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(73) Patenthaver: **Würth International AG, Aspermontstrasse 1, 7000 Chur, Schweiz**

(72) Opfinder: **WITTIG, Klaus, Hornberg Straße 55, 74676 Öhringen-Cappel, Tyskland**

(74) Fuldmægtig i Danmark: **Dennemeyer & Associates S.A, P.O. Box 700425, DE-81304 Munich, Tyskland**

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STORAGE LOGISTICS METHOD

Description

The invention relates to a storage system having at least one shelf unit, the shelf unit having a plurality of shelves arranged on top of each other, each shelf being logically subdivided into a plurality of compartments arranged next to one another. The invention also relates to a method for setting up such a storage system and a method for operating such a storage system.

In order to meet the requirements of modern and therefore sophisticated logistics, it is nowadays necessary to make the storage devices used for this purpose intelligent and integrate them into higher-level overall systems.

In general, some approaches for automated storage systems with automatic detection devices are already known.

DE 10 2007 017 207 A1 describes a sensor for occupancy recognition and discloses a drawer with a standard foam part and recesses for receiving tools. At the base of a recess, there is a sensor designed as a reflex light barrier, comprising a light transmitter and a receiver arranged in the immediate vicinity. Depending on whether a tool is located in the recess or not, the emitted light is reflected or not, so that the receiver only generates a signal when a tool is present in the recess.

DE 197 14 799 C2 discloses a device for storing goods units having a matrix of sensors and corresponding signal lines arranged at the bottom of a goods deposit, wherein the signal lines in the region of the goods deposit are formed by a printed circuit board strip on which the sensors are also mounted, wherein the sensors are pressure sensors, capacitive/inductive sensors or mechanical switches.

EP 1 217 345 A1 shows a system for monitoring the flow of goods from different suppliers to a place of use, a warehouse being provided at the point of use that automatically detects the need to refill the shelf unit.

DE 698 27 454 T2 shows a method for managing a warehouse with a plurality of containers, the containers being automatically refilled.

DE 20 2014 004 232 U1 shows a goods shelf unit for self-service removal of baked goods. The goods shelf unit has a storage compartment and at least one light barrier. This makes it possible to detect the filling level of the storage compartment in the area of the light barrier.

EP 2 178 035 A1 discloses a method and an arrangement for measuring empty space

for storage or transport spaces. A storage or transport space is divided into a plurality of partial areas. A distance measurement is carried out in the partial areas. The results of the measurement are transmitted to a central entity. The central entity can process the results of the measurement so that information about the occupancy of the storage or transport space can be determined.

WO 2005/088494 A1 relates to a storage system with at least one receptacle for stored goods. The storage system has a gravimetric sensor element for detecting the goods. The storage system can have additional types of sensors for detecting the goods.

DE 10 2004 035 819 A1 discloses a method for automatically detecting stored goods in a warehouse. Each individual article stored in the warehouse is equipped with a transponder. Object-related data is transmitted from the transponder to a reader device and detected by a warehouse management computer.

In addition, other solutions are known, which determine with force sensors, such as load cells or strain gauges, the weight of and thus detect an occupancy level. Optical systems are known in which cameras record images and the image data is evaluated with regard to occupancy recognition.

US 2012/0229279 A1 discloses a storage system having at least one shelf unit, the shelf unit having a plurality of shelves arranged on top of each other, each shelf being logically sub-divisible into a plurality of compartments arranged next to one another, the compartments each forming a partial section within a surveillance space and each of the compartments being assigned a unique address, and having a sensor system for detecting the occupancy of the compartments, the sensor system being configured to spatially scan the occupancy of one of the compartments in order to generate occupancy information indicating whether the compartments are full or empty, and having a data bus which is connected to the sensor system and a communication device, the storage system being designed to perform the following steps: acquisition of occupancy information of each of the compartments by the sensor system, transmission of the occupancy information with the address assigned to the compartment from which the occupancy information was detected by the sensor system to the communication device via the data bus, establishment of a network connection by the communication device in order to transmit occupancy information to a server or control information to the storage system in unidirectional or bidirectional communication. The sensor system may have a plurality of sensor assemblies. The surveillance space is bordered or encompassed by delimitation elements.

US 2007/069867 A1 discloses a storage system with at least one shelf for goods to be

stored, a communication network, and a computing unit for deriving inventory data. The storage system has a gravimetric sensor element for detecting the goods, in the form of a sensor array or a sensor matrix. By detecting a plurality of measured values of the goods, the entire storage system can be in the form of a sensor network and, with regard to the model, is configured for the derivation of inventory data, which enables both the identification of the type of goods stored and the determination of the quantity thereof.

The object of the invention is to provide an improved storage system and methods for setting up and operating such a storage system, which enable the storage system to be set up in an improved manner.

The objects of the invention are each achieved with the features of the independent claims. Embodiments of the invention are specified in the dependent claims.

Embodiments of the invention are particularly advantageous since the stock levels in the individual compartments of the storage system can be detected automatically. If the occupancy information indicates that the stock in a compartment is too low, the communication device or the server can initiate a reorder of the respective articles. These can then be sorted into the respective compartments, with the new stocks being able to be detected by the sensor assemblies. Simplified warehousing is thus possible. Furthermore, the occupancy information can be retrieved, for example, via the communication device or the server, so that a remote query can also be made as to whether there are sufficient stocks of individual articles in the compartments.

According to embodiments of the invention, the storage system is provided with at least one shelf unit, the shelf unit having a plurality of shelves arranged on top of each other. Each shelf is logically subdivided into a plurality of compartments arranged next to one another, the compartments each forming a partial section within a surveillance space and a unique address being assigned to each of the compartments. Furthermore, the storage system has a sensor system for detecting the occupancy of the compartments, the sensor system being designed for spatial scanning of the occupancy of one of the compartments in order to generate occupancy information that indicates a degree of occupancy of the compartment in question, as well as a data bus that is connected to the sensor system and a communication device. The sensor system has a plurality of sensor assemblies. The surveillance space is bordered or encompassed by delimitation elements that have devices for receiving further delimitation elements or separation elements for setting up the partial sections, the further delimitation elements or the separation elements being configured to be pushed into the devices from above, so that

approximately right-angled corners as well as the respective partial section arise. The devices have lateral contact surfaces which are configured to electrically connect the delimitation elements inserted there and the sensor assemblies contained therein to the sensor system. The storage system is designed to perform the following steps:

- detecting occupancy information of each of the compartments by the sensor system,
- transmitting the occupancy information with the address assigned to the compartment from which the occupancy information was detected by the sensor system to the communication device via the data bus,
- establishing a network connection by the communication device in order to transmit occupancy information to a server or control information to the storage system in unidirectional or bidirectional communication.

The shelf unit can be a shelf unit having inclined shelves, and the shelves can have a slope in the direction of a withdrawal side of the shelf unit. In the case of a shelf unit having inclined shelves, the shelves are inclined in a filling or withdrawal direction, so that the articles stored in the compartments automatically slide down in the withdrawal direction after an article has been removed. The articles are therefore located adjacent to one another without gaps. The use of a sensor system in such shelf units having inclined shelves is particularly advantageous, since it is possible to detect the inventory with few sensors, since there is no need to detect any free spaces between the articles. It is necessary only to detect the position of the last article. If the length of the individual articles or the number of articles per unit length is known, the number of articles in the respective compartment can be determined. For example, the length of the individual articles may already be known or this is determined and stored during the installation of the shelf system. If the position of the last article is known when the shelf is filled with the minimum quantity, it is also sufficient, for example, to only query the sensor element assigned to this position in order to check whether a minimum quantity of the respective article is available. For example, when setting up the shelving system, it can be filled with the minimum quantity and the position of the last sensor which indicates occupancy, or the position of the first sensor element that indicates no occupancy, can be detected.

Each of the sensor assemblies is assigned to one of the compartments, a sensor assembly in turn having a number of sensor elements arranged in the longitudinal direction of the sensor assembly. The assignment of the sensor assemblies to the compartments can simplify the control or the installation of the storage system. The

sensor elements arranged in the longitudinal direction can be arranged in the longitudinal direction of a compartment, for example in the withdrawal direction in the case of a shelf unit having inclined shelves, so that the inventory in a compartment can be easily detected.

In particular, each sensor assembly can be uniquely assigned to exactly one compartment and the longitudinal direction of the sensor assembly runs in the direction of the slope of the compartments.

A sensor assembly can have a strip-shaped flexible or rigid conductor board as a carrier. The conductor board can be adapted to the shape or the geometry of the respective compartment.

The storage system can also have a control electronics for each of the sensor assemblies, the control electronics being designed to connect the sensor assembly to the data bus and to output the address assigned to the compartment and the occupancy information on the data bus.

For example, at least one optical signalling means is uniquely assigned to each of the compartments, the optical signalling means being connected to the data bus in order to receive a signal for optical indexing of a compartment via the data bus and to implement the optical indexing. The signalling means can indicate, for example, a compartment to be filled.

The storage system can be configured to store an inventory time and an automatic inventory is carried out when the inventory time is reached. The detection of the stocks of all compartments can take a certain amount of time, depending on the size of the storage system, wherein it may be desired that no articles are removed or sorted during the detection of the stock levels. The time for the inventory can be selected such that no withdrawal or entry is made in the storage system during the inventory, for example at night.

In the communication device, for example, an occupancy plan is stored in which an assignment of goods types to one or more addresses or compartments and a threshold value for the occupancy quantity of goods of each goods type is stored. The communication device can be configured in such a way that the quantity of goods of each goods type stored in the storage system is determined from the occupancy information received via the data bus and the respectively assigned addresses, the determined amount of goods of each goods type is compared with the quantity threshold value assigned to this goods type, and a signal can be sent when the determined quantity of goods of this goods type falls below the quantity threshold value

assigned to it. This ensures that there is always a sufficient quantity of the articles stored in the compartments.

According to embodiments of the invention, a remote maintenance program module can be installed on the communication device, which can be addressed via the network and can directly carry out maintenance operations on the storage system. The remote maintenance program module is configured, for example, in such a way that, based on the receipt of a command via the network, the sensor system is controlled in such a way that the occupancy information of a compartment, specified in the command by indicating a corresponding address, is detected and, on the basis of the occupancy information, an occupancy information signal is generated which is sent via the network.

The communication device can store occupancy information of the storage system dynamically, so that in the event of a system failure, the occupancy information can be restored at any time and used again when the system becomes available again.

The communication device is designed, for example, to connect a computer via a local connection in order to visualize an occupancy plan stored in the communication device on a user interface of the computer.

The communication device can have a setup mode, wherein an occupancy of the storage system detected by means of the sensor system in the setup mode can be stored as an occupancy plan, the occupancy plan in particular containing the goods type assigned to each compartment and an occupancy threshold value assigned to this goods type, which is given by the occupancy detected by the sensor system.

The storage system can furthermore have a hand-held scanner for the optical detection of an optically readable code, each of the compartments bearing an optically readable code indicating the respective address, the communication device being configured in such a way that the assignment of a goods type to one or more of the compartments takes place by the communication device receiving from the hand-held scanner an optically detected address and a goods type assigned to the optically detected address.

For example, the hand-held scanner is designed to be wireless and has a wireless communication interface for communication with the communication device.

The sensor system may have one sensor assembly per compartment as a flexible, strip-shaped conductor board.

The signal transducers and the signal receivers of a sensor assembly can be arranged in pairs on the conductor board, so that a signal emitted by one of the signal transducers can be received by a signal receiver of the same pair. The signal transmitted by the signal transmitter can thus be received more easily by the signal

receiver, so the distance between the signal receiver and the signal transmitter is shorter and/or the signal does not have to cross the receiving space of the compartment. In particular, the signal can be designed to be weaker, so that the risk of being influenced by the signals from neighbouring signal transmitters is lower. Another advantage is that the signal receiver and the signal transmitter do not have to be aligned with one another in the compartment. The alignment is already accomplished by the arrangement on the conductor board. This has the advantage that a greater manufacturing tolerance is possible in the manufacture of the shelf unit, since it is not necessary to align the shelves or the sensor assemblies on the shelves with respect to one another.

In particular, the signal receiver and the signal transmitter can be arranged adjacently on the conductor board. For example, the signal receiver is arranged in a ring around the signal transmitter so that the former can receive the signal emitted by the signal transmitter regardless of the direction of emission.

The signal transducers, the signal receivers and/or conductor tracks for interconnecting the signal transducers and signal receivers are, for example, printed on the conductor board with the data bus.

According to embodiments of the invention, a method for setting up the storage system is also provided, having the following steps:

- switching the communication device into a setup mode,
- occupying the compartments of the storage system according to a specified occupancy plan with minimum stock quantities, below which repeat orders shall be triggered,
- detecting the minimum stock quantities with the sensor system and storing them in the communication device,
- completing the occupancy to the nominal stock in the storage system

A goods type can be assigned to one of the compartments by means of a hand-held scanner.

The hand-held scanner has, for example, a wireless communication interface to the communication device in order to transmit an assignment signal for assigning the goods type to one of the compartments to the communication device.

According to embodiments of the invention, a method for operating the storage system is also provided, having the following steps:

- detecting the occupancy information of at least one of the compartments,
- comparing the detected occupancy information with a stored occupancy plan by

means of the communication device,

- if the communication device detects a discrepancy between the detected occupancy information and the occupancy plan, generating, by the communication device, a false occupancy signal, and sending the false occupancy signal via the data bus to the address of the very sensor assembly from which the occupancy information has been detected.

The optical signalling means can be connected to the data bus via the sensor assembly and the electronic controller of the sensor assembly, which receives the false occupancy signal from the communication device via the data bus, can control the optical signalling means of the relevant sensor assembly to output the false occupancy signal.

Further features of possible embodiments are described below, wherein the features can be combined with one another and with the features mentioned above.

Advantageously, the sensor assembly may have a carrier element with at least two sensor elements, wherein the sensor elements are arranged on different outer surfaces of the carrier element.

It is preferred that the carrier element has a polygonal, preferably a triangular or a four-cornered, in particular a square or rectangular cross section.

It is proposed that the carrier element is polygonal, circular, cross-shaped, y-shaped, strip-shaped, grid-shaped, meander-shaped and/or star-shaped.

It is further proposed that the carrier element is rigid, flexible or semi-flexible or has at least two rigid, flexible or semi-flexible sections, which are interconnected.

The carrier element can be constructed from a film or from a plurality of layers of identical or different films and/or materials.

It can preferably be provided that the carrier element is at least partially designed as a conductor board with conductor tracks or at least electrical conductor structures for electrical contacting and/or forwarding of the signals of the sensor elements and/or other electrical and/or electronic components and/or for connection to a data bus and/or to a power supply and/or for connection to at least one further sensor assembly.

It is also proposed in a further development that a sensor element is designed in each case as a signal transducer or as a signal receiver.

It is advantageous that a test signal transducer is assigned in the signal receiver in such a way that the signal receiver can detect signals of the assigned test signal transducer either directly or indirectly.

Furthermore, it is proposed that the at least first sensor element of a first outer surface

of the sensor assembly is complementary to the at least second sensor element of a second outer surface of the sensor assembly, in particular that the first sensor element is designed as a signal transducer and the second sensor element as a signal receiver or that the first sensor element is designed as a signal receiver and the second sensor element is designed as a signal transducer.

In a further development, it is proposed that the at least two sensor elements are complementary to one another and are arranged on mutually opposite outer surfaces of the carrier element, in particular that a first sensor element on a first outer surface is designed as a signal transducer and the second sensor element on a second outer surface opposite the first is designed as a signal receiver or that a first sensor element is designed on a first outer surface as a signal receiver and the second sensor element on a second outer surface opposite the first is designed as a signal transducer.

It is advantageous that the sensor elements are arranged at least partially integrated on or in an outer surface of the carrier element.

It can preferably be provided that the signal emitted by at least one signal transducer and received by at least one signal receiver is a magnetic, an electromagnetic or an acoustic signal.

In a further development, it is proposed that the signal transducer has at least one LED, an OLED or a piezocrystal or is formed from an array of these elements.

In particular, it is proposed that IR light is emitted by at least one signal transducer.

It is also proposed that at least one sensor element and/or a conductor track is printed.

It is further proposed that a control electronics is arranged on the carrier, wherein the control electronics uniquely identifies the sensor assembly with respect to other sensor assemblies.

It is also proposed that the control electronics activates the sensor elements and registers, further processes and forwards the data signals of the sensor elements.

In a further development, it is proposed that the signal generated by the control electronics and emitted by the signal transducer can be varied in terms of its frequency and/or its intensity.

In another further development, it is proposed that the emitted signal is clocked such that the signal is coded.

It is also proposed that an operating state in the existing sensor elements can be activated or requested by the control electronics individually, in groups or all at once, in particular that a signal transducer emits a signal or that a signal receiver is queried as to whether it receives a signal.

It is further proposed that the carrier element has on at least one outer surface more than two, preferably a plurality of sensor elements which are arranged in a defined manner to each other, preferably arranged on at least one line or in at least one row.

In a further development, it is proposed that sensor elements for different signal types be grouped together on an outer surface of the carrier element and/or arranged alternately.

In a further development, it is proposed that only sensor elements of one type are arranged on an outer surface, in particular that the sensor elements arranged on an outer surface are each designed only as signal transducers or each only as signal receivers.

Advantageously, it can be provided that signal transducers and signal receivers are grouped together on an outer surface of the carrier element and/or arranged alternately.

It is also proposed that a marker be present for later positioning and/or alignment of the sensor assembly.

It is further proposed that a fixing device for later positioning and/or fixing of the sensor assembly is present.

It is also proposed that the carrier element has an adhesive surface on at least one outer surface.

In a further development, it can be provided that the adhesive surface is at least temporarily covered with a detachable cover film.

Furthermore, a sensor system for occupancy detection with at least two sensor assemblies is advantageously provided, wherein the sensor assemblies are at least partially arranged in such a way that they at least partially comprise a surveillance space and that an emitted signal of at least one signal transducer of a first sensor assembly can be detected by at least one signal receiver of a second sensor assembly in at least one occupancy state, so that a received signal is interpreted as a first occupancy state and a transmitted, but not received, signal is interpreted as a second occupancy state.

In a further development, it is proposed that the sensor assemblies are arranged in at least one position in such a way that at least one of their outer surfaces at least partially oppose each other and in that on each of the at least partially opposing outer surfaces at least one sensor element is arranged, which in each case are complementary to each other, in particular in that the at least first sensor element is designed as a signal transducer and that the at least second sensor element is designed as a signal receiver or in that the at least first sensor element is designed as a signal receiver and in that the

at least second sensor element is designed as a signal transducer.

Furthermore, it is proposed that at least one further sensor element is arranged on at least one of the outer surfaces not facing the other sensor assemblies in the case of one of the sensor assemblies.

It is further proposed that at least one further sensor element is arranged on the outer surface facing in each case away from the other sensor assembly in the case of one of the sensor assemblies.

In a further development, it is proposed that the at least one further sensor element is complementary to the type of the at least one sensor element on the outer surface facing the at least one other sensor assembly, in particular the sensor element is designed as a signal transducer and the sensor element as a signal receiver or that the sensor element is designed as a signal receiver and the sensor element is designed as a signal transducer.

In a further development, it is proposed that with regard to the arrangement of the at least two sensor assemblies, the sensor elements of one type all have the same orientation, in particular that all signal transducers are oriented in a first direction and all signal receivers in a second direction.

The first direction and the second direction can be oriented in opposite directions to one another.

It is further proposed that at least two, preferably a plurality of, sensor elements are arranged on an outer surface of a sensor assembly or a section of a sensor assembly with sensor element.

Furthermore, it is proposed that the sensor elements of at least two adjacent sensor assemblies are each positioned approximately on a common axis.

Furthermore, it is proposed that only sensor elements of one type are arranged on the outer surfaces of a sensor assembly or a section of a sensor assembly facing each other, in particular that sensor elements arranged on a respective outer surface are designed only as signal transducers or only as signal receivers.

In a further development, it is proposed that the sensor elements are spaced apart from each other so that at least one pair of sensor elements is present for each smallest unit to be measured, in particular that at least one signal transducer and one signal receiver are present for each smallest unit to be measured, preferably that for each smallest measuring unit a plurality of signal transducers and a plurality of signal receivers are present.

It is further proposed that a control electronics coordinates complementary and

cooperating sensor elements of the at least two sensor assemblies or coordinates different sensor assemblies in pairs or groups, in particular synchronizes the same with each other and in particular controls the delivery and detection of signals.

In a further development, it is proposed that the surveillance space be subdivided into at least two partial sections, wherein the partial sections are logically managed by the control electronics, in particular at least one signal transducer and a signal receiver or a group of complementary and interacting sensor elements are assigned to a first partial section and at least one further signal transducer and a further signal receiver or a group of further, complementary and interacting sensor elements are assigned to a further partial section.

