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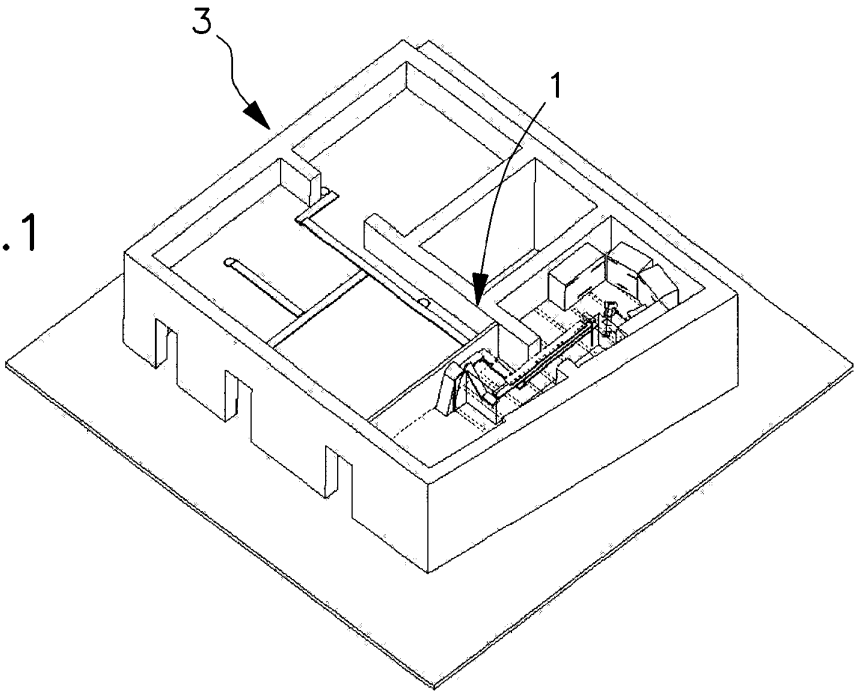
(54) **Automatic storage system for pharmacies**

(57) The automatic storage system for pharmacies comprises medicine containment means (7) arranged at a storage zone (4) and means (8) for gripping and releasing said medicines arranged in vicinity of the storage zone (4), suitable to be actuated to access the containment means (7). Automatic recognition and identification means (94) are arranged in a medicine identification station (92), accessible to the grip and release means (8). Transporting and singling means (9) are suitable to receive the medicines from the grip and release means (8) and to transport the same medicines to at least one delivery station (10), as well as to receive from load means the medicines to be stored in said containment means (7) and to supply the same medicines to be stored to said grip and release means (8).

Fig.1



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Description

Technical Field

[0001] The present invention regards an automatic storage system for pharmacies.

Background Art

[0002] The use of automatic storage systems for pharmacies has been known nowadays in pharmacies, substituting the conventional storing systems. The use of such automatic storage systems allows to manage a high quantity of medicines with greater speed and efficiency, in particular in selling step.

[0003] Nevertheless the known automatic storage systems do not fully satisfy the exigencies of the users. A reported drawback of known storage systems consists for example of the important dimensions that they generally involve. In fact the used apparatuses require, for installation in existing pharmacies or pharmacies to be built, the substitution of the usual manual storehouses with shelving and automatic apparatuses having a noticeable encumbrance, that small dimension pharmacies cannot provide. In particular, storage systems which provide the installation of lines of facing opened shelving, between which automatic grip means for medicines are suitable to be handled in shifting motion, for performing the positioning thereof on the shelves, turn out to be particularly encumbering and difficult to adapt in existing realities. Moreover medicines of the same type are generally positioned in stockpile beside each other, in lines in continuous formation inside suitable storage alveolus. Since the first medicine of the line is the only one accessible to grip means when the type of corresponding product is required by the operator, such storage systems cannot easily carry out an optimal handling of the expiry dates, that is such as to choose the medicine specimen to be drawn between the ones with closer expiry date, and not only on the basis of the positioning in the storage alveolus.

Disclosure

[0004] The task of the present invention is that of solving the aforementioned problems, devising a storage system for pharmacies which enables to handle in an automatic manner a relevant quantity of medicines, in particular being able to automatically replenish the medicines to be stored to the relative containment devices.

[0005] Within such task, it is a further scope of the present invention that of providing a storage system for pharmacies able to separate the medicines to be handled, to identify and take them singularly to a predetermined place.

[0006] Another object of the present invention is that of providing an automatic storage system for pharmacies which allows to distribute the medicines in an automatic way to diverse delivery areas.

[0007] A further scope of the invention is that of providing an automatic storage system for pharmacies which presents a reduced encumbrance.

[0008] Another scope of the invention is that of providing an automatic storage system for pharmacies which can be adapted to existing storehouses.

[0009] A further scope of the invention is that of providing an automatic storage system for pharmacies having a simple conception, a securely reliable functioning and versatile use, as well as relatively economic cost.

[0010] At last object of the invention is that of providing a method for handling the automatic medicine storage that enable to handle the storage and distribution of the medicines in an optimal way.

[0011] The cited scopes are attained, according to the present invention, by the automatic storage system for pharmacies according to claim 1.

[0012] According to the present invention, the storage system comprises means for gripping and releasing medicines suitable to be actuated in order to access medicine containment means, arranged at a storage zone, and to cooperate with transporting and singling means suitable to receive said medicines from said grip and release means and to transport the same medicines to at least one delivery station, as well as to receive from load means the medicines to be stored in said containment means and to provide the same medicines to be stored to said grip and release means.

[0013] In particular the storage system allows to handle in an optimal way the provisions of medicines, as the grip and release means are of the type suitable to access the medicine containment means according to a FIFO logic. Such a logic, optimal for managing the expiry dates of the medicines, is made possible mainly thanks to the providing of robotized grip and release means and of containment means provided with extractable shelves or anyway that can be accessed in any storage position of the medicines for the aforesaid robotized means. Therefore thanks to such a providing each medicine already positioned in the containment means can be directly drawn by the grip and release means to be supplied to the delivery stations, without having to be subjected to intermediate moving.

[0014] Usefully the storage systems provides automatic recognition means, arranged in a medicine identification station accessible to said grip and release means, suitable to identify correctly any medicine independently from the respective orientation.

[0015] Preferably, said medicine containment means, said grip and release means, said automatic recognition means and said transporting and singling means are arranged in an upper zone of the pharmacy.

[0016] Finally, it is important to note that the method for handling the automatic medicine storage according to the invention is suitable to interact with the electronic archive of data relative to the products of the pharmacy, to enable the recognition of the inlet medicines, the in-

sertion in archive of medicines not known yet further than the processing of statistical and/or historical data, for example to identify the medicines most frequently required from the delivery stations.

Description of Drawings

[0017] Details of the invention shall be more apparent from the detailed description of a preferred embodiment of the automatic storage system for pharmacies according to the invention, illustrated for indicative purposes in the attached drawings, wherein:

[0018] figure 1 shows a perspective view of the rooms of a pharmacy provided with the automatic storage system according to the invention;

[0019] figures 2, 3 and 4 respectively show enlarged perspective views of portions of the automatic storage system in hand;

[0020] figure 5 shows a side view of a detail of the storage system in hand;

[0021] figure 6 shows a partial top view of the storage system;

[0022] figures 7 and 8 show a same portion of the transporting and singling means used in the automatic storage system, respectively in perspective and top views;

[0023] figure 9 shows a top view of a detail of the transporting and singling means illustrated in figures 7 and 8;

[0024] figure 10 shows a perspective view of a medicine in box suitable to be handled by the automatic storage system;

[0025] figures 11 a and 11 b show a detail side view of a medicine in recognition step;

[0026] figure 12 shows a further embodiment of the automatic storage system in hand;

[0027] figure 13 shows a block diagram of the method for handling the automatic medicine storage according to the invention.

Best Mode

[0028] With particular reference to such figures, the automatic storage system for pharmacies according to the invention is indicated in its entirety with 1. The storage system 1 for the medicines 2 is suitable to be installed inside a pharmacy 3, preferably in the upper part of its internal volume, in such a way as to enable the disposition of the selling area in the lower part of the same internal volume without limiting the useful surface. In particular, the storage system 1 is suitable to be installed in an upper zone of the pharmacy, for example on an intermediate surface constituted by an appropriate intermediate floor (fig. 1 and 2).

