

**DEVICE, ASSEMBLY AND SYSTEM FOR ENHANCING
RELIABLE AND MONITORED INTAKE OF
PRODUCTS AND A METHOD FOR
MANUFACTURE THEREOF**

The invention relates to a device, assembly and system for enhancing reliable and monitored intake of products, in particular medication.

A pillbox is known provided with three
5 compartments to be opened, in which compartments can be arranged products to be taken such as medication. The pillbox is provided with a clock which generates sound signals at all points in time when one of the
10 compartments with medication must be emptied. The clock can be operated by means of a number of control buttons arranged on the pillbox. After each time signal all three compartments are opened and the user himself makes a selection from one of the three compartments. The drawback to this known pillbox is that, when all
15 compartments are opened simultaneously, products not intended to be taken are also presented and may possibly fall out of the pillbox.

Also known is an inhaler device for inhaling dosed quantities of medication, for instance for people
20 with bronchial disorders. The inhaler device is provided with exchangeable discs on which eight doses of medication are arranged at a time in compartments. The device is provided with a mechanism for rotating said disc in order to provide the quantity of medication from
25 one compartment at each inhalation. The inhaler device has the advantage, among others, that a compartment with a measured quantity of medication can be provided each time to the user and that the discs are exchangeable. The inhaler does not however indicate when the medication
30 must be administered and whether this has actually taken place.

The object of the invention is to provide a device for enhancing reliable and monitored intake of products such as medication, measured quantities of diet food and the like, wherein using a pre-set clock an indication is given as to when a determined quantity of product (and no other quantity of product) must be taken. In addition to the possibility of indicating at a determined time a particular dose or quantity of the product to be taken, the device also provides the possibility of storing in a memory the time at which this must take place and whether this has actually taken place. This memory is readable and the data therefrom can be processed in a computer, so that a reliable picture of the actual intake behaviour of individuals can be compared to the prescribed intake pattern. Depending on the intake behaviour, said clock can be re-set in order to adjust the intake behaviour of the patient as the case arises. In all cases the prescribed pattern can be — changed, in accordance with the individual situation, by the user himself or by a third party or via a connection made by computer to an external organization or database manager.

The present invention is therefore intended inter alia to play an important part in the treatment of diseases wherein medication must be taken for a lengthy period in accordance with a fixed pattern or wherein it is not so much the duration but the complexity of the medication therapy which is paramount, since in present everyday practice both can result in a significantly erratic implementation of the therapy, with the consequence of a worsening of the suffering and undesired complications, which could have been prevented by the use of the present invention. The invention is also intended to play an important part in scientific research wherein therapy dedication is of crucial importance for the success of the therapy and the storage of data concerning this therapy dedication can yield important information.

This information can result in possible adaptation of dosage schedules and other prescription behaviour.

In order to limit the cost of use of medication by developing optimum therapies for the user, there is a
5 need to cause the intake behaviour of medication and other products by patients and/or other users to take place in a more controlled manner and to further examine the actual use and, if desired, to adapt and adjust it.

For this purpose the device according to the
10 invention comprises:

- a product container for holding the products to be taken;
- a product passage for allowing passage of products out of the product container, which product
15 passage can be placed into at least an open and a closed position;
- a registration member coupled to the product passage for generating a registration signal which indicates that a transition from the closed to the open
20 position of the product passage and/or vice versa has taken place;
- clock means for generating a time signal;
- processing means coupled to the clock means and the registration member for processing the
25 registration signal and the time signal;
- memory means which are coupled to the processing means and to which the processing means provide a memory signal with registration and time data.

The product container is preferably provided
30 with a cover member which is provided with the product passage and which is slidable into the pushed-out or pushed-in position. It is hereby possible to open and close the product passage in simple and sure manner.

The product container is preferably provided
35 with at least two product compartments, so that the products required per intake episode are kept in a separate compartment. This has the advantage that the

user is aided in the choice of the quantity of products to be taken per intake episode.

The product container is preferably provided moreover with at least one rotatable disc member divided into product compartments. Pills and the like are divided over product compartments so that a quantity of a determined product or medication known in advance is arranged per product compartment. The product container is preferably provided with rotation means for rotating the disc member through an angle corresponding with a product compartment during the transition from the closed to the open situation of the product passage or vice versa. During closing or opening of the product container the disc member is rotated such that a new product compartment, and preferably only one new product compartment, becomes available for the product passage. Each time a user operates the product container he is therefore presented with a new product compartment. Furthermore, the presentation of medication can hereby be registered in simple manner.

