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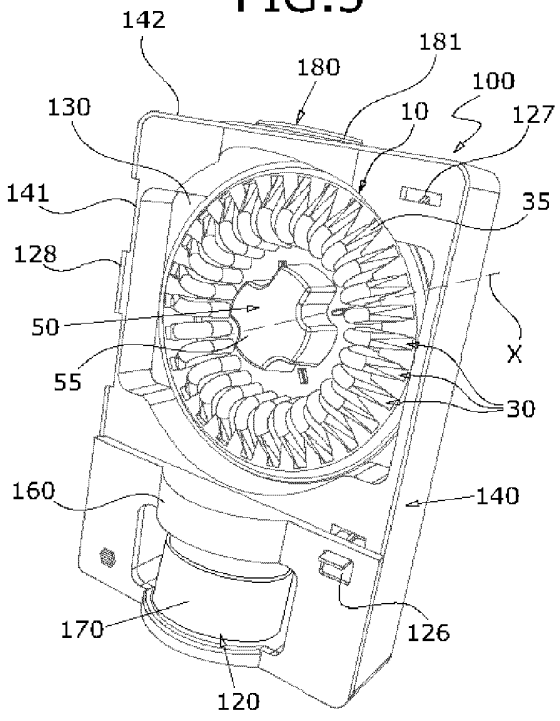
(54) DEVICE FOR THE AUTOMATIC DISPENSING OF MEDICATION AND AUTOMATIC APPARATUS FOR DISPENSING OF MEDICATION

(57) The automatic medication dispensing device (10) comprises a body (20) with medication receiving pockets (30), a drive portion (50) to be releasably coupled to a means (150) for driving the body (20) towards a target dispensing position for cutting a foil cover (40) that is bonded to the body (20), and a blade guiding recess (32) associated with said pockets (30) for receiving and guiding blades (112, 113) for cutting the foil cover (40) for dispensing medication. An apparatus (100) is also provided configured for receiving said device for dispensing medication.

FIG.5



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Description

[0001] The present disclosure refers to dispensing of medication. More particularly, the present disclosure refers to devices for the automatic dispensing of medication and to apparatuses including, or that are configured to include, such devices.

BACKGROUND

[0002] The term medication is intended herein to include pills, capsules, tablets, caplets, and variants thereof, containing pharmaceuticals or drugs in solid, liquid or any other form, or any other substance used to diagnose, treat, cure or prevent a disease.

[0003] Management and dispensing of medication are typically difficult, time-consuming, and risky. Patients who are prescribed a medication may forget taking a given dosage or may take the wrong dosage of medication. If a patient does not follow a prescribed treatment properly, medication is ineffective. Poor or non-adherence to a prescribed medication regimen has become a serious problem which often leads to serious health consequences, in particular when takings are performed in residential settings, and when multiple medications with different dosing amounts and time schedules are required for treatment. The problem is further aggravated in elderly patients, patients suffering several conditions, mobility-impaired patients, persons living alone, etc. This may result in serious side effects and, in general, worsening of the patient, which in some cases may even lead to hospitalization.

[0004] As used herein, adherence refers to compliance with a prescribed therapy or treatment. Adherence to treatment is defined by the World Health Organization as the extent to which a patient's history of therapeutic drug-taking coincides with a given prescribed treatment. Thus, treatment adherence may be considered as the degree to which a person's behavior corresponds with agreed recommendations from a health care provider.

[0005] In order to ensure adherence to a prescribed medication regimen, devices have been developed for automatic dispensing of a prescribed dose of medication to a patient at scheduled times.

[0006] For example, document WO2016141102 discloses a medication dispensing device that comprises a reservoir having pill receiving slots. At least one dispensed pill is selectively dispensed from at least one slot by a dispensing mechanism to an extendible tray.

[0007] US2019133888 discloses a medication management device comprising cartridge slots for receiving a pill cartridge including pills, and an extractor mechanism with a pill extractor. The medication management device determines a medication regimen based on patient data and the pill extractor extract pills from the cartridge as required.

[0008] In such known devices, however, the medication is stored in a reservoir or a cartridge for being sequentially delivered according to a predetermined schedule. Such devices suffer from a disadvantage that access to the medication is allowed before being been loaded in the reservoir or cartridge. The patient or another person can access the reservoir or cartridge and change dosage by adding or removing pills so there is no suitable protection for the medication before being administered. This could result in serious consequences if the patient does not pay attention to the medication that is being dispensed. In the best case scenario, this may lead to an increased risk of non-adherence, e.g. in terms of under-dosage and over-dosage of the medication. This disadvantage is highly significant in risk patient populations.

[0009] In an attempt to overcome this issue, other medication dispensing devices have been proposed in the art where the reservoir or cartridge is sealed with a film prior to the administration. For example, US5564593 discloses an apparatus for dispensing medications at timed intervals. Said medication dispensing apparatus comprises rotatably dose modules each including one or more medication discs. Said medication discs are provided with a plurality of equally spaced cylindrical apertures formed therethrough about the perimeter in each medication disc. The apertures define compartments for containing a single dose of a medication. Film layers are applied to both faces of the medication discs for sealing the apertures each containing said single dose of a medication. In use, the film is pierced by an extractor mechanism for releasing the medication contained in said apertures.

[0010] Such medication dispensing apparatus is intended to be operated by an operator in a medical setting. Therefore, no matter how bulky and cumbersome the apparatus is. A further disadvantage is derived from this apparatus that it is intended and configured for merely dispensing an individual, single dose of a particular medication to a patient.

[0011] There thus remains a need for a simple, compact, and yet efficient device that can be easily used by the patient herself/himself for administering medication while suitably ensuring adherence to medication treatment regimens, even in treatments involving different types of medication or multiple prescriptions, by always dispensing an appropriate amount of medication at an appropriate time to a patient or a number of patients in a safe way.

SUMMARY

[0012] A device for the automatic dispensing of medication is disclosed herein with which the above needs are met and with which a number of significant advantages are achieved, as it will be detailed below. The present device will hereinafter be referred to as automatic medication dispensing device.

[0013] The present automatic medication dispensing device comprises a body intended for containing a medication to be dispensed to at least one user, or patient,

and in general to at least one person receiving medical treatment or under health care.

[0014] The body of the automatic medication dispensing device may be made of a semi-rigid material, preferably a durable plastic material, such as a thermoplastic polymer. One example of a suitable thermoplastic polymer for the manufacturing of the body of the automatic medication dispensing device is high-density polyethylene (HDPE). HDPE is a preferred, but not the only, material which the body of the automatic medication dispensing device may be made from, due to low cost, good vapor and moisture barrier qualities, good chemical resistance, and because it is chemically inert. However, the present disclosure is not by any means limited to this material. Many other similar materials compatible with drug delivery, preferably materials accepted at recycling facilities, can be used for making the body of the automatic medication dispensing device.

