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(54) **CARDBOARD DISPENSING APPARATUS**

(57) A cardboard dispensing apparatus (11) for providing cardboards (13) at a food product supply area comprises a cardboard store (23) for storing cardboards that form a cardboard stack (24), a cardboard buffer storage (29) for storing a plurality of cardboards (25), and a cardboard conveyor (31) for conveying the cardboards from the cardboard buffer storage to the food product supply

area. A cardboard extracting device (27) is configured to extract cardboards from the cardboard store and move the cardboards into the cardboard buffer storage, while the cardboard conveyor is configured to remove the cardboards from the cardboard buffer storage and convey them to the food product supply area.

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Description

[0001] The invention relates to a cardboard dispensing apparatus for providing cardboards for use as a food product bottom support or as a food product packaging element at a food product supply area where food products are provided by a conveying apparatus, in particular meat products or bacons, preferably slices of food products cut off by a slicing apparatus located upstream of the food product supply area.

[0002] In the processing of food products and in particular meat products like bacons, comparably large products may be cut into portions and conveyed to a packaging machine where the portions may be packaged to be offered to the consumer. In order to generate the portions, a slicing apparatus may be used to cut off slices from the food products and form portions comprising several slices. The portions may then be conveyed to the packaging machine, such that several slices of the food products may be packaged and sold as a portion. Further, portions containing only a single slice may be generated or food products may be cut into several pieces to convey the pieces as portions comprising one or more pieces to a packaging machine.

[0003] In general, a processing line comprising a slicing apparatus and a packaging machine offers to completely process the initial food products and, after the processing, provide packages including portions that may for example be transported to a supermarket to be sold to the consumer. In addition to these processing steps, a cardboard dispensing apparatus may be used in such a food processing line to provide cardboards, e.g. as a bottom support for the food products or the portions before the food products are packaged. For example, a cardboard may be positioned underneath a portion and packaged with the portion, such that the consumer may take out the portion of the package and present the portion on the cardboard for consumption. Further, cardboards may be used as packaging elements and packaged together with a food product or a portion of a food product to, e.g., provide information printed on the cardboards to the consumer.

[0004] However, since high throughputs and high efficiencies are aimed at in the automatic processing of food products, the cardboards need to be provided at a high rate at the food product supply area. Further, a reliable and controllable provision of cardboards in the food product supply area is required to avoid interruptions of the processing, in particular the provision of exactly one cardboard for a food product or portion conveyed to the food product supply area at the time the food product arrives at the food product supply area.

[0005] In principal, a cardboard dispensing apparatus might be constructed with a robot to draw the cardboards from a cardboard stack using a picker arm of the robot, e.g. by gripping the cardboards using vacuum techniques, and to position the cardboards in the food product supply area through a movement of the picker arm. While

this approach facilitates a comparably well controlled provision of cardboards at the food product supply area, the construction of a cardboard dispensing apparatus including a robot is rather expensive and, since the cardboards must be drawn and moved to the food product supply area through a movement of the picker arm, the cardboards may only be moved to the food product supply area at a comparably slow rate. Alternatively, the cardboards may be provided as a cardboard stack and an endlessly circulating belt positioned above the cardboard stack may be used to successively move the cardboards into the food product supply area using the friction between the belt and the uppermost cardboard. While this approach facilitates high rates and may be realized less expensively, it is usually accompanied by a larger amount of errors, e.g. the extraction of more than one cardboard from the cardboard stack due to a friction between the uppermost cardboard and the subsequent cardboard. Further, the varying height of the cardboard stack may affect the conditions under which the cardboards are drawn, such that it may be difficult to ensure a stable operation as the cardboard stack continuously decreases.

[0006] An object of the invention is, thus, to provide a cost-effective cardboard dispensing apparatus that facilitates a reliable and controllable provision of cardboards at a food product supply area while being operable at high rates.

[0007] This problem is solved by a cardboard dispensing apparatus having the features of claim 1.