The product container is preferably provided with replacement detection means coupled to the processing means for detecting replacement of the disc member, wherein the processing means provide to the memory means a memory signal with the time of replacement. The intake behaviour can hereby be better monitored and studied.

Said clock means can preferably be coupled to pre-adjustable signalling means for indicating the point in time for intake of the products. The signalling means can preferably be connected to a monitor, sound signal means and/or vibration means. At pre-set moments in time the signalling means make it clear to the user via the monitor, a buzzer and/or a vibrating component that one or more product compartments must be emptied. The user is hereby stimulated to improve his intake behaviour or carry it out strictly according to prescription.

The device is preferably provided with a sensor means which is coupled to the processing means and which provides sensor signals to the processing means which indicate whether or not the product has been removed from the product container. The processing means provide a memory signal to the memory means with the time of actual removal of a medicine from the product container.

The product container is preferably provided with blocking means which block a closed product passage when it is situated in an undesired position. The blocking means are herein preferably drivable by their own weight. This prevents products for intake being lost because they fall out of their product compartment when the container is situated in an undesired position, such as for instance with its product passage directed downward.

The present invention also provides an assembly of the above described device and two or more of said disc members, wherein registration data and time data of successive disc members can be stored in the memory means.

The present invention also provides a system comprising the above stated device, a computer which is provided with a storage medium with a communication terminal and a coupling member which is connectable to the communication terminal of the computer and to the device in order to provide two-way communication between the computer and the device.

Data from the memory means of the device can preferably be stored on the storage medium of the computer, whereafter all types of (statistical) processing can be performed thereon and the clock means and memory means of the device are adjustable by the computer.

According to a further aspect of the invention a storage system is provided for storing two or more product containers, comprising:

- a first product container provided with product compartments;
- a first closing member to be arranged over the first product container and which closes at least the product compartments;
wherein the first closing member comprises a standing edge over which a second product container can be fixed. Two or more product containers can hereby be closed and stacked on top of each other in simple manner.

10 According to a preferred embodiment a drying agent such as preferably silica gel is arranged in order to limit the air humidity in the product compartments.

Further developed preferred embodiments of the device, the system and the assembly are specified in the dependent claims.

The device, the assembly and the system according to the present invention will be further described hereinbelow with reference to the preferred embodiments shown in the figures. Herein:

20 - figure 1 shows a front view of a device according to the invention which is arranged in a coupling member;

- figure 2 shows a front view of the coupling members of figure 1;

25 - figure 3 shows a view of a system according to the invention;

- figure 4 shows a partly cut-away top view of the device in closed situation;

30 - figure 5 shows a partly cut-away top view of the device in the opened situation;

- figure 6 shows a view of the rear of the device in the opened situation;

- figure 7 is a view of a disc with twenty-eight medicine compartments;

35 - figure 8 is a view of a disc with twenty medicine compartments;

- figure 9 is a view of a disc with eight medicine compartments and one collection compartment;

- figure 10 shows a partly cut-away view of a blocked device;

- figure 11 shows a partly cut-away view of an unblocked device; and

5 - figure 12 shows a view of the monitor of the device, wherein an overview is given of the symbols for displaying on the display;

10 - figure 13 is a front view of another embodiment of the device which is arranged in another embodiment of the coupling member;

- figure 14 shows a partly cut-away view in perspective of a further preferred embodiment of the device;

15 - figures 15A and 15B show detail views from figure 14;

- figure 16 is a partly cut-away view in perspective of a further preferred embodiment;

- figure 17 shows a view of a filling diagram for filling a medicine disc; and

20 - figure 18 shows a partly cut-away view in perspective of a storage system for two or more product containers according to the invention.

Shown in figure 1 is a preferred embodiment of the device or medicine container 1 which is arranged in a coupling member 2. Medicine container 1 is provided on the front side with four push-buttons 4-7, wherein push-button 4 is provided with the word "alarm" and functions as switch-off button for the signalling function of medicine container 1, push-button 6 is provided with the word "menu" and is arranged for the purpose of choosing the menus appearing on the LCD display 8 with which the medicine container can be preset, and push-buttons 5 and 7 are respectively provided with symbols "-" and "+" in order to carry out settings in the chosen menu. LCD display 8 is provided with a back-lighting which can be switched on and off. Medicine container 1 is provided on a side surface with a slide 3 for switching on and off the sound signal function of medicine container 1. Medi-

cine container 1 is provided on the rear with a cover 9 which can be slid into and out of the housing of medicine container 1 by a user. The cover can be manufactured from transparent material so that the medication present in medicine container 1 is readily visible to the user.