[0015] The body of the present automatic medication dispensing device has at least one medication receiving pocket. Such medication receiving pockets are configured as cavities suitably sized and shaped for receiving therein at least one medication to be dispensed. Each medication receiving pocket of the body may contain the same or different types of medication. The medication contained in one medication receiving pocket may correspond to one medication prescribed dosage or taking.

[0016] Thus, a prescribed medication is first loaded into one, a number, or all of the receiving pockets of the body of the automatic medication dispensing device. Then, a foil cover is attached, i.e. adhered, stuck, or bonded, to a surface of the body where the medication receiving pockets are formed for covering said medication receiving pockets. As a result, the medication receiving pockets formed in the body of the automatic medication dispensing device are duly covered and sealed and the medication contained therein is duly protected against external environment.

[0017] The foil cover may be made, for example, from aluminum. However, many other safe, non-toxic, cold and heat resistant foil materials may be used as long as they provide a foil having a consistent thickness and a suitable tensile strength for pharmaceutical packaging, as well as good gas barrier properties and moisture resistance, preventing bacteria and microorganisms from penetrating into the medication receiving pockets.

[0018] The present automatic medication dispensing device defined by the body and the foil cover is thus configured as a blister or blister pack suitable for packaging medication within said pockets or cavities formed in the body that are covered by the above mentioned foil cover. Such blister may be a single-use or non-reusable element. Reusable blisters are not ruled out if necessary.

[0019] In one non limiting example of the present dispensing device, the body may be provided with twenty-eight individual medication receiving pockets. Other number of medication receiving pockets is possible. In one example, when all of the medication receiving pockets are loaded with the prescribed medication, up to one week including four daily intakes, seven days a week, can be reliably and safely scheduled to be dispensed.

[0020] Each medication receiving pocket may be suitable for containing one or a plurality of equal or different pills, such as of the order of five pills of the common type, for example, in each receiving pocket. As stated above, the pills contained within each receiving pocket may correspond to an individual intake to be delivered to a patient.

[0021] The body of the present automatic medication dispensing device further comprises a drive portion having a shape matching the shape of a driving means for driving the body towards at least one dispensing position where a dispensing portion of the foil cover corresponding to a medication receiving pocket can be cut. In one non-limiting example, the drive portion may be a shaped recess, for example, a recess in the form of a prism, suitable for receiving a matching shaped protrusion, for example in the form of a matching prism, of a driving means in an automatic medication dispensing device. Other examples are of course possible such as those where the drive portion is a shaped protrusion, for example a protrusion in the form of a prism, suitable for fitting into a matching recess, for example in the form of a prism, of a driving means in an automatic medication dispensing device.

[0022] In one preferred example, the body is circular in shape and the drive portion of the body is arranged so that the body is driven in rotation towards a dispensing position. In such example where the body is circular, it may be preferred that the medication receiving pockets are radially distributed in the body. Other body shapes and types of movements are also possible as well as arrangement of the receiving pockets in the body of the automatic medication dispensing device.

[0023] At least one blade guiding protrusion is provided in the body of the automatic medication dispensing device. Said blade guiding protrusion is associated with each medication receiving pocket. The blade guiding protrusion is configured for receiving and guiding at least one cutting blade for cutting the dispensing portion of the foil cover for dispensing medication out of the body.

[0024] It may be preferred that at least one medication receiving pocket of the body has an inner surface, where the medication rests, that is inclined to a horizontal plane. When the present automatic medication dispensing device is arranged to operate in a vertical position, that is, perpendicular to the ground, during use, it is preferred that said inner surface is at an angle to the ground, that is, not horizontal, so as to allow medication to be properly dispensed sliding thereon out of the body by gravity.

[0025] The term horizontal is intended herein to refer to something that is oriented horizontally, that is, arranged at a placement in space that is parallel to the ground, that is, at right angles to the vertical. The term vertical is intended herein to refer to a placement in space that is perpendicular to a horizontal line.

[0026] At least one of the body and the foil cover may include printed information regarding at least medication contained in the medication receiving pockets. Other printed information that can be applied to at least one of the body and the foil cover may include patient profiles, dose, frequency, and type of prescribed medication, etc.

[0027] An automatic apparatus for dispensing of medication configured for receiving the above described automatic medication dispensing device is also disclosed herein. Also, an automatic apparatus is disclosed herein for dispensing of medication, including the automatic medication dispensing device described above for the automatic dispensing of medication.

[0028] In both cases, the automatic medication dispensing apparatus comprises at least one device receiving area that may be formed in or be part of a housing. In one preferred example, the housing of the apparatus is designed to be placed in a vertical position that is, perpendicular to the ground. Said device receiving area is configured for receiving at least one of the above described automatic medication dispensing device. In one preferred example, said device receiving area is configured for receiving the automatic medication dispensing device in a vertical position. Other positions for the automatic medication dispensing device in the apparatus are of course possible.

[0029] In both automatic apparatuses, cutting means are provided for cutting, tearing or breaking the foil cover, specifically a dispensing portion thereof corresponding to a medication receiving pocket of the body as described above. The cut dispensing portion of the foil cover is properly sized and shaped for allowing medication to be dispensed, e.g. by gravity, out of the body. The cutting means may include a first blade that may be carried by a guiding carriage to move it along a first direction to make a first cut in the foil cover. The cutting means may further include two second, spaced apart blades configured to move along a second direction, different from the first direction, along the blade guiding protrusion of the body of the automatic medication dispensing device to make corresponding second cuts in the foil cover. The second direction may be perpendicular to the first direction although other relative orientations, and thus other cutting shapes, are not ruled out. The cutting means are thus configured to perform a dual cut defined by the first and second cuts performed by the first blade and the second blades, respectively, forming the dispensing portion of the foil cover in the form of a shaped opening such as a U-shaped opening. Said opening is so sized that the medication contained within the medication receiving pocket of the body of the automatic medication dispensing device fall through a guiding channel to be dispensed out of the body into a medication container such as a glass that may have been placed by the user or patient at a lower portion of the automatic apparatus. The medication may be thus dispensed by gravity due to the inclined inner surface within the medication receiving pocket, in particular when the automatic medication dispensing device is arranged vertical to the ground.

