desired intervals, irrespective of whether or not the patient had removed the prior dosage from the device, might result in the patient's inadvertently skipping one dosage and then obtaining and administering a double dosage.

Accordingly, it is an object of the invention to provide a timed dispensing apparatus for medications or the like.

A further object of the invention is the provision of an automatic device of the class described which may be readily loaded and which, in the loaded condition, positively prevents access to its contents.

A further object of the invention is the provision of a device of the type described which has sensor means for detecting delivery of a dosage to the delivery station, the sensor means being effective to prevent reactivation of the timer device and, hence, prevent the deposit of a further dose unless the prior dose has been physically removed from the dispensing station.

A further object of the invention is the provision of a device of the class described which may be readily set up to deliver dosages at selected intervals, the timer mechanism for varying the dispensing intervals being flexible so that the dosage schedule may be easily varied even by an unskilled operator.

To attain these objects and such further objects as may appear herein or be hereafter pointed out, reference is made to the accompanying drawings, forming a part hereof, in which:

FIG. 1 is a perspective view of a dispensing mechanism in accordance with the invention, partly open to admit vials for loading purposes;

FIG. 2 is a side elevational view with parts broken away;

FIG. 3 is a horizontal section taken on the line 3—3 of FIG. 2;

FIG. 4 is a sectional view on an enlarged scale taken along line 4—4 of FIG. 2;

FIGS. 5 and 6 are vertical sectional views of the dispensing mechanism of the device, respectively in the withholding and the dispensing positions thereof;

FIG. 7 is a sectional view showing the parts at the dispensing station of the device;

FIG. 8 is a sectional view of a portion of the timer mechanism taken on the line 8—8 of FIG. 5; and

FIG. 9 is a schematic circuit diagram of the device.

Referring now to the drawings, the dispensing apparatus 10 includes a medication compartment 11 and a mechanism housing 12. The compartment 11, which may comprise a channel-like extrusion, is elongated and generally rectangular in horizontal section so as to define a vertically extending guideway for stacked cylindrical medicine vials or like containers 26. The compartment 11 includes a loading aperture 13 at its upper end, the aperture preferably being formed by cutting away portions from its spaced apart front walls 14, 15 of the compartment 11. A locking tab 16 projects forwardly from the top 17 of the compartment.

To the rear wall 18 of the housing 12 is fixed a hinge portion 19, the other leaf of the hinge being connected to a lid or cover member 20 for the housing 12. A second hinge 21 is fixed at a forward end of the lid 20, the hinge 21 pivotally linking the compartment cover 22 to the compartment 11.

As will be clear from FIGS. 1 and 2, the cover member 22 is coextensive with the exposed portion of the container 11 and includes adjacent its upper end 23, a locking aperture 24. The apertured tab 16 at the upper end of the container 11 may be disposed through the aperture 24 in the cover member 22, in which position a lock 25, passed through the aperture in the tab, will fix the cover member 22 against the columnar compartment 11 and at the same time retain the lid 20 in position to seal the housing 12.

It will be understood that the cylindrical containers or vials 26 will be stored in the compartment 11 by loading the same through the loading aperture 13 and will be released at spaced time intervals to the dispenser mouth 27 by dispensing mechanism referred to generally as 28, next to be described, which mechanism is interposed between the compartment 11 and the mouth.

The dispenser mechanism is operated by an intermittently actuated solenoid 29 fixed to a side wall 30 of the housing, as by machine screws 31, the armature or plunger 32 of the solenoid controlling a dispensing linkage.

The dispensing linkage includes a release lever 33 pivotally mounted on pivot pin 34 fixed to a bracket 35 made fast to the front wall 36 of the housing.

The release lever includes a swing out protruding arm 37 which projects into the path of the lowermost container 26 through an access aperture 38 defined in the compartment 11. The lever 37 is biased into the path of the containers by coil spring 39 tensioned between spring seat 40 at the upper end of the lever 33 and the anchor pin 41 which extends laterally inwardly from bracket 42 fastened to the side wall 30 of the housing.

An operator link 43 is swingably connected at its upper end to the bracket 42 by a pivot 44 extending laterally from the bracket. A slide pin, 45, made fast to the link 43, lies within a vertically extending retractor slot 46 formed in the release lever 33. The link 43 includes a guide slot 47, within which slot loosely rides a cross bar 48 carried by the bifurcated end 48' of solenoid armature or plunger 32.