[0029] The storage system provides a storage zone 4 for the medicines 2, facing a feed zone 5 for the medicines 2, from which extends a zone 6 for transporting the same medicines 2. In particular, in the feed zone 5 the medicines 2 are either fed from a load zone below towards the storage zone 4, or transferred from the storage zone 4 to the transporting zone 6, as better described in the following.

[0030] In the storage zone 4 are arranged containment means 7 for the medicines comprising at least one storage device suitable to receive a plurality of medicines 2, suitably packaged in suitable boxes. Preferably, the storage devices 7 are constituted by shelving provided with a plurality of drawers or extractable shelves 7a suitable to contain the medicines 2 preferably in a single accumulation layer. The drawers or shelves can be extracted or opened, level or inclined, anyway suitable to receive and position the single medicines 2 in univocal positions inside storage alveolus. In particular such positions are univocally determined by the system in hand as a function of the dimensions of the box of the medicine 2, preferably of the base if the medicine is positioned from the top, not necessarily of the type, as better described thereafter.

[0031] In particular the shelves 7a are extractable to allow the access from the top to the medicines 2 in any position they are located, with an optimal handling of the available space. Nevertheless it is possible to provide storage devices for the medicines lacking of drawers that can be extracted or opened.

[0032] The storage system is also provided with means 8 for gripping and releasing said medicines arranged in vicinity of the storage zone 4 and suitable to be actuated to access the aforesaid containment means 7. The means 8 for gripping and releasing the medicines suitably consist of an automated device, such as in particular an anthropomorphic robot, of the six axis type. The anthropomorphic robot 8 is suitable to perform in an efficient way the extraction and the successive closure of the drawers or shelves 7a. Alternately it is possible to provide the use of a four axis robot.

[0033] The robot 8 is preferably provided with an articulated arm 80 carried rotatable by a support foot 81 and provided with a grip head 82 connected in an articulated way at the free end of the articulated arm 80. The grip head 82 is provided with grip members 83, such as for example suction cap pneumatic members, suitable to draw the boxes of medicines 2 to be handled, further than preferably with grasp members, such as for example a radial actuation pneumatic pliers, to grasp a portion of the drawers 7a, and perform the extraction and closure thereof (fig. 3, 11 a and 11 b). The robot 8 is controlled by suitable processing means for the electronic management of the system 1, as better described in the following.

[0034] At the feed zone 5 of the storage system, are provided transporting and singling means 9 suitable to receive the medicines 2 from said grip and release means 8 and to transport the same medicines 2 to at least one delivery station 10, as well as to receive from suitable load means the medicines 2 to be stored in said containment means 7 and to supply the same medicines 2 to be stored to said grip and release means 8.

[0035] The transporting and singling means 9 comprise a conveyor belts device whereon are transported the medicines 2. With such a belts device is associated

a lifter member 90 suitable to transfer the medicines 2 from a load zone below, which cannot be seen in figure 4, to the aforesaid upper zone of the pharmacy 3.

[0036] More in particular, the conveyor belts device comprises first conveyor means 91, suitable to convey the medicines exiting from the lifter member 90 towards a medicine identification station 92. In the illustrated case, the first conveyor means 91 define a segmented feed path, composed by a first tract 91 a placed at the outlet of the lifter member 90, a second tract 91 b which extends perpendicularly to the first tract 91 a, and a third tract 91 c perpendicular to the second tract 91 b and extended until the identification station 92 (see fig. 4).

[0037] It is to note that the tracts 91 a, 91 b and 91 c of the first conveyor means 91 are arranged in sequence substantially horizontal and at different heights, progressively decreasing, in such a way that the passage of the boxes of medicines 2 from a tract to another one occurs by fall. Furthermore each tract can be realized by two or more conveyor belts.

[0038] The successive belts are suitably actuated with increasing peripheral speeds, so as to perform the gradual distancing and thus the singling of the conveyed boxes of medicines 2.

[0039] The conveyor belts device also comprises second conveyor means 93, suitable to take the medicines 2 back in recycle from the identification station 92 to the first conveyor means 91, for example if an incomplete singling of the medicines 2 is detected. The second conveyor means 92 are suitable to transport the medicines 2 in opposite direction with respect to the first conveyor means 91 (fig. 5).

[0040] In the illustrated case, the second conveyor means 92 define a segmented feed path, composed by a first tract 93a arranged substantially underneath the third tract 91 c of the first conveyor means 91 and extended between the identification station 92 and a second tract 93 perpendicular thereto, extended towards a third tract 93c, which extend until the first tract 91 a of the first conveyor means 91. Analogously to the first conveyor means 91, the first, second and third tract 93a, 93b and 93c are arranged in such a way that the passage of the boxes of medicines 2 from a tract to another one occurs by fall.

[0041] It is to note that the first and the second tract 93a, 93b of the second conveyor means 93 are substantially horizontal, while the third tract 93c is arranged inclined in a way as to have an end underneath the second tract 93b of the second conveyor means 93, to receive falling the boxes of medicines 2 coming from the same second tract 93b, and the opposite end above the first tract 91 a of the first conveyor means 91, so as to enable the return by fall of the medicines 2 on the same first tract 91 a.

[0042] It is also to note that the end of the first tract 93a of the second conveyor means 93 is protruding with respect to the end of the third tract 91 c of the first conveyor means 91, so as to be able to receive medicines 2 falling from the first conveyor means 91.

[0043] The identification station 92 comprises automatic recognition means 94 of the position and the dimensions of the medicines 2. Such means are suitable to detect real data of the medicine 2 in box, such as the dimensions, the contour, the height and the orientation on the feed conveyor belt. Such data are transmitted from the automatic recognition means 94 to the electronic processing unit suitable to control the grip and release means 8, in order to verify whether the positioning of the medicine on the conveyor belt is appropriated to the successive grip. Thanks to such data and to the data transmitted by the control devices associated with the actuation means, relative to the instant peripheral speed of the conveyor belt, the processing unit can also process the instant position of the barycentre of the medicines 2 in motion. The cited control devices are for example of the encoder type.

[0044] The automatic recognition means 94 can be arranged for example at the end of the second conveyor means 93, so as to be able to identify the medicines 2 after the fall from the first conveyor means 91 (fig. 5), or at the first conveyor means 91 (fig. 7).

[0045] The automatic recognition means 94 preferably comprise at least one laser scan device 94a cooperating with at least one optical picture detecting device 94b, of the video camera type, to detect the aforesaid physical and kinetic data of the medicine 2 in feed motion (fig. 7).

[0046] Along the first conveyor means 91 upstream of the automatic recognition means 94 are preferably prearranged centring members 11 and aligning members 12 to make the recognition and the successive identification of medicine 2 easier, as better described in the following.

[0047] The centring members preferably comprise lateral edges, for example sheet made, arranged between a tract and the other one of the conveyor means, suitably converging in an outlet portion to perform the transverse centring of the single medicine 2 fed towards a preferably central position of the belt. Instead the aligning members 12 comprise a mobile wall, for example tilting, arranged transverse to the conveyor means, suitable to represent a mobile beat for aligning the medicines 2 (fig. 7).

[0048] The feed device 9 is further provided with third conveyor means 95, arranged at an height on average lower than the second conveyor means 93, and suitable to convey the medicines 2 from the storage zone 4 to the transport zone 6 (fig. 5). The third conveyor means 95 preferably consist of at least one conveyor belt, and extend from the storage zone 4 to at least one delivery station 10, preferably consisting of a slide, which cannot be seen in the figures, suitable to receive the medicines 2 falling and to guide the same towards a corresponding request station, from which the transported medicines were requested. Preferably the delivery station 10 is arranged under the transport zone 6, but it is possible to provide the presence of a delivery station 10 in any zone of the automatic storage system 1 suitable to receive the

medicines 2 from the conveyor means (see fig. 6).