[0030] For positioning the automatic medication dispensing device at a desired position, for example, at a given angular position, relative to the cutting means in order to form the above mentioned opening through the foil cover, driving means are provided. The driving means are configured for releasably coupling to the drive portion of the body for driving the body towards said desired position. The desired position corresponds to at least one dispensing position where a dispensing portion of the foil cover corresponding to a medication receiving pocket of the body can be cut by said cutting means for dispensing the medication contained therein. A foil cover cutting operation is repeated for each selected intake of medication.

[0031] The present automatic apparatus for dispensing of medication may further include one or more of the following sensors for controlling operation. Specifically, a device loaded sensor may be provided for detecting if an automatic medication dispensing device has been suitably loaded in the apparatus. Such device loaded sensor may be also configured to detect if a door of the housing of the apparatus has been properly closed once an automatic medication dispensing device has been loaded in the apparatus. A medication container sensor may be also provided for detecting that a medication container, such as a glass, as stated above, is present in a medication receiving area located in a lower portion of the apparatus. Further, a first medication sensor may be also provided for detecting that at least one medication, e.g. a pill, is present in said medication container. Other sensors may be also envisaged such as a second medication sensor for detecting medication present in the medication receiving pockets of the body so as to warn the user when one, a number, or all of the medication receiving pockets of the body are empty in order to replenish the automatic medication dispensing device or that the automatic medication dispensing device should be replaced with another if it is reusable.

[0032] The apparatus may further include a control unit for managing a medication dosage profile so as to drive the automatic medication dispensing device accordingly. A SIM card reader may be provided for receiving a SIM card inserted into a slot formed in the housing. The SIM card is able to communicate with a remote device so as to receive remote patient profile information that is handled by said control unit for operating the automatic medication dispensing device accordingly. Display means may be also provided for displaying information regarding detected conditions by the above mentioned sensors.

[0033] The operation of the automatic apparatus for dispensing of medication described above is as follows.

[0034] An automatic medication dispensing device whose medication receiving pockets have been previously loaded by a doctor, medical practitioner, physician, pharmacist, caregiver, or a family member with a personalized type and amount of medication, e. g. a prescribed number of pills, required for each individual intake, is

loaded in a vertical position into said device receiving area in the interior of the apparatus. This is carried out such that the driving portion of the body of the automatic medication dispensing device fits a matching driving portion of the apparatus in a way that the former can be driven by the latter, e.g. in rotation. The door of the apparatus housing is then closed by the user. In some cases, said door of the housing may be locked by the user if required once it is properly closed.

[0035] When a device loaded sensor in the apparatus detects that the automatic medication dispensing device has been loaded in the apparatus and the door has been properly closed, and when a medication container sensor detects that a medication container is present in a medication receiving area of the apparatus, a scheduled dispensing operation can begin.

[0036] A visual or sound signal is issued by the apparatus when it is time for taking the medication warning or reminding the user to take the medication. This information can be sent to another person such as a family member. Then, a start button, preferably located at a top, accessible and visible central portion of the apparatus, e. g. at central top portion thereof, is depressed by the user to start operation of the apparatus. Actuation of the start button may involve unlocking the door in the apparatus housing so that a device receiving area in the interior of the apparatus can be easily accessed by the user to load the automatic medication dispensing device in the apparatus.

[0037] Then, the automatic medication dispensing device is driven, e.g. in rotation, coordinated with the actuation of the cutting means of the apparatus as follows. More specifically, in each dispensing operation, the automatic medication dispensing device is driven, e.g. in rotation, towards a dispensing position, for example corresponding to a given angular position of the dispensing device, where a target medicament receiving pocket is positioned to coincide with, e.g. in close proximity to, the cutting means of the apparatus. When this position has been reached, a dispensing portion of the foil cover corresponding to a medication receiving pocket is cut such that an opening is formed therein. Medication is thus caused to go out of the medication receiving pocket through a guiding channel into the above mentioned medication container, for example a glass. When the first medication sensor in the apparatus detects that a medication, e.g. a pill, is present in the medication container, e.g. a glass, a medication dispensing alarm may be issued to the user warning her/him to remove the medication container, e.g. the glass, for taking the medication contained therein. When the medication has been taken, the user brings the medication container back to the medication receiving area of the apparatus for future intakes. The medication container could be replaced with a new medication container if required.

[0038] After a predetermined period of time, the medication container sensor checks if a medication container is in the medication receiving area of the apparatus. In case a medication container is detected in the medication receiving area of the apparatus, the first medication sensor checks for a second time if medication, e.g. at least one pill, is present in the medication container, e.g. the glass. In case that medication, e.g. at least one pill, is present in the medication container, e.g. the glass, for a second time, a non-delivery alarm is issued warning the user about an incomplete taking.

[0039] It is to be noted that, as described above, the present apparatus does not perform loading of medication into the dispensing device, i.e. the blister, but dispensing of medication in a safe and reliable manner, ensuring that correct types and amounts of medication are dispensed at the right time and to the intended person, promoting medication adherence, with medication dispensing operations being controlled remotely.

[0040] Prescribed intakes may be scheduled through a website or by a software application accessible on any platform and by any suitable remote devices such as mobile smartphones or tablets allowing treatment information to be shared with a corresponding care team. Treatments or prescriptions for multiple profiles can be managed and tracked easily and reliably.

[0041] For the above reason, the present apparatus is very simple in construction, structure, and operation. The present apparatus is also very easy to use so that it can be operated by any person without the intervention of an operator such as a doctor, medical practitioner, physician, pharmacist, or caregiver. The above mentioned remote control of medication dispensing operations allows dosages to be changed quickly, for example when new prescriptions are required.

[0042] As stated above, in a preferred example, the housing of the apparatus is designed to be placed in a vertical position that is, perpendicular to the ground. As a result, the apparatus takes up very little space so that it is suitable for home use, for example, such as in a kitchen. Furthermore, the housing of the apparatus is also designed to have a compact appearance that reminds daily household appliances such as a coffee machine, instead of a medical or robotic product as with prior art apparatuses. With the present apparatus, the medication should be not be kept hidden from view anymore as it is stored safely within the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] One non-limiting example of the present disclosure will be described in the following, with reference to the appended drawings.

[0044] In the drawings:

Figure 1 is a general perspective view of one example of the automatic apparatus for the automatic dispensing of medication;

Figure 2 is a top perspective view of one example of the device for the automatic dispensing of medica-

tion to be fitted in the automatic apparatus in figure 1;

Figure 3 is a front perspective view of the device in figure 2;

Figure 4 is a detail view of the cutting means of the apparatus in figure 1;

Figure 5 is a perspective view of the apparatus in figure 1 where a door has been removed therefrom to see the blister receiving area with the device loaded therein; and

Figure 6 is a perspective view of the apparatus in figure 5 where a door has been removed showing the blister receiving area with no device loaded in the apparatus.