[0008] The cardboard dispensing apparatus comprises a cardboard store for storing cardboards that form a cardboard stack in the cardboard store, a cardboard extracting device for extracting cardboards from the cardboard store, a cardboard buffer storage for storing a plurality of cardboards, and a cardboard conveyor for conveying the cardboards from the cardboard buffer storage to the food product supply area. The cardboard extracting device is configured to extract cardboards from the cardboard store and move the cardboards into the cardboard buffer storage, while the cardboard conveyor is configured to remove the cardboards from the cardboard buffer storage and convey the cardboards to the food product supply area. In particular, the cardboard conveyor may be configured to successively remove the cardboards from the cardboard buffer storage and successively convey the cardboards to the food product supply area.

[0009] The cardboard buffer storage may in particular be located between the cardboard store and the food product supply area. The cardboard store may form an initial store in which cardboards to be provided at the food product supply are stored in a cardboard stack, such that the cardboards may be successively drawn from the cardboard stack during operation. However, the cardboards are not moved into the food product supply area immediately from the cardboard stack, but the cardboards are firstly moved into the cardboard buffer storage by the cardboard extracting device. The cardboard buffer

storage may, thus, form an intermediate storage into which the cardboards taken from the cardboard stack are filled before being conveyed to the food product supply area by the cardboard conveyor.

[0010] By providing such a cardboard buffer storage, the cardboards may be drawn from the cardboard buffer storage in which only the plurality of cardboards rather than the entire cardboard stack is stored. Since the plurality of cardboards stored in the cardboard buffer storage may, in particular at the beginning of operation, be less than the cardboards stored in the cardboard store, the handling of the cardboards and the conveying to the food product supply area may be simplified compared to the immediate drawing from the cardboard stack. Thus, less sophisticated and less expensive configurations may be used for the cardboard conveyor while being able to achieve a stable operation and reliable provision of cardboards.

[0011] Further, while the cardboard stack and the number of cardboards stored in the cardboard store will constantly decrease during operation as the cardboards are moved to the food product supply area, the cardboard buffer storage may in particular be refilled during operation to keep the plurality of cardboards stored in the cardboard buffer storage at a constant number or in a predetermined or settable range. The conditions under which the cardboard conveyor interacts with the cardboards in the cardboard buffer storage may thus be kept comparably constant, in particular constant, and/or independent of the number of cardboards stored in the cardboard store or the height of the cardboard stack. In particular this decoupling of the number of cardboards stored in the cardboard store and the conveying of the cardboards to the food product supply area enables a simple construction of the cardboard conveyor and, e.g., the use of an endlessly circulating belt to convey an uppermost cardboard stored in the cardboard buffer storage through the friction between the belt and the cardboard. The inclusion of an intermediate cardboard buffer storage, thus, enables to keep the conditions under which cardboards are moved into the food product supply area constant or in a constant range, such that cost-effective cardboard conveyors that are operable at high rates may be used while reliably providing the required amount of cardboards at the food product supply area with a precise timing.

[0012] For example, the cardboard extracting device may be configured to successively extract cardboards from the cardboard store and move the cardboards into the cardboard buffer storage. Before the start of operation, the cardboard extracting device, may, in such a configuration, successively move the plurality of cardboards into the cardboard buffer storage. During operation, the cardboard extracting device may, in particular, move a subsequent cardboard from the cardboard store into the cardboard buffer storage after a cardboard has been conveyed to the food product supply area by the cardboard conveyor, such that, when the next cardboard is conveyed from the cardboard buffer storage to the food prod-

uct supply area, the cardboard conveyor acts on the same number of cardboards in the cardboard buffer storage. Thus, conditions for conveying the cardboards to the food product supply area and the number of cardboards stored in the cardboard buffer storage may be kept constant during operation. As an alternative to restoring the number of cardboards stored in the cardboard buffer storage after each cardboard that has been conveyed to the food product supply area, a predetermined number of cardboards may be moved from the cardboard buffer storage to the food product supply area and only after that, the cardboard extracting device may refill the cardboard buffer storage, thus keeping the number of cardboards stored in the cardboard buffer storage in a predetermined range.