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3,369,697 PROGRAMMED MEDICATION DISPENSER
John Glucksman, 145 W. 86th St. 10024, and Joseph R. Kuh, 51 E. 91st St. 10028, both of New York, N.Y. Filed Aug. 5, 1966, Ser. No. 573,444 7 Claims. (Cl. 221—9)

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The operation of the linkage 28 will be evident from a comparison of FIGS. 5 and 6. In the normal or deacti-

vated condition of the solenoid of the linkage shown in the position shown in FIG. 5 wherein it will be seen

that the tension of spring 39 will pivot the release lever 33 clockwise about the pivot pin 34, to maintain the release fingers 37 interposed in the path of the containers 26 in the compartment 11. When the solenoid is energized, how-

ever, the cross bar 42 will draw the operator link 43 out-

wardly, rotating the link 43 counterclockwise about the pivot 44, the cross bar 48 riding within the slot 47 formed in the operator link 43 during such retracting movement. The aforesaid pivotal movement of the operator link will be transferred to the release lever by the slide pin 45 riding in the slid guide slot 46 of the lever. In the course of the retracting movement, the fingers 37 will be with-

drawn from its position beneath the lowermost container 26 and such container will be permitted to fall to the

dispenser mouth 27.

The rearward movement of the lower end of the lever 37 will cause a concomitant forward or outward move-

ment of the upper blocking portion 49 of the lever 33, projecting the portion 49 into the path of the second con-

tainer 26 in the compartment 11, thus preventing such container from following the dropped vial through the

dispenser mouth.

The position of the parts after energization of the solenoid is shown in FIG. 6.

When the solenoid is de-energized, spring 39 will cause the parts to return to the position shown in FIG. 5, where-

in the blocking finger 37 will be re-established in the path between the compartment 11 and the mouth 27 in time to catch the vial 26 previously prevented from descending through compartment 11 by the upper portion 49 of the release lever.

As will be obvious from an examination of FIG. 5, it will be seen that attempts manually to release a container 26 by an inward pressure against the release finger 37 will be of no avail since the mechanical arrangement set up by the pins 44, 45 and 48 is such that the linear forces which may be exerted will be ineffective to clear the finger 37 from the path of the lowermost container 26.

The solenoid 29 is periodically activated by a timer mechanism 50 next to be described.

The timer mechanism, which is best illustrated in FIGS. 2, 3 and 8, includes a mounting frame 50 supported by spacer bars 51, the lower ends of which are fixed to the underside 52 of the housing. A motor assembly 53 is bolted to the mounting frame and, through the usual gears and shafts, drives the timer shaft 54 at a predetermined speed, preferably one revolution per day.

The timer shaft carries a turntable 55 which is formed with a plurality of circumferentially spaced apart mounting holes 56. In the illustrated embodiment, twelve mounting holes are shown, it being understood that more or fewer mounting holes may be employed and that the speed of rotation of the timer shaft 54 will be a governing factor in the number of mounting holes.

As best seen in FIGS. 3 and 8, a peripheral groove 57 is formed in the turntable 55, the groove 57 being prefer-

ably sufficiently deep so as to intersect the mounting holes 56. An annular coil spring 58 is seated under tension in the groove 57, the tensioned condition of the spring causing portions of the spring to be exposed through the mounting holes 56.

One or more of the mounting holes 56 is used to support actuator pins 59 which trip the timing switch mechanism. The actuator pins 59 are best illustrated in FIG. 8 and include a depending cylindrical stud portion 60 of a size to fit with minimum clearances within the mounting holes 56, the upper end of the stud portion carrying a tubular collar 61 of greater diameter than stud portions 60. The actuator pins 59 are assembled in any desired relation in the turntable by inserting the depending studs 60 through the selected mounting holes 56 until the lower-

most surface of the tubular collar 61 is seated against the upper surface of the turntable.

The pins are maintained on the turntable against inadvertent dislocation by the close fit provided between the stud 60 and the mounting holes 56 and by the frictional engagement of the coil spring 58, portions of which, by reason of the intersecting relation of the groove 57 and the holes 56, bear against side portions of the studs 60. In order to establish the schedule for the mechanism, a time indicator bezel 62, comprising an an-

nular member, is supported on the mounting frame 59 by means of bolts 63 extending through spacer sleeves 64 and threaded into the frame. As shown in FIG. 3, the bezel is marked with an arrow 65, indicating the present or “time now” position and, in addition, with numerical hour indicators or other indicia 66, corresponding with the spacing of the mounting holes of the turntable, to indicate the proper location of pins for the dispensing of dosages at times corresponding to the markings on the bezel.

Thus, if a dose is to be dispensed two hours from the initially set time, an actuator pin 59 will be inserted in the mounting hole 56 opposite the indicator #2, etc.