In a further development, it is proposed that the control electronics evaluates the detected signals and passes on the signals and/or the detected occupancy states using a communication device to a higher-level storage device or to a higher-level control unit.

A storage device for storage and management of stored products, in particular piece and/or bulk goods, with at least one surveillance space for receiving the stored products, and a sensor system are provided.

It is proposed that the occupancy state and/or the degree of filling of the surveillance space is monitored by at least two, approximately opposite sensor elements, wherein in at least one occupancy state an emitted signal of at least one signal transducer of a first sensor assembly can be detected by at least one signal receiver of a second sensor assembly, so that a received signal can be interpreted as the first occupancy state and a sent but not received or an attenuated received signal can be interpreted as the second occupancy state, the combination of a plurality of occupancy states being interpretable as the degree of filling.

It is also proposed that the surveillance space is at least partially delimited by at least two delimitation elements or by at least two sections of a delimitation element, wherein the delimitation elements or the sections are at least partially approximately opposite at least one outer surface.

Furthermore, it is proposed that at least one sensor assembly is arranged on a respective delimitation element or on a respective section.

It can preferably be provided that at least one sensor assembly is arranged on an outer surface of a delimitation element facing the surveillance space.

In a further development, it is proposed that at least one sensor assembly is arranged on the outer surface of the respective delimitation element facing away from the surveillance space.

In another further development, it is proposed that at least on one side of the surveillance space at least one sensor assembly is at least partially integrated into the respective delimitation element.

It can also be provided that the delimitation element has at least one signal opening, so that the at least one integrated sensor assembly or the at least one sensor assembly arranged on the outer surface facing away from the surveillance space can send a signal to at least one further sensor assembly through the signal opening and/or can receive a signal from at least one further sensor assembly.

This design is instrumental in making it possible to use sensor assemblies with sensors on opposing outer surfaces of a carrier, as sensors from both sides can be thereby involved in the process and can interact with other sensors. On the other hand, this also makes it possible to save half of the otherwise necessary sensor assemblies, as with this embodiment sensors obtain access on two sides and one side is not hindered by a normally impermeable delimitation element, nor are sensors used that are otherwise only equipped on one side.

In a further development, it can be provided that the signal opening is at least partially filled by a sensor element and/or that the signal opening is at least partially covered and/or filled up by a material permeable to the signal.

It can further be provided that at least one delimitation element has a device or recess for at least partially receiving at least one sensor assembly.

In particular, it can further be provided that the device or recess has an opening for introducing a delimitation element on at least one outer surface.

Advantageously, it can be provided that at least one sensor assembly is fixed to at least one delimitation element in a defined position with respect to a reference point of the storage device and/or the delimitation element and/or at least one further sensor assembly.

It is further proposed that at least one sensor assembly is glued to at least one delimitation element.

It is further proposed that at least two, preferably a plurality of, sensor assemblies are arranged approximately parallel to one another on a delimitation element, wherein the sensor elements arranged in one plane form a sensor matrix.

At least one, preferably a plurality of, separation elements can each be arranged on at least two delimitation elements that are opposite and thus approximately parallel to each other, wherein the separation elements run transversely to the delimitation elements, so that at least two, preferably a plurality of, surveillance spaces are formed.

In a further development, it is proposed that at least one fixing device for at least one separation element be provided on at least one delimitation element on at least one outer surface.

In a further development, it is proposed that a plurality of fixing devices are arranged on at least one side of a delimitation element, so that a variable subdivision of the surveillance space is possible.

It is further proposed that each surveillance space is assigned at least one signal transducer and one signal receiver.

In particular, it is proposed that the storage device is a shelf unit and at least a first delimitation element forms a shelf.

It is further proposed that in each case further delimitation elements form further shelf levels in the shelf unit, wherein the space between each two shelf levels forms at least one surveillance space.

Furthermore, it is proposed that the at least one sensor assembly is arranged according to the force of gravity in each case below the respective shelf of a shelf level.

Sensor elements of different shelf levels can each be aligned approximately on a common axis according to their respective position on the sensor assembly, the axis running vertically in accordance with the force of gravity.

It is further proposed that sensor elements of different shelf levels of their respective type are respectively oriented in one direction only, in particular that all signal transducers of different levels are oriented only in a first direction and that all signal receivers of different planes are oriented only in a second direction.

In a further development, it is proposed that all signal transducers are oriented in accordance with gravity from top to bottom and all signal receivers are oriented oppositely from bottom to top.

It is also proposed that the shelf of each shelf level has a gradient in at least one direction with respect to the horizontal spatial plane.

In particular, it is proposed that the storage device is a cupboard having at least one drawer, wherein at least in each case two opposite side walls of the drawer at least partially enclose a surveillance space as delimitation elements.

In a further development, it is proposed that at least one sensor assembly is integrated into at least one delimitation element forming a side wall.

Sensor elements of different delimitation elements can each be aligned approximately on a common axis according to their respective position on the sensor assembly, the axis running approximately horizontally, transverse to the force of gravity F.

It is further proposed that sensor elements of different delimitation elements of their respective type are respectively oriented in one direction only, in particular that all signal transducers of different delimitation elements are oriented only in a first direction and that all signal receivers of different delimitation elements are oriented only in a second direction.

It is also proposed that all signal transducers are oriented according to the withdrawal direction of the drawer from its rear wall to its front wall and all the signal receivers are oriented oppositely from their front wall to their rear side.

It is also proposed that at least one further delimitation element, arranged transversely to the withdrawal direction of the drawer, be present.

It is also proposed that at least one separation element arranged parallel to the withdrawal direction of the drawer is present.

In a further development, it is proposed that the drawer has a drawer plug which electrically connects the drawer, at least in the closed state, to a power supply and/or a data line in the cupboard body.

It is also proposed that a control unit request at least one occupancy state of at least one surveillance space or part of a subdivided surveillance space or a partial section, and evaluate the result and/or forward it to a higher-level management system.

It is also proposed that the control unit logically manage at least two cooperating sensor elements of at least two different sensor assemblies of the at least partial quantities of cooperating sensor matrices, thus defining at least one logical partial section extending in a plane along a direction of a first sensor assembly and/or transversely to the direction of a first sensor assembly via at least one further, parallel sensor assembly.

In a further development, it is proposed that at least one partial section corresponds to exactly one unit of stored product to be stored.

In a further development, it is proposed that at least one logical partial section corresponds to at least one arrangement of delimitation elements and/or separation elements, in particular corresponds to the size of at least one partial section formed from delimitation elements and/or separation elements.

In a further development, it is proposed that the control unit in an initialization detects the partial sections based on the arrangement of the delimitation elements and/or separation elements with one another and correspondingly defines the surveillance space into its logical partial sections and stores them in the management system.

Further features, details and advantages of the invention will become apparent from the claims, the wording of which is incorporated by reference into the content of the

description. The aforementioned features and those yet to be explained below can be applied not only in the corresponding specified combination, but also in other combinations or in isolation without departing from the scope of the present invention.

Embodiments and examples of the invention are shown in the drawings and are explained in more detail in the following description. In the following:

Fig. 1: shows a perspective view of a sensor assembly,

Fig. 2: show different views of a sensor assembly,

Fig. 3: show perspective views of possible cross sections of a sensor assembly,

Fig. 4: show top views of possible forms of a sensor assembly,

Fig. 5: shows a perspective view of a sensor assembly,

Fig. 6: shows a perspective view of a sensor assembly,

Fig. 7: shows a front view of a sensor assembly,

Fig. 8: shows a front view of a sensor assembly,

Fig. 8a: shows a front view of a sensor assembly according to a comparative example,

Fig. 9: shows a front view of a sensor assembly with a partial section,

Fig. 10: shows a side view of a sensor assembly,

Fig. 11: shows a diagram of possible signals,

Fig. 12: shows a side view of a sensor assembly,

Fig. 13: shows a plan view of a sensor assembly,

Fig. 14: shows a schematic illustration of a sensor system,

Fig. 15: shows a side view of a sensor system,

Fig. 16: shows a side view of a sensor system,

Fig. 17: shows a side view of a sensor system according to a comparative example,

Fig. 18: show schematic illustrations of a storage device,

Fig. 19: show schematic illustrations of a storage device with different occupancy states,

Fig. 20: shows side views of the arrangement of a sensor assembly on a storage device,

Fig. 21: shows a side view of delimitation elements,

Fig. 22: shows a side view and a section of a delimitation element,

Fig. 23: shows perspective illustrations of delimitation elements,

Fig. 24: shows perspective illustrations of delimitation elements,

Fig. 25: shows a perspective illustration of a delimitation element according to a comparative example,

Fig. 26: shows a perspective illustration of a delimitation element according to a comparative example,

Fig. 27: shows a perspective illustration of a delimitation element according to a comparative example,

Fig. 28: shows a perspective representation and a plan view and detailed view of a delimitation element,

Fig. 29: shows a perspective illustration of a shelf unit,

Fig. 30: shows a storage device designed as a shelf unit,

Fig. 31: shows a shelf and a section through a plurality of shelves according to a comparative example,

Fig. 32: shows a schematic illustration of a shelving system,

Fig. 33: shows a block diagram of the shelving system of Fig. 32,

Fig. 34: shows a flow diagram of the setup of the shelving system from Figs. 32 and 33, and

Fig. 35: shows a flow diagram of the operation of the shelving system of Figs. 32 and 33.

Fig. 1 shows a perspective view of a sensor assembly 100, which in one embodiment is produced with a carrier 10 made of a flexible material. It can be seen from diagonally above on the front left corner, which is shown here bent up and allows a view of both the upper side 12 and on the lower side 14. At least one sensor element 20 is arranged both on the upper and on the lower side 12, 14 on the sensor assembly 100.

This arrangement allows the sensor assembly to operate in two directions (Fig. 2a). In principle, each of the outer surfaces of the sensor assembly can be equipped with sensor elements so that one sensor assembly could operate in all three spatial axes in two directions in each case. In Fig. 2b, such a sensor assembly with the sensor elements on at least on two side surfaces 11, 12 is shown in a plan view. The sensor elements in the remaining side walls 13, 14 and the end faces has not been shown. A sensor assembly as shown in Fig. 2b could, with further assemblies each pivoted by 90°, monitor a space at its spatial boundaries. A sensor assembly according to Fig. 2c could, in combination with other sensor assemblies, monitor a space diagonally, and also in the direct spatial axes with a design as in Fig. 2d.

In this case, the cross-section of a sensor assembly can assume a plurality of possible shapes (Fig. 3). For receiving corresponding sensor elements, the shapes that are most suitable provide a straight surface with respect to the dimensions or the number of installed sensor elements, for which purpose a cross section with corners is best suited.

Fig. 4 shows the plan views of a plurality of possible forms of sensor assemblies for the best possible adaptation to the space to be monitored and its design (Fig. 4a − 4c). If the sensor assembly is to be optimized with respect to the design of the space to be monitored, then the assembly can be produced with a shape which does not cover the full surface but in a form that best covers the space, for example, cross-shaped (Fig. 4d) or meandering (Fig. 4e), wherein the sensors may be placed on the dashed line or the shape of the carrier is narrow and follows the dashed line.

The sensor assembly is designed in one embodiment as a flat strip (Fig. 4b), i.e. the height is very much less than the width, the width being less than the length. It is also possible to form a longer sensor assembly from a carrier 10 with two or even more sections 10a, 10b, which later receive the sensor elements, and to connect the sections to each other using a flexible subsection, wherein the subsection also contains in particular the electrical cables for the power supply and the signals of the sensor elements.

Fig. 6 shows a perspective view of a sensor assembly 100 in an embodiment with a strip-shaped carrier 10. The carrier may be made of a rigid or of a flexible material, or else made of a composite of a plurality of layers of the same or different materials. The carrier 10 in this embodiment functions as a conductor board and is equipped with corresponding conductor tracks 15 and points for contacting the sensor elements and/or possibly other electrical components or assemblies. The conductor tracks as well as the contact surfaces for the sensors can be applied directly to the carrier or else to a foil which is later laminated onto the carrier.

Fig. 7 shows the frontal view of a sensor assembly 100, each having a sensor element 20 arranged on an outer surface 12, 14. The sensor elements 20 are each formed as copies of a kind, either as a signal transducer 21 or as a signal receiver 22. Signal transducers and receivers are designed for signals of one type. According to the transmitter-receiver principle, this can be all types of transmittable and receivable signals, in particular light signals, preferably IR light or acoustic signals, preferably ultrasound signals. In the other exemplary embodiments, light signals are assumed. The signal transducers 21 are shown here schematically as circles or closed semicircles, while the signal receivers 22 are shown schematically as open semicircles or “bowls" with the opening facing away from the corresponding outer surface. An orientation direction OR for the sensor elements 20 introduced later is to be understood such that a straight line passes from its centre point and the highest or lowest point of the circular line with respect to the respective outer surface, said straight line reflecting the main

outlet or inlet direction of the signals.

In a further embodiment, a test signal transducer 26 is assigned to a signal receiver 22, i.e. in the immediate or at least indirect distance from the signal receiver 22 (Fig. 8). The functional reliability of the sensor assembly or the higher-level system can thus be improved. If a signal was sent out by a first opposite sensor assembly, but none was received, the functionality of the signal receiver can be checked again with this. Basically, the same principle can also be applied to a signal transducer.

In a comparative example in Fig. 8a, the signal transducer 21 and the signal receiver 22 of a sensor assembly 100 are arranged in pairs on the same conductor board, in particular directly adjacent. The signal transducer 21 and the signal receiver 22 are assigned to a recess located in the shelf 410, so that a signal emitted by the signal transducer 21 can be sent or received by the signal receiver 22 through the recess. This ensures a short signal path, so that the reliability of the sensor assembly is increased. In particular, the recess can be covered by a film, so that contamination of the recess and thus of the signal transducer 21 and the signal receiver 22 is prevented.

The sensor elements 20 can be integrated at least partially on a respective outer surface in the carrier 10, both as a signal transducer 21 and as a signal receiver 22, in order to protect a corresponding sensor element 20 or also to obtain a smooth outer side. In Fig. 9, a signal receiver 22 which is completely integrated in the carrier 10 is shown on an outer surface 12 in a partial section. On the lower side 14, the signal transducer is integrated by means of a laminated further layer 32 such that the signal transducer 21 is at least partially integrated into the carrier, wherein the protective layer 32 at the corresponding locations of the position of a sensor element 20 has recesses and thus also protects the sensor elements or the corresponding conductor tracks or provides a smooth outer surface (Fig. 9).

The signal transducer 21 could alternatively also be arranged on the upper side of the shelf (reference sign 21′), in particular directly adjacent to the signal receiver 22. The signal transmitted by the signal transmitter can thus be received more easily by the signal receiver, so the distance between the signal receiver and the signal transmitter is shorter and/or the signal does not have to cross the receiving space of the compartment. In particular, the signal can be designed to be weaker, so that the risk of being influenced by the signals from neighbouring signal transmitters is lower. Another advantage is that the signal receiver and the signal transmitter do not have to be aligned with one another in the compartment. The alignment is already accomplished by the arrangement on the conductor board. This has the advantage that a greater

manufacturing tolerance is possible in the manufacture of the shelf unit, since it is not necessary to align the shelves or the sensor assemblies on the shelves with respect to one another.

Fig. 10 shows a side view of a sensor assembly 100 having a plurality of sensor elements arranged on a respective outer surface 12, 14, wherein in each case only sensor elements of one type are arranged on an outer surface. In this way, many sensor assemblies can be cascaded, i.e. combined in one direction at a time. The distance between the sensor elements on each outer surface from each other can be selected so that a signal transducer only ever address one signal receiver or multiple signal receivers by arranging the sensor elements 20 so closely to each other that the signal cones on the receiver side overlap.

Fig. 11 is a diagram relating to a plurality of signals. A first signal S1 indicates two different occupancy states BZ1 and BZ2, wherein no signal S1 is received in the occupancy state BZ1 and is thus interpreted as a sensor area 21/22 occupied by a stored product G, whereas in the occupancy state BZ2 a signal S1 is received and is thus interpreted as a sensor area without a stored product G. Signals 2-4 show signals with different intensity, modulation or with individual frequency blocks. These signals can be used to improve the signal or data integrity or also to address or identify individual sensor elements, in particular with overlapping signal cones.

Fig. 12 shows a side view of a sensor assembly again with a plurality of sensor elements 20 arranged on opposite outer surfaces of the carrier 10, wherein the upper sensor elements 20 are at least partially embedded in a protective layer 32 by a protective layer 32 and thus an approximately smooth surface is achieved. On the opposite outer surface, however, the sensor elements 20 are completely integrated into the carrier. On this lower side, an adhesive layer 30 is applied, which is covered by a non-adhesive cover layer 31. At least the adhesive layer 30 has corresponding recesses at the positions of the sensor elements 20, so as not to damage or contaminate the sensor elements 20, and to later allow the signals S to pass unhindered. For later assembly, the non-adhesive cover layer 31 is removed from the adhesive layer 30, and thus can be aligned with a device 300 and attached to the device using the adhesive layer 30.

Fig. 13 shows a plan view of a sensor assembly 100 having a carrier 10 and conductor tracks 15 located on the carrier 10 and sensor elements 20 connected to the conductor tracks 15. At the right end of the sensor assembly, a small rigid conductor board is mounted, which contains the necessary control electronics 16 to control the sensor

elements 20 and other electrical or electronic components 23, for example, a plug element 23 for power supply and receiving or outputting control signals 24/25 of the sensor elements 20 for forwarding to a higher-level sensor system 200 or to a higher-level control system 260. The sensor assembly 100 has additional markers or devices 40 for fixing to a device, which are designed as optical markings (e.g. as an arrow) or as shapes (e.g. semicircles, bores). In particular, the bores can be used to later fix the sensor assembly 100 in a certain position with a screw, etc.

Fig. 14 schematically shows the arrangement of a sensor system 200 consisting of a surveillance space R and two sensor assemblies 100a, 100b that at least partially border or comprise this space, wherein the sensor assemblies are at least partially opposite each other. The sensor assemblies 100a, 100b or the sensor elements 20 located on these mutually facing outer surfaces are arranged so that at least one signal transducer 21 of the first sensor assembly 100a is approximately opposite a signal receiver 22 of a second sensor assembly 100b, so that a signal emitted by the signal transducer 21 can be sent and received by the signal receiver 22 of the second sensor assembly 100 B through the surveillance space R. Such an arrangement can be designed arbitrarily in the space. Fig. 14b shows two vertically oriented sensor assemblies 100a, 100b, wherein the signal S here is transmitted and received horizontally through a surveillance space R.

Fig. 15 shows an embodiment of a sensor system 200 in a side view with an assembly of two sensor assemblies 100a, 100b, wherein the sensor assemblies are aligned relative to each other such that, at the mutually opposite outer surfaces 14a and 12b, the sensor elements 20a and 20b can act together, i.e. a signal emitted by a signal sensor element 20a can be received by a second sensor element 20b.

In this case, the sensor elements are positioned relative to one another and the type thereof selected such that one signal transducer 21 and one signal receiver 22 are always opposite each other on their mutually facing outer surfaces 14a and 12b on sensor assemblies 100a, 100b. At the outer surfaces of the two sensor assemblies 100a, 100b that are facing away from each other, further sensor elements are arranged, which are each complementary to the sensor element that is located on the respective sensor assembly on the outer surface facing the other sensor assembly. Complementary here means the other type of sensor element, respectively. In Fig. 15a, the sensor assembly 100a with its outer surface 14a with a signal transducer 20a is positioned opposite the outer surface 12b of the sensor assembly 100b with a signal receiver 20b. Thus, the further sensor element 20c is formed as a signal receiver on the

outer surface 12a that is not opposite the sensor assembly 100b. On the sensor assembly 100b, the further sensor element 20d is formed as a signal receiver on the outer surface 14b facing away from the sensor assembly 100a. Correspondingly, all sensor elements of different sensor assemblies of one type each are oriented in one direction OR, that is, all signal transducers are oriented in a first direction OR 21 and all signal receivers in a second direction OR 22 (Fig. 15b).

Fig. 16 shows a sensor system 200 in a side view with four stacked sensor assemblies 100, in which the respective signal transducer 21 is oriented in a first direction OR 21 from the top downwards and all respective signal receivers 22 are oriented in a second direction OR 22 from the bottom upwards. In this way, it is possible to efficiently arrange a plurality of identically constructed sensor assemblies in an entire sensor system and to combine them with one another in a cascading manner. In this case, interacting sensor elements of at least two adjacent sensor assemblies lie on a common axis A.