[0013] Further, the cardboard extracting device may be configured to jointly move a group of cardboards from the cardboard store into the cardboard buffer storage. For example, the cardboard extracting device may be configured to move, at the start of operation, a group of cardboards from the cardboard store into the cardboard buffer storage, such that the group may form the plurality of cardboards. During operation, after a certain number of cardboards has been conveyed to the food product supply area, the cardboard extracting device may move a subsequent group of cardboards into the cardboard buffer storage, thus keeping the number of cardboards stored in the cardboard buffer storage in a predetermined range. For example, the cardboard extracting device may move a subsequent group of cardboards into the cardboard buffer storage after the cardboard buffer storage has been emptied or the cardboard extracting device may be configured to move a subsequent group of cardboards into the cardboard buffer storage after a certain number of cardboards has been conveyed to the food product supply area.

[0014] In particular, the cardboard extracting device may be configured to move a group of a predetermined number of cardboards into the cardboard buffer storage at the start of operation and, after half of the cardboards of that group have been conveyed to the food product supply area, the cardboard extracting device may move a subsequent group of the predetermined number of cardboards into the cardboard buffer storage. After these two initial groups, the cardboards extracting device may be configured to move a subsequent group of the predetermined number of the cardboards into the cardboard buffer storage each time the predetermined number of cardboards has been conveyed from the cardboard buffer storage to the food product supply area. Thus, the number of cardboards stored in the cardboard buffer storage may be kept in a range between one half of the predetermined number and a factor of 1.5 of the predetermined number.

[0015] For example, the plurality of cardboards may include, in particular consist of, ten cardboards, fifteen cardboards, twenty cardboards, twenty-five cardboards, thirty cardboards or fifty cardboards. In particular, ten

cardboards, fifteen cardboards, twenty cardboards, twenty-five cardboards, thirty cardboards or fifty cardboards may be moved into the cardboard buffer storage at the start of operation.

[0016] In the food product supply area, food products may be positioned on a cardboard, such that the cardboard may form a food product bottom support. For example, the cardboards may be provided at the transition between two conveyor bands of the conveying apparatus and in particular be moved from below the conveying apparatus through the transition while a food product is moved over the transition, such that the food product may be positioned on the cardboard. After a food product has been placed on a cardboard, the cardboard may further be folded to form a packaging element that at least partially surrounds the food product. Cardboards used in this way may in particular be known as L-boards and/or be used to provide printed information to a later consumer. The cardboards may be produced of paper, plastic, foil or the like. In particular, the food products may be provided as portions of food products at the food product supply area, e.g. including one or more slices or one or more pieces of a food product, which may have been cut off by a slicing apparatus.

[0017] Further embodiments are disclosed in the dependent claims, the description and the drawings.

[0018] According to some embodiments, the cardboard extracting device may be configured to successively extract a respective uppermost cardboard from the cardboard stack and move the respective uppermost cardboard from the cardboard stack into the cardboard buffer storage. Alternatively, the cardboard extracting device may be configured to jointly extract a group of cardboards comprising a predetermined number of cardboards from the cardboard stack and move the group of cardboards jointly from the cardboard stack into the cardboard buffer storage.

[0019] In order to successively move a respective uppermost cardboard from the cardboard stack into the cardboard buffer storage, the cardboard extracting device may, e.g., comprise an endlessly circulating belt positioned above the cardboard stack. The belt may be brought into contact with the cardboard stack, thus interacting with the uppermost cardboard to accelerate the cardboard towards the cardboard buffer storage via frictional forces. In order to move a subsequent cardboard from the cardboard store into the cardboard buffer storage, the cardboard stack may in particular be lifted to bring the subsequent cardboard into contact with the cardboard extracting device and/or an endlessly circulating belt.