The actuator pins 59, and more particularly the stud portions 60 thereof, operate a dispenser microswitch mechanism 67 located on the upper face of the mounting frame 59, the microswitch 67 controlling solenoid 29.

The microswitch 67 includes a trip bar 68 having a curved end portion 69, the bar being fabricated of spring steel or phosphor bronze. As best seen from FIG. 3, the curved end portion 69 projects into the path of the studs 60 as the same are clockwise rotated by the turntable 55, periodically to close the switch when the trip bar 68 has been sufficiently outwardly biased by the passing of the stud portions 60 of the actuator pins 59. The contacts of the microswitch 67 will remain closed until after the stud portion 60 has passed beyond the tip portion 65, whereupon the trip bar 68 will spring back to its normal position in the path of the next stud, permitting the contacts of the switch 67 to re-open.

An important feature of the invention lies in the provision of a sensor switch 70 which is disposed in the path of the containers released by the dispensing finger 37. As best shown in FIGS. 7, 8 and 9, the dispenser switch 70 includes an operator arm 71 which is normally outwardly biased to lie adjacent the dispenser mouth 27.

The arm 71 may be shifted inwardly to the position shown in FIG. 7 by a light pressure, to close the switch 70 by the falling of a vial or container 26 adjacent the mouth 27. As will be clear from FIG. 7, the arm 71 will be maintained in its inwardly pivoted position so long as the dispensed vial or container remains in the dispenser mouth 27.

The switch 70 is of the single pole, double throw type. As can best be seen from the circuit diagram, FIG. 5, switch 70 in its normal or outwardly projected position (FIGS. 2 and 9), completes the circuit to the timer motor 53. Thus, so long as the arm 71 is outwardly disposed, the timer motor 53 will continue to run. When the arm 71 is shifted inwardly, the circuit to motor 53 is opened and the circuit, through an indicator light 73 (or a buzzer or other alarm, as desired) is closed.

As shown in FIG. 7, the dispensed vial will maintain the circuit through the light or alarm in closed condition until the vial is removed, permitting the arm 71 to spring outwardly, opening the circuit through the light and again closing the circuit through the timer motor.

The operation of the device will be obvious from the preceding description. The device is initially loaded by depositing within the container 11 a series of vials 26, each vial containing a desired dose or dosages. At the same time, the operator will insert actuator pins 59 into the appropriate portion of the dis-

pending mechanism will be activated a predetermined period of time from the initial or setup time.
With the device properly loaded and the pins properly set, the lid is shut and lock 25 applied, to prevent tampering or manipulation of the contents of the device. The device may then be connected to a source of power applied to terminals V to activate the timer motor 53. When the turntable has been rotated sufficiently to bring stud portion 60 into closing contact with the curved end portion 69 of the trip bar 68 of the switch 67, the contacts of switch 67 will be closed, energizing the solenoid 29.

When the solenoid is energized, the armature or plunger 32 will retract the dispensing linkage from the position shown in FIG. 5 to the position shown in FIG. 6, whereby the lowermost via 26 will be permitted to fall to the dispensing mouth 27 and the second-in-line via 26 will be urged into contact with the blocking portion 49 at the upper surface of release lever 33. So long as the circuit through the solenoid 29 remains energized, the parts will remain in the position shown in FIG. 6. Since such circuit may remain energized for a protracted period, it is preferable that the solenoid 29 be of the "continuous duty" type.

The released via 26, in the course of its downward movement, will engage and inwardly shift the arm 71 of sensor switch 70, shifting the switch from the position shown in circuit diagram, FIG. 9, to open the circuit to motor 53 and close the circuit to the light 73, thus apprising the patient or attendant, by the signal light, that a dosage has been dispensed and should be administered. The signalling indication provided by the light is implemented by the hum of the energized solenoid 29, which acts as a sonic reminder that a dosage has been dispensed.

So long as the dispensing via 26 remains at the mouth portion 27, the parts will remain in the condition of FIG. 6 and the timer motor will not be reactivated. The timer motor is reactivated only after the via is removed from the mouth, permitting the switch arm 71 to swing outwardly into the mouth portion, causing switch 70 to de-activate the light 73 and re-energize the motor 83.

From the foregoing description it will be clear that while the first dosage is dispensed in a predetermined time period after initiation of the operation of the device, subsequent dosages are dispensed a predetermined time period after the physical removal of the device from the previously dispensed dosage. Thus it is impossible if, for instance, the patient is to be injected prior to each dosage, for a second dosage to be released until the expiration of a predetermined time lapse after removal of the first dosage.