DETAILED DESCRIPTION OF ONE EXAMPLE

[0045] Figures 1 and 5-6 of the drawings show one non-limiting example of the present apparatus 100 for the automatic dispensing of medication. The apparatus for the automatic dispensing of medication will be referred hereinafter to as automatic medication dispensing apparatus 100.

[0046] The automatic medication dispensing apparatus 100 in the example described herein is provided with a device 10 for the automatic dispensing of medication as illustrated in figure 5. The device for the automatic dispensing of medication will be referred hereinafter to as blister 10. Figure 5 thus shows the blister 10 loaded in the automatic medication dispensing apparatus 100. The blister 10 has been illustrated in isolation in the detail figures 2 and 3 of the drawings.

[0047] In the example shown in the figures 1 and 5-6 of the drawings, the automatic medication dispensing apparatus 100 comprises a compact housing 140 intended to be placed at home in a vertical position, perpendicular to the ground, that is, arranged parallel to a line which runs up and down the page in the drawings. Although the housing 140 of the apparatus 100 may appear inclined in figures 5 and 6 this is simply due to the different perspective views in said figures. In fact, the apparatus 100 in the example shown is arranged in vertical position, that is, upright.

[0048] The compactness and the vertical positioning of the housing 140 results in that the automatic medication dispensing apparatus 100 takes up very little space so it is well suited for home use such as for example to be placed in the kitchen.

[0049] Still referring to figures 1, 5 and 6 of the drawings, a blister receiving area 130 is defined within the housing 140 of the automatic medication dispensing apparatus 100, as shown in figures 5 and 6. Said blister receiving area 130 is sized and shaped for receiving the blister 10 in a vertical position that is, perpendicular to the ground, that is, in the position shown in figure 3.

[0050] The automatic medication dispensing apparatus 100 is illustrated in figure 1 with the housing 140 closed by a door 125 to prevent access to the blister receiving area 130. In figures 5 and 6, the automatic medication dispensing apparatus 100 is illustrated with the door 125 released from the housing 140 so as to show the blister receiving area 130. In figure 5 the automatic medication dispensing apparatus 100 is illustrated with the blister 10 loaded in the blister receiving area 130 while in figure 6 the automatic medication dispensing apparatus 100 is illustrated with no blister 10 loaded in the blister receiving area 130.

[0051] The automatic medication dispensing apparatus 100 has a lower base portion 160 with a medication receiving area 120. The medication receiving area 120 is suitable for receiving a glass 170, as shown in figure 5 of the drawings, for receiving dispensed pills. The lower base portion 160 of the automatic medication dispensing apparatus 100, in this example, is provided with a light ring 165 for illuminating the medication receiving area 120 and the glass 170 placed therein when the apparatus 100 is in use.

[0052] Driving means 150 are provided in the automatic medication dispensing apparatus 100 for driving the blister 10 in rotation. The driving means 150 comprise a cross-shaped protrusion 155 as shown in figure 6 of the drawings. Said cross-shaped protrusion 155 is coupled to a gear train, not shown, associated with an electric motor, not shown. The electric motor is powered by suitable DC or AC power source. A suitable DC power source may be a battery or a rack of batteries that may be for example built-in rechargeable batteries. A suitable DC power source may be the electrical grid by connecting via a standard wall outlet. Examples where the electric motor is powered by combined DC/AC power sources are also possible.

[0053] In use, a rotational movement of the electric motor is transmitted to the cross-shaped protrusion 155 through the above mentioned gear train which rotates the blister 10 through the above mentioned drive portion 50 of its body 20 into a target angular position within the dispensing apparatus 100.

[0054] The blister 10, shown in detail in figures 2 and 3 of the drawing, comprises a non-reusable circular body 20 made of a light weight material featuring high strength, stiffness, durability, permeability to gas, and resistance to moisture such as high-density polyethylene (HDPE). The body 20 of the blister 10, in the example shown, has twenty-eight individual, radially distributed medication receiving pockets 30. In this example, all the pockets 30 are configured in the same way as cavities suitably sized and shaped for receiving therein fifteen pills to be dispensed. With the configuration shown in said figures 2 and 3, up to one week including four daily intakes, seven days a week, can be conveniently scheduled for dispensing when the medication receiving pockets 30 are loaded with prescribed pills.

[0055] In some cases, the pills contained within each

medication receiving pocket 30 may be different from one another in terms of size, shape, surface composition, colour, etc. depending on the prescription in terms of amount of drug, concentration, formulation, and on the manufacturer. In other cases, the pills contained within each medication receiving pocket 30 may be all the same. In the present example, the pills contained within each medication receiving pocket 30 correspond to an individual prescribed intake to be delivered to a patient.

[0056] The medication receiving pockets 30 in the body 20 of the blister are covered by a foil cover 40, as shown in figures 2 and 3. The foil cover 40 in this non-limiting example is an aluminium foil that is bonded, e.g. heat-sealed or glued, on to a back surface of the body 20 where an outlet opening of each medication receiving pocket 30 is formed, corresponding to a back surface of the body 20 according to figure 3. Bonding of the foil cover 40 on the body 20 of the blister may be performed for example through a heat seal primer and a heat seal lacquer coating applied on the foil cover 40. This is carried out after the required medication receiving pockets 30 have been duly loaded with the prescribed pills. However, the foil cover 40 may be made of any other material than aluminium, as long as it can act a sealing sheet for protecting the pills contained in the medication receiving pockets 30 and, that at the same time can be easily cut by blades of a cutting means 110 in the automatic medication dispensing apparatus 100 allowing easy dispensing of the prescribed pills by a simple cutting action as it will be described below.

[0057] The body 20 and the foil cover 40 of the blister 10 both include printed information about the medication that is contained therein, and about patient profiles, dose, frequency, and type of prescribed medication.

[0058] The body 20 of the blister 10 includes a drive portion 50 as shown in figures 2 and 3 of the drawings. The drive portion 50 of the blister 10 comprises a cross-shaped recess 55 that is formed extending into the back surface of the body 20, as shown in figures 2 and 3, to protrude from the front surface of the body 20, in the same way as the medication receiving pockets 30. The cross-shaped recess 55 of the drive portion 50 of the body 20 is conveniently sized for releasably receiving a matching cross-shaped protrusion 155 of the above mentioned driving means 150 of the automatic medication dispensing apparatus 100 that is shown in figure 6 of the drawings. In use, the drive portion 50 of the blister 10 is releasably coupled to the driving means 150 of the automatic medication dispensing apparatus 100 such that the blister 10 can be driven in rotation around a horizontal axis x as shown in figure 5. As used herein, rotation around an axis refers to rotation of at least 360 degrees around the axis. Rotation of the blister 10 is performed until the above mentioned target angular position has been reached. Said target angular position relates to a dispensing position of the foil cover 40 corresponding to a medication receiving pocket 30.