Figure 2 shows a view of the coupling member 2 without medicine container 1 being arranged. Coupling piece 10 on coupling member 2 has a corresponding coupling piece (not shown) on medicine container 1, so that electrical conduction results when medicine container 1 is placed in coupling member 2. The function of this electrical conduction is to recharge the power supply arranged in medicine container 1, for instance an accumulator or rechargeable batteries. This is particularly important in embodiments in which the current consumption is so great that a standard commercially available full non-rechargeable battery lasts for only one week or less. This situation occurs for instance if a medicine cooling is arranged in medicine container 1. This recharging function is also of importance in another embodiment where a continuous temperature monitoring is provided in order to check where the user carries his medicine container 1. In other embodiments the medicine container 1 is powered by one or more batteries, wherein said electrical conduction between medicine container 1 and coupling member 2 can be dispensed with.

On coupling member 2 are arranged contact pieces 11 and 12 with corresponding contact pieces (not shown) on medicine container 1, wherein contact piece 11 is intended for transmitting data (TXD) and a contact piece 12 is intended for receiving data (RXD). Arranged on coupling member 2 are a red LED 13 and a green LED 14 which light up when respectively contact piece 11 (TX) and contact piece 12 (RX) are in use. Lips 15 and 16, which are preferably manufactured from plastic but can also be constructed from for instance metal, hold medicine container 1 in place when this container is arranged in coupling member 2.

Instead of the above described connections between medicine container 1 and coupling member 2 via contact pieces 11 and 12, in other preferred embodiments of the invention the communication between medicine
5 container 1 and coupling member 2 can also be performed in different ways, such as by means of infrared transmitters and receivers in accordance with the standardized IRDA protocol, by inductive coupling, capacitive coupling, via optical LEDs etc.

10 Figure 3 shows an overview of a system of coupling member 2, medicine container 1, computer 19 and an additional serial device 20. The connection between computer 19 and coupling member 2 consists of a nine-pin PC cable 17 which is connected to the computer via
15 terminal 21 and to coupling member 2 via terminal 22. The connection between coupling member 2 and the additional serial device 20 consists of a cable 18. In a preferred embodiment the additional serial device 20 is an interconnected mouse connection which is used if computer
20 19 has no second serial connection 21. Coupling member 2 has among other functions that of enabling a communication link between medicine container 1 and computer 19, whereby data can be exchanged or alarm times and the like can be programmed subject to the prescribed
25 therapy. Figure 3 also shows that medicine container 1 is provided on the rear with a number of circular apertures 23 for passage of sound waves originating from a sound signalling to be described further, such as for instance using a buzzer.

30 Shown in figure 4 is a partly broken away view of medicine container 1 as seen from the front, i.e. the side provided with display 8. In the shown embodiment of medicine container 1 a rotatable disc 30 is arranged on a disc support 33. Disc 30 is rotatable in the direction of
35 the arrow. The underside of disc 30 is divided into eight compartments using compartment partitions 32. Arranged on the top side of the disc at the position of the compartment partitions 32 are compartment pins 31, using which

the medicine disc 30 is drivable. Arranged on plate 34 are the required electronics such as inter alia an electronic clock, contacts, a central processing unit, memory, etc.. The power supply of medicine container 1 is provided by batteries 38, which are arranged in the present embodiment in the bottom part of the container. Blocking component 37 has the function of blocking a closed cover 9 of medicine container 1 when medicine container 1 is situated in a particular undesired position. The operation of this blocking component 37 will be further explained in the description of figures 10 and 11.

In order to prevent the medicine disc 30 being rotatable in the opposite direction to the arrow, a resilient lip 36 is arranged behind which a compartment pin 31 becomes snagged when medicine disc 30 is rotated in opposite direction to the arrow. Compartment pin 31 carries the resilient lip 36 along until this latter becomes snagged against the protrusion 35 arranged on medicine container 1. In the case of a rotation in the direction of the arrow the compartment pin 31 overcomes the spring force of resilient lip 36 and is not therefore stopped. Rotation in the direction of the arrow hereby remains possible.