[0049] In the illustrated example, the third conveyor means 95 are composed by a first tract 95a, below the first tract 93a of the second conveyor means 93, by a second tract 95b perpendicular thereto. The second tract 95b extends between the opposite end of the first tract 95a until a third tract 95c arranged perpendicular to the second tract 95b in the transport zone 6. The third conveyor means 95 comprise a fourth tract 95d, arranged substantially perpendicular to the second tract 95b in an intermediate part of the same, and a fifth tract 95e arranged perpendicular to the fourth tract 95d in an intermediate part of the same. In the illustrated example are provided five delivery stations 10 served by the third conveyor means 95. Obviously can be provided a bigger or smaller number of delivery stations 10, served by conveyor means arranged in a suitable way.

[0050] It is to be noted that the end of the first tract 95a of the third conveyor means 95 is protruding with respect to the end of the first tract 93a of the second conveyor means 93, in such a way that the grip device 8 is able to deposit a box of medicines on the end of the first tract 95a of the third conveyor means 95.

[0051] The third conveyor means 95 cooperate with a plurality of deviator means 96, arranged laterally to the feed and transport line, to deviate the medicines 2 for example falling on an adjacent tract of the third conveyor means 95 or towards a slide 10 (fig. 7 and 9). In particular the deviator means 96 comprise pusher members 97, for example constituted by double stem cylinders, suitable to carry interception means 98 provided with obstruction walls for a medicine 2 crossing along the conveyor means 95. The pusher members 97 are alternatively mobile between an advanced interception position wherein the interception means 98 are arranged on the third conveyor means 95 in a way as to be able to receive and retain at least one medicine 2 against the respective obstruction walls, and a retracted position wherein the interception means 98 are arranged externally at the side of the conveyor means 95 so as to release the intercepted medicine 2 in the zone below. From the lateral walls of the interception means 98 preferably extend respective guide edges 99 gradually diverging preferably until the side edges of the conveyor means 95, to guide the interception of the medicines 2.

[0052] Finally the storage system 1 comprises an identification station 100, arranged at the storage zone 4 accessible to the anthropomorphic robot 8 (fig. 7 and 8). The identification station 100 is suitable to detect the nature of the medicine 2 in order to communicate it to the cited processing unit which controls the grip and release means 8 to which it is connected, such that it can determine the destination location in the containment means 7.

[0053] The identification station 100 is preferably provided with identification means of the bar code reader type, suitable to read the codes present on one face of the medicines 2 usually packaged in parallelepiped shaped boxes (fig. 10).

[0054] The identification station preferably comprises a first group of readers 100a suitable to detect the presence of the code bar on a face 2a of the medicine 2 arranged on the upper side. The first group 100a preferably provides a couple of readers arranged according to orthogonal directions to read codes arranged both longitudinally and transversely to the feed direction A of the medicine.

[0055] The identification station 100 can also comprise a second group of readers 100b suitable to detect the presence of the code on the side faces 2b of the medicine 2.

[0056] Finally the identification station 100 can comprise a third group of readers 100c suitable to read the remaining faces of the medicine 2 while the medicine 2 is suitably handled gripped by the robot 8. Such a third group can possibly substitute the reading performed by the readers of the cited second group 100b.

[0057] At the same readers 100c is preferably provided an auxiliary support device 110, suitable to receive temporarily supported the medicine 2 in box, to allow the robot 8 to change the grip face of the medicine 2 at a face suitable for the successive positioning operations in the containment means 7. In particular, if the medicine 2 is drawn at a face not suitable to the release into the storage alveolus, the robot 8 temporarily puts it on the auxiliary support device 110 and draws it again at the correct face (see the diagram of fig. 13).

[0058] In alternative it can be provided to perform the search and reading of the bar code while the medicine 2 is supported on the auxiliary support device 110, providing to make the walls thereof in transparent material suitable to the reading of the identification means.

[0059] The management method of the automatic storage system turns out to be easy to understand from the preceding description.

[0060] In step of filling the containment devices 7, the medicines 2, packaged in respective boxes, are loaded at the load zone, not represented, below the storage system 1. The loaded boxes are then lifted by the lifter 90 and successively transferred on the first conveyor means 91. In particular, in the illustrated example, the boxes reach the first tract 91 a of the first conveyor means, and are then successively conveyed on the second and the third tracts 91 b, 91 c, passing from one to the successive one by fall. During this conveying, the passage of the boxes on different successive endless belts actuated at increasing speeds performs the distancing of the boxes from each other and so the singling of the same towards the identification station 92.

[0061] Aligning of the singled medicines occurs at the first conveyor means 91 by the centring members 11 and the aligning members 12. Successively the automatic recognition means 94 perform the recognition or reading of the real dimensions, of the contour, of the orientation and of the height of the medicine 2 in box, transmit the data to the electronic processing unit which calculates the instant positioning of the barycentre, to enable the

grip and release means 8 to perform the following or "tracking" of the medicine 2, for the successive grip, possibly also "immediately", of the same medicine 2. Furthermore the recognition of the dimensions for example of the base of the medicine 2 in box allows the processing unit to predetermine in an univocal and optimal way for the management of the available space the alveolus wherein the medicine 2 will be located on the shelf 7a.

[0062] In the identification station 100 then begins the search of the bar code of the medicine 2, to complete the recognition and the identification of the same.

[0063] If the code is found by the first group of readers 100a, meaning it is located on the upper face 2a of the medicine 2, then the processing unit detects the code and, interacting with the central electronic archiving database for the medicines 2, verifies if the code is known. In affirmative case, if the medicine 2 is in a position appropriated to the drawing and the positioning in the storage devices 7, as in figure 11 a for example, then it is drawn by the drawing and release means 8 in order to be stored in the indicated position and memorized by the electronic processing unit. If the medicine does not offer the grip member 83 the face appropriated to both the grip and the positioning in the indicated alveolus, then it is temporarily put on the auxiliary support device 110, lifted and repositioned by the grip and release means 8 in correct support for the successive grip and positioning step.

[0064] In contrary case, that is if the bar codes are not read by the first group of readers 100a, then the further provided readers of the groups 100b and possibly 100c operate until the codes are identified and read, in order to register the complete data of the nature of the medicine 2, including the relative expiry date.

[0065] In the case wherein the code is not found, the medicine 2 is positioned by the grip and release means 8 on the third conveyor means 95 to be transported to a delivery station 10 suitable for the discarding of the non conformed products.

[0066] Instead when the code is found, but is not known by the electronic archive, the medicine 2 is equally driven as described to a delivery station 10, this time to perform the registration thereof, in such a way that it can successively be loaded again in order to be then recognized and identified as previously described.

[0067] It is to be noted that the grip is preferably performed by means of the grip head 82, in a way as to allow the anthropomorphic robot 8 to grasp the drawers 7a through the radial actuation pliers to perform the opening thereof. The anthropomorphic robot then provides to deposit the box in the predetermined location, and to close the drawer 7a.

[0068] In a medicine request step, the operators of the pharmacy provide to request the medicine through a suitable request station, under the automatic storage system 1, in particular under a corresponding delivery station 10. In the illustrated example is provided a plurality of request stations, which allow various operators to simultaneously request medicines 2.

[0069] The request is automatically transmitted to the processing unit, which on the basis of the memorized data relative to the medicines 2 present in store and to their current location on the shelves 7a provides to control the anthropomorphic robot 8 for extracting the shelf 7a wherein is stored the requested medicine 2, gripping the box of the requested medicine 2, preferably through the suction caps of the grip head 82, and successively closing the extracted shelf 7a. As already said, opening and closing the shelf 7a are carried out through the radial actuation pliers of the grip head 82.

[0070] Successively, the grip member 83 transfers the box on the end of the first tract 95a of the third conveyor means 95, in proximity of the identification station 92. The third conveyor means 95 are then actuated to convey the box towards the delivery station 10 arranged above the request station from where the request being worked comes.

[0071] In particular, if the delivery station is arranged at the feed zone 5, laterally to the third conveyor means 95, at the passage of the box are actuated the lateral push members 96 in order to push the box according to a direction lateral to the feed direction of the box in a way as to allow the fall thereof towards the slide 10, and the consecutive delivery to the request station.