Figure 17 shows a comparative example of a sensor system 200 with three respectively stacked sensor assemblies 100, each having a plurality of sensor elements 20. The sensor elements of each respective type are again oriented exclusively in a first direction OR 21 and in a second direction OR 22. The sensor elements of different sensor assemblies that interact with one another are all located on a common axis A. Between each two opposing sensor assemblies 100 there is a surveillance space R with a plurality of signal elements of different sensor assemblies that act together at least in pairs. The surveillance spaces R can be subdivided into smaller partial sections by the control electronics 260 defining groups and assigning these groups to the corresponding partial sections TB.

Fig. 18 schematically shows a storage device 300 with a sensor system 200. For this purpose, the storage device 300 has a storage space R for receiving or a depositing area for a stored product G, which is at least partially bordered or comprised by a delimitation element 310 or sections 321, 322 of a delimitation element 310 or by two different delimitation elements 310a, 310b. In one embodiment, a sensor system 200 with two different sensor assemblies 100a, 100b is arranged on two delimitation elements 310a, 310b such that at least one signal transducer 21 of the first sensor assembly 100a can act with at least one signal receiver 22 of the second sensor assembly 100b, wherein a signal S transmitted from the signal transducer 21 is transmitted through the surveillance space R to the signal receiver 22 (Fig. 19a). If no stored products G are obstructing the path of the signal S, then the signal receiver 22 receives the signal S emitted by the signal transducer 21 and interprets this as a first

occupancy state BZ1, namely that no stored products G are contained in the surveillance space R (Fig. 19b).

However, if a stored product G is contained in the surveillance space R, then the signal path S is disturbed and a signal S emitted by a signal transducer 21 cannot be received by the signal receiver 22, which is interpreted as a second occupancy state BZ 2, namely that there is a stored product G in the surveillance space R (Figure 19d).

Fig. 20 shows various options for arranging a sensor assembly 100 on a delimitation element 310. A sensor assembly 100 can either be arranged on an outer surface of a delimitation element 310 facing the surveillance space R (Fig. 20a). A second possibility is to arrange the sensor assembly 100 on an outer surface of a delimitation element 310 facing away from the surveillance space R (Fig. 20b). Another possibility is to at least partially integrate a sensor assembly 100 into a delimitation element 310 in a corresponding recess 318 (Fig. 20c).

In one embodiment for the arrangement of a sensor assembly according to Figures 20b and 20c, in which the sensor assembly and sensor elements arranged thereon would not have access to the surveillance space R and thus would not be able to send or receive signals S, an opening is incorporated into the delimitation element 310 as a signal opening 315 for the passage of signals of the sensor elements. This signal opening 315 may either be punched or drilled into the delimitation element 310, and allows a sensor element 20 to interact with a complementary sensor element through the surveillance space R. Fig. 21a shows a sensor assembly arranged on a rear side of a delimitation element 310 that faces away from the surveillance space R, having a signal opening 315 through the entire thickness of the delimitation element 310. In the case of an integrated sensor assembly 100, at least one signal opening 315 is provided on at least one side or at least two signal openings 315 on the two sides at the corresponding positions of the sensor elements (Fig. 21b).

The sensor element 20 can project on the surface of the sensor assembly 100 and can thus at least partially fill in such a signal opening 315. In this case, the sensor assembly is positioned with respect to the delimitation element and at least rudimentarily fixed, so that the at least one sensor element 20 securely coincides with the signal opening 315.

In a further embodiment, the signal opening 315 is at least partially filled with a material permeable to the type of signal used by the sensor elements, for example with a transparent synthetic resin. Thus, a smooth surface is present and no dirt that would interfere with the signals can be collected in the signal openings (Fig. 22a).

Alternatively or additionally, it is also possible to apply a further protective layer 316, for

example a film or an adhesive tape made of a transparent material (Fig. 22b).

To arrange a sensor assembly 100, in one embodiment of the invention, a device 319 (Fig. 23a) or a receiving space 318 (Fig. 23b) is arranged on a delimitation element 310. Fig. 23a shows a device with an opening 319 into which a sensor assembly 100 can be pushed and is engaged from behind by the device, so that the sensor assembly is securely held on an outer surface. In the delimitation element 310, a signal opening 315 corresponding to the surveillance space R is incorporated so that the sensor elements 20 of a sensor assembly 100 can send or receive signals.

Fig. 23b shows a recess intended to receive a sensor assembly 100 in the form of a recess 318 accessible from above. Therein, a sensor assembly 100 is then inserted flushly in a further embodiment. In the recess, downwardly opening signal openings 315 are introduced.

Fig. 24a shows a delimitation element 310 with a recess 318 that opens upwards, into which a sensor assembly 100 can be introduced from above 319. Fig. 20b shows a delimitation element 310 with a recess which is open to the side and into which a sensor assembly can be pushed laterally.

Fig. 25 shows a comparative example of a plate-shaped delimitation element 310 with an upper mating side for stored products G and corresponding to a surveillance space located at the top in relation to gravity F, on the underside of which a plurality of sensor assemblies 100 are arranged parallel to one another. The sensor assemblies 100 are aligned on the delimitation element 310 in accordance with the sensor elements 20 arranged on the outer surfaces so that the sensor elements 20 coincide with the corresponding signal openings 315. The flexible sensor assemblies 100 are then fixed to the outer surface of the delimitation element 310 with the adhesive layer present on one side.

Each sensor assembly 100 has a plurality of sensor elements 20, each of which is arranged in a row on the respective sensor assembly 100. Since a plurality of sensor assemblies 100 are arranged parallel to one another on the delimitation element 310, a sensor matrix (Fig. 26) is produced, which can be selectively controlled and/or evaluated, even in partial sections, with a control electronics 360 (Fig. 27).

In one embodiment, the delimitation elements 310 bordering or comprising a surveillance space have devices 325 (Fig. 28a) for receiving further delimitation elements 310 or separation elements 330 for setting up partial regions TB, which are also referred to in the following as compartments, within a surveillance space R (Fig. 28b). The further delimitation elements 310 or separation elements 330 are pushed into

the devices 325 from above, so that an approximately rectangular corner and, in conjunction with the same procedure, at the other end of the inserted delimitation elements 310 or separation elements 330 a separate partial section TB is created overall. In one embodiment, the devices 325 include lateral contact surfaces 326 (Fig. 28c), such that delimitation elements 310 inserted therein and the sensor assemblies 100 contained therein are electrically connected to the sensor system 200 or the storage device 300. Further, the delimitation elements 310 or separation elements 330 contain power and data lines 327 for incorporating inserted elements into the power supply and data lines of the drawer 523.

Figure 29 shows a perspective view of a shelf 410 with sensor assemblies arranged on the lower side and signal openings 315 passed through the contact surface for stored products G. In addition, the shelf is divided into multiple shelf compartments by separation elements 330 running parallel to the sensor assemblies. A frame which runs around all sides of the shelf prevents stored products G from falling out sideways.

Figure 30 shows a storage device 300 embodied as a shelf unit 400 having a first shelf 410 for receiving storage goods and further shelves 410, wherein between each two shelves 410 due to their spatial arrangement to one another a surveillance space R is defined, on each shelf 410 of which, located above, a plurality of sensor assemblies 100 are arranged on the lower side thereof.

Figure 31 shows a section through a shelf unit 400 with a total of three shelves and two surveillance spaces R. The section passes through a sensor assembly 100 at the level of the sensor elements 20 arranged on a line. In each case on the lower side of a shelf, a sensor assembly is arranged, wherein the signal transducers 21 are oriented from top to bottom and the signal receivers 22 from bottom to top. The shelves have on one side a slope, which ensures that the gap of a removed stored product G, for example, a package with screws, is closed by sliding packages and a package is always available at the front of the withdrawal point, as long as there are packages left in the corresponding goods compartment. Packages present in the storage compartment prevent the reception of the signals S emitted by the signal transducers 21 arranged above the packets by the signal receivers 22 hidden by the packets, so that a transmitted, but not received, signal S is interpreted as “present” as a first occupancy state. Where there are no more packets available, a signal S can be received, which is interpreted as a second occupancy state and as "empty". The individual occupancy states are either requested periodically or on the basis of an event, e.g. a manual request, and forwarded to a higher-level management system which carries out an

inventory update for certain goods and, if necessary, triggers order processes therefor based on the storage bin or the allocation of a surveillance space R or its partial sections TB.

If the length of the individual articles or the number of articles per unit length is known, the number of articles in the respective partial section TB can also be determined, for example. For example, the length of the individual articles can already be known or this is determined and stored while the shelf unit 400 is being set up. For example, the position of the last sensor element with the occupancy state “present” or the position of the first sensor element with the occupancy state “empty” can be detected. The number of articles can then be entered manually. With this information, depending on the distance between the individual sensor elements, it is possible to calculate the size of the individual articles and thus make a more precise determination of the number of articles in the partial section when individual articles are removed.

Alternatively, the position of the last sensor element with the occupancy state “present” or the position of the first sensor element with the occupancy state “empty” can be stored. In order to check whether a minimum quantity of the respective article is available, it can be sufficient to query only the sensor element assigned to this position. The time required for a query can thus be significantly reduced. For example, when setting up the shelving system, it can be filled with the minimum quantity and the position of the last sensor which indicates occupancy, or the position of the first sensor element that indicates no occupancy, can be detected.

Figures 32 and 33 show a storage system 600 with a plurality of shelf units 400, shown for example in Fig. 31. Each shelf unit 400 has a plurality of shelves 310, each of which is subdivided into a plurality of partial sections or compartments TB. The shelf units 400 can be, for example, shelf units having inclined shelves in which the shelves 310, as described in Figures 31a and 31b, are inclined in a filling direction or a withdrawal direction. The compartments TB each run in the withdrawal direction, so that the articles arranged on the shelves 310 each slide to the front, lower end of the shelves 310.

The storage system 600 furthermore has a sensor system 200 which consists of a plurality of sensor assemblies 100, a sensor assembly 100 being assigned to each compartment TB. The sensor assemblies 100 are each designed to scan the occupancy of the compartments TB and to generate occupancy information. The compartments TB are each assigned a unique address, which is displayed on a barcode 680 on the front of the compartment.

Furthermore, a data bus 620 is provided which is connected to a communication device

630 which can establish a network connection 640 to a server 650. The communication device 630 can send the occupancy information received via the data bus and the address of the compartments TB assigned to the occupancy information via the network connection 640 to the server 650. Furthermore, the communication device 630 can receive control information from the server 650 via the network connection 640. For example, the control information is instructions for carrying out an inventory or information for carrying out remote maintenance.

The storage system also has a hand-held scanner 670 for the optical detection of an optically readable code, each of the compartments TB bearing an optically readable code indicating the respective address. The communication device is configured in such a way that the assignment of a goods type to one or more of the compartments TB takes place in that the communication device 630 receives an optically detected address from the hand-held scanner 670 and a goods type assigned to the optically detected address.

The hand-held scanner can be wireless and have a wireless communication interface for communication with the communication device.

The compartments also have signalling means 690 which, for example after receiving the false occupancy signal, output an optical signal that optically indicates false occupancy for a user.

To set up the storage system 600, the communication device 630 is first switched to a setup mode. Subsequently, the compartments TB of the storage system 600 are occupied according to a predetermined occupancy plan 700 with minimum stock levels below which reorders shall be triggered, and the minimum stock levels are detected with the sensor system 200 and the minimum stock levels are stored in the communication device. Finally, the occupancy to the nominal stock in the storage system 100 is completed.

The operation of the storage system 600 after it has been set up involves the following steps:

- detecting the occupancy information 710 of at least one of the compartments TB,
- comparing the detected occupancy information 710 with a stored occupancy plan by means of the communication device 630,
- if the communication device 630 detects a discrepancy between the detected occupancy information and the occupancy plan, generating, by the communication device 630, a false occupancy signal, and sending the false occupancy signal via the data bus to the address of the very sensor assembly 100 from which the

occupancy information has been detected.

The sequence of the setup and the operation of the storage system 600 is shown again schematically in Figures 33 and 34.

The storage system 100 can carry out the occupancy detection permanently or periodically, for example in order to log a current stock inventory in each case by storing the occupancy information in the communication device 630. Alternatively, the occupancy detection can only take place at specified times or upon request. For example, an inventory time is specified at which the storage system carries out an automatic inventory, that is, an occupancy detection of all compartments TB.

A remote maintenance program module 720 is installed on the communication device 630, which can be addressed via the network and can directly carry out maintenance operations on the storage system. The remote maintenance program module is configured, for example, in such a way that, based on the receipt of a command via the network, the sensor system 200 is controlled in such a way that the occupancy information of a compartment TB, specified in the command by indicating a corresponding address, is detected and, on the basis of the occupancy information, an occupancy information signal is generated, which is sent via the network.

The communication device 630 is designed to connect a computer 730 via a local connection in order to visualize an occupancy plan 700 stored in the communication device 630 on a user interface of the computer.

The communication device 630 also has a setup mode, wherein an occupancy of the storage system 600 detected by means of the sensor system 200 in the setup mode can be stored as an occupancy plan, the occupancy plan in particular containing the goods type assigned to each compartment TB and an occupancy threshold value assigned to this goods type, which is given by the occupancy detected by the sensor system 200.

The shelves 310 can have a plurality of recesses in the filling direction of the compartments TB, in particular in the direction of the slope, in order to enable a signal reception and/or a signal output by the sensor system 200, the sensor assemblies 100 of the sensor system 200 being arranged below the shelves 310, and with a film which is applied to an upper side of the shelf 310 in the filling direction and which covers the recesses.

The film is, for example, a plastic film, in particular a PVC film, the plastic film being transparent in particular in the range of a frequency of signal reception and/or signal output.

Further features of possible embodiments are described below, wherein the features can be combined with one another and with the features mentioned above.

The sensor assembly (100) for occupancy detection has, for example, a carrier element (10) with at least two sensor elements (20), the sensor elements (20) being arranged on different outer surfaces (11), (12), (13), (14) of the carrier element (10).

For example, the carrier element (10) has a polygonal, preferably a triangular or a four-cornered, in particular a square or rectangular cross section.

The carrier element (10) is, for example, polygonal, circular, cross-shaped, Y-shaped, strip-shaped, lattice-shaped, meander-shaped and/or star-shaped.

The carrier element (10) is, for example, rigid, flexible or semi-flexible or has at least two rigid, flexible or semi-flexible sections (10)(a) (10)(b) which are connected to one another.

The carrier element (10) can be constructed, for example, from a film or from a plurality of layers of identical or different films and/or materials.

The carrier element (10) can be for example at least partially designed as a conductor board with conductor tracks (15) or has at least electrical conductor structures for electrical contacting and/or forwarding of the of the sensor elements (20) and/or other electrical and/or electronic components (23) and/or for connection to a data bus (24) and/or to a power supply (25) and/or for connection to at least one further sensor assembly (100).

A sensor element (20) is designed, for example, as a signal transducer (21) or as a signal receiver (22).

For example, a test signal transducer (26) is attached to the signal receiver (22) in such a way that the signal receiver (22) can detect signals from the attached test signal transducer (26) directly or indirectly.

The at least first sensor element (20) (a) of a first outer surface (11), (12) of the sensor assembly (100) is designed, for example, to be complementary to the at least second sensor element (20) (b) of a second outer surface (13), (14) of the sensor assembly (100), in particular, for example, that the first sensor element (20) (a) is designed as a signal transducer (21) and the second sensor element (20)(b) as a signal receiver (22) or that the first sensor element (20) (a) is designed as a signal receiver (22) and the second sensor element (20) (b) as a signal transducer (21).

The at least two sensor elements (20) (a), (20) (b) are designed, for example, to be complementary to one another and are arranged on opposite outer surfaces (11), (13) or (12), (14) of the carrier element (10), in particular, for example, a first sensor element

(20) (a) is implemented on a first outer surface (11), (12) as a signal transducer (21) and the second sensor element (20) (b) is implemented on a second outer surface (13), (14) opposite to the first as a signal receiver (22) or a first sensor element (20) (a) is implemented on a first outer surface (11), (12) as a signal receiver (22) and the second sensor element (20) (b) on a second outer surface (13), (14) opposite to the first, as a signal transducer (21).

The sensor elements (20) are arranged, for example, at least partially integrated on or in an outer surface (11), (12), (13), (14) of the carrier element (10).

The signal emitted by at least one signal transducer (21) and the signal received by at least one signal receiver (22) is a magnetic, an electromagnetic, or an acoustic signal, for example.

The signal transducer (21) has, for example, at least one LED, an OLED or a piezocrystal or is formed from an array of these elements.

For example, IR light is emitted by at least one signal transducer (21).

At least one sensor element (20) and/or a conductor track is printed, for example (15).

For example, a control electronics (16) is arranged on the carrier (10), the control electronics uniquely identifying the sensor assembly with respect to other sensor assemblies.

The control electronics (16) activates, for example, the sensor elements (20) and registers, further processes and forwards the data signals from the sensor elements (20).

The signal generated by the control electronics (16) and emitted by the signal transducer (21) can be varied, for example, in terms of its frequency and/or its intensity.

The emitted signal (S) is clocked, for example, in such a way that the signal (S) is coded.

An operating state in the existing sensor elements (20), for example, can be activated or requested by the control electronics (16) individually, in groups or all at once, in particular a signal transducer emits a signal or a signal receiver is queried as to whether it receives a signal.

For example, the carrier element (10) has on at least one outer surface more than two, preferably a plurality of sensor elements (20), which are arranged in a defined manner to each other, preferably arranged on at least one line or in at least one row.

For example, sensor elements (20) for different types of signals are grouped together and/or arranged alternately on an outer surface (11), (12), (13), (14) of the carrier element (10).

For example, only sensor elements of one type are arranged on an outer surface (11), (12), (13), (14), in particular sensor elements (20), for example, arranged on an outer surface (11), (12), (13), (14) are in each case designed only as signal transducers (21) or only as signal receivers (22).

Signal transducers (21) and signal receivers (22) are, for example, grouped together and/or arranged alternately on an outer surface (11), (12), (13), (14) of the carrier element (10).

For example, a marker (40) is present for later positioning and/or alignment of the sensor assembly (100).

For example, a fixing device (40) is present for later positioning and/or fixing of the sensor assembly (100).

The carrier element (10) has, for example, an adhesive surface (30) on at least one outer surface (11), (12), (13), (14).

The adhesive surface (30) is, for example, at least temporarily covered with a removable cover film (31).

A sensor system (200) for detecting an occupancy has at least two sensor assemblies (100) (a), (100) (b), wherein the sensor assemblies (100) (a), (100) (b) in at least one position are arranged relative to each other in such a way that they at least partially comprise a surveillance space (R) and that an emitted signal (S) of at least one signal transducer (21) of a first sensor assembly (100) (a) can be detected by at least one signal receiver (22) of a second sensor assembly (100) (b) in at least one occupancy state (BZ), so that a received signal (S) is interpreted as a first occupancy state (BZ) and a transmitted, but not received, signal (S) is interpreted as a second occupancy state (BZ).

The sensor assemblies (100) (a), (100) (b) are arranged in at least one position in such a way that at least one of their outer surfaces (14)(a), (12)(b) at least partially oppose each other and that on each of the at least partially opposing outer surfaces (14) (a), (12) (b) at least one sensor element (20) (a), (20) (b) is arranged, which in each case are complementary to each other, in particular that the at least first sensor element (20) (a) is designed as a signal transducer (21) (a) and that the at least second sensor element (20) (b) is designed as a signal receiver (22) (b) or that the at least first sensor element (20) (a) is designed as a signal receiver (22) (a) and that the at least second sensor element (20) (b) is designed as a signal transducer (21) (b).

In at least one of the sensor assemblies (100) (b) at least one further sensor element (20) (c) is arranged, for example, on at least one of the outer surfaces (11) (b), (13) (b),

(14) (b) not facing the other sensor assembly (100) (a).

In at least one of the sensor assemblies (100) (b) at least one further sensor element (20) (c) is arranged, for example, on the outer surface (14) (b) facing away from the other sensor assembly (100) (a).

The at least one further sensor element (20) (c) is, for example, complementary to the type of the at least one sensor element (20) (b) on the outer surface (12) (b) facing the at least one other sensor assembly (100) (a), in particular that the sensor element (20) (b) is designed as a signal transducer and the sensor element (20) (c) as a signal receiver or that the sensor element (20) (b) is designed as a signal receiver and the sensor element (20) (c) as a signal transducer.

With regard to the arrangement of the at least two sensor assemblies (100) (a), (100) (b), for example, the sensor elements (20) each of one type (21), (22) all have the same orientation (OR), in particular that all signal transducers (21) are oriented in a first direction (OR) (21) and all signal receivers (22) are oriented in a second direction (OR) (22).