The drive of medicine disc 30 takes place by means of a carrier element 41. Carrier element 41 is provided with a resilient lip 40 which carries along a compartment pin 31 during movement in the direction of the arrow shown in figure 5 and which slides over a compartment pin 31 during movement opposed to the direction of the arrow. Carrier element 41 is itself displaceable along the longitudinal axis of medicine container 1 and is driven by shifting the cover 9 of medicine container 1. For this purpose a protrusion 44 is arranged on carrier element 41 and a protrusion 43 on the ends 42 of cover 9. Protrusion 43 is enclosed between protrusion 44 of carrier element 41 and a spring element 45 arranged on carrier element 41. By shifting the cover

9, and therefore shifting the protrusion 43 fixedly connected thereto, the carrier element 41 is shifted in similar manner.

Figure 5 shows that by sliding out cover 9 in a direction opposite to that of the arrow, the carrier element 41 is displaced in corresponding manner in the same direction. Due to the resilient lip 40 the carrier element 41 slides over compartment pin 31. No rotation of disc 30 therefore takes place during the sliding-out movement of cover 9. When cover 9 is pushed back the movement of protrusion 43 of cover 9 is transmitted to carrier element 41, which in turn carries compartment pin 31 in the direction of the movement of the cover. Disc 30 is hereby rotated. The angle of rotation of medicine disc 30 depends on the placement of protrusion 43 on cover member 9. By providing the protrusion 43 for instance at the position designated with A in the case of a different cover member 9, the carrier element 41 is carried along over a shorter distance and the angle of rotation of medicine disc 30 is correspondingly smaller. Depending on the number of compartments of medicine disc 30, and therefore the required angle of rotation at each medicine intake, a different cover member 9 with its protrusion 43 at a changed position must be arranged in medicine container 1. Stop 46 is provided in medicine container 1 in order to prevent cover 9 during sliding out thereof from being released from medicine container 1. When medicine disc 30 is replaced it is however necessary to remove cover 9 from medicine container 1. For this purpose both ends 42 of cover 9 are pressed in slightly so that they can be moved past the stop 46.

Figure 6 shows that cover 9 is provided with a passage 50, so that in pulled-out position of cover 9 a compartment of medicine disc 30 between two compartment partitions 32 is accessible from outside. Arranged in the compartment are medicines which can be easily removed therefrom by a user. In the pushed-in position of cover 9 the passage 50 is likewise closed whereby in this situa-

tion the medicines remain enclosed in medicine container 1.

Shown in figure 7 is a view of a medicine disc 30 which is divided by compartment partitions 32 into twenty-eight compartments instead of the eight shown in figures 5 and 6. In the case of the medicine disc 30 with a larger number of compartments a corresponding cover member must be arranged wherein protrusion 43 is arranged at a position such that the medicine disc rotates through a smaller angle when the cover member is pushed shut.

Figure 8 shows a view of a medicine disc 30 which is divided into twenty compartments by means of compartment partitions 32 and removable partitions 51. By removing the removable partitions 51 the medicine disc 30 can be divided into compartments of a size depending on the daily dosage. In the shown embodiment the medicine disc is divided into ten compartments. The quantity of medicines to be taken per intake episode can therefore be changed without providing a different type of medicine disc 30.

Shown in figure 9 is a view of an embodiment of a medicine disc 30 which is provided with an outer ring of medicine compartments for medicines of which the time of intake must be stored in addition to an inner ring consisting of one collection compartment 57 for medicines which can be taken at all times without data thereof having to be stored in a memory. Examples hereof are pain-killers, vitamin tablets and the like. In this embodiment the passage 50 is replaced by two small medicine passages, of which medicine passage 58 is intended for making the outer ring of medicine compartments accessible and medicine passage 59 is intended for making the collection compartment 57 accessible. When cover 9 is pushed out over about half the total distance, passage 59 is situated above collection compartment 57 so that medicines can be removed therefrom. Sliding the cover 9 open and shut over half the distance is not registered and no data is therefore stored in the memory. When cover

9 is slid over the full distance, passage 59 is situated above one of the compartments of the outer ring so that medicines can be removed therefrom. Sliding cover 9 open and/or shut over the full distance is herein registered
5 and data relating thereto is stored in the memory.

In figures 10 and 11 the operation of a preferred embodiment of blocking component 37 is further explained in a partly cut-away schematic view. Figure 10 shows the situation in which the medicine container is
10 placed such that display 8 faces upward. Plate part 55 is mounted on the fixed part of medicine container 1 while protrusion 56 is arranged on the movable cover 9. Arranged in plate part 55 is a recess into which the blocking component 37 can slide. In the position of
15 medicine container 1 shown in figure 10, blocking component 37 prevents sliding out of cover 9 since protrusion 56 remains snagged behind blocking component 37.