[0020] For jointly moving a group of a predetermined number of cardboards from the cardboard stack into the cardboard buffer storage, the cardboard extracting device may, for example, comprise a pusher that may jointly push a group of uppermost cardboards from the cardboard stack into the cardboard buffer storage. Alternatively, the cardboard extracting device may also comprise

a gripper to either move the uppermost cardboard or a group of a predetermined number of cardboards from the top of the cardboard stack into the cardboard buffer storage. In particular in case a group of cardboards is jointly moved into the cardboard buffer storage, the use of a gripper still enables the provision of cardboards at the required rate since - due to the joint provision of a group of cardboards - the gripper may work at a slower rate than the rate at which (single) cardboards need to be provided at the food product supply area.

[0021] In particular, the cardboard extracting device may be configured to move the plurality of cardboards into the cardboard buffer storage at the start of operation either by successively moving respective uppermost cardboards of the cardboard stack into the cardboard buffer storage or by jointly moving a group of cardboards that forms the plurality of cardboards from the cardboard store into the cardboard buffer storage. Further, the plurality of cardboards may comprise several, e.g., two or three, groups of a predetermined number of cardboards, such that the cardboard extracting device may be configured to move the several groups of cardboards from the cardboard store into the cardboard buffer storage at the start of operation to provide the plurality of cardboards in the cardboard buffer storage.

[0022] According to some embodiments, the cardboard extracting device may be configured to move the uppermost cardboard from the cardboard stack and/or the group of cardboards underneath cardboards that are already stored in the cardboard buffer storage. Thus, the cardboards may be provided at the cardboard buffer storage and the food product supply area in the order of the cardboard stack formed in the cardboard store. The cardboards may accordingly be moved to the food product supply area starting with the uppermost and ending with the lowermost cardboard of the cardboard stack.

[0023] In some embodiments, the cardboard store may include a cardboard ramp and the cardboard extracting device may be configured to move the cardboards over the cardboard ramp into the cardboard buffer storage. By providing such a cardboard ramp, the cardboards may be moved from the cardboard store into the cardboard buffer storage with an upward movement component to be positioned underneath the cardboards already stored in the cardboard buffer storage. During the provision of new cardboards at the cardboard buffer storage, the cardboards already stored in the cardboard buffer storage may, thus, be lifted due to this upward movement of the cardboards moved into the cardboard buffer storage. Further, the cardboard ramp may act as a barrier preventing a subsequent cardboard from being jointly moved into the cardboard buffer storage with the uppermost cardboard or the group of cardboards due to frictional forces.

[0024] According to some embodiments, the cardboard store and the cardboard buffer storage may partly overlap. In particular, a rear end of a cardboard located in the cardboard buffer storage may overlap front ends

of cardboards stored in the cardboard store. However, the cardboard conveyor may be mounted such that it only acts on cardboards already moved into the cardboard buffer storage while not contacting cardboards stored in the cardboard store. In particular, the cardboard conveyor may be installed such that it may contact front ends of cardboards moved into the cardboard buffer storage and in particular a front end of a respective uppermost cardboard in the cardboard buffer storage.

[0025] According to some embodiments, the cardboard dispensing apparatus may include a measuring device for detecting cardboards moved into the cardboard buffer storage. In particular, the measuring device may be configured to detect a rear end of a cardboard moved into the cardboard buffer storage. By detecting a rear end of the cardboards at a predefined position, it may be determined that the cardboard has been completely moved into and correctly positioned in the cardboard buffer storage. A signal of the measuring device may be used for controlling the cardboard dispensing apparatus, e.g. as a start signal for removing a cardboard from the cardboard buffer storage as the signal indicates that the filling and/or refilling of the cardboard buffer storage has been completed. For example, the measuring device may be configured as a light barrier and/or include a distance sensor, wherein a distance sensor may in particular enable to measure the height of a stack of cardboards stored in the cardboard buffer storage or the height of the cardboard stack to determine whether a cardboard has been moved from the cardboard store into the cardboard buffer storage.