[0072] Instead if the delivery station is arranged at the transport zone 6, the box is conveyed along the second tract 95b of the third conveyor means 95, and then towards the determined slide 10 through possible further tracts of the second conveyor means 95. According to the position of a tract with respect to the preceding one, or of a slide with respect to the belt of the third conveyor means 95, the passage of the processed box from a tract to a successive tract of to a slide 10 is carried out through the fall of the box, the fall being due either to the reaching of the end of a belt or to a lateral push of the box, performed by the corresponding lateral push member 96.

[0073] According to a further embodiment, represented in figure 12, the storage system 1 also comprises one or more auxiliary storage stations 120 each served by a respective auxiliary anthropomorphic robot 121, and arranged in proximity of the delivery stations 10. Such auxiliary storage stations 120 provide respective auxiliary containment means 122 arranged adjacent to the auxiliary robots 121, so as to prearrange therein, preferably in the times of closing to the public of the pharmacy 3, the most frequently requested medicines 2. Such medicines are identified thanks to their historic and statistical data processed and memorized by the same electronic processing unit which controls the storage system. Drawing up the most requested medicines 2 in the auxiliary storage stations 120 in proximity of the delivery stations 10, the way to be performed until the delivery results considerably reduced, thus warranting a faster completing of the requests, in times of the range of 5 seconds. Preferably during the closing periods of the pharmacy it is also possible to provide to update the content of the auxiliary containment means 122, discharging the medicines

2 in excess and requesting other ones according to the historic and statistical data processed by the electronic processing unit (fig. 12).

[0074] The storage system in hand attains the scope of performing in an optimal manner the automatic storage of the medicines in the containment means, limiting the encumbrance of the storehouse. Such a result is obtained in particular thanks to the inventive idea of using a robot 8 preferably anthropomorphic serving containment means that can be opened.

[0075] The systems allows to perform in automatic way the management of the expiry dates of the medicines, performing the identification and location thereof in positions accessible by the grip and release means 8.

[0076] Moreover the grip and release means 8 are controlled by an electronic processing unit suitable to interact with the electronic archive of the pharmacy 3, therefore detecting not only the known products, but also the unknown ones, and processing statistical and historic data useful for the optimal management of the storehouse.

[0077] The robot 8 is usefully provided with the grip head 82, provided with two types of grip members which confer it a double function, for gripping and opening the drawers.

[0078] A characteristic of the system in hand consists in the fact that it allows to automatically separate the medicine boxes fed on the feed device. This effect is attained thanks to the use of a plurality of endless belts arranged in succession and actuated at speeds which are increasing from one to another.

[0079] The storage system according to the invention further allows to deliver in an automatic way various medicines simultaneously requested from different request stations.

[0080] The storage system has a reduced encumbrance, also by virtue of the fact that it is installed in height, on a suitable intermediate floor.

[0081] The storage system according to the present invention has the advantage of being adaptable to any pharmacy already existing, as it can be installed for any containment device already present, and as the diverse conveyor mean can be composed and combined in a way as to adapt to any disposition inside the pharmacy.

[0082] In practice, the embodiment of the invention, the materials used, as well as the shape and dimensions, may vary depending on the requirements.

[0083] Should the technical characteristics mentioned in each claim be followed by reference signs, such reference signs were included strictly with the aim of enhancing the understanding the claims and hence they shall not be deemed restrictive in any manner whatsoever on the scope of each element identified for exemplifying purposes by such reference signs.

Claims

1. Automatic storage system for medicines in a pharmacy, comprising medicine containment means (7) arranged at a storage zone (4), said medicine containment means (7) comprising extractable shelves (7a) suitable to receive said medicines (2);
robotized means (8) for gripping and releasing said medicines, the grip and release means (8) being arranged in vicinity of said storage zone (4) and suitable to be actuated in order to access said containment means (7) operating the extraction and the closing of said extractable shelves (7a); automatic recognition and identification means (94, 100) for the medicines (2), arranged in a medicine (2) detection and identification station (92, 100) accessible to said medicine grip and release means (8);
transporting and singling means (9) suitable to receive said medicines (2) from said grip and release means (8) and to transport the same medicines (2) to at least one delivery station (10), and to receive from load means the medicines (2) to be stored in said containment means (7) and to provide the same medicines (2) to be stored to said grip and release means (8); electronic processing means connected to the electronic archive of said pharmacy (3), as well as to said recognition and identification means (94, 100) and to said grip and release means (8), suitable to receive data from said automatic recognition and identification means (94, 100) in order to memorize the identity of said medicines recognized and identified, process the instant position of said medicines (2) on said transporting and singling means (9), as well as to actuate said grip and release means (8) to operate the storage and/or the delivery of said medicines (2).

2. Automatic storage system according to claim 1, **characterized in that** said grip and release means (8) comprise an anthropomorphic robot or palletizer.

3. Automatic storage system according to claim 2, **characterized in that** said robot (8) is provided with an articulated arm (80) carried rotatable by a support foot (81) and with a grip head (82) connected in an articulated way to the free end of said articulated arm (80), said grip head (82) carrying suckers pneumatic grip members (83).

4. Automatic storage system according to claim 3, **characterized in that** said grip head (82) further comprises radial actuation pneumatic grasping members.

5. Automatic storage system according to one of the previous claims, **characterized in that** said recognition and identification means comprise laser scan means and/or visual detection optical means (94) and bar code readers (100a, 100b, 100c).

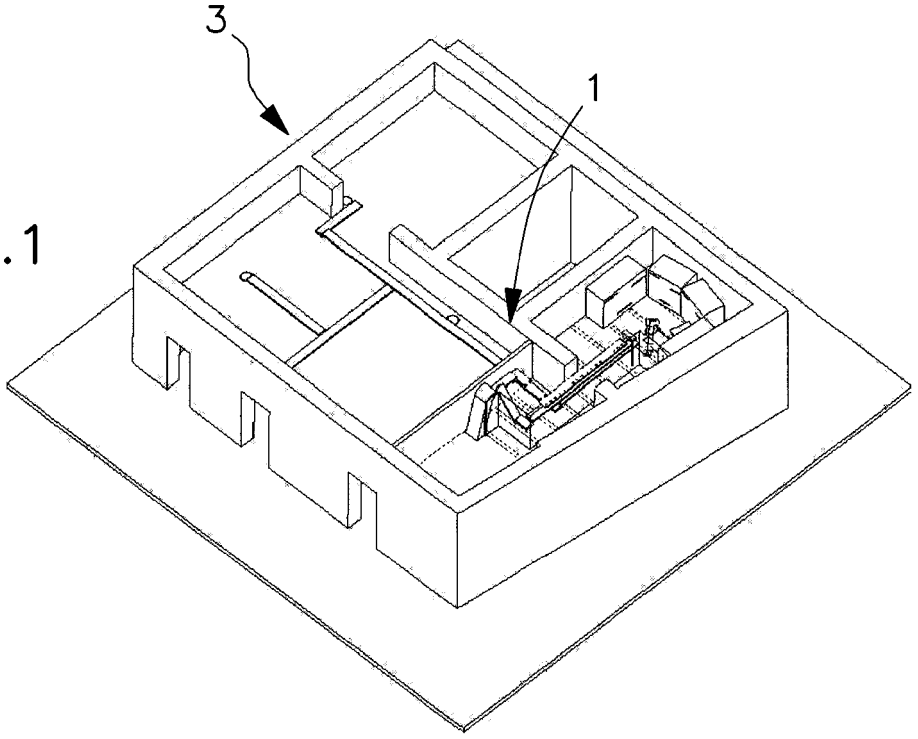
6. Automatic storage system according to one of the

previous claims, **characterized in that** it comprises and cooperates with at least one auxiliary storage station (120) arranged in vicinity of one said delivery station (10), provided with respective auxiliary containment means (122) for the medicines (2), with a respective auxiliary robot (121) suitable to prearrange in said auxiliary containment means (122) medicines (2) indicated on the ground of historic and statistical data and memorized by said electronic processing means.