Figure 11 shows medicine container 1 in the
20 position in which display 8 faces downward. Blocking component 37 has been shifted in the direction of the small arrow by its own weight. It hereby becomes possible to slide cover 9 in the direction of the large arrow since the protrusion 56 arranged on cover 9 is no longer
25 fixed by blocking component 37. The blocking component 37 thus ensures that cover 9 can be opened when medicine container 1 is situated in the position shown in figure 11. Thus is prevented that cover 9 is opened in the position shown in figure 10 whereby medicines could fall
30 out of the passage cover 50.

The blocking component 37 is provided on its elongate outer end with a chamfered surface 61. It is hereby always possible to displace cover 9 from the pushed-out to the pushed-in position. In the orientation
35 of medicine container 1 shown in figure 10, i.e. with display 8 facing upward, the protrusion 56 fixed on cover 9 pushes blocking component 37 upward as a result of the chamfered outer end 61 thereof, so that cover 9 can be

pushed in. In the orientation of medicine container 1 shown in figure 11, i.e. with display 8 facing downward, cover 9 can likewise be pushed in.

In a further preferred embodiment time blocking means are provided for blocking or unblocking the product passage subject to the moment in time. In this embodiment variant (not shown) a spring is arranged which urges blocking component 37 into a "blocked" situation, the blocking component 37 is magnetized and a magnetic coil relay is arranged which is activated for only a fixed period of time, for instance 30 seconds, after generating of an alarm signal for the purpose of temporarily interrupting the blocking of cover 9. After the intake of a dosage of medicine, the relay is deactivated whereby cover 9 is once again blocked until the following alarm signal occurs.

Shown in figure 12 is an example of the information which can be displayed on a display 8. In addition to the time and day indication, an indication is for instance given as to which medicine compartments have already been emptied, whether the battery must be recharged and the like. Medicine container 1 contains a clock provided with an alarm function. At preset points in time a warning signal is provided, for instance in the form of a sound signal or in that medicine container 1 begins to vibrate, which indicates that a user must take medication. The user opens cover 9 whereby passage 50 is opened and the medication to be taken is removed from medicine container 1. The patient or user takes the medication and subsequently closes cover 9 whereby passage 50 is once again closed. Opening and/or closing of cover 9 is registered by a registration component (not shown). Via the central processing unit the point in time and/or date at which this took place is stored in a memory, preferably an EEPROM, FLASH or SRAM memory. When in the course of time all compartments of medicine disc 30 have been emptied, the cover 9 is removed whereafter medicine disc 30 can be replaced by a subsequent medicine

disc 30 or whereafter medicine disc 30 can be refilled with medication. Replacement of medicine disc 30 can also be detected and the time of replacement can be stored in the memory.

5 Thus stored in the memory after a period of time are on the one hand set-up data indicating the points in time at which medication has to be taken and on the other hand data relating to registration of the opening and/or closing of cover 9 and detection of
10 replacement of medicine disc 30. Furthermore, all settings and/or changes made by the user can be registered.

 In a further embodiment of the invention, when a user has omitted to take his medication, this is stored
15 in the memory of medicine container 1. At a following point in time for taking medication an extra warning signal is given, for instance by displaying on display 8 a symbol intended for this purpose, whereby the user is alerted to the fact that he omitted to take his medica-
20 tion on the previous occasion and that now not the next but the subsequent medicine compartment must be emptied.

 In a further preferred embodiment of the invention the user places medicine container 1 at a given moment into coupling member 2 in order to recharge the
25 rechargeable batteries present in medicine container 1 and to exchange data with computer 19, or to program alarm times consequent to a (new) therapy (change). Via contact pieces 11 and 12 communication is then possible between the central processing unit of medicine container
30 1 and the central processing unit of computer 19. Data from the memory of medicine container 1 can be stored in a storage medium, such as for instance a hard disk, of computer 19. It is hereby possible to chart the behaviour of the patient. It is for instance possible to check
35 whether the patient has taken all medication at the correct times. Depending on the data read from the memory of medicine container 1, it is possible using software present on computer 19 or by means of input by a

physician to adapt the therapy of the user, for instance by taking different medication and/or (new) medication at other times. Once a new therapy as well as the times for taking the medication during the subsequent period have
5 been established, said times are stored via coupling member 2 and the processing unit of medicine container 1 in the memory thereof.