The first direction (OR) (21) and the second direction (OR) (22) are oriented in opposite directions to one another, for example.

On an outer surface (11), (12), (13), (14) of a sensor assembly (100) or a section (10) (a), (10) (b) of a sensor assembly (100) with sensor element (20), for example, at least two, preferably a plurality of sensor elements (20) are arranged.

The sensor elements (20) of at least two adjacent sensor assemblies (100) (a), (100) (b) are each positioned approximately on a common axis (A), for example.

On the facing outer surfaces (14) (a), (12) (b) of a sensor assembly (100) or a section of a sensor assembly (10) (a), (10) (b) with sensor elements (20), only sensor elements (20) of one type are arranged, in particular, sensor elements (20) arranged on a respective outer surface (14) (a), (12) (b) are designed only as signal transducers (21) or only as signal receivers (22).

The sensor elements (20) for example are spaced apart from each other so that at least one pair of sensor elements (20) is present for each smallest unit to be measured, in particular that at least one signal transducer (21) and one signal receiver (22) are present for each smallest unit to be measured, preferably that for each smallest unit to be measured a plurality of signal transducers (21) and a plurality of signal receivers (22) are present.

A control electronics (260) coordinates, for example, sensor elements (20) of the at least two sensor assemblies (100) (a), (100) (b) or different sensor assemblies that act

in a complementary manner and interact with one another in pairs or groups, in particular, synchronises them with one another and in particular controls the delivery and acquisition of signals S.

The surveillance space (R) is, for example, subdivided into at least two partial sections (TB), wherein the partial sections (TB) are each logically managed by the control electronics (260), in particular at least one signal transducer (21) (a) and a signal receiver (22) (a) or a group of complementary acting and interacting sensor elements (20) (a), (b) are assigned to a first partial section (TB) (1) and at least one further signal transducer (21) (b) and a further signal receiver (22) (b) or a group of further, complementary acting and interacting sensor elements (20) (b) are assigned to a further partial section (TB) (2).

The control electronics (260) evaluates, for example, the detected signals and the signals and/or reports the detected occupancy states BZ using a communication device (270) to a higher-level storage device (300) or to a higher-level control unit (360).

A storage device (300) for storing and managing stored goods (G), in particular piece and/or bulk goods, has at least one surveillance space (R) for receiving the stored goods (G), and a sensor system (200) described above.

The occupancy state (BZ) and/or the degree of filling (FG) of the surveillance space (R) is monitored by at least two, approximately opposite sensor elements (20) (a), (20) (b), wherein in at least one occupancy state (BZ) an emitted signal (S) of at least one signal transducer (21) (a) of a first sensor assembly (100) (a) can be detected by at least one signal receiver (22) (b) of a second sensor assembly (100) (b), so that a received signal (S) can be interpreted as the first occupancy state (BZ) and a sent but not received or an attenuated received signal (S) can be interpreted as the second occupancy state (BZ), the combination of a plurality of occupancy states being interpretable as the degree of filling (FG).

The surveillance space (R) of at least two delimitation elements (310) (a), (310) (b) or of at least two sections (321), (322) of a delimitation element (310) is, for example, at least partially bounded, the delimitation elements (310) (a), (310) (b) or the sections (321), (322) each with at least one outer surface are at least partially approximately opposite one another.

For example, at least one sensor assembly (100) is arranged on each delimitation element (310) (a), (310) (b) or on each section (321), (322).

At least one sensor assembly (100) (a) is arranged, for example, on an outer surface (311) (a) of a delimitation element (310) (a) facing the surveillance space (R).

At least one sensor assembly (100) (b) is arranged, for example, on the outer surface (311) (b) of the respective delimitation element (310) (b) facing away from the surveillance space (R).

At least on one side of the surveillance space (R), for example, at least one sensor assembly (100) (b) is at least partially integrated into the respective delimitation element (310) (b).

The delimitation element (310) has at least one signal opening (315), so that the at least one integrated sensor assembly or the at least one sensor assembly (100) (b) arranged on the outer surface facing away from the surveillance space (R) can send a signal (S) to at least one further sensor assembly (100) (c) through the signal opening (315) and/or can receive a signal from at least one further sensor assembly (100) (a).

The signal opening (315) is at least partially filled, for example, by a sensor element (20) and/or the signal opening (315) is, for example, at least partially covered and/or filled by a material that is permeable to the signal.

At least one delimitation element (310) has, for example, a device or recess (316) for at least partially receiving at least one sensor assembly (100).

The device or recess (316) on at least one outer surface has, for example, an opening (317) for introducing a delimitation element 310.

At least one sensor assembly is fixed in a defined position, for example, on at least one delimitation element in relation to a reference point (B) of the storage device (300) and/or the delimitation element 310 and/or at least one further sensor assembly (100).

At least one sensor assembly (100) is glued to at least one delimitation element (310), for example.

At least two, preferably a plurality of sensor assemblies (100) are arranged, for example, approximately parallel to one another on a delimitation element (310), the sensor elements arranged in one plane forming a sensor matrix.

At least one, preferably a plurality of, separation elements (330) are each arranged on at least two delimitation elements (310) that are opposite and thus approximately parallel to each other, wherein the separation elements (330) run transversely to the delimitation elements (310), so that at least two, preferably a plurality of, surveillance spaces (Rn) is formed.

At least one delimitation element (310) has at least one fixing device (325) for at least one separation element (330) on at least one outer surface (311).

A plurality of fixing devices (325) are arranged, for example, on at least one side of a delimitation element (310), so that a variable subdivision of the surveillance space (R) is

possible.

For example, at least one signal transducer (21) and one signal receiver (22) are assigned to each surveillance space (Rn).

The storage device (300) is, for example, a shelf unit (400) and at least one first delimitation element (310) forms a shelf (410).

For example, further delimitation elements (310) each form further shelf unit levels (RE) in the shelf unit (400), the space between each two shelf unit levels (RE) (a), (RE) (b) forming at least one surveillance space (R).

For example, the at least one sensor assembly (100) is arranged in accordance with the force of gravity (F) below the respective shelf (410) of a shelf unit level (E).

For example, sensor elements (20) of different shelf unit levels (RE) are each aligned approximately on a common axis (A) according to their respective position on the sensor assembly (100), the axis (A) running vertically according to the force of gravity (F).

Sensor elements (20) of different shelf unit levels (RE) are, for example, oriented in only one direction (OR) according to their respective type, in particular all signal transducers (21) of different levels are only oriented in a first direction (OR) (21) and all signal receivers (22) of different levels are only oriented in a second direction (OR) (22).

For example, all signal transducers (21) are oriented from top to bottom in accordance with the force of gravity (F) and all signal receivers (22) are oriented in the opposite direction from bottom to top.

The shelf of each shelf unit level (RE) has, for example, a slope with respect to the horizontal spatial plane (E) in at least one direction.

The storage device (300) is, for example, a cabinet (500) with at least one drawer (501), with at least two opposite side walls (510) of the drawer at least partially enclosing a surveillance space (R) as delimitation elements (310) (a), (310) (b).

At least one sensor assembly (100) is integrated, for example, in at least one delimitation element that forms a side wall.

For example, sensor elements (20) of different delimitation elements (310) can each be aligned approximately on a common axis (A) according to their respective position on the sensor assembly (100), the axis (A) running approximately horizontally, transverse to the force of gravity (F).

For example, sensor elements (20) of different delimitation elements are, for example, oriented in only one direction (OR) according to their respective type, in particular all signal transducers (21) of different delimitation elements are only oriented in a first

direction (OR 21) and all signal receivers (22) of different delimitation elements are only oriented in a second direction (OR22).

For example, all signal transducers (21) are oriented from their rear wall to their end wall according to the withdrawal direction of the drawer (501) and all signal receivers (22) are oriented in the opposite direction from their end wall to their rear side.

For example, at least one further delimitation element (310 c) is arranged transversely to the withdrawal direction of the drawer (501).

For example, at least one separation element (330) is arranged parallel to the withdrawal direction of the drawer (501).

The drawer 501 has, for example, a drawer plug 523 which electrically connects the drawer 501, at least in the closed state, to an energy supply and/or a data line in the body of the cupboard 500.

For example, a control unit (360) queries at least one occupancy state BZ of at least one surveillance space (R) or part of a subdivided surveillance space (TB) and evaluates the result and/or reports it to a higher-level management system (660).

The control unit (360) logically manages, for example, at least two cooperating sensor elements (20) of at least two different sensor assemblies (100) or at least partial quantities of cooperating sensor matrices, thus defining at least one logical partial section (TB) extending in a plane along a direction of a first sensor assembly and/or transversely to the direction of a first sensor assembly via at least one further, parallel sensor assembly.

For example, at least one partial section corresponds to exactly one unit of a stored good (G) to be stored.

For example, at least one logical partial section (TB) corresponds to at least one arrangement of delimitation elements (310) and/or separation elements (330), in particular the size of at least one partial section (TB) formed from delimitation elements (310) and/or separation elements (330).

The control unit (360) detects the partial sections (TB), for example in an initialization, based on the arrangement of the delimitation elements (310) and/or separation elements (330) among one another and accordingly defines at least one surveillance space (R) into its logical partial sections (TB) and saves it in the management system (660).

List of reference signs

100 Sensor assembly
10 Carrier element
11 Outer surface
12 Outer surface
13 Outer surface
14 Outer surface
15 Conductor track
16 Control electronics
20 Sensor element
21 Signal transducer
22 Signal receiver
23 Electrical/electronic components
24 Data bus
25 Power supply
26 Test signal transducer
30 Adhesive surface
31 Cover film
32 Protective layer/film
40 Marker/fixation
200 Sensor system
260 Control electronics
270 Communication device
300 Storage device
310 Delimitation element
311 a, b, c, d, e, f Outer surfaces of delimitation element
315 Signal opening for the transmission of signals
316 Recess
317 Insertion opening
321 Section of the delimitation element
322 Section of the delimitation element
325 Fixing device for the separation element
326 Contact fixing device
327 Power and data line
330 Separation element

331 Contact
360 Control unit
400 Shelf unit
410 Shelf
500 Cupboard
501 Drawer
510 a, b, c, d Side walls
523 Drawer plug
524 Data bus
525 Power supply
600 Storage system
620 Data bus
630 Communication device
640 Network connection
650 Server
660 Management system
670 Hand-held scanner
680 Optically readable code
690 Signalling means
700 Occupancy plan
710 Occupancy information
720 Remote maintenance module
730 Computer
A Axis
B Reference point
BZ Occupancy state
E level
F Gravity
G Stored goods
OR Orientation
R Surveillance space
S Signal
TB Partial section

FREMGANGSMÅDE TIL LAGERLOGISTIK

Patentkrav

1. Lagersystem (600) med mindst én reol (400), hvor reolen (400) har en flerhed af hylder (410), som er anbragt over hinanden, hvor hver hylde (410) er logisk opdelt i en flerhed af afsnit (TB), som er anbragt ved siden afhinanden, hvor hvert afsnit danner et delområde (TB) inden for et overvågningsrum (R), hvor en unik adresse er tilordnet hvert af afsnittene (TB), og med et sensorsystem (200) til detektering af afsnittenes (TB) belægning, hvor sensorsystemet (200) er udformet til rumlig scanning af belægningen af et af afsnittene (TB) for at generere en belægningsoplysning (710), der angiver en belægningsgrad i det pågældende afsnit (TB), og med en databus (620), der er forbundet med sensorsystemet (200) og en kommunikationsanordning (630), hvor lagersystemet (600) er udformet til udførelse af følgende trin:

- registrering af en belægningsoplysning (710) for hvert af afsnittene (TB) via sensorsystemet (200),
- overførsel af belægningsoplysningen (710) med adressen, der er tilordnet det afsnit (TB), hvor belægningsoplysningen (710) blev registreret, fra sensorsystemet (200) via databussen (620) til kommunikationsanordningen (630),
- etablering af en netværksforbindelse (640) ved hjælp af kommunikationsanordningen (630) for at overføre belægningsoplysninger (710) til en server (650) eller styringsoplysninger til lagersystemet (600) i envejs- eller tovejskommunikation,
- hvor sensorsystemet (200) omfatter en flerhed af sensorenheder (100);
- kendetegnet ved, at overvågningsrummet (R) er indrammet eller omsluttet af begrænsningselementer (310), der indeholder anordninger (325) til optagelse af yderligere begrænsningselementer (310) eller adskillelseselementer (330) til indretning af delområderne (TB), hvor de yderligere begrænsningselementer (310) eller adskillelseselementerne (330) er konfigureret til at blive indskudt i anordningerne (325) ovenfra, således at der dannes omtrent retvinklede hjørner og det respektive delområde (TB);
- og at anordningerne (325) har laterale kontaktflader (326), som er konfigureret til elektrisk at forbinde de dér indskudte begrænsningselementer (310) og de deri indeholdte sensorenheder (100) med sensorsystemet (200).

2. Lagersystem ifølge krav 1, hvor reolen (400) er en skråhyldereol, og hvor hylderne (410) har et fald i retning af en udtagningsside på skråhyldereolen.

3. Lagersystem ifølge krav 1 eller 2, hvor hver af sensorenhederne (100) er tilordnet et af afsnittene (TB), hvor en sensorenhed (100) for sit vedkommende omfatter et antal af sensorelementer (20), som er anbragt i sensorenhedens (100) længderetning.

4. Lagersystem ifølge krav 2 og 3, hvor hver sensorenhed (100) er entydigt tilordnet et specifikt afsnit (TB), og hvor sensorenhedens (100) længderetning forløber i retning af afsnittenes (TB) fald.

5. Lagersystem ifølge krav 3 eller 4,

hvor en sensorenhed (100) omfatter en strimmelformet fleksibel eller stiv printplade som bærer, og/eller

med en styreelektronik (16) til hver af sensorenhederne (100), hvor styreelektronikken (16) er udformet til at forbinde sensorenheden (100) med databussen (620) og til at udlæse adressen, der er tilordnet afsnittet (TB), og belægningsoplysningen (710) til databussen (620).

6. Lagersystem ifølge et af de foregående krav,

hvor mindst én optisk signaleringsanordning (690) er entydigt tilordnet hvert af afsnittene (TB), hvor den optiske signaleringsanordning (690) er forbundet med databussen (620) for via databussen (620) at modtage et signal til optisk indeksering af et afsnit (TB) og til at realisere den optiske indeksering; og/eller

hvor lagersystemet (600) er konfigureret til at lagre et lagerstatustidspunkt, og hvor der udføres en automatisk lagerstatus, når lagerstatustidspunktet nås; og/eller

hvor der i kommunikationsanordningen (630) er lagret en belægningsplan (700), i hvilken der er lagret en tilordning af varetyper til en henholdsvis flere adresser eller afsnit (TB) og en tærskelværdi for belægningsmængden af varer til i hvert enkelt tilfælde en varetype, og hvor kommunikationsanordningen (630) er konfigureret således, at der ud fra de via databussen (620) modtagne belægningsoplysninger og de respektive tilordnede adresser kan bestemmes den mængde varer, der er lagret i lagersystemet (600), for hver enkelt varetype, at den bestemte mængde varer for hver enkelt varetype kan sammenlignes med den mængdetærskelværdi, som er tilordnet denne varetype, og at der kan sendes et signal, hvis den bestemte varemængde af denne varetype falder

under den hertil tilordnede mængdetærskelværdi; og/eller

hvor der er installeret et fjernvedligeholdelsesprogrammodul (720) i kommunikationsanordningen (630), som kan adresseres via netværket og direkte kan udføre vedligeholdelsesopgaver på lagersystemet (600), hvor fjernvedligeholdelsesprogrammodulet (720) er konfigureret således, at sensorsystemet (200) aktiveres på grundlag af modtagelsen afen kommando via netværket på en sådan måde, at belægningsoplysningen (710) registreres af et afsnit (TB), der er specificeret i kommandoen via angivelse af en tilsvarende adresse, og der på grundlag af belægningsoplysningen (710) genereres et belægningsinformationssignal, som sendes via netværket; og/eller

hvor kommunikationsanordningen (630) dynamisk kan lagre belægningsoplysninger (710) om lagersystemet (600), således at belægningsoplysningerne (710) i tilfælde af systemsvigt til enhver tid kan gendannes og bruges igen, når systemet atter er tilgængeligt; og/eller

hvor kommunikationsanordningen (630) er udformet til at forbinde en computer (730) via en lokal forbindelse for at visualisere en belægningsplan (700), der er lagret i kommunikationsanordningen (630), på en brugergrænseflade i computeren (730).

7. Lagersystem ifølge et af de foregående krav, hvor kommunikationsanordningen (630) har en opsætningstilstand, hvor en belægning af lagersystemet (600), der er registreret ved hjælp af sensorsystemet (200) i opsætningstilstanden, kan lagres som belægningsplan (700), hvor belægningsplanen (700) navnlig indeholder den varetype, der er tilordnet ethvert afsnit (TB), og en belægningstærskelværdi, som er tilordnet denne varetype, og som opstår på grundlag af den af sensorsystemet (200) registrerede belægning.

8. Lagersystem ifølge krav 7,

med en håndscanner (670) til optisk registrering af en optisk læsbar kode (680), hvor hvert afsnit (TB) bærer en optisk læsbar kode (680), der angiver den respektive adresse, hvor kommunikationsanordningen (630) er konfigureret således, at tilordningen af en varetype til et eller flere af afsnittene (TB) sker ved, at kommunikationsanordningen (630) fra håndscanneren modtager en optisk registreret adresse og en varetype, der er tilordnet den optisk registrerede adresse; og/eller

hvor håndscanneren (670) er udformet trådløst og har en trådløs kommunikationsgrænseflade til kommunikation med kommunikationsanordningen (630).

9. Lagersystem ifølge et af de foregående krav, hvor sensorsystemet (200) for hvert enkelt afsnit (TB) omfatter en sensorenhed (100) i form af en fleksibel strimmelformet printplade.

10. Lagersystem ifølge krav 9,

hvor signalgiverne (21) og signalmodtagerne (22) i en sensorenhed (100) er anbragt parvist på printpladen, navnlig på den samme printplade, således at et signal, der udlæses af en af signalgiverne, kan modtages af en signalmodtager i det samme par; og/eller

hvor signalgiverne, signalmodtagerne og/eller lederbaner til forbindelse af signalgiverne og signalmodtagerne med databussen (620) er trykt på printpladen.

11. Fremgangsmåde til indretning af et lagersystem (600) ifølge et af de foregående krav med følgende trin:

- skift af kommunikationsanordningen (630) til en opsætningstilstand,
- belægning af lagersystemets (600) afsnit (TB) i henhold til en foreskrevet belægningsplan (700) med minimumsbeholdningsmængder, under hvilke der skal udløses genbestillinger,
- registrering af minimumsbeholdningsmængderne med sensorsystemet (200) og lagring i kommunikationsanordningen (630),
- komplettering af belægningen til den ønskede beholdning i lagersystemet (600).

12. Fremgangsmåde ifølge krav 11,

hvor tilordningen af en varetype til et af afsnittene (TB) sker ved hjælp af en håndscanner; og/eller

hvor håndscanneren har en trådløs kommunikationsgrænseflade til kommunikationsanordningen (630) for at overføre et tilordningssignal til tilordning af varetypen til et af afsnittene (TB) til kommunikationsanordningen (630).

13. Fremgangsmåde til drift af et lagersystem (600) ifølge et af kravene 1 til 10, med følgende trin:

- registrering af belægningsoplysningen (710) for mindst ét af afsnittene (TB), hvor afsnittene hver især danner et delområde (TB) inden for et overvågningsrum (R),
- sammenligning af den registrerede belægningsoplysning (710) med en lagret

belægningsplan ved hjælp af kommunikationsanordningen (630),

- generering af et fejlbelægningssignal ved hjælp af kommunikationsanordningen (630), hvis kommunikationsanordningen (630) registrerer en uoverensstemmelse mellem den registrerede belægningsoplysning (710) og belægningsplanen, og afsendelse af fejlbelægningssignalet via databussen (620) til adressen på den sensorenhed (100), hvorfra belægningsoplysningen (710) er blevet registreret.

14. Fremgangsmåde ifølge krav 13, hvor optiske signaleringsanordninger (690) er forbundet med databussen (620) via sensorenheden (100), og hvor sensorenhedens elektroniske styring, som modtager fejlbelægningssignalet fra kommunikationsanordningen (630) via databussen (620), aktiverer den optiske signaleringsanordning (690) i den pågældende sensorenhed (100) til udlæsning af fejlbelægningssignalet.