[0026] In some embodiments, the cardboard extracting device may include a separation device that is movable between a passive position and a separation position, wherein the separation device may be configured to separate cardboards of the cardboard stack above an extraction height from cardboards of the cardboard stack below the extraction height.

[0027] In particular, an extracting device including such a separation device may be configured to jointly move a group of cardboards including a predetermined number of cardboards from the cardboard store into the cardboard buffer storage, in particular a group of cardboards positioned above the extraction height. For example, the cardboard store may include a lifting device for lifting the cardboard stack in a lifting direction, in particular in a vertical direction, such that in dependence on the position of the lifting device, a certain number of cardboards may be positioned above the extraction height. Thus, by lifting the cardboards, the cardboards of the cardboard stack may basically be divided into two groups, one group of cardboards above the extraction height and one group of cardboard below the extraction height. The separation device may then, in particular after the cardboards have been lifted by the lifting device, separate the cardboards above the extraction height from cardboards below the extraction height.

[0028] For example, the separation device may be con-

figured to move the cardboards above the extraction height towards the cardboard buffer storage while not interacting with the cardboards below the extraction height, thus creating an offset between the rear ends of cardboards above the extraction height and the rear ends of cardboards below the cardboard height. The cardboards above the extraction height may accordingly form a step in the cardboards stack after having been separated. E.g., the separation device may include a pusher that is movable at or slightly, in particular less than the thickness of a cardboard, above the extraction height to move the cardboards above the extraction height towards the cardboard buffer storage.

[0029] Alternatively, the separation device may be configured to at least partly elevate the cardboards above the extraction height from the cardboards below the extraction height to create the separation. In particular, the separation device may be configured to elevate the rear ends of cardboards positioned above the extraction height while the remaining part of the cardboards may keep resting on the cardboards below the extraction height. Thus, a gap between the rear ends of the cardboards above the extraction height and the rear ends of the cardboards below the extraction height may be creatable by the separation device.

[0030] In particular, the cardboards separated by the separation device, i.e. the cardboards above the extraction height, may be movable into the cardboard buffer storage by the cardboard extracting device. Thus, a group of cardboards of a predetermined number may be formed by moving said predetermined number of cardboards above the extraction height and separating the predetermined number of cardboards from cardboards below the extraction height using the separation device. After this separation, the group of cardboards may in particular be moved jointly into the cardboard buffer storage by the cardboard extracting device. In particular, the separation of the group of cardboards before their movement into the cardboard buffer storage may prevent errors, e.g. the movement of more cardboards than the predetermined number designated to form the group of cardboards. After the cardboards have been moved into the cardboard buffer storage, the cardboard stack may be lifted again to position subsequent cardboards, in particular again a predetermined number of cardboards, above the extraction height, then separate those cardboards from the remaining cardboards below the extraction height and move the subsequent group of cardboards into the cardboard buffer storage.

[0031] The separation device may in particular be configured to separate the cardboards of the cardboard stack above the extraction height from cardboards below the extraction height by moving from the passive position to the separation position. For example, the separation device may be positioned adjacent the cardboard stack in the passive position such that the cardboard stack may pass the separation device while being lifted. In the separation position, however, the separation device may in-

terfere with the cardboard stack and act on the cardboards above the extraction height to separate those cardboards from cardboards below the extraction height. To accomplish this, the separation device may, e.g., move linearly from the passive position to the separation position to push the cardboards above the extraction height. Alternatively, the separation device may, e.g., be pivotable between the passive position and the separation position to push and/or elevate the cardboards above the extraction height.

[0032] In general, it is also possible to use the separation device in an extracting device that is configured to move the uppermost cardboard of the cardboard stack and/or a single cardboard into the cardboard buffer storage. In such embodiments, the uppermost cardboard of the cardboard stack may be positioned above the extraction height and separated by the separation device before being moved into the cardboard buffer storage.