In addition to reprogramming the therapy and the timing for the intake of medication, it is also
10 possible in a preferred embodiment of the invention to reprogram the software for controlling the electronic components in medicine container 1. The reason for this is that within each therapy a different approach has to be taken in handling early and late intake or even
15 completely "forgetting" to take the prescribed medication. A medicine which must for instance always be taken just before meals may, if it is forgotten at 8 o'clock in the morning, only be taken again at 12 o'clock midday, even if the following alarm time is set at 10
20 o'clock. In further consultation, for instance with the manufacturer or a physician, a so-called "mismatch" strategy will be determined per therapy in which is defined how medicine container 1 reacts optimally to variations in the intake behaviour of the user.

25 Alternatively, push-buttons 5-7 can be used for set-up of medicine container 1 using computer 19 and coupling member 2.

In an embodiment of the invention which is not shown, medicine container 1 also contains a sensor which
30 detects whether the medication has actually been removed from medicine container 1. In above described embodiments only the opening and/or closing of cover 9 of medicine container 1 is registered, while no registration is made in these cases as to whether medicines have actually been
35 removed from container 1. By placing a sensor, which detects the removal of medicines, in medicine container 1 and storing in the memory the times of the actual removal

of medication, additional information concerning the intake behaviour of the patient can be obtained.

In an embodiment of the invention (not shown) the medicine container 1 contains cooling means which
5 ensure that the medication situated in the compartments remains cooled to below predetermined temperatures.

In an embodiment of the invention (not shown) the compartments on medicine disc 30 are provided on the top side with a "seal", preferably manufactured from
10 aluminium, for prepacked dosages or a so-called combination therapy. The impermeable layer is removed from medicine disc 30 before it is placed in medicine container 1. No mistakes can hereby occur, for instance in the case the users are becoming demented, due to the
15 users themselves having to fill the compartments of medicine container 1.

Figure 13 shows another preferred embodiment of a pillbox 70 with a coupling member or docking station 74. Pillbox 70 is largely identical to pillbox 1 of figure 1.

Slide 72 in pillbox 70 not only has the function of adjusting the sound volume but also of switching on and off the vibration function. In this embodiment vibration of pillbox 70 is actuated in shock-wise manner, wherein the shocks are easily felt by the patient but the medication does not start to rattle in the medicine compartments. The intensity of the alarm, i.e. the volume of the sound and/or intensity of the vibrations, preferably increases when a patient fails to take the medicines at the correct time.

The embodiment of cover 71 of pillbox 70 is modified relative to cover 9 of pillbox 1, and these modifications will be described hereinbelow. Finally, an alarm light 73 is provided on the front side of pillbox 70 which can emit a brightly flickering red light, so that pillbox 70 can be localized during the night without the patient for instance having to get out of his/her bed.

Docking station 74 is embodied such that it lies easily in the hand. The station moreover has smaller dimensions relative to the coupling member of figure 2, thereby improving the transportability. Provided in docking station 74 are two elastic parts 75 and 76 which are arranged on docking station 74 and which each have a respective lip 77 and 78 formed on an outer end. Openings corresponding with parts 75 and 76 are formed in pillbox 70. In the coupled situation lips 77 and 78 of parts 75 and 76 hook behind the housing of pillbox 70. By depressing protrusions 79 and 80 formed on the sides of station 74 the parts 75 and 76 are bent so far that lips 77 and 78 can be pulled out of the openings in pillbox 70. Docking station 74 is hereby disconnected. Docking station 74 and pillbox 70 are further provided with a number of connections 81 and 82 for enabling inter alia data transmission and, as option, for supplying charging current for a rechargeable battery optionally present in pillbox 70. Docking station 74 can be connected via connection 84 to an external computer.

Figure 14 shows a further preferred embodiment of pillbox 70. The slide or cover 71 is herein slidable along housing 85 of pillbox 70. Cover 71 is provided with two resilient lips 86 and 87. The action of resilient lip 87 is further elucidated in figures 15A and 15B. The action of resilient lip 86 is however wholly analogous.