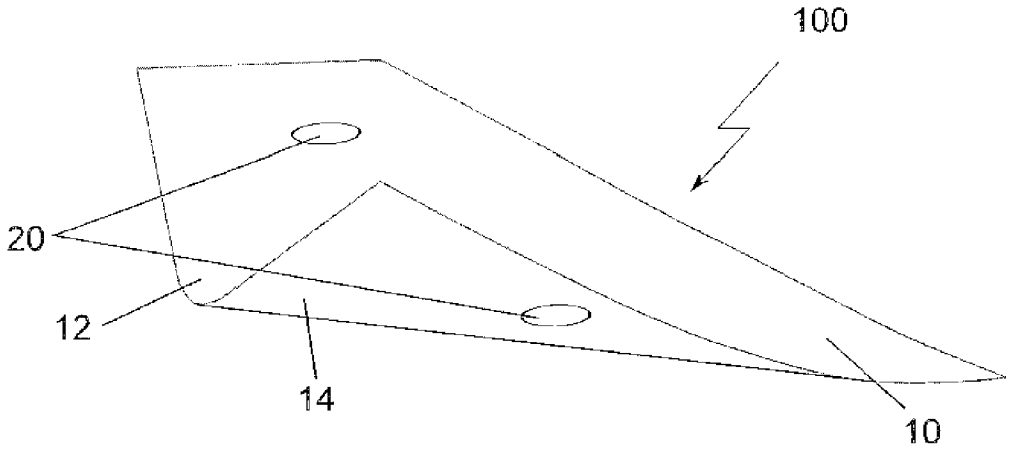


Fig. 1

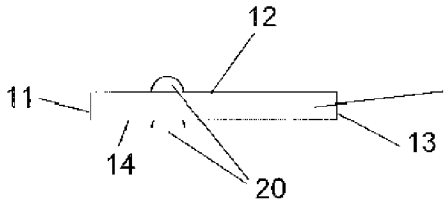


Fig. 2 a

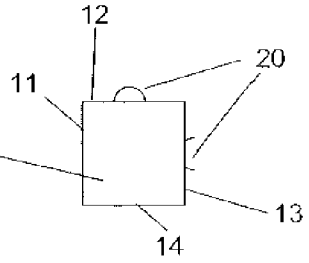


Fig 2 b

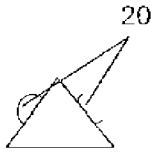


Fig 2 c

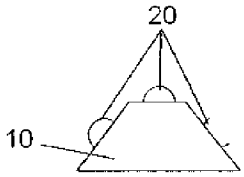


Fig. 2 d

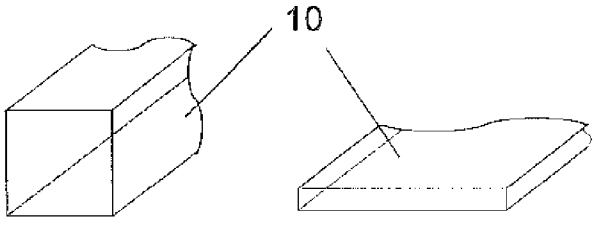


Fig. 3 a

Fig. 3 b

Fig. 3 c

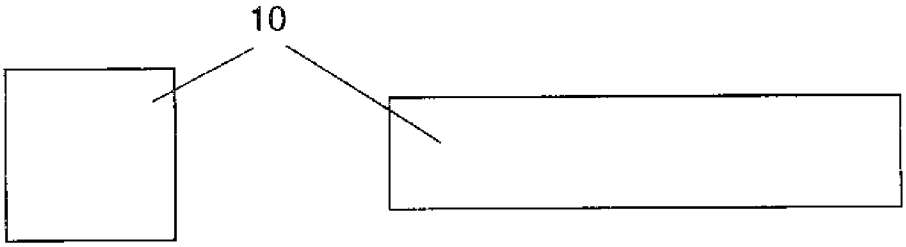


Fig. 4a

Fig. 4b

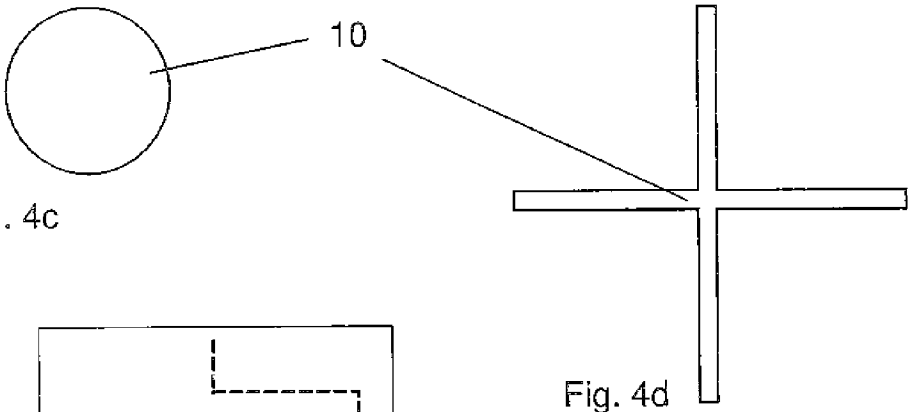
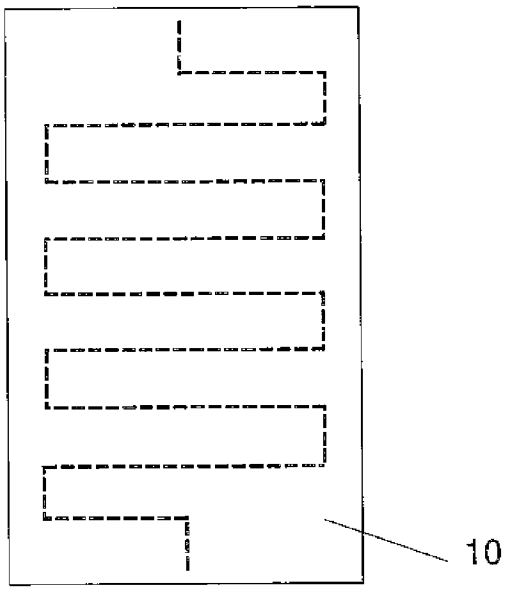


Fig. 4c

Fig. 4d



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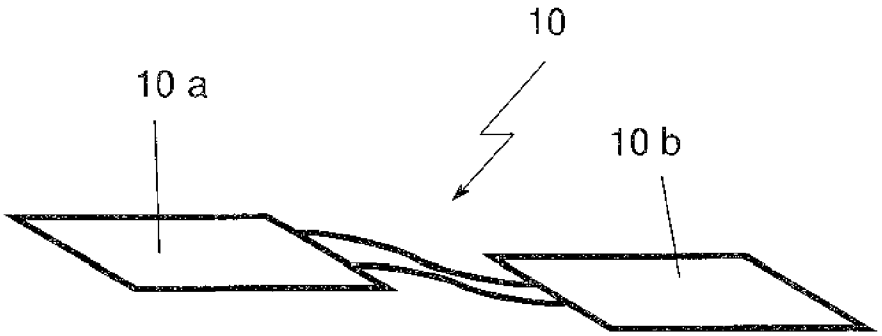


Fig. 5

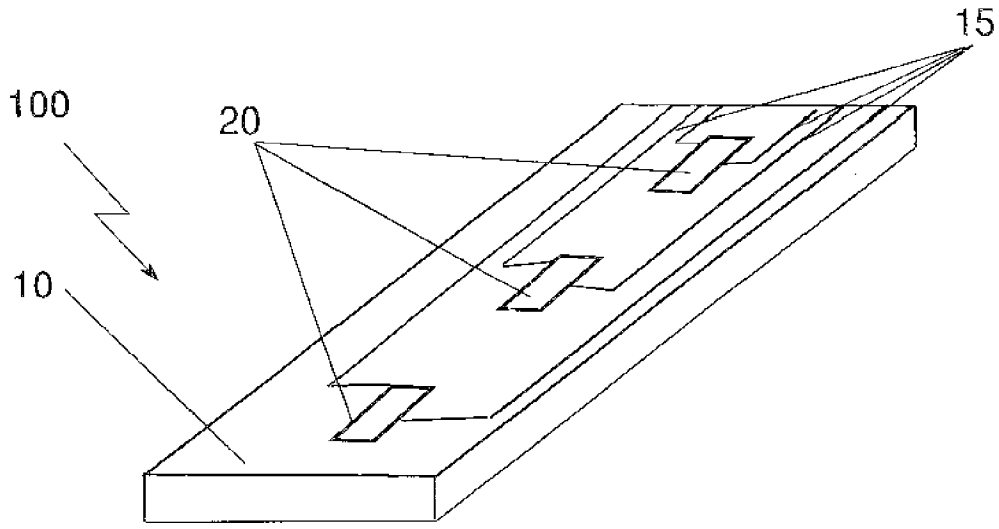
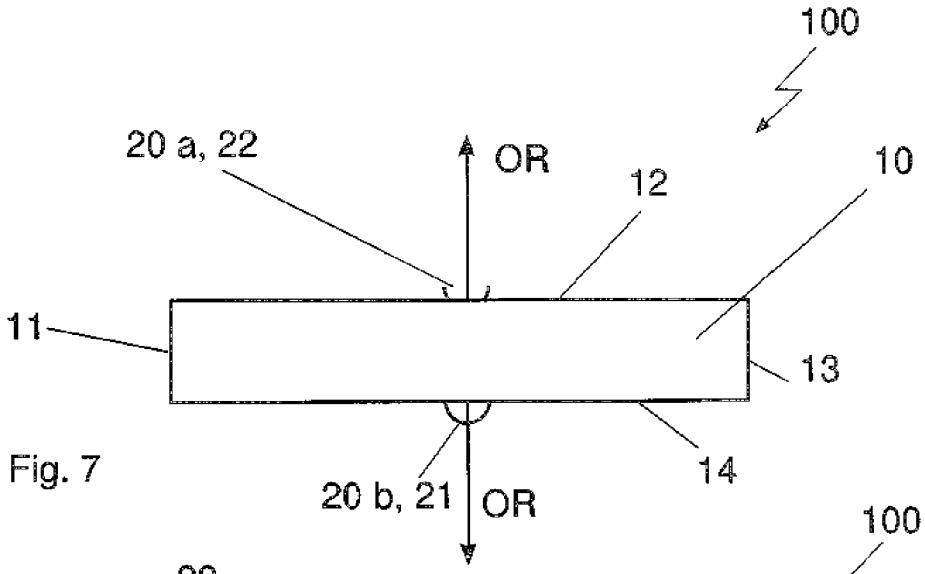


Fig. 6



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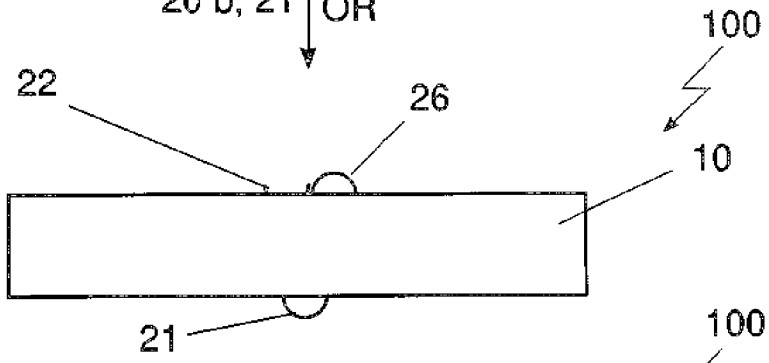


Fig. 8

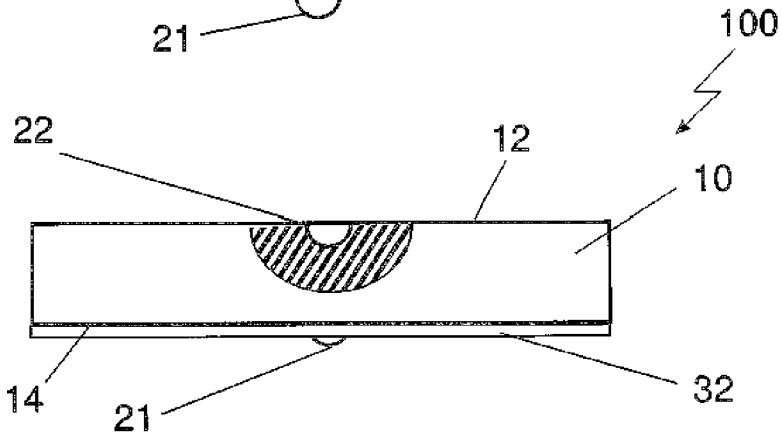
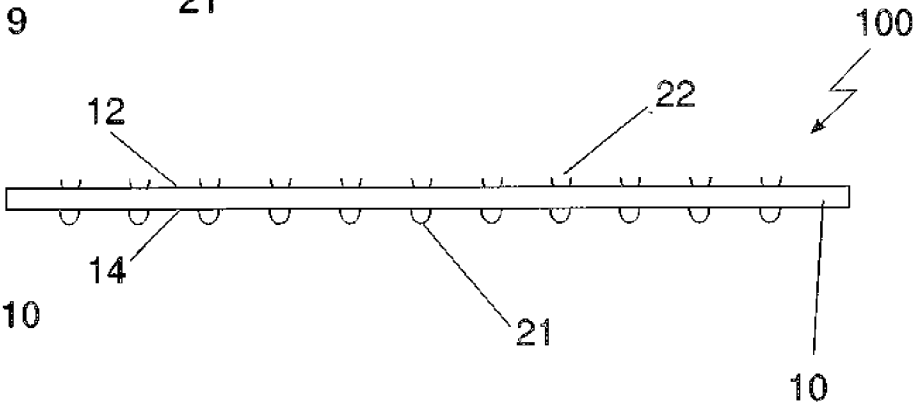


Fig. 9



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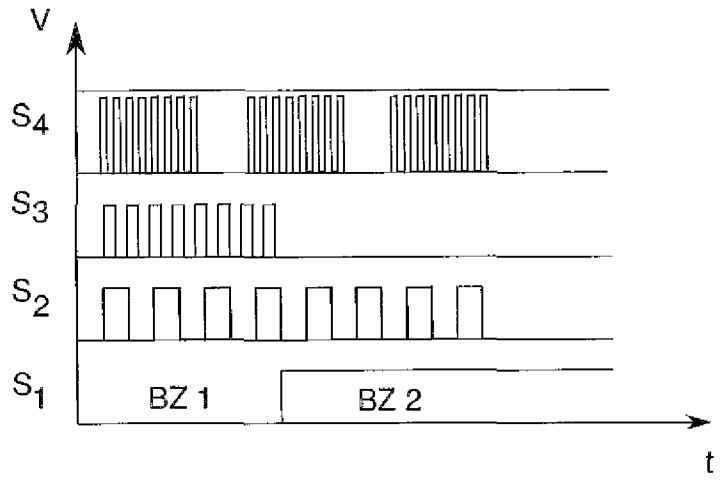