[0033] According to some embodiments, the cardboard extracting device may comprise a blocking member, the blocking member being movable between a release position and a blocking position. The blocking member may be configured to block a movement of cardboards below the extraction height towards the cardboard buffer storage in the blocking position.

[0034] In particular, the blocking member may act on the cardboards below the extraction height to ensure that these cardboards may not move towards or at least may not move into the cardboard buffer storage, thus ensuring that only cardboards above the extraction height and, accordingly, cardboards that have been separated by the separation device may be moved into the cardboard buffer storage by the cardboard extracting device. This enables to reliably control the number of cardboards that are moved into the cardboard buffer storage. In particular, a clearly defined group of cardboards, in particular a group of a predetermined number of cardboards, may be formed by moving cardboards above the extraction height and separating those cardboards from cardboards below the extraction height using the separation device. The thus created group of cardboards may then be moved into a cardboard buffer storage while the blocking member prevents further cardboards from moving into or towards the cardboard buffer storage.

[0035] In particular, the blocking member, in the blocking position, may exert a pressure on the rear ends of cardboards below the extraction height, and, e.g., clamp those cardboards to prevent them from moving towards the cardboard buffer storage. In the release position, the blocking member may be positioned adjacent the cardboard stack to enable a lifting of the cardboard stack. The blocking member may for example be movable between the release position and the blocking position by a linear movement and/or by a pivoting movement.

[0036] According to some embodiments, the blocking member and the separation device may be coupled such that the blocking member is moved from the release position to the blocking position when the separation device

is moved from the passing position to the separation position. The coupling may also be such that the separation device is moved from the passive position to the separation position when the blocking member is moved from the release position to the blocking position.

[0037] Through such a coupling of the blocking member and the separation device, the cardboards may be separated and essentially in the same step and/or as soon as the separation has taken place, a movement of cardboards below the extraction height may be blocked by the blocking member having moved from the release position to the blocking position. Thus, to some extent, the blocking member may emphasize or complete the separation since the cardboards below the extraction height are clearly segregated from the cardboards above the extraction height in that a movement of the cardboards below the extraction height towards the cardboard buffer storage is blocked after the separation.

[0038] For example, the blocking member may include a motion link in which the separation device may be guided. For example, the separation device may include a pin that is guided in a motion link of the blocking member, such that a movement of the blocking member, in particular between the release position and the blocking position, may be transmitted to the separation device in order to move the separation device from the passive position to the separation position. This enables a joint and mechanically coordinated movement of the separation device and the blocking member to separate the cardboards above the extraction height from cardboards below the extraction height and block a movement of the cardboards below the extraction height through a joint movement of the blocking member and the separation device. Similarly, the separation device may include a motion link in which the blocking member, in particular via an interfering pin, may be guided. The motion link may further be configured such that, via the separation of the cardboards by the separation device, a space may be created for the blocking member to contact the cardboards below the extraction height without interfering with cardboards above the extraction height. Thus, the motion link may be configured such that the separation device contacts the cardboards before the blocking member.

[0039] According to some embodiments, the blocking member may be biased towards the blocking position. In such embodiments, the blocking member may be kept in the release position by a further component of the cardboard extracting device that blocks a movement of the blocking member due to the biasing force. In order to move the blocking member to the blocking position, said component needs to be moved to release the blocking member without the blocking member needing to be controlled separately. For example, the blocking member may be biased by a biasing spring or positioned such that it is movable from the release position to the blocking position by gravitational forces. Since, further, the blocking member and the separation device may be coupled

to each other, the biasing force may also act on the separation device such that whenever the blocking member is released, the separation device may also move from the passive position to the separation position. Alternatively, the separation device may be biased towards the separation position and the blocking member may follow a movement of the separation device.