Resilient lip 87 is provided on one end with a hook-shaped portion 88 which in the position drawn in figure 15A prevents cover 71 of housing 85 being able to slide, since portion 88 is held back by a protruding part of housing 85. A part 89 formed on housing 85 moreover ensures that the cover cannot be removed from housing 85 in the direction of arrow B. However, when a pressure is exerted on resilient lip 87 in the direction of arrow A, for instance by a finger of a patient, the resilient lip 87 bends slightly whereby cover 71 (in the position shown in figure 15B) can be removed from housing 85 in the direction of arrow B.

In figure 16 is shown an alternative embodiment of pillbox 70. Medicine disc 90 is provided on the underside with a number of compartment pins 91. The blocking lip 92 arranged on the housing is provided on an outer end with a portion 93 extending obliquely upward. When the medicine disc is rotated in the direction of the arrow compartment pins 91 slide over portion 93 of blocking lip 92 without therein obstructing the rotation movement. On rotation of the medicine disc in the direction opposite to that of the arrow, portion 93 of lip 92 blocks the rotation movement. As a result of these measures the medicine disc can be rotated substantially in only one direction.

In this embodiment two recesses 95 are arranged per compartment in the side wall 94 of the medicine disc. Recesses 95 can co-act with sensors 96 and 97 arranged in a standing wall of housing 85. Sensors 96 and 97 are provided with respective rotatable contacts 98 and 99. A contacts 98 or 99 is situated in a first position when the medicine disc is rotated such that a recess 95 in side wall 94 of the medicine disc is located opposite this contact 96 or 97. On further rotation a contact 96 or 97 is situated in a second pressed-in position. Depending on the position in which a contact is situated, a signal is generated by sensors 96 and 97 which is sent to the central processor unit. This determines for instance whether or not a medicine disc is present, in which position the medicine disc is situated, how many medicine compartments have already been emptied, and so on.

Figure 16 also shows that a rotating and pulling mechanism 100 is applied which differs from the pulling mechanism described with reference to figure 4. this alternative embodiment of the pulling mechanism is within the reach of the skilled person in the field of designing such injection-moulded medicine containers and is therefore not further explained here.

Figure 17 shows a preferred embodiment of a filling diagram 110 for a pillbox according to the invention. Filling diagram 110 is laid onto a table, whereafter a medicine disc 90 is placed on filling diagram 110, this such that the positions of the compartments of the medicine disc correspond with those of the diagram compartments 111 designated in filling diagram 110, wherein use is made of arrow 112 and an optical marking shown on the medicine disc. Using designations 113 a relation is established between a determined medicine compartment and a number between 1 and 8 (in the case the medicine disc has 8 compartments). The different types of medicine used by a patient are shown on fill-in labels 114a-114f. Bands 115a-115f running from fill-in labels 114a-114f indicate, in co-action with designations 116 of the time of medicine intake, precisely which medicine types and which medicine quantities, related in each case to a determined time of intake, must be arranged in the associated medicine compartment. This provides the patient with a simple and certain prospect of filling a medicine disc in correct manner.

The above described filling diagram can either be completed by the patient himself or calculated by an external computer and subsequently printed. An additional advantage of the use of a computer is that the computer itself determines how many medicine compartments are required per intake. In the case of manual filling of the medicine disc this is left to the patient.

In figure 18 is shown a preferred embodiment of a storage system 120 for two medicine discs 121 and 122 filled with medicines. Medicine discs 121 and 122 are provided with respective covers 123 and 124. These covers have the primary function of preventing medicines dropping out of already pre-filled medicine discs.

The covers can also be used to provide a storage system. The covers have standing edges 125 and 126, wherein medicine disc 122 can be arranged over the

edge 125 of the lower cover 123. A third medicine disc (not shown) can then be placed over the edge 126 of cover 124. The covers therefore provide not only a sealing of the medicine compartments but also the option of stacking a large number of medicine discs on top of each other.

Covers 123 and 124 shown in figure 18 are provided with respective closing walls 127 and 128 so that a space is created per medicine disc in which a quantity of moisture-absorbent material 129 such as for instance silica gel can be arranged in order to reduce the air humidity. Embodiments can however also be envisaged wherein the closing walls 127 and 128 are omitted, whereby one large space is available in the heart of the medicine discs for arranging said silica gel.

The present invention is not limited to the above described preferred embodiments thereof; the rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.



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CLAIMS

1. Device for enhancing reliable and monitored intake of products, in particular medication, comprising:

- a product container for holding the products to be taken;

5 - a product passage for allowing passage of products out of the product container, which product passage can be placed into at least an opened and closed position;

10 - a registration member coupled to the product passage for generating a registration signal which indicates that a transition from the closed to the opened position of the product passage and/or vice versa has taken place;

 - clock means for generating a time signal;

15 - processing means coupled to the clock means and the registration member for processing the registration signal and the time signal;

 - memory means which are coupled to the processing means and to which the processing means
20 provide a memory signal with registration and time data.