[0059] Still referring to figures 2 and 3 of the drawings, each medication receiving pocket 30 of the body 20 of the blister 10 has one blade guiding recess 32 associated therewith. Each blade guiding recess 32 is arranged next to each medication receiving pocket 30 and is configured for receiving and guiding second, spaced apart blades 112, 113 of the above mentioned cutting means 110 of the automatic medication dispensing apparatus 100. Blades 112, 113 are intended to cut the foil cover 40 for dispensing the pills out of the body 20 of the blister 10 into a glass 170 placed in the medication receiving area 120 of the automatic medication dispensing apparatus 100 as shown in figure 5.

[0060] As also shown in figures 2 and 3 of the drawings, each medication receiving pocket 30 of the body 20 has an inclined inner surface 35 formed therein onto which the pills rest within the pocket 30. Said inner surface 35 is inclined at an angle relative to a horizontal plane, that is, at an angle relative to the ground. The angle of inclination of the inner surface 35 in each medication receiving pocket 30 is suitable for dispensing the pills contained therein out of the body 20 of the blister 10 by gravity into the glass 170 placed in the medication receiving area 120 of the automatic medication dispensing apparatus 100.

[0061] As stated above, the present automatic medication dispensing apparatus 100 includes cutting means 110, which have been illustrated in detail in figure 4 of the drawings. The cutting means 110 in the non-limiting example shown comprise a first blade 111 and the above mentioned second, spaced apart blades 112, 113. The second, spaced apart blades 112, 113 are arranged parallel to each side of the first blade 111. The first blade 111 is carried by a guiding carriage 114.

[0062] The guiding carriage 114 is configured to move the first blade 111 along a first direction D1 to make a first cut in the foil cover 40 of the blister 10. The first direction D1 is horizontal, that is, a direction parallel to the ground or to the lower base portion 160 of the apparatus 100.

[0063] The second, spaced apart blades 112, 113 are configured to move along a second direction D2. The second direction D2 is vertical, that is, perpendicular to the first direction D1, that is, a direction parallel the length of the housing 140 or to a line which runs up and down the page in the drawings. Other directions for the movement of the blades 111, 112, 113 are possible. As stated above, the second blades 112, 113 are configured to be driven along the blade guiding recess 32 formed in the body 20 of the blister 10 to make corresponding second lateral cuts in the foil cover 40. Each blade guiding recess 32 guides the movement of the second blades 112, 113 along said second direction D2 avoiding the pills from being contacted by the blades 112, 113. This helps prevent the pills from being broken up or at least contaminated by the blades 112, 113.

[0064] The first and second cuts made by the blades 111, 112, 113 of the cutting means 110 define a U-shaped opening in a dispensing portion in the foil cover 40 so

that the pills contained within the medication receiving pockets 30 of the blister 10 can be dispensed therethrough by gravity. The cutting operation is repeated for each selected intake of medication.

[0065] A blister loading sensor, not shown, is provided in the automatic medication dispensing apparatus 100 for detecting if the blister 10 has been loaded in the blister receiving area 130 of the housing 140 in the automatic medication dispensing apparatus 100. Said blister loading sensor is also suitable for detecting if the door 125 is properly closed and locked before operation. A medication container sensor, not shown, is also included in the present automatic medication dispensing apparatus 100 for detecting that a glass 170 is present in the medication receiving area 120. A first medication sensor, not shown, is also provided for detecting that at least one pill is present in the glass 170. Furthermore, the automatic medication dispensing apparatus 100 further includes a second medication sensor, not shown, for detecting pills in the medication receiving pockets 30 of the blister 10. The second medication sensor is configured to warn the user when one, a number, or all of the medication receiving pockets 30 are empty such that the blister 10 should be replenished with pills or that it should be replaced with a new blister 10 as required.

[0066] A control unit, not shown, is also provided. The control unit is configured to manage a medication dosage profile so as to drive the blister 10 in rotation accordingly. The control unit can be remotely controlled via a SIM card configured to communicate with a remote device. The automatic medication dispensing apparatus 100 further includes an LCD display, not shown, for displaying information to the user about the operation of the apparatus 100. The dispensing apparatus 100 may be configured to be remotely controlled over Bluetooth or Wi-Fi if required.

[0067] Operation of the dispensing apparatus 100 is as follows. A blister 10 is provided in which one, a number, or all of the medication receiving pockets 30 of the blister 10 have been properly loaded by a doctor, medical practitioner, physician, pharmacist, caregiver, or a family member with a personalized and prescribed type and number of pills that are required for each individual intake. This involves loading of medication receiving pockets 30 with prescribed pills and then bonding a foil cover 40 on the body 20 of the blister 10.

[0068] The user then unlocks the door 125 of the automatic medication dispensing apparatus 100 by pushing a door locking button 126 arranged at a lower portion of the housing 140 as shown in figures 1, 5 and 6, and mechanically connected to a door locking element 127 arranged at a lower portion within the housing 140 of the apparatus 100 as shown in figures 5 and 6. As the door locking button 126 is pressed downwards, the door locking element 127 is moved downwards against a spring, not shown, to release the door 125 so that it can be opened or closed. The door 125 is hinged to the housing 140 of the apparatus 100 through a hinge 128 that is located at a side portion 141 of the housing 140 of the apparatus 100 as shown in figures 5 and 6.

[0069] As a result of releasing of the door 125, the apparatus 100 remains as depicted in figure 6, with the door 125 open or released from the apparatus 100 and with the blister 10 still not loaded into the blister receiving area 130.

[0070] The blister 10 can be then loaded into the blister receiving area 120 in the interior of the housing 140 of the automatic medication dispensing apparatus 100 in a vertical position as illustrated in figure 5. When the blister 10 is loaded in the blister receiving area 120 of the apparatus 100, the cross-shaped protrusion 155 of the driving means 150 of the apparatus 100 is releasably coupled to the cross-shaped recess 55 of the body 20 of the blister 10, that is, the protrusion 155 of the driving means 150 of the apparatus 100 is received into the the recess 55 of the body 20 of the blister 10.

[0071] The door 125 of the automatic medication dispensing apparatus 100 is then closed by the user until it is locked due to the above mentioned spring that biases the door locking element 127 into a door locking condition. The apparatus 100 at this point remains as shown in figure 1, that is, with the blister 10 loaded in the blister receiving area 120 of the apparatus 100 and with the door 125 safely closed in place.