Fig. 11

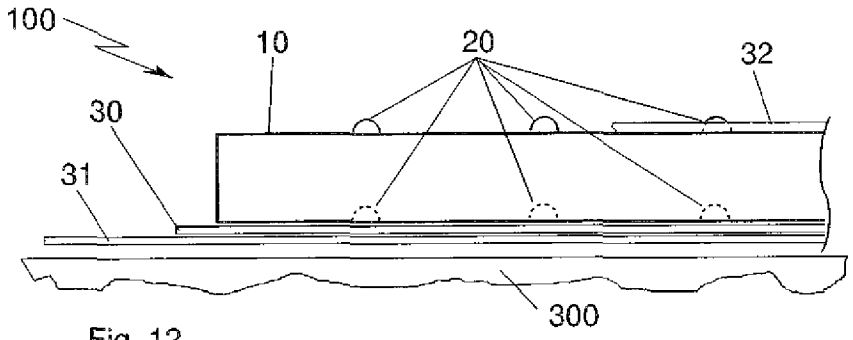


Fig. 12

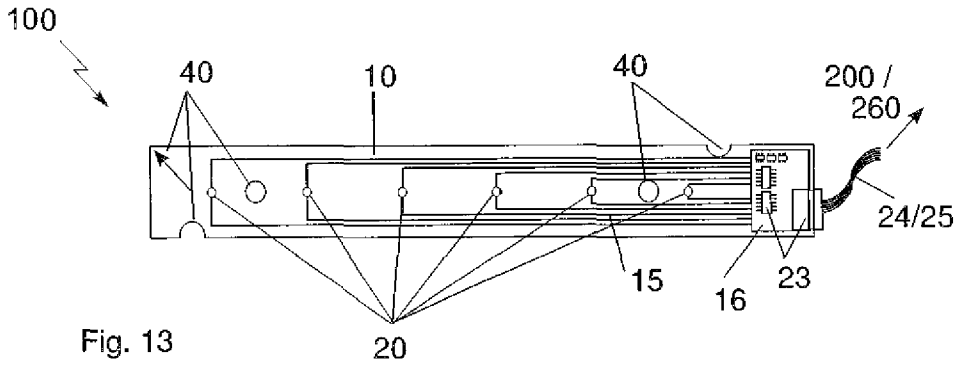


Fig. 13

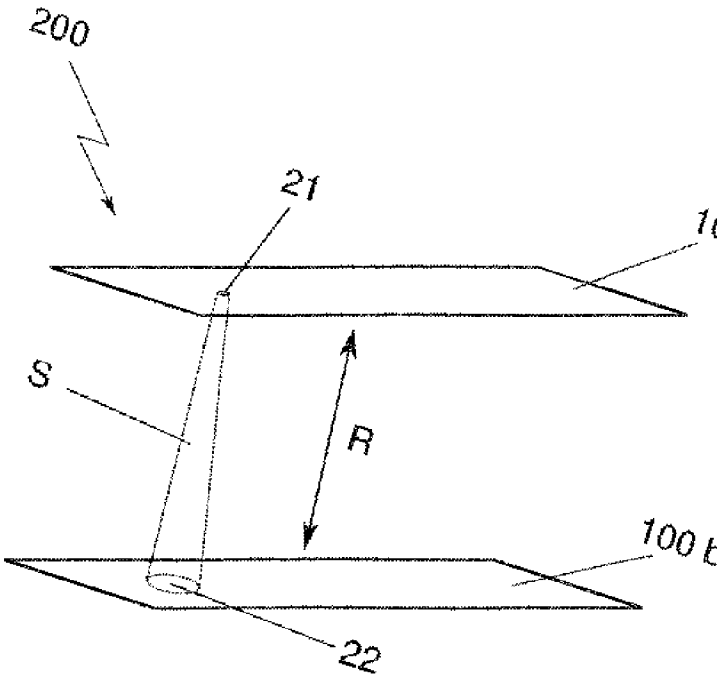


Fig. 14 a

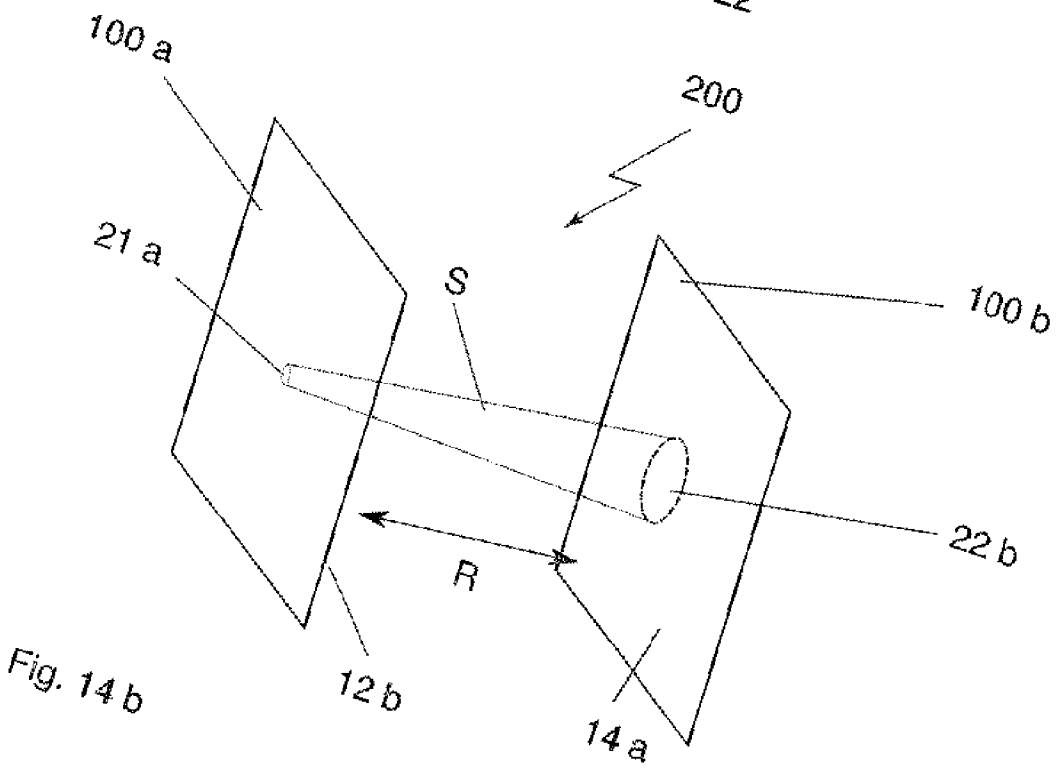


Fig. 14 b

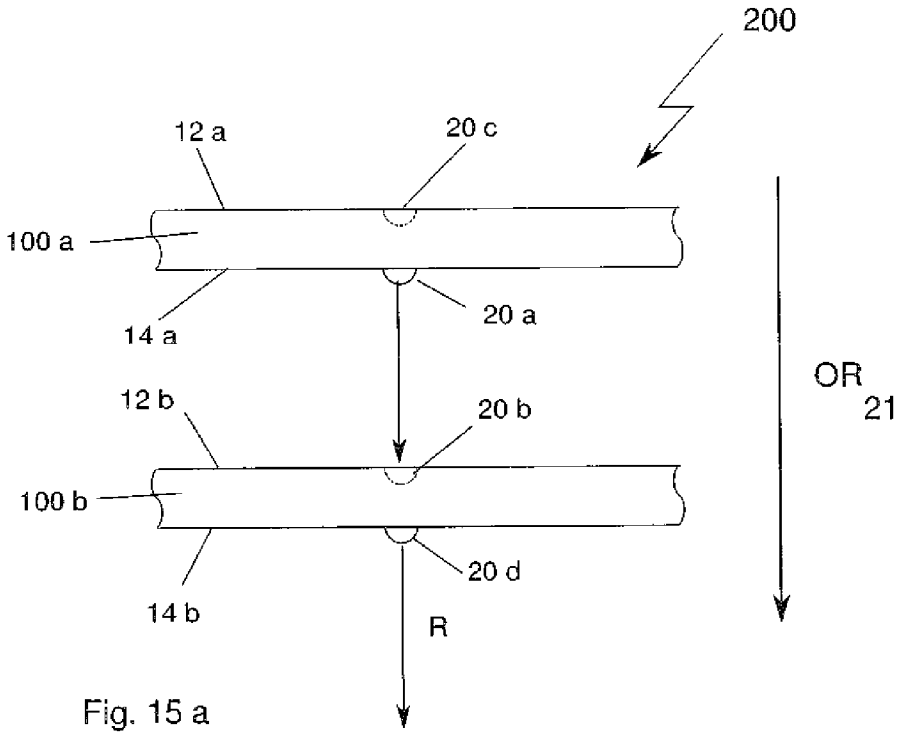


Fig. 15 a

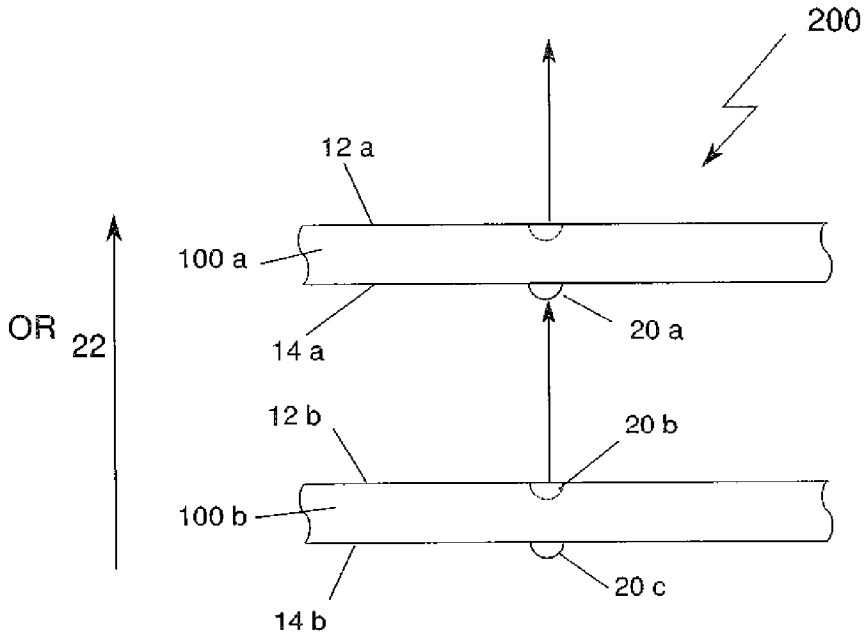
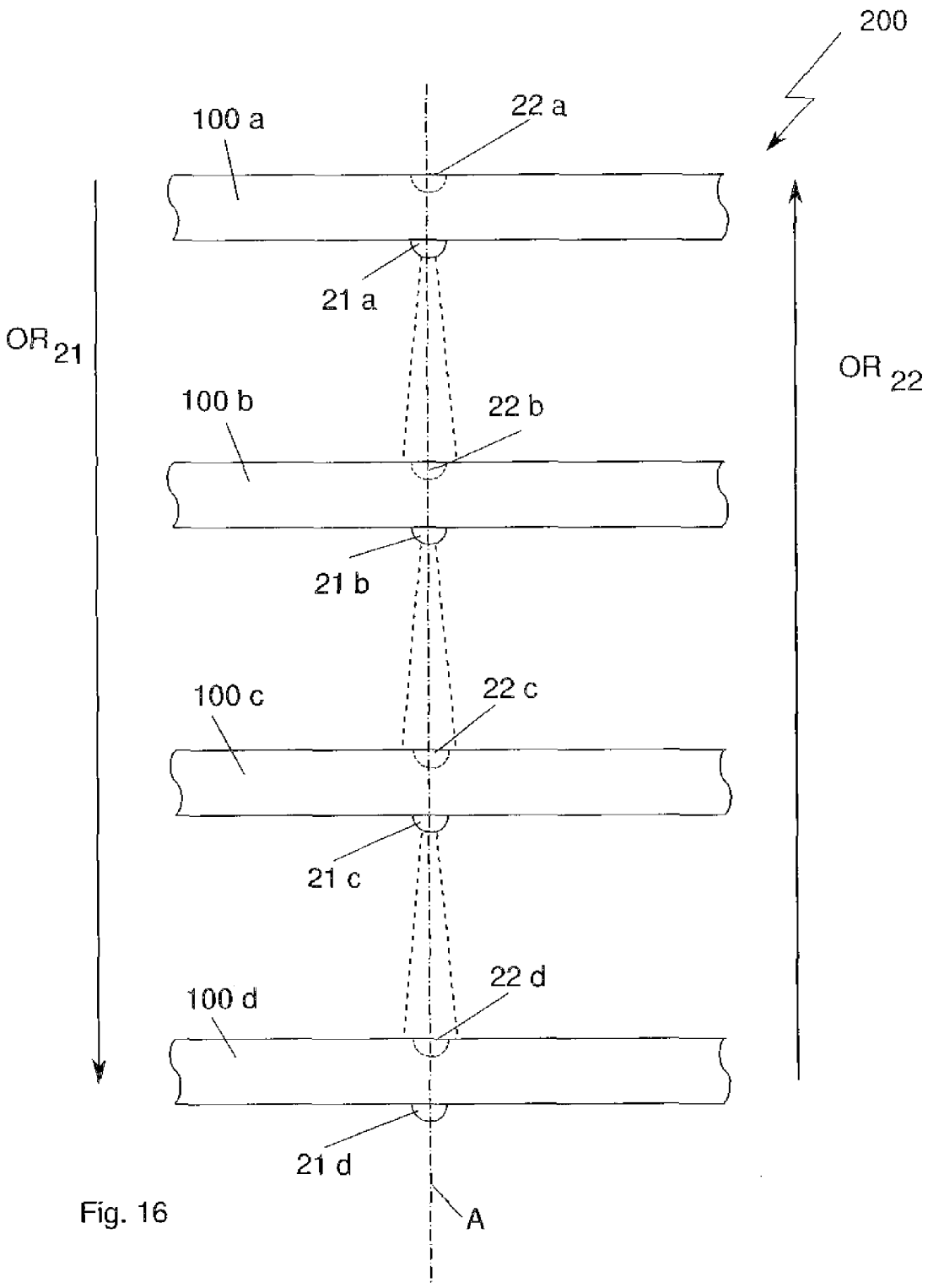


Fig. 15 b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OR 21
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A

Fig. 16

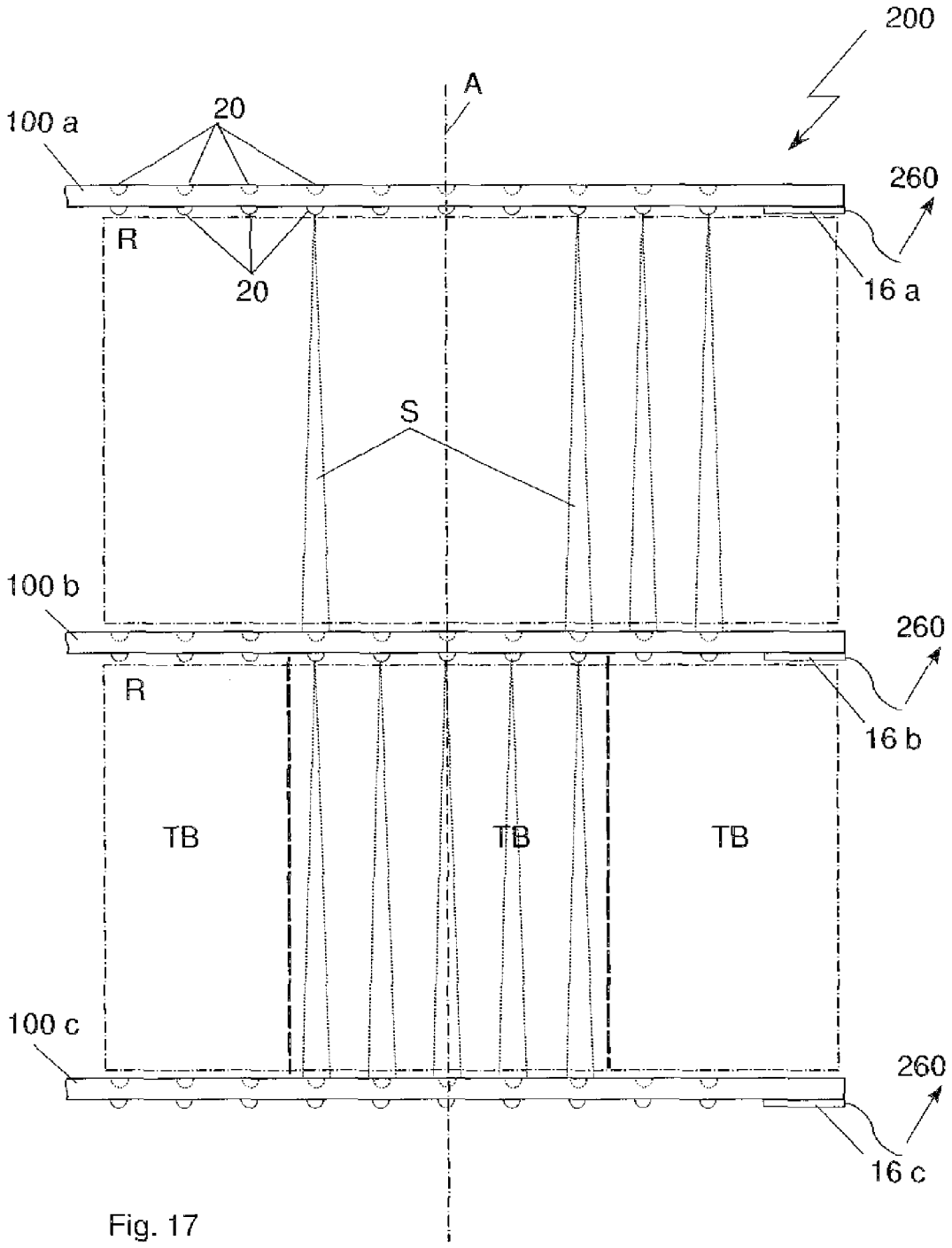
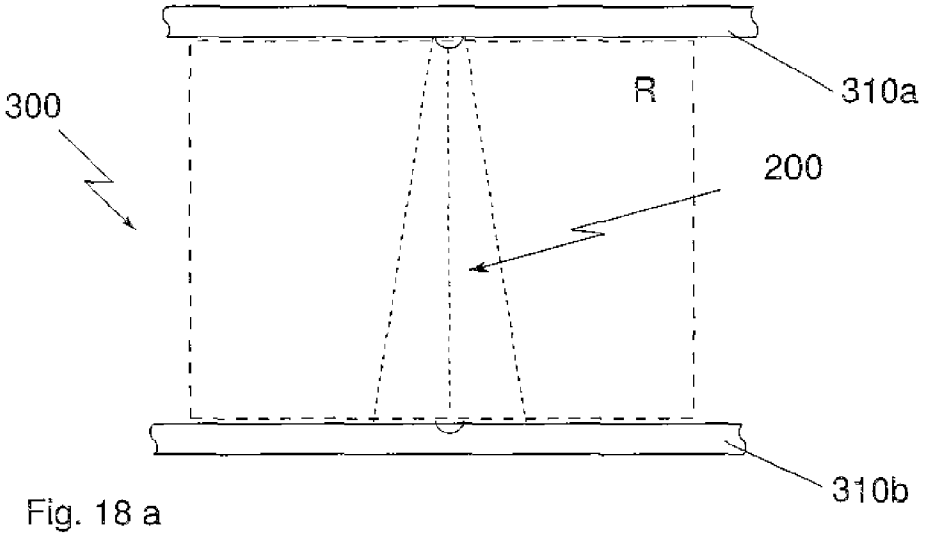


Fig. 17



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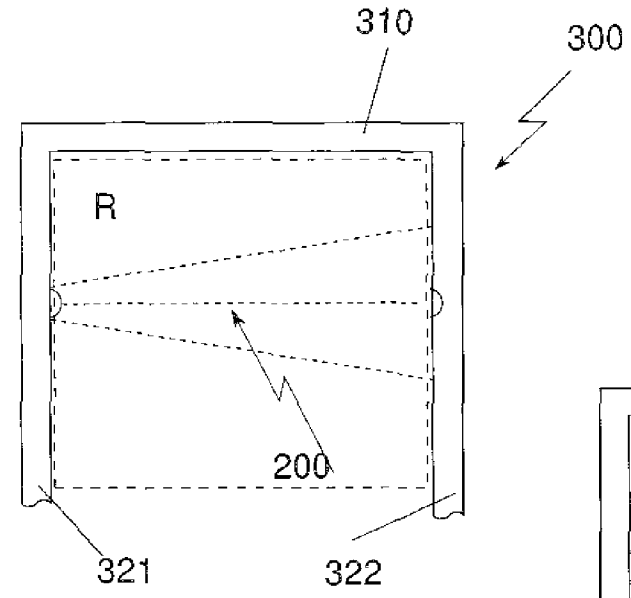