[0040] According to some embodiments, the separation device and the blocking member may be pivotable around respective pivoting axis. For example, the separation device may pivot from the passive position to the separation position to contact the rear ends of the cardboards above the extraction height and elevate those rear ends, thus creating a space for the blocking member pivoting in the blocking position to act on the rear ends of the cardboards below the extraction height that, accordingly, have not been elevated by the separation device. In particular, the separation device and the blocking member may be mechanically coupled to coordinate the respective movements, in particular such that the separation device acts on the cardboards above the extraction height before the blocking member arrives in a position in which it may act on the cardboards below the extraction height. Thus, the space required for the movement of the blocking member may be created.

[0041] As an alternative to pivoting movements, the separation device and the blocking member may also be linearly movable. For example, the separation device may be configured to push cardboards above the extraction height towards the cardboard buffer storage while the blocking member may be configured to move downwardly into the blocking position to block a movement of the cardboards below the extraction height. Also in such embodiments, the separation device may first create the space for the blocking member to act on the cardboards, in particular the rear ends of the cardboards, below the extraction height. E.g., the separation device may push the cardboards above the extraction height towards the cardboard buffer storage to form a step in the cardboard stack and create a space for the blocking member to contact the cardboards below the extraction height.

[0042] In some embodiments, the cardboard extracting device may comprise an entrainer, in particular a pusher, wherein the entrainer may be configured to move the separated cardboards into the cardboard buffer storage.

[0043] In such embodiments, the separation device may be used to separate the cardboards above the extraction height from the cardboards below the extraction height, thus defining a group of cardboards to be moved into the cardboard buffer storage. After this group of cardboards has been defined and separated, the entrainer may be used to move said group of cardboards into the cardboard buffer storage. In particular, the entrainer may comprise a pusher or be configured as a pusher that contacts the group of cardboards at their rear ends to push the cardboards into the cardboard buffer storage. For example, such a pusher may be linearly movable.

[0044] In such embodiments, the cardboard extracting device may further comprise the already mentioned blocking member. In order to move cardboards and in particular a group of a predetermined number of cardboards from the cardboard store into the cardboard buffer storage, in particular the following three steps may be performed:

- the cardboards above the extraction height may be separated from cardboards below the extraction height by the separation device, in particular by moving the separation device from the passive position to the separation position,
- the blocking member may be moved from the release position to the blocking position to block a movement of the cardboards below the extraction height towards the cardboard buffer storage, and
- the entrainer may move the separated cardboards, i.e. the cardboards above the extraction height, into the cardboard buffer storage.

[0045] Further, the cardboard store may in particular comprise a lifting device for lifting the cardboard stack, such that, before separating the cardboards, a predetermined number of cardboards may be lifted above the extraction height and, after the cardboards have been moved into the cardboard buffer storage, the cardboard stack may be lifted again to move further cardboards above the extraction height to be separated and moved into the cardboard buffer storage.

[0046] According to some embodiments, the entrainer may be movable between a start position and a pushing position, wherein, in the start position, the entrainer may retain the blocking element in the release position and wherein, in the pushing position, the entrainer may release the blocking member for a movement to the blocking position. In particular, such a configuration may be provided in embodiments in which the blocking member is biased towards the blocking position such that, by actuating the entrainer to move from the start position to the pushing position, the blocking member may automatically move to the blocking position. Further, the separation device may be coupled to the blocking member such that also the separation device may immediately be movable from the passive position to the separation position by actuating the entrainer. Vice versa, the blocking member may be movable from the blocking position to the release position and/or the separation device may be movable from the separation position to the passive position by moving the entrainer from the pushing position to the start position. Thus, only the entrainer needs to be actuated to achieve the separation of the cardboards. In the pushing position, the entrainer may in particular be in, or nearly in, contact with the separated cardboards to be able to act on the cardboards and move the cardboards into the cardboard buffer storage starting from the pushing position.

[0047] The entrainer may, for example, be movable

back and forth, such that, after having moved the separated cardboards into the cardboard buffer storage, the entrainer may be moved backwards to a start position. Alternatively, the entrainer may, e.g., be movable in a circle to re-reach the start position after having moved the separated cardboards into the cardboard buffer storage.