[0072] A visual or sound signal is then issued by the apparatus 100 warning or reminding the user that it is time for taking the prescribed pill(s). This information can be sent to another person such as a family member where deemed appropriate.

[0073] The user now or previously places a glass 170, whether containing water or the like or not, in the medication receiving area 120, as shown in figure 5 of the drawings.

[0074] The user then depresses a start button 180 located at a top portion 142 of the housing 140 of the automatic medication dispensing apparatus 100. In some cases, operation of the start button 180 could allow actuation of the door locking element 127 so as to unlock the door 125 as described above so that the blister receiving area 120 can be accessed by the user to load the blister 10 into the apparatus 100.

[0075] When a blister 10 is detected by the above mentioned blister loading sensor to be loaded in the automatic medication dispensing apparatus 100 and when the door 125 is detected to be properly closed and locked by the blister loading sensor, and also when a glass 170 is detected by the medication container sensor to be present in the medication receiving area 120 of the apparatus 100, a dispensing operation starts.

[0076] Operation of the automatic medication dispensing apparatus 100 is indicated by a status light ring 181 that is arranged surrounding the above mentioned start button 180 in the top portion 142 of the housing 140 of the apparatus 100.

[0077] As the information about the prescribed intake has been processed by the control unit, the blister 10 is

then driven in rotation by the driving means 150 of the automatic medication dispensing apparatus 100 in a required direction of rotation around axis x towards a dispensing position. The dispensing position is where a dispensing portion of the foil cover 40 corresponding to a target medicament receiving pocket 30 coincides with the blades 111, 112, 113 of the cutting means 110 of the apparatus 100. When a target dispensing position has been reached, said dispensing portion of the foil cover 40 corresponding to a medication receiving pocket 30 is properly cut by the blades 111, 112, 113 resulting in a U-shaped opening formed in the foil cover 40 through which the pills can to go out of each medication receiving pocket 30 sliding onto the inclined inner surface 35 of the pockets 30 and through a guiding channel into the glass 170 that is placed in the medication receiving area 120 of the automatic medication dispensing apparatus 100.

[0078] When a pill is detected by the first medication sensor, not shown, of the apparatus 100 to be present in the glass 170, a dispensing alarm is issued to the user. The user then removes the glass 170 from the medication receiving area 120 of the apparatus 100 and takes the pill(s) contained in the glass 170. The user finally brings the glass 170, back to the medication receiving area 120 of the automatic medication dispensing apparatus 100 or replaces it with a new glass 170 in said medication receiving area 120 if required, for future intakes.

[0079] The medication container sensor checks, after a predetermined period of time, if a glass 170 is in the medication receiving area 120 of the automatic medication dispensing apparatus 100. When a glass 170 is detected to be present in the medication receiving area 120 of the dispensing apparatus 100, the first medication sensor checks for a second time if at least one pill is present in the glass 170. In case that at least one pill is detected in the glass 10 for a second time, a non-delivery alarm is issued warning the user about an incomplete taking.

[0080] The above is repeated for each dispensing operation.

[0081] A number of examples have been disclosed herein. However, many other alternatives, modifications, uses and/or equivalents thereof are possible.

[0082] For example, although the present automatic medication dispensing apparatus has been described with a blister receiving area configured for receiving the blister in a vertical position, i.e. such that it is driven in rotation around a horizontal axis, the automatic medication dispensing apparatus may be also configured to operate the blister in other position than vertical such as horizontal, i.e. such that it is driven in rotation around a vertical axis. In any case, the blister can be driven in rotation in different directions of rotation as required. For example, a dispensing operation according to a selected intake of medication may involve the blister being driven in rotation in one direction of rotation. However, it may be the case that a dispensing operation according to a selected intake of medication involves the blister being driven in rotation according to a number of different directions of rotation.

[0083] On the other hand, although the automatic medication dispensing apparatus has been described as having one or more blister receiving areas formed being part of a vertical housing, other different positions from vertical such as horizontal are not ruled out.

[0084] Also, although the blister has been described as having a drive portion comprising a shaped recess suitable for receiving a matching protrusion of a driving means in the dispensing apparatus, examples where the drive portion is a shaped protrusion for fitting into a matching recess of said driving means in the dispensing apparatus are also envisaged.

[0085] Furthermore, the inner surface of the medication receiving pockets where medication rests might be inclined at the same angle to the ground in all the medication receiving pockets, or said inner surface might be inclined at different angles to the ground in different medication receiving pockets in the same blister depending on the specific type of medication contained therein.

[0086] In addition, although the cutting means of the automatic medication dispensing apparatus have been described as comprising blades configured to move along two different, perpendicular directions, the blades might be configured to move along different directions inclined other than perpendicular.

[0087] Locking means might be also included to releasably lock the drive portion of the blister to the driving means of the automatic medication dispensing apparatus for preventing the blister from coming out of the automatic medication dispensing apparatus during use.

[0088] On the other hand, although the body of the blister has been described as being preferably circular in shape, a blister having other shapes such as a polygonal, oval, etc. is also envisaged. Examples where the body is not circular but has medication receiving pockets radially distributed therein are also possible.

[0089] Also, although the blister has been described as being driven in rotation towards a target dispensing position, the blister might be alternatively displaced along a linear or curvilinear path towards a target dispensing position.

[0090] Finally, although the blister has been described as being a single-use or non-reusable element or even a reusable element, there may however be cases where only the body, or only the foil cover is a single-use or non-reusable element or a reusable element.

[0091] All possible combinations of the described examples are also covered. Thus, the scope of the present disclosure should not be limited by the example that has been described herein, but should be determined only by a fair reading of the claims that follow.

[0092] Reference signs related to drawings placed in parentheses in the claims are solely for attempting to increase the intelligibility of the claim, and shall not be construed as limiting the scope of the claim.

Claims

1. A device for the automatic dispensing of medication (10), the device (10) comprising a body (20) with at least one medication receiving pocket (30) for receiving therein at least one medication to be dispensed, and a foil cover (40) attached to the body (20) for covering the medication receiving pockets (30),
wherein the body (20) further comprises:

    - a drive portion (50) having a shape matching the shape of a driving means (150) for driving the body (20) towards at least one dispensing position where a dispensing portion of the foil cover (40) corresponding to a medication receiving pocket (30) can be cut; and
    - at least one blade guiding recess (32) associated with each medication receiving pocket (30) for receiving and guiding at least one cutting blade (112, 113) for cutting the dispensing portion of the foil cover (40) for dispensing medication out of the body (20).

2. The device (10) according to claim 1, wherein the at least one medication receiving pocket (30) of the body (20) has an inner surface (35) where medication rests, said inner surface (35) being inclined to a horizontal plane.