Fig. 18 b

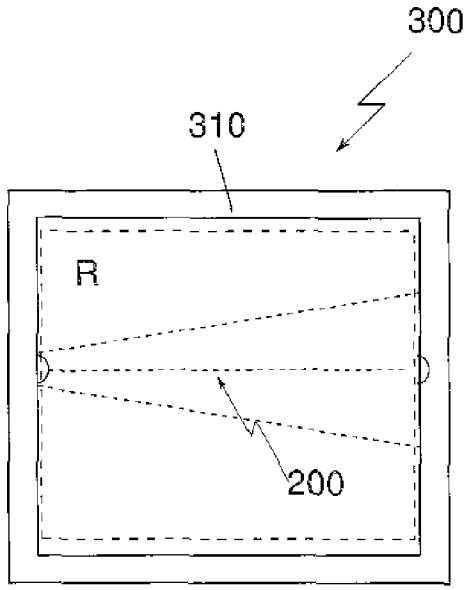


Fig. 18 c

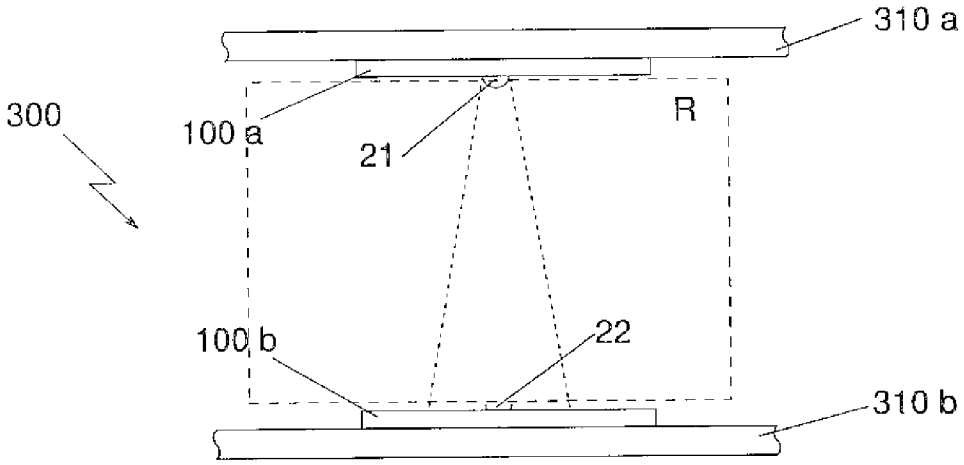


Fig. 19 a

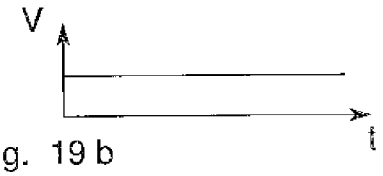


Fig. 19 b

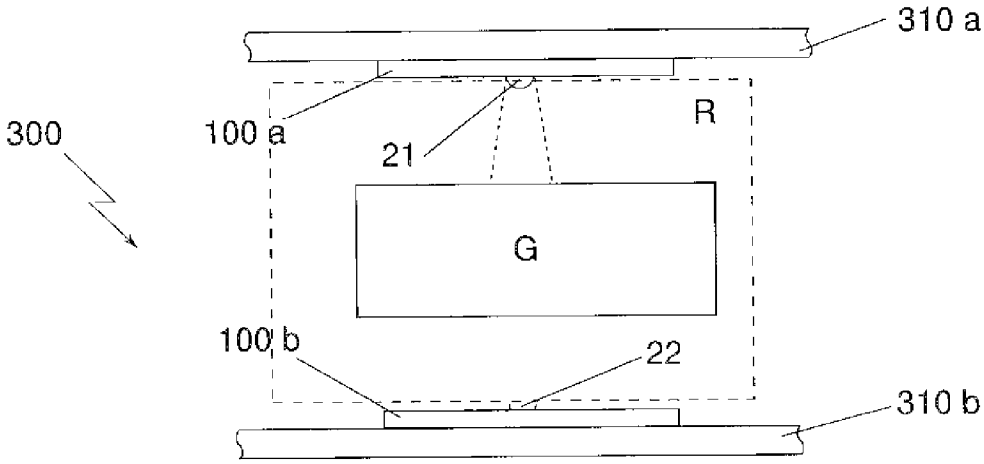


Fig. 19 c

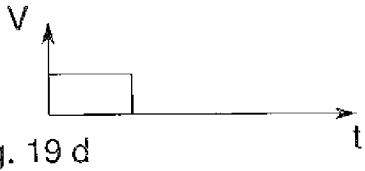


Fig. 19 d

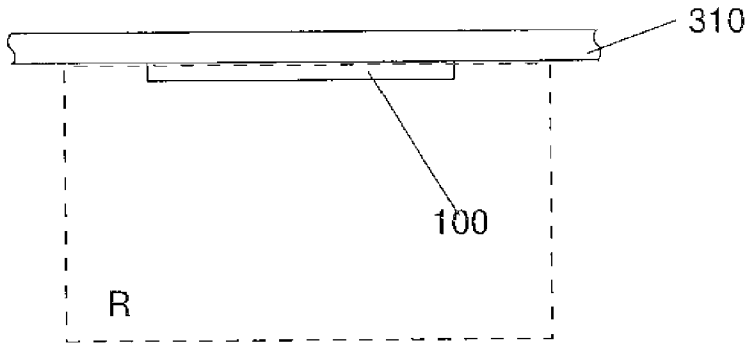


Fig.20 a

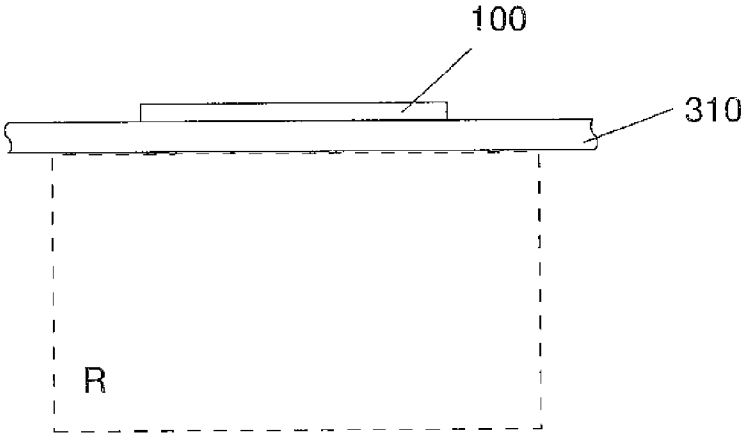


Fig. 20 b

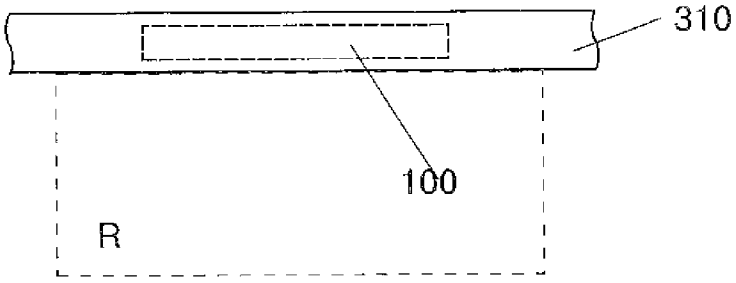
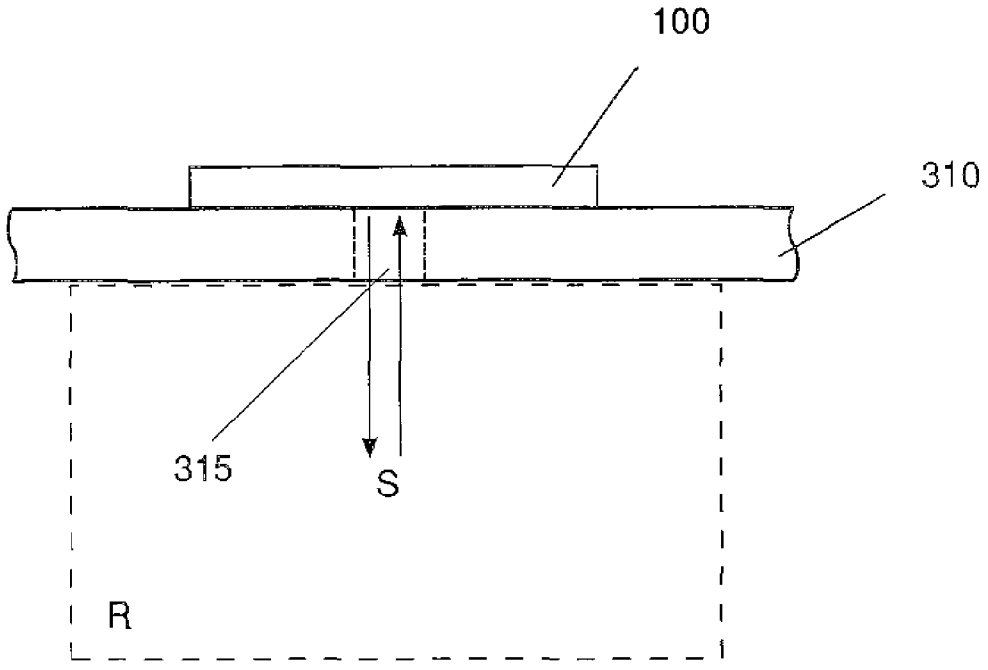


Fig. 20 c



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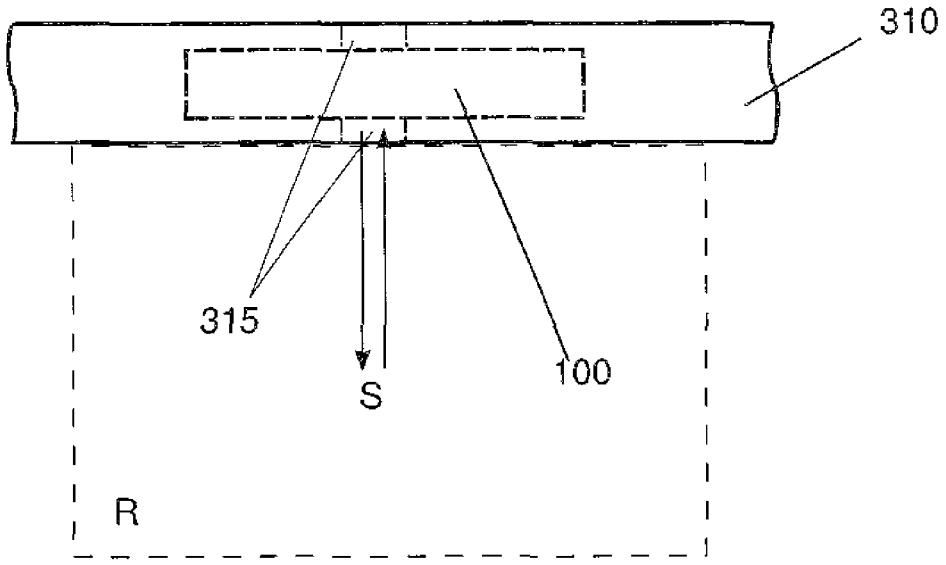


Fig. 21 b

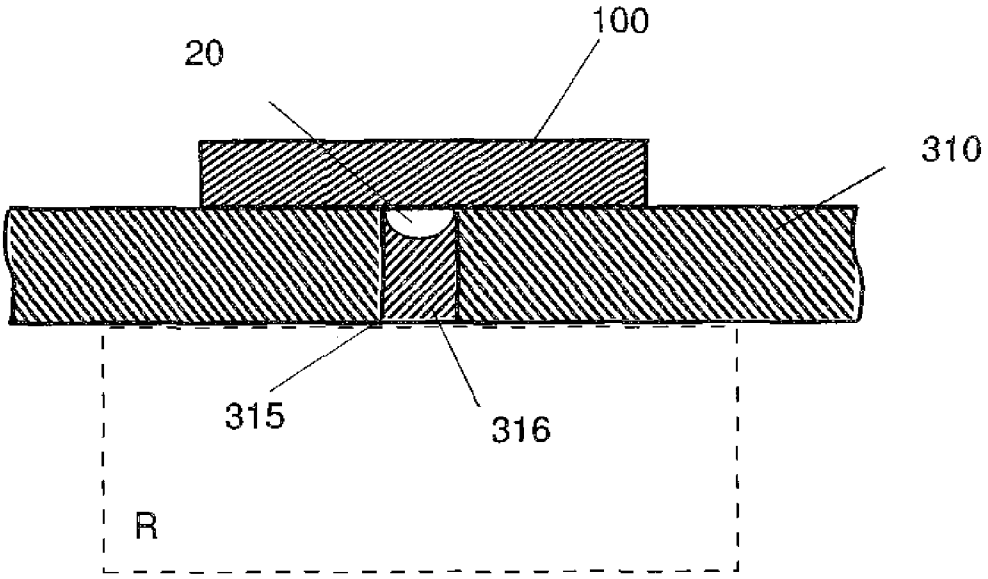


Fig. 22 a

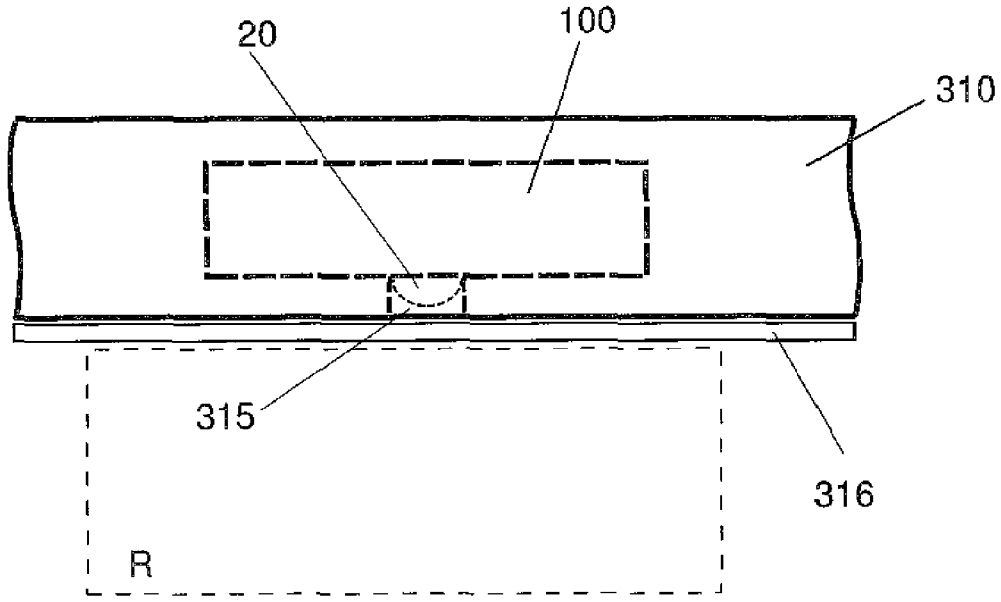


Fig. 22 b

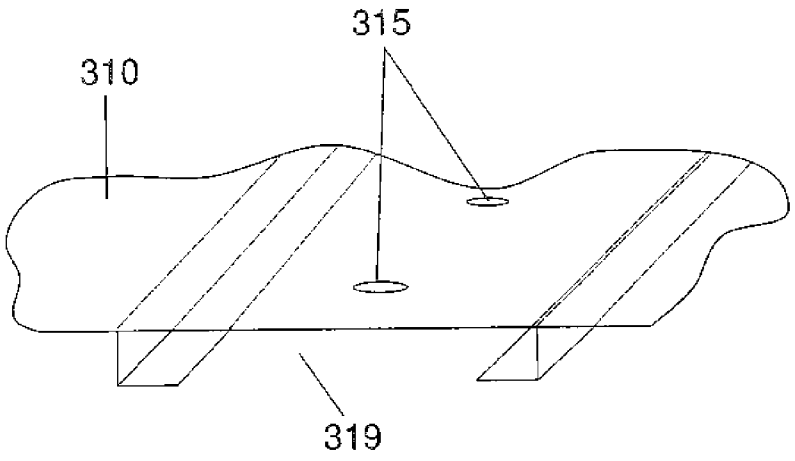


Fig. 23 a

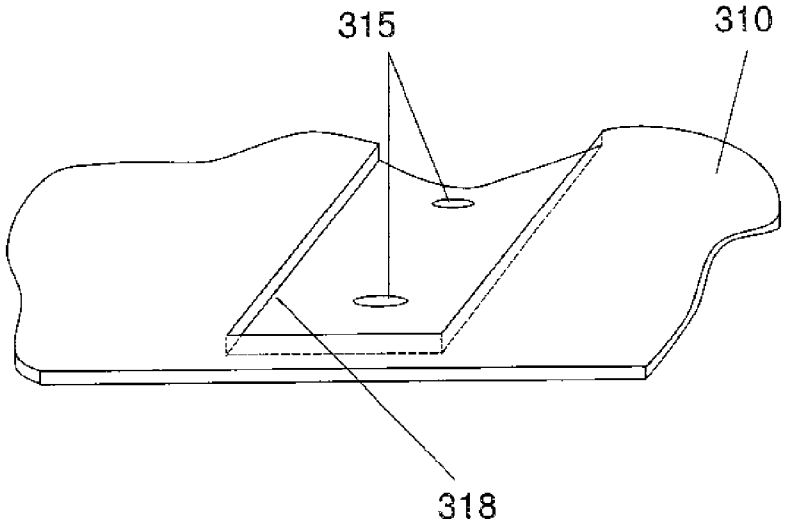
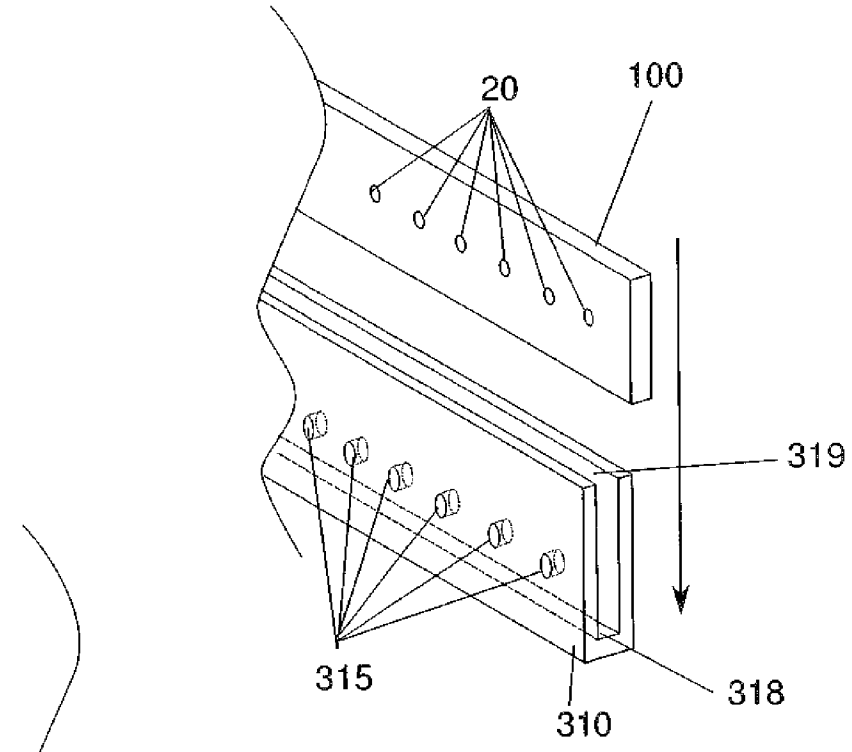


Fig. 23 b



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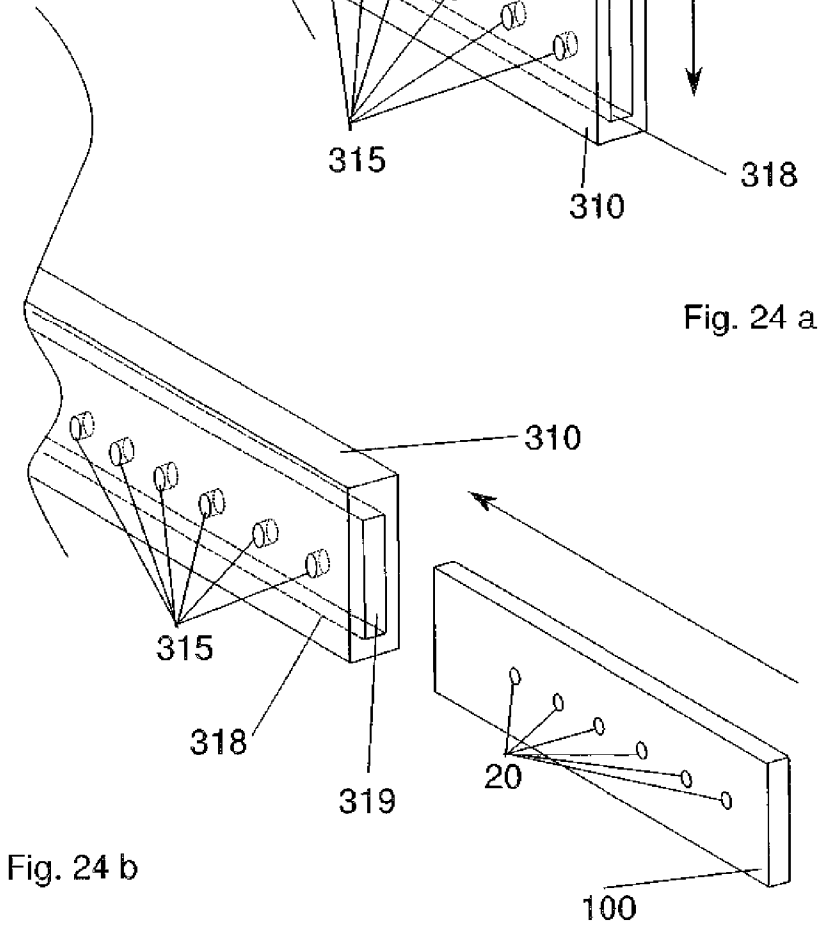