7. Management method for the automatic storage of medicines in a pharmacy, comprising the steps of

a. prearranging at least one medicine (2) fed on transporting and singling means (9)
b. recognizing the actual dimensions of said medicine (2) fed on said transporting and singling means (9) through recognition means (94)
c. transmitting said actual dimensions to electronic processing means connected to grip and release means for said medicine (2) in order to process the instant position thereof
d. reading through identification means (100a, 100b, 100c) an identifying code present on at least one side of said medicine (2)
e. transmitting said identifying code to said electronic processing means
f. matching said identifying code read with the codes present in an electronic archive for the management of the pharmacy
g. assigning a location for said identified medicine (2) in containment means (7) accessible to said grip and release means (8) as a function of said recognized actual dimensions
h. controlling said grip and release means (8) to operate the withdrawal of said medicine (2) identified at said processed instant position; and
i. controlling said grip and release means (8) to extract shelves (7a) of said containment means (7)
j. controlling said grip and release means (8) to position from the top said identified medicine (2) into said assigned location.

Fig.1



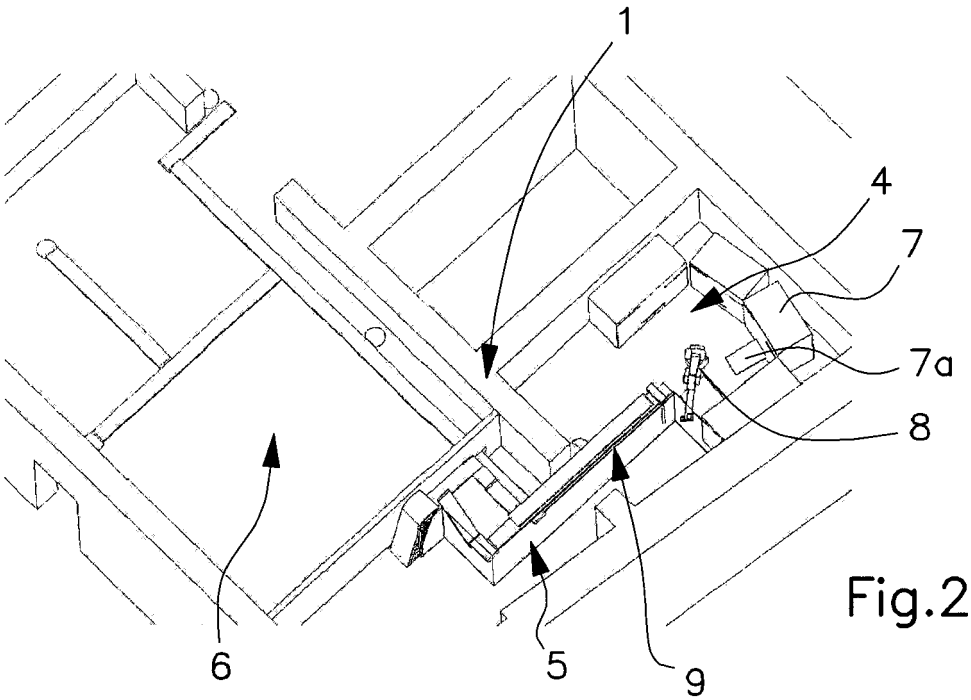
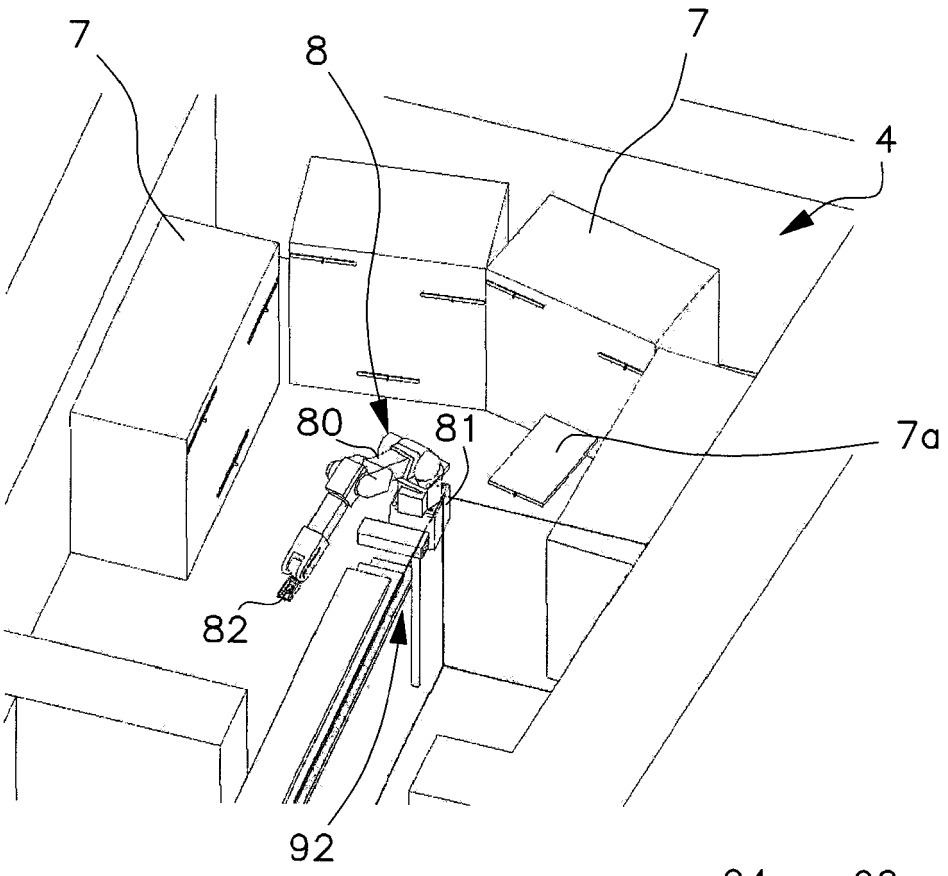