3. The device (10) according to any of the preceding claims, wherein the drive portion (50) of the body (20) is arranged so that the body (20) can be driven in rotation towards the dispensing position.

4. The device (10) according to any of the preceding claims, wherein the body (20) is circular in shape.

5. The device (10) according to any of the preceding claims, wherein the body (20) has a number of medication receiving pockets (30) radially distributed in the body (20).

6. The device (10) according to any of the preceding claims, wherein the body (20) is made of a semi-rigid material.

7. The device (10) according to any of the preceding claims, wherein at least one of the body (20) and the foil cover (40) has printed information regarding at least medication contained in the medication receiving pockets (30).

8. An automatic apparatus (100) for dispensing of medication, the apparatus (100) comprising:

    - a device receiving area (130) configured for receiving the device for the automatic dispensing of medication (10) according to any of the preceding claims;
    - cutting means (110) for cutting a dispensing portion of the foil cover (40); and
    - driving means (150) for releasably coupling to the drive portion (50) of the body (20) for driving the body (20) towards at least one dispensing position where a dispensing portion of the foil cover (40) corresponding to a medication receiving pocket (30) of the body (20) can be cut for dispensing medication into a medication container placed in a medication receiving area (120).

9. The apparatus (100) according to claim 8, wherein the cutting means (110) comprise a first blade (111) configured to move along a first direction (D1) to make a first cut in the foil cover (40) and a two second, spaced apart blades (112, 113) configured to move along a second direction (D2), different from the first direction (D1), along the blade guiding recess (32) of the body (20) of the medication dispensing device (10) to make corresponding second cuts in the foil cover (40), said first and second cuts defining the dispensing portion of the foil cover (40) through which medication is dispensed out of the body (20).

10. The apparatus (100) according to claim 8 or claim 9, wherein it includes sensor means configured for detecting at least one of the following conditions:

    - dispensed medication present in a medication container;
    - medication container for containing dispensed medication present in a medication receiving area (120); and
    - dispensed medication present in medication container.

11. The apparatus (100) according to any of the claims 8-10, wherein it further includes a control unit for managing a medication dosage profile so as to drive the device for the automatic dispensing of medication (10) accordingly.

12. The apparatus (100) according to claim 10 or claim 11, wherein it further includes display means for displaying information regarding said detected conditions according to a signal output by the sensor means relating to said detected conditions.

13. The apparatus (100) according to any of the claims 8-12, wherein the device receiving area (130) is configured for receiving the device for the automatic dispensing of medication (10) in a vertical position.

14. The apparatus (100) according to any of the claims

8-13, wherein each medication receiving pocket (30) of the body (20) contains the same or different types of medication.

15. An automatic apparatus (100) for dispensing of medication, the apparatus (100) including a device for the automatic dispensing of medication (10) according to any of the claims 1-7, cutting means (110) for cutting a dispensing portion of the foil cover (40), and driving means (150) for releasably coupling to the drive portion (50) of the body (20) for driving the body (20) towards at least one dispensing position where a dispensing portion of the foil cover (40) corresponding to a medication receiving pocket (30) of the body (20) can be cut for dispensing medication into a medication receiving area (120).