2. Device as claimed in claim 1, wherein the product container comprises a cover member which is provided with the product passage and which is slidable into a pushed-out or pushed-in position.

25 3. Device as claimed in claim 1 or 2, wherein the product container is provided with at least two product compartments.

 4. Device as claimed in claim 1 or 2, wherein the product container is provided with one or more
30 rotatable disc members divided into product compartments.

 5. Device as claimed in claim 4, wherein the number of product compartments is variable.

 6. Device as claimed in claim 4 or 5, wherein the product container is provided with rotation means for



rotating the disc member through an angle corresponding with a product compartment during the transition from the closed to the opened situation of the product passage or vice versa.

5 7. Device as claimed in claim 4, 5 or 6, wherein the disc member is replaceable when the cover member is removed.

8. Device as claimed in claim 4, wherein the product container is provided with replacement detection
10 means coupled to the processing means for detecting replacement of the disc member, wherein the processing means provide to the memory means a memory signal with the time of replacement.

9. Device as claimed in claim 1, wherein the
15 clock means can be coupled to pre-adjustable signalling means for indicating the point in time for intake of products.

10. Device as claimed in claim 9, wherein the signalling means can be connected to a display.

20 11. Device as claimed in claim 10, wherein the display is provided with a back-lighting which can be switched on and off.

12. Device as claimed in claim 9, wherein the signalling means can be connected to sound signal means.

25 13. Device as claimed in claim 9, wherein the signalling means can be connected to vibration means.

14. Device as claimed in any of the foregoing claims provided with a sensor means which is coupled to the processing means and which provides a sensor signal
30 to the processing means which indicates whether or not a product has been removed from the product container, wherein the processing means provide a memory signal to the memory means with the time of removal.

15. Device as claimed in any of the foregoing
35 claims, wherein the product container is provided with blocking means which block a closed product passage when it is situated in an undesired position.

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16. Device as claimed in claim 15, wherein the blocking means are also provided with time blocking means for blocking or unblocking the product passage subject to the moment in time.

5 17. Device as claimed in claim 15, wherein the blocking means are drivable by their own weight.

18. Device as claimed in any of the foregoing claims, wherein the product container is provided with a cooling member for cooling the products to be taken.

10 19. Device as claimed in any of the foregoing claims, wherein the product container is provided with a collection compartment for storing products to be taken without providing a memory signal.

15 20. Device as claimed in any of the foregoing claims, wherein a removable seal can be arranged on a product compartment.

20 21. Device as claimed in any of the foregoing claims, wherein in the opened situation of the product passage only one product compartment is accessible at a time.

22. Assembly comprising a device with at least two disc members as claimed in any of the claims 1-21, wherein registration data and time data of successive disc members can be stored in the memory means.

25 23. System comprising:

- a device as claimed in claims 1-21;
- a computer which is at least provided with a storage medium and a communication terminal;
- a coupling member which is connectable to the communication terminal of the computer and to the device in order to provide two-way communication between the computer and the device.

30 24. System as claimed in claim 23, wherein data from the memory means of the device can be stored on the storage medium of the computer.

35 25. System as claimed in claim 23 or 24, wherein the clock means and memory means of the device are adjustable by the computer.





26. Method for manufacturing a device as claimed in claims 1-21.

27. Device as claimed in any of the claims 1-12, wherein the cover member is manufactured from transparent material.

28. Device as claimed in claim 13, wherein the vibrating means can be actuated in shock-wise manner.

29. Filling diagram for filling a device as claimed in any of the claims 4-7, comprising means for establishing a relation between the product compartments and the products for intake.

30. Storage system for storing two or more product containers, comprising:

- a first product container provided with product compartments;
 - a first closing member to be arranged over the first product container and which closes at least the product compartments;
- wherein the first closing member comprises a standing edge over which a second product container can be fixed.

31. Storage system as claimed in claim 30, also comprising a drying agent for limiting the air humidity in the product compartments.

32. Storage system as claimed in claim 31, wherein the drying agent comprises a silica gel.

33. Storage system as claimed in claim 30, 31 or 32, wherein product containers of the device as claimed in any of the claims 1-21, 27-28 are used.

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