When the motor is restarted by the return of switch 70 to the initial position, the solenoid 29 will remain energized for a short period of time, i.e., until the actuator pin 59 which caused the dosage drop, has shifted to a position beyond the tip 69 of the trip bar 68. When the pin 59 passes the noted position, the switch 67 will be opened to the position shown in FIG. 9, whereupon the solenoid armature will be withdrawn by the spring 39, re-energizing the dispense link 33 to the position shown in FIG. 5, whereas the now lowermost via 26 will be permitted to fall from its position adjacent the blocking portion 49 of the lever to a position above the release finger 37 thereof.

Optionally, but preferably, the mechanism may be provided with an alarm system for indicating to the patient or attendant that the dispense mechanism has been disconnected from the power mains. This function is performed by a relay 80 having a holding coil 81 normally connected across the power mains to maintain an open circuit between the lines 82 and 83 (illustratively shown in closed circuit condition in FIG. 9). Lines 82, 83 are connected in series with a battery 84 and an alarm mechanism 85.

From the foregoing it will be seen that in the event of an inadvertent disconnection of the apparatus from the power mains, the interruption in the circuit of holding coil 81 will close the circuit between lines 82, 83 and activate the battery alarm 85, thus immediately apprising the patient or an attendant of the disconnection.

It will thus be seen that the present invention provides an automatic means for dispensing dosages at timed intervals, which device will be particularly useful in reducing the burden on nurses, attendants and aides under present crowded hospital conditions.

A particular advantage of the device lies in its unique ability to condition the dispensing of a subsequent dosage on the occurrence of two factors, namely, the expiration of a predetermined amount of time and the removal of a previously dispensed dose from the apparatus, presumably for administration.

The device of the present invention is simple and may be easily loaded and set up for operation by relatively inexperienced help, and is essentially foolproof in its operation.

The dispensing mechanism is so arranged as to be incapable of manual operation, so that the dosages may not be manually removed from the apparatus prior to the time for their intended administration.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. A device for dispensing medicament containers of the like at timed intervals comprising a compartment having a series of containers disposed therein, delivery means actuated through a cycle to discharge one container at a time from said compartment to a delivery station during said cycle, timer means for actuating said delivery means at spaced intervals, said timer means including a turntable, motor means driving said turntable at a predetermined speed, spaced mounting means formed on said turntable, trip means removably supported in said mounting means, delivery control means in the path of said trip means for actuating said delivery means through a cycle responsive to passage of a trip means, and motor control means responsive to delivery of a container to said station and removal of a container from said station for deactivating said motor means on delivery of a container to said station; and reactivating said motor means, upon removal of a container from said station, respectively.

2. A device in accordance with claim 1 wherein said mounting means comprises apertures defined in said turntable and said trip means include mounting portions insertible into said apertures.

3. A device in accordance with claim 2 wherein said turntable includes portions defining a peripheral groove intersecting said apertures, and an annular spring member seated under tension in said groove, said spring member including side portions bearing against said mounting portions of said trip means, thereby frictionally to retain the latter on said turntable.

4. A vial dispenser comprising a housing having an enclosed guideway in which a plurality of containers may be stacked, a dispenser mouth at one end of said guideway and means for permitting passage of the one container nearest said mouth to said mouth, said means including a link pivot mounted on said housing, a dispenser link member mounted on said pivot, said link member having a stop finger interposed between said guideway and said mouth and said container, an elongated slot formed in said dispenser link member, a retractor pivot mounted on said housing in parallel spaced relation to said link pivot, a retractor link mounted on said retractor pivot, a slide
pin on said retractor link, said pin being slidably guided in said slot of said dispenser link member, a line between said slide pin and said retractor pivot being approximately normal to the axis of said elongated slot, solenoid means mounted on said housing, plunger means driven by said solenoid means and pivotally connected to said retractor link for pivoting said retractor link about said retractor pivot to cause said slide pin to slide within said slot and pivot said dispenser link member to clear said stop finger from said guideway.

5. A device in accordance with claim 4 wherein said slot extends in a generally radial direction with respect to said link pivot.

6. A device in accordance with claim 4 wherein said dispenser link member includes a blocking portion spaced from said stop finger, said blocking portion being located to shift into blocking position of said guideway at a point between the vial next adjacent said one container and said mouth when said finger is pivoted clear of said guideway.

7. A device in accordance with claim 4 wherein said retractor link includes a slot portion, and said plunger means includes a retractor pin slidably mounted in said slot portion of said retractor link.

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