Fig. 24 b

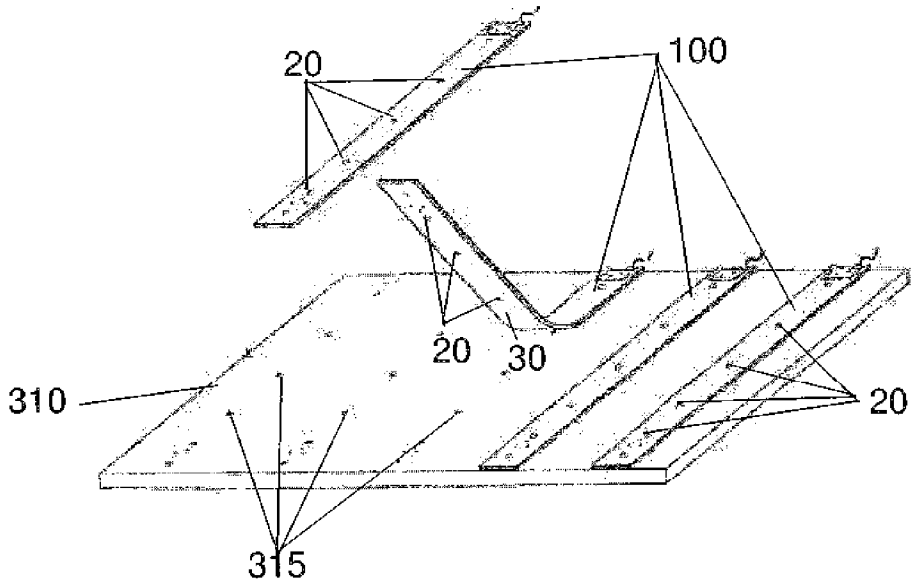

Fig. 25

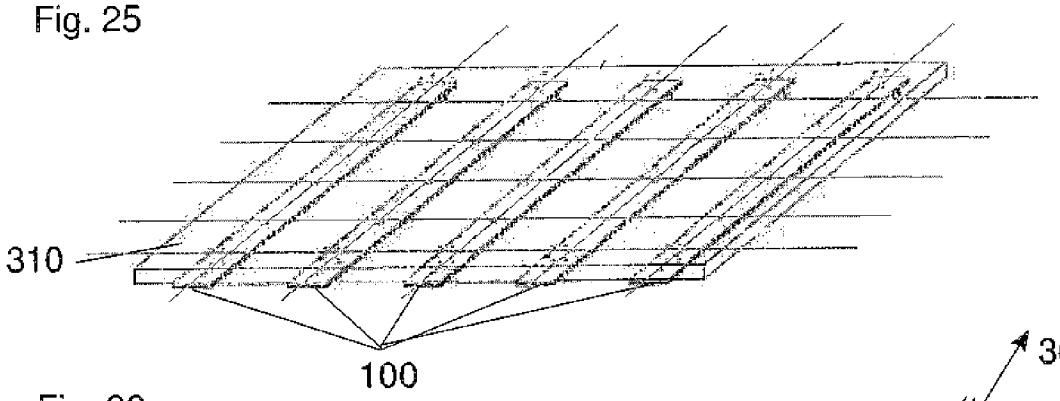

Fig. 26

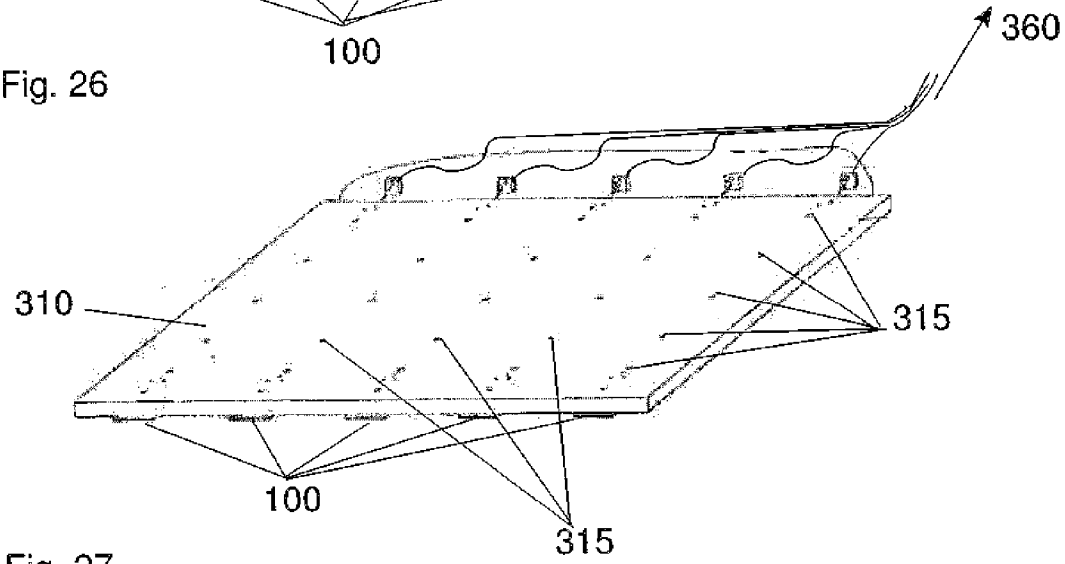

Fig. 27

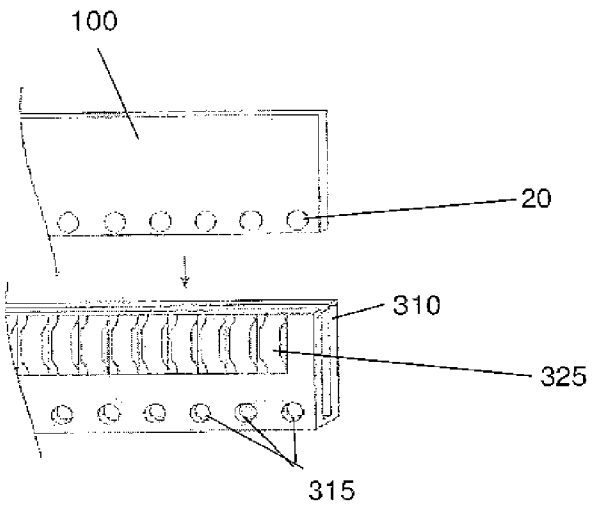

Fig. 28 a

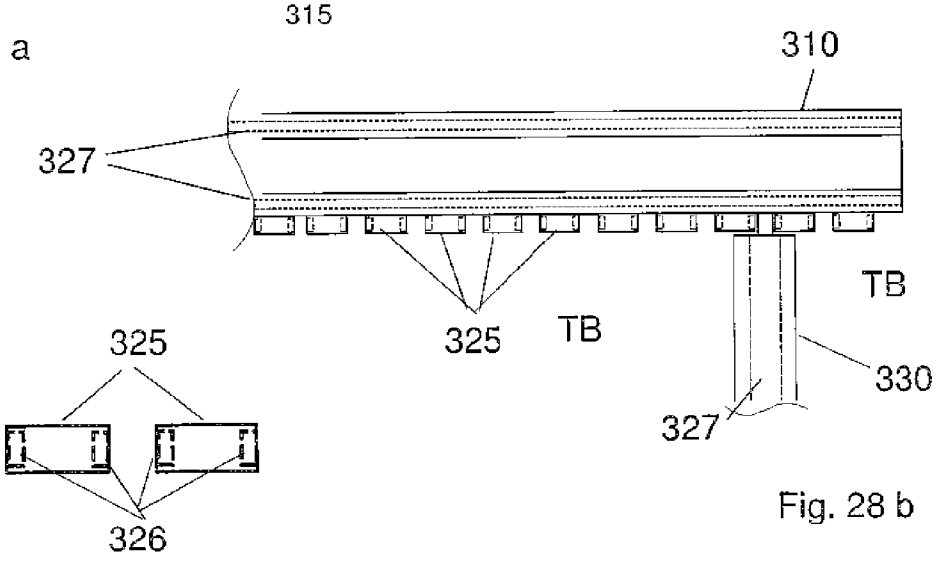

Fig. 28 b

Fig. 28 c

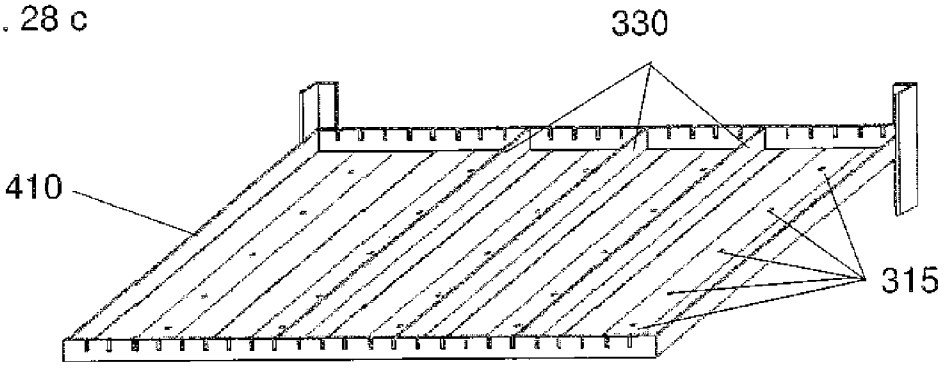

Fig. 29

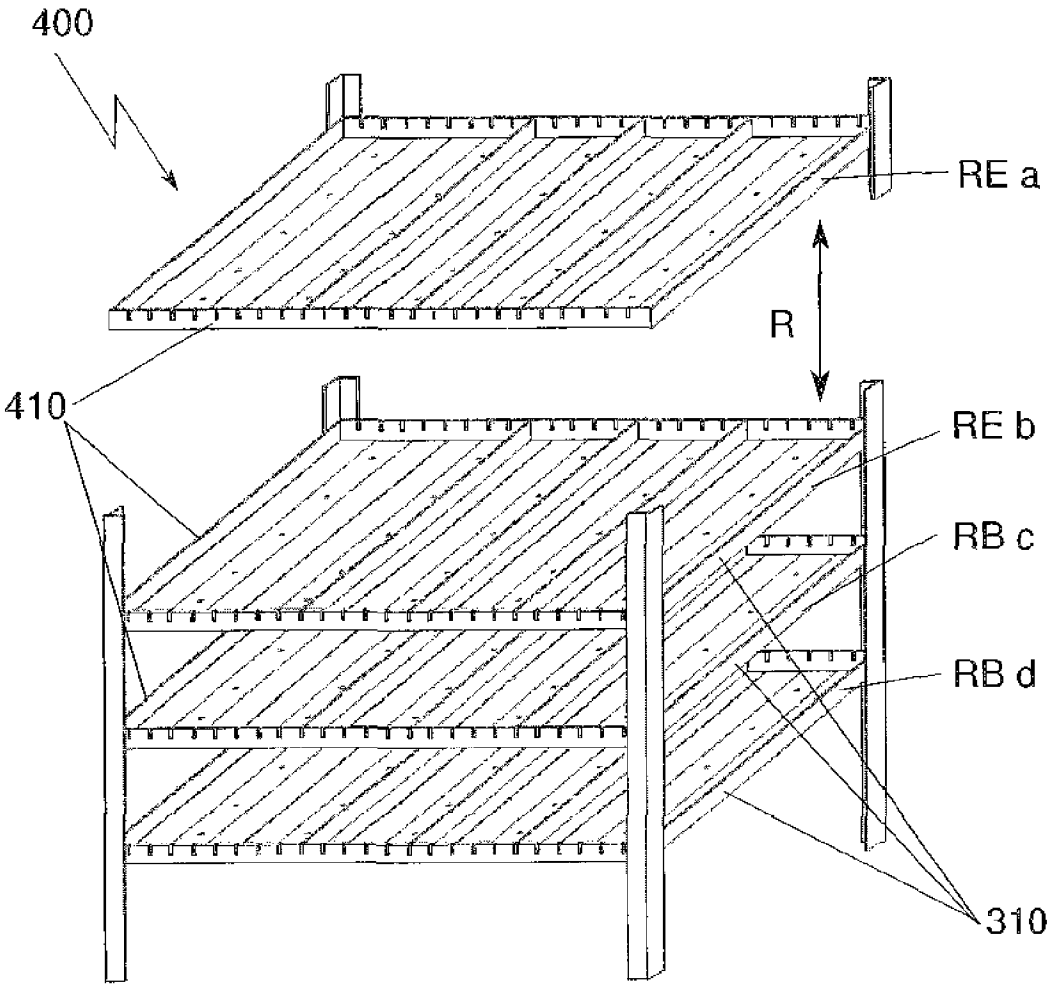

Fig. 30

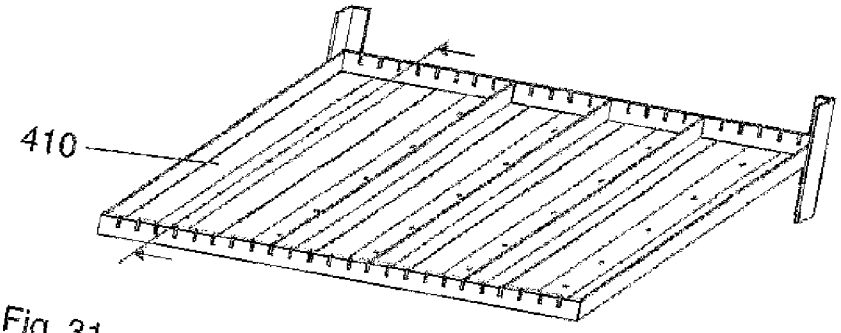

Fig. 31 a

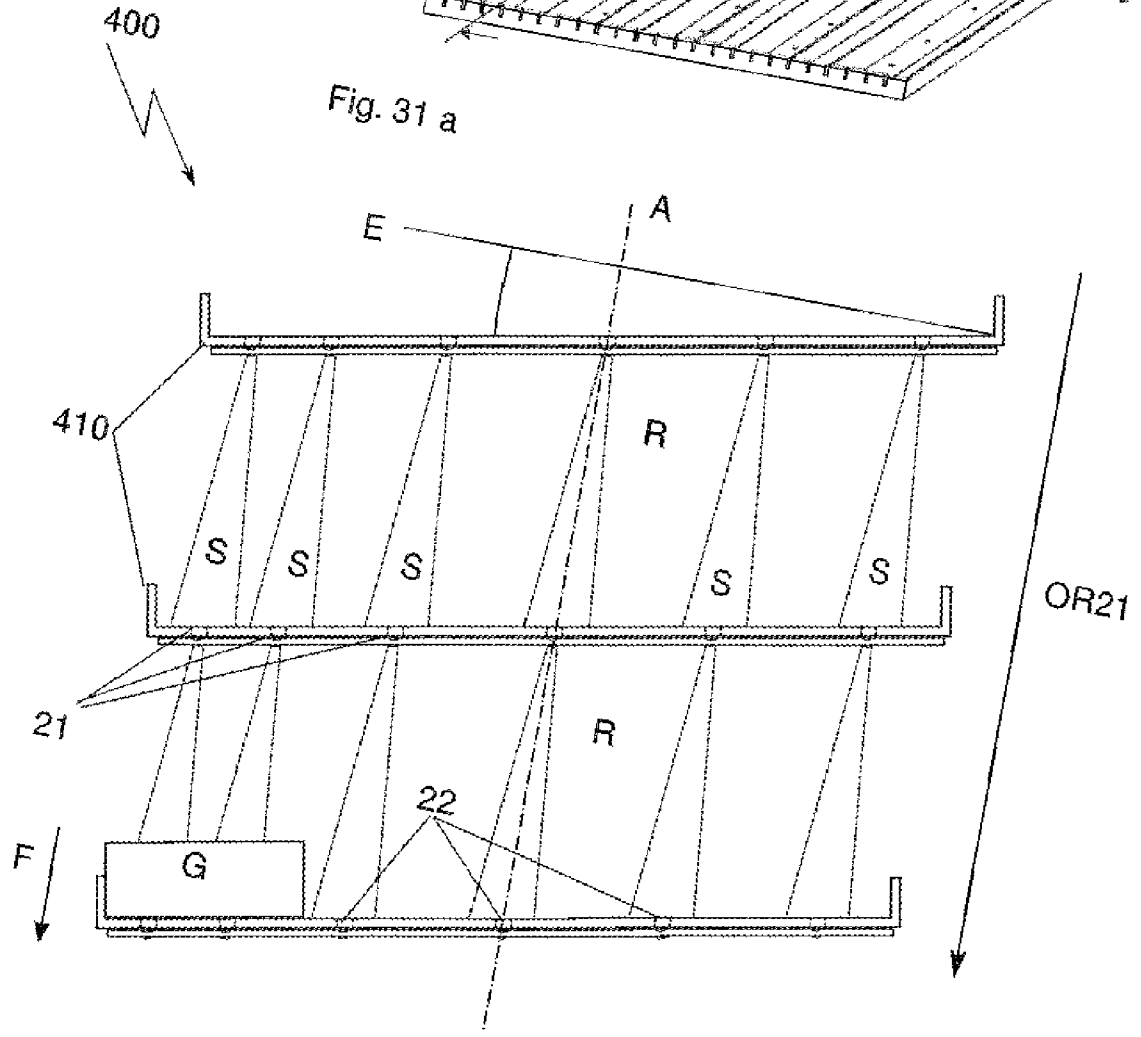

Fig. 31 b

Fig. 32

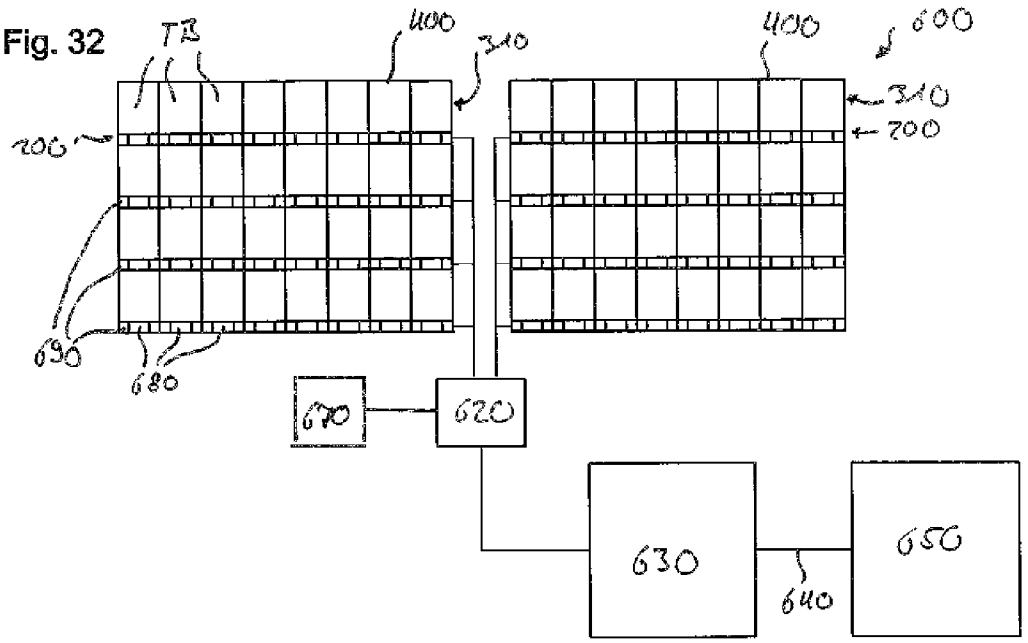
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Fig. 33

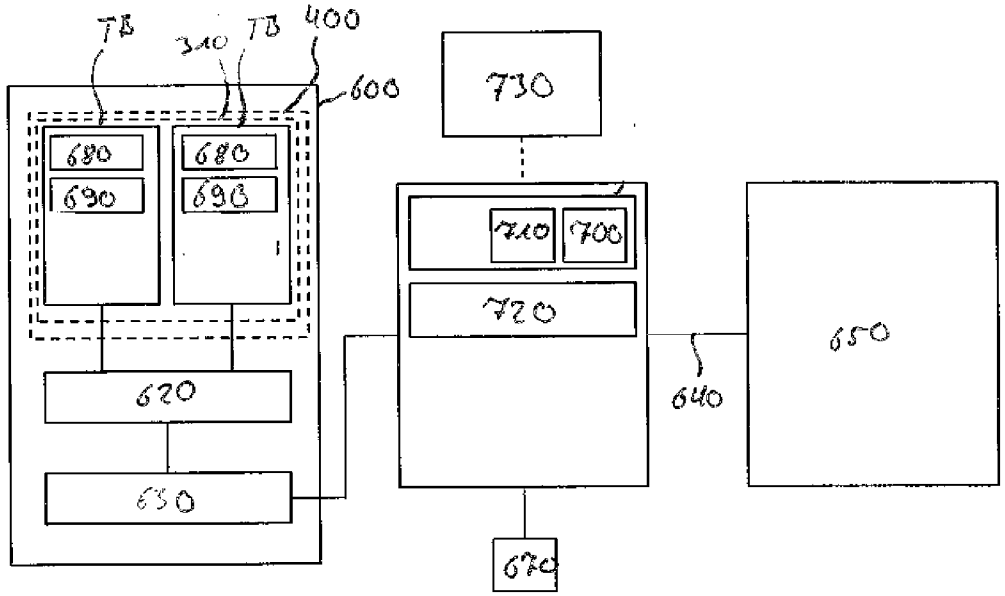
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Fig. 34

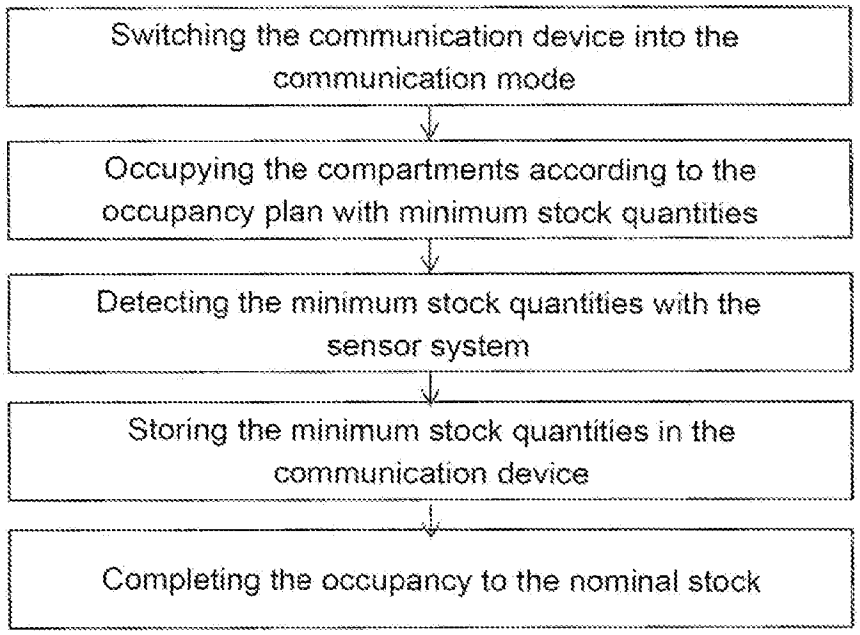
Switching the communication device into the communication mode
Occupying the compartments according to the occupancy plan with minimum stock quantities
Detecting the minimum stock quantities with the sensor system
Storing the minimum stock quantities in the communication device
Completing the occupancy to the nominal stock

Fig. 35

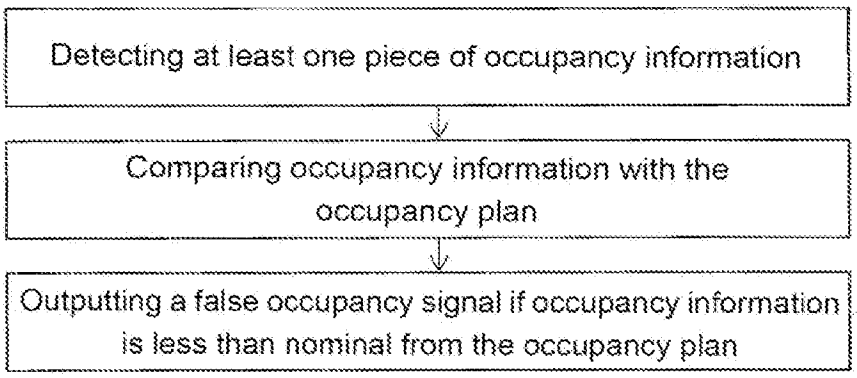
Detecting at least one piece of occupancy information
Comparing occupancy information with the occupancy plan
Outputting a false occupancy signal if occupancy information is less than nominal from the occupancy plan

Fig. 8a