Fig.2

Fig.3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8
7
4
80
81
7a
82
92

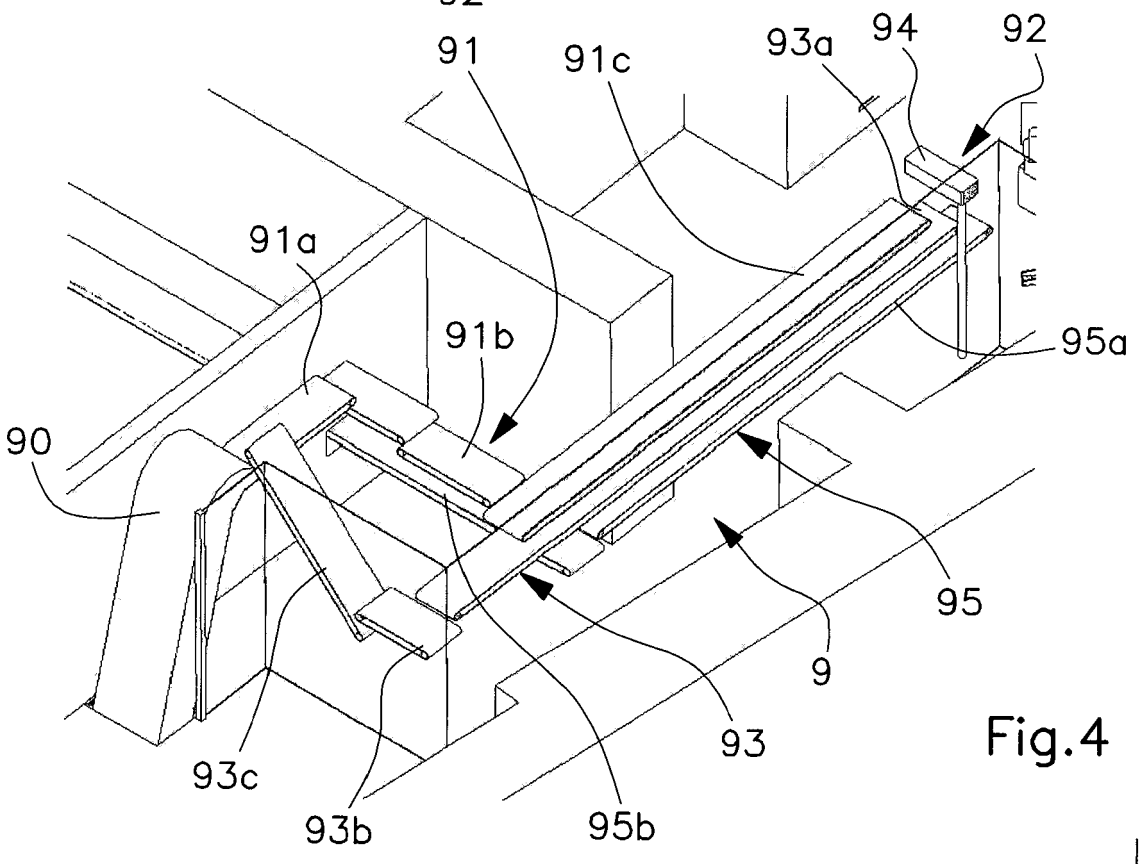
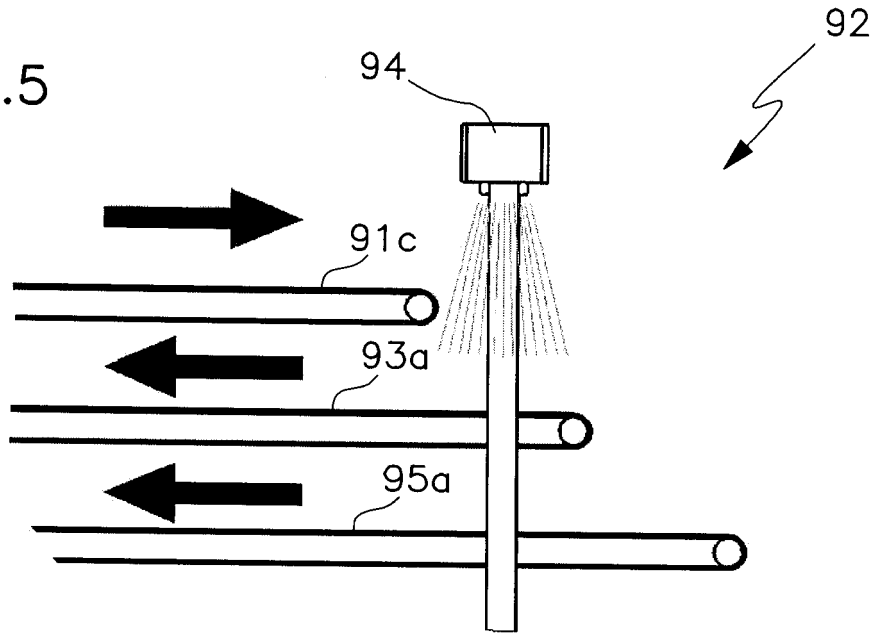