FIG.1

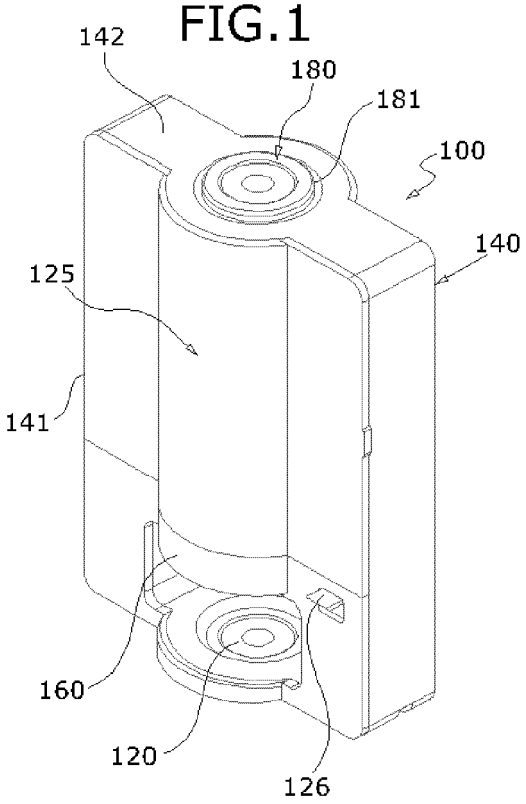


FIG.2

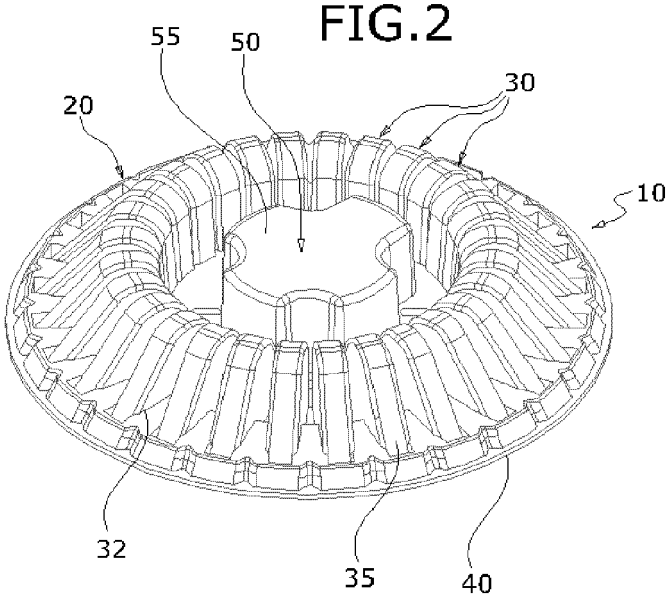


FIG.3

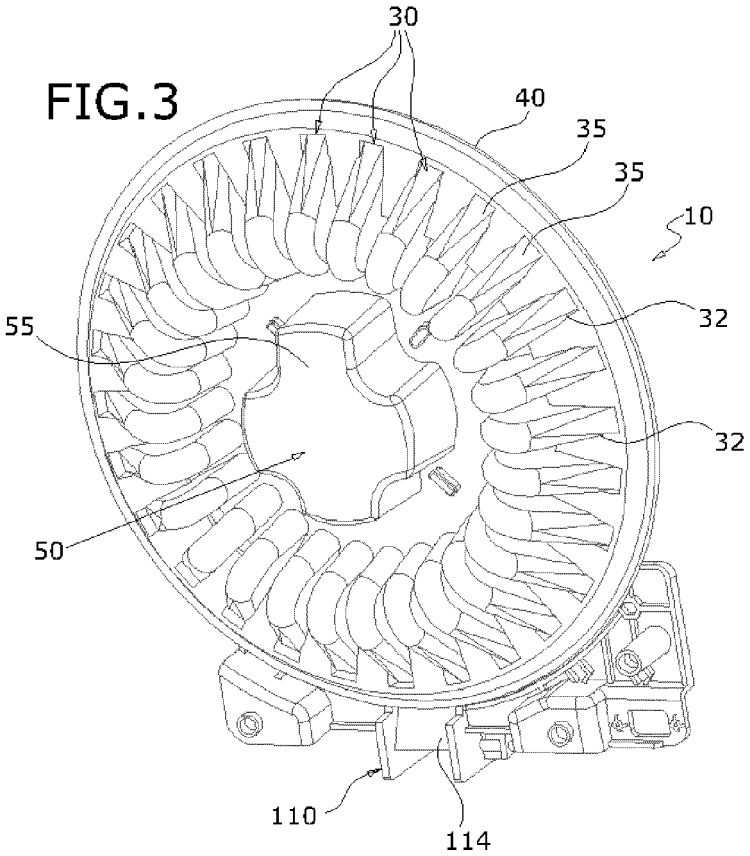


FIG.4

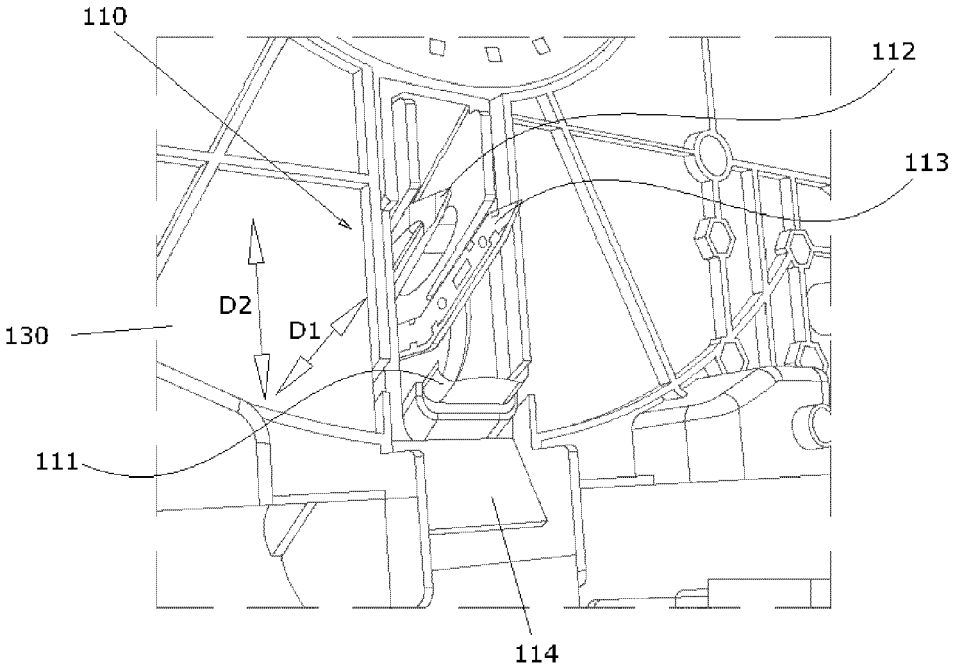


FIG.5

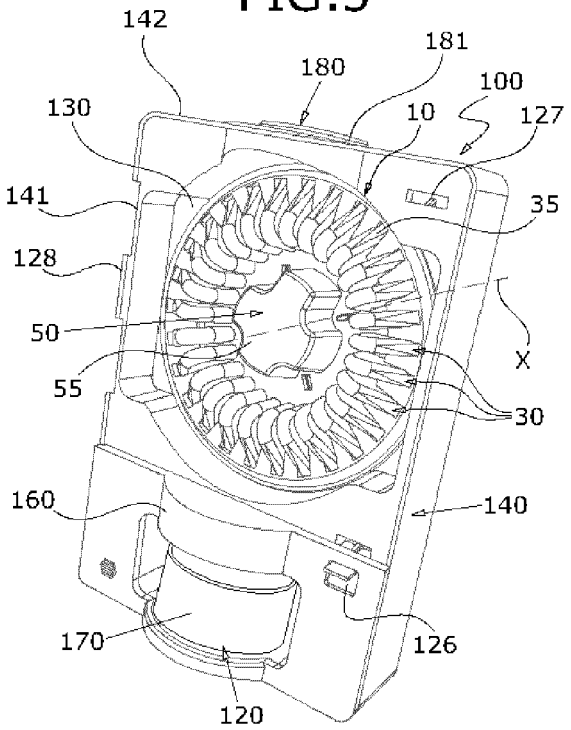
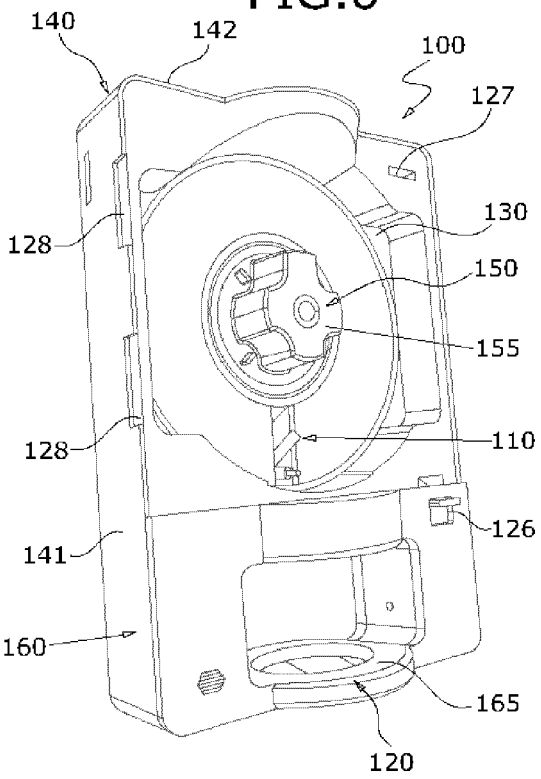


FIG.6



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EUROPEAN SEARCH REPORT

Application Number
EP 20 38 2258

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TECHNICAL FIELDS SEARCHED (IPC)

A61J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 August 2020	Mammeri, Damya

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18-08-2020

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