91
91c
93a
94
92
91a
91b
95a
90
95
9
93
93c
93b
95b

Fig.4

Fig.5



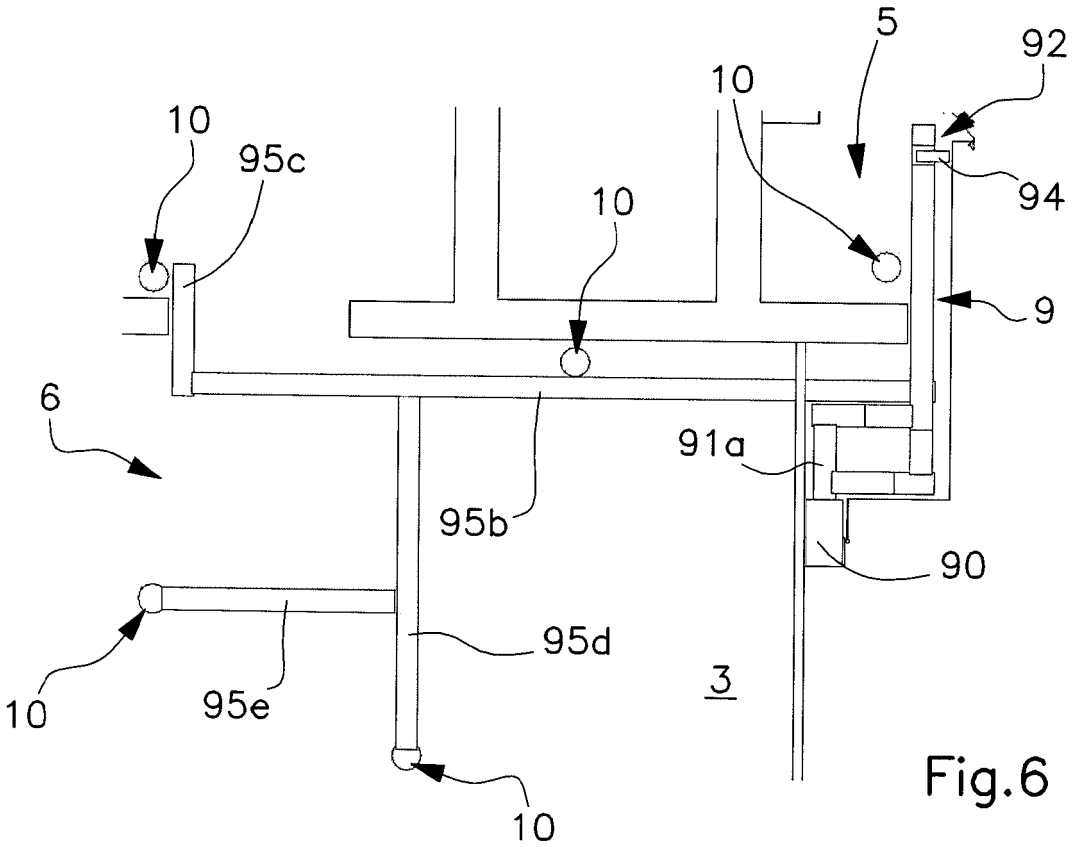


Fig.6

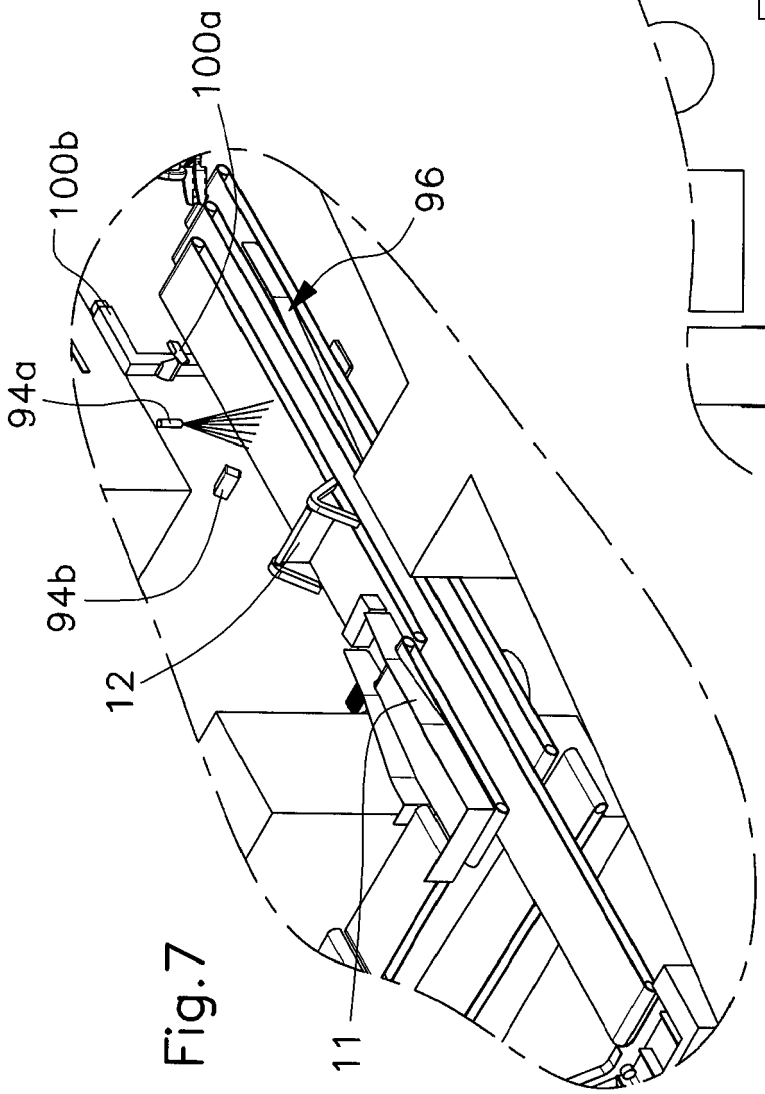


Fig.7

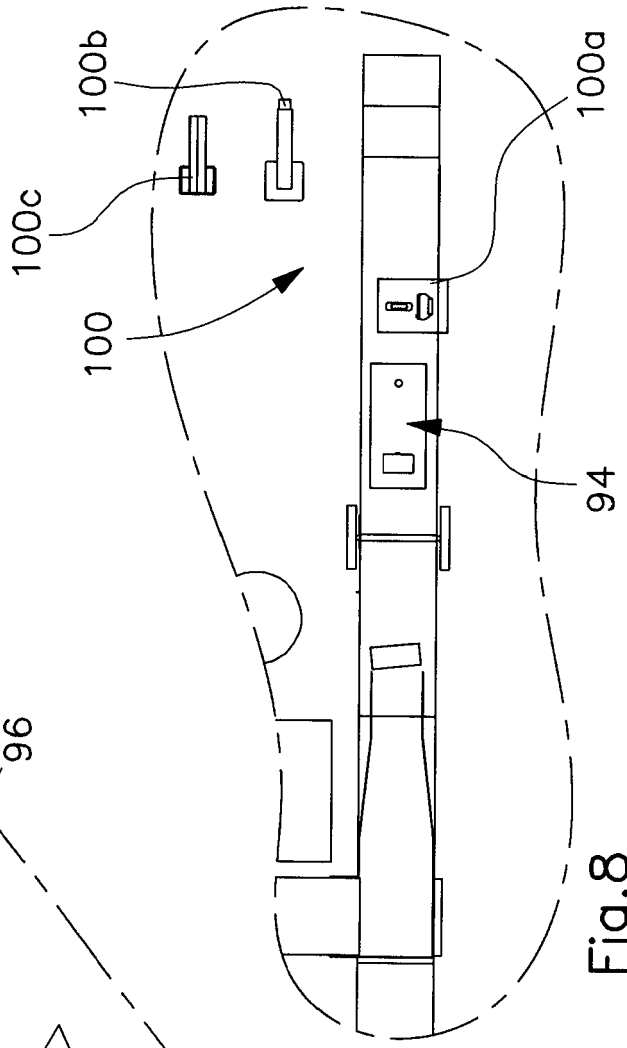
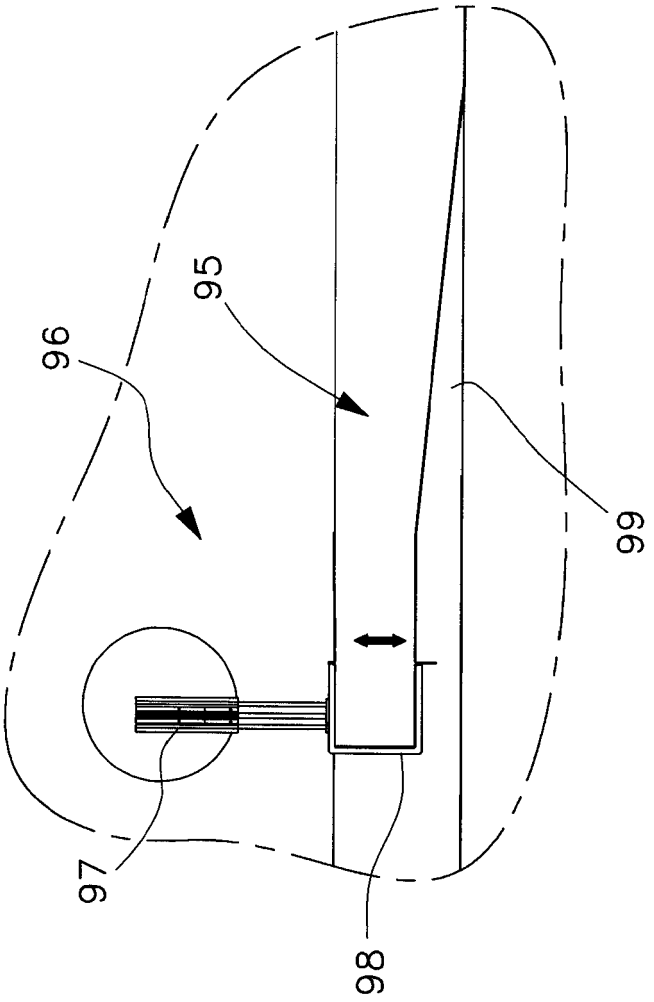


Fig.8

Fig.9



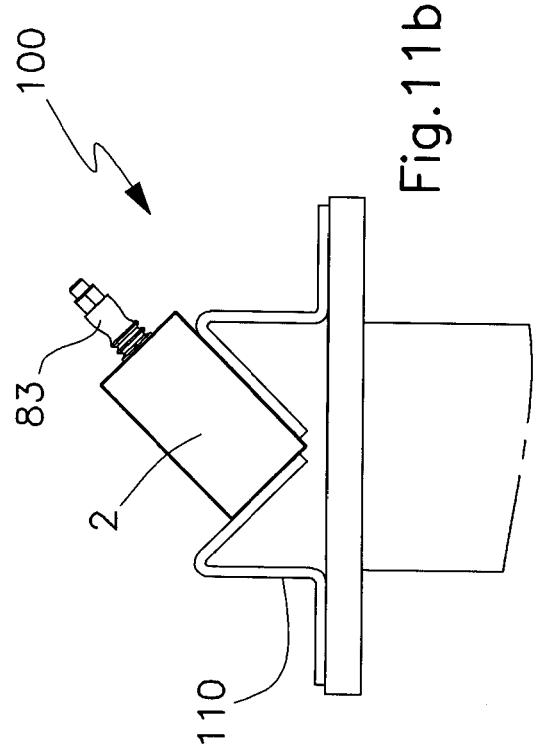


Fig.11b

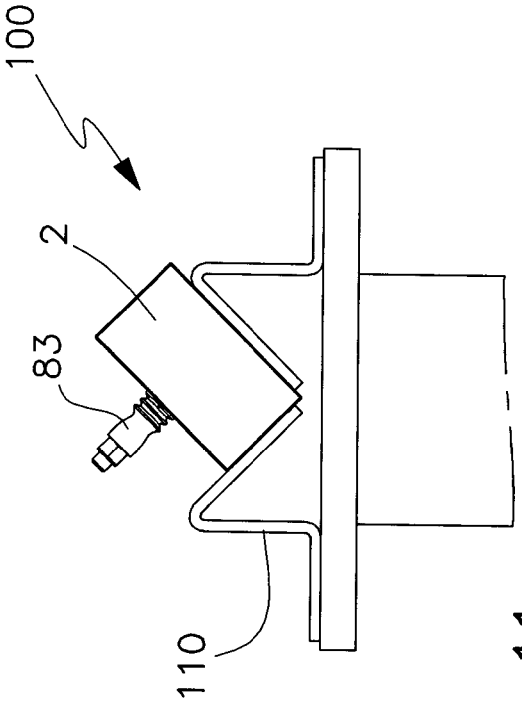


Fig.11a

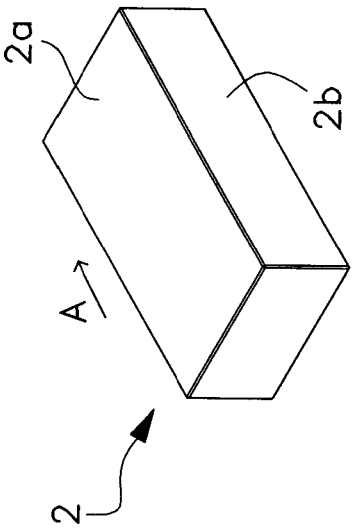


Fig.10

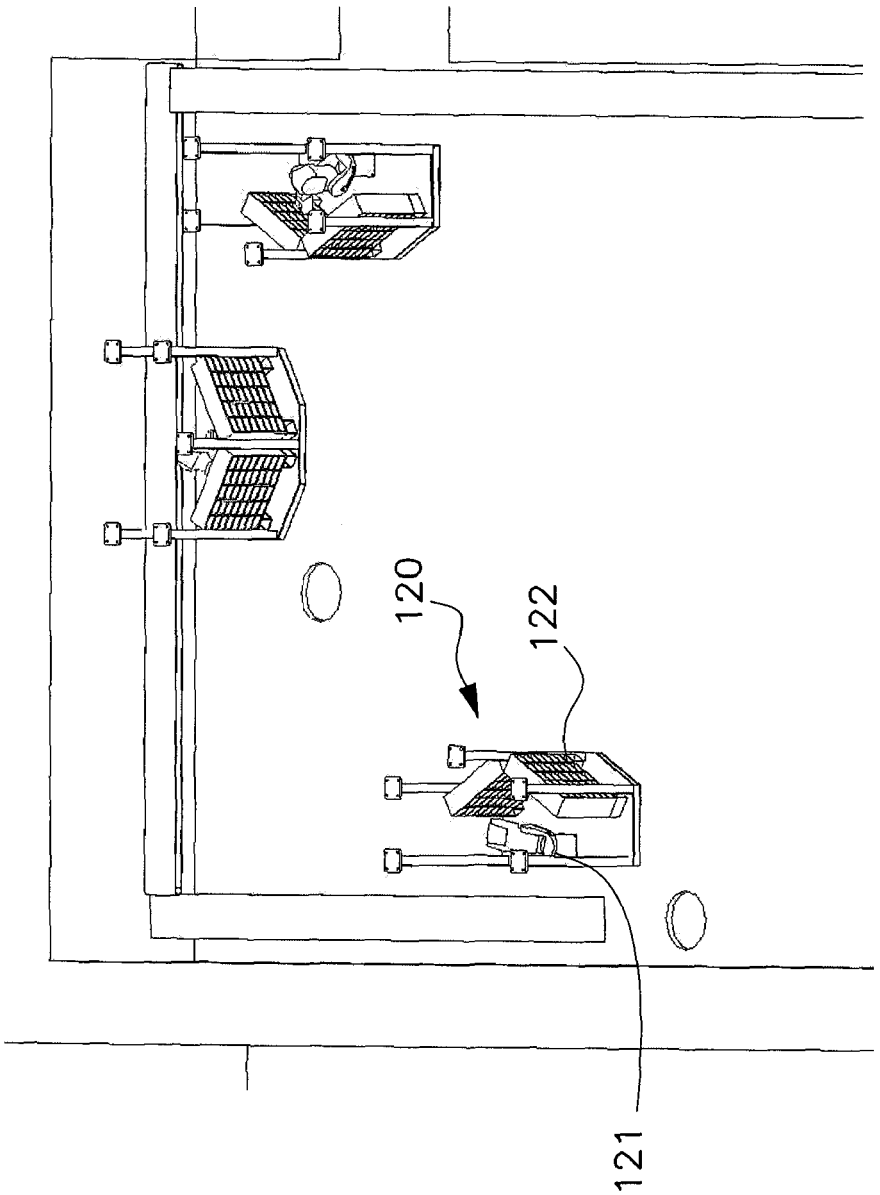


Fig. 12

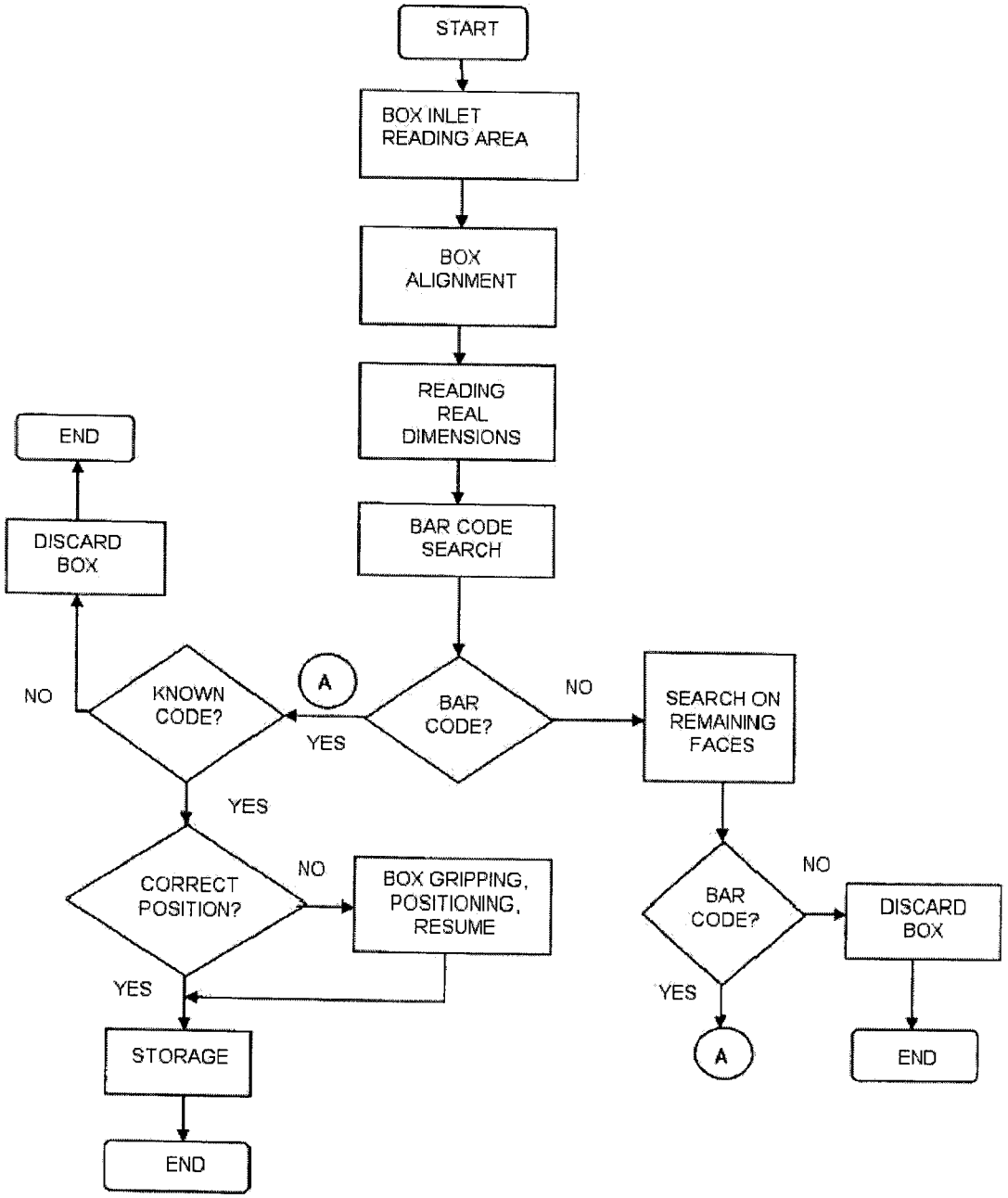

START
BOX INLET READING AREA
BOX ALIGNMENT
READING REAL DIMENSIONS
BAR CODE SEARCH
BAR CODE?
NO
SEARCH ON REMAINING FACES
BAR CODE?
NO
DISCARD BOX
END
YES
A
KNOWN CODE?
NO
DISCARD BOX
END
YES
CORRECT POSITION?
NO
BOX GRIPPING, POSITIONING, RESUME
YES
STORAGE
END

Fig.13

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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 6621

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Place of search	Date of completion of the search	Examiner
The Hague	11 January 2012	Van Dop, Erik

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