[0048] According to some embodiments, the cardboard extracting device may include a conveying means, in particular a conveying roll, a conveying belt or a movable pushing surface, for extracting the cardboards from the cardboard store and moving the cardboards into the cardboard buffer storage. In particular, the cardboard extracting device may include a driven conveying roll that acts on an upper side of the uppermost cardboard in the cardboard store to move said uppermost cardboard into the cardboard buffer storage using frictional forces.

[0049] According to some embodiments, the cardboard extracting device may be configured to move an uppermost cardboard from the cardboard stack into the cardboard buffer storage. For example, the cardboard extracting device may include a conveying roll that, via friction, may move the uppermost cardboard into the cardboard buffer storage. In particular, such a conveying roll, or a conveying belt, may be used in alternative configurations of the extracting device compared to configurations including a separation device, a blocking member and/or an entrainer as described above.

[0050] According to some embodiments, the cardboard extracting device may include a spacer means, wherein the spacer means may be arranged offset from the conveying means with respect to a height direction in which the cardboard stack is formed. The spacer means may, further, be arranged to contact the uppermost cardboard of cardboards stored in the cardboard buffer storage when the plurality of cardboards is stored in the cardboard buffer storage. In particular, in such embodiments, the plurality of cardboards stored in the cardboard buffer storage may be formed by a predetermined number of cardboards and the spacer means may contact the uppermost cardboard when the predetermined number of cardboards is stored in the cardboard buffer storage.

[0051] In such embodiments, when the plurality of cardboards or a predetermined number of cardboards is stored in the cardboard buffer storage and the spacer means contacts the uppermost cardboard of the cardboards stored in the cardboard buffer storage, the conveying means may not or no longer contact the uppermost cardboard in the cardboard store. Hence, the spacer means may rest on a stack of cardboards stored in the cardboard buffer storage, while the conveying means may be positioned above the uppermost cardboard in the cardboard store without contacting the uppermost cardboard. Accordingly, when the predetermined number of cardboards or the plurality of cardboards is stored in the cardboard buffer storage and the spacer means rests on the uppermost cardboard, the conveying

means may not exert any frictional forces on the uppermost cardboard stored in the cardboard store and a movement of that cardboard into the cardboard buffer storage may be prevented. This ensures that the cardboard buffer storage is not overfilled with a number of cardboards exceeding the predetermined number. To achieve this, the spacer means and the conveying means may in particular be coupled to each other and/or the conveying means may be supported by the spacer means, in particular when the spacer means contacts the cardboards in the buffer storage.

[0052] According to some embodiments, the rear cardboard ends of the cardboards stored in the cardboard buffer storage may overlap cardboards stored in the cardboard store. The spacer means may in particular be arranged to contact a rear end of the uppermost cardboard stored in the cardboard buffer storage when a predetermined number of cardboards is stored in the cardboard buffer storage.

[0053] According to some embodiments, a predetermined number of cardboards forming the plurality of cardboards may be positioned in the cardboard buffer storage as soon as the height of the cardboards stored in the cardboard buffer storage exceeds the offset between the spacer means and the conveying means. Hence, as soon as the predetermined number of cardboards is reached, the conveying means may automatically be positioned above the uppermost cardboard of the cardboard stack without contacting the cardboard, thus preventing further cardboards from being moved into the cardboard buffer storage. However, when a cardboard, in particular the uppermost cardboard, is removed from the cardboard buffer storage, the height of the cardboards stored in the cardboard buffer storage may decrease below the offset between the spacer means and the conveying means, such that the conveying means may contact the uppermost cardboard of the cardboard stack in the cardboard store while the spacer means may be positioned above the uppermost cardboard in the cardboard buffer storage without contacting it. To some extent, after a cardboard has been moved from the cardboard store into the cardboard buffer storage or after a cardboard has been removed from the cardboard buffer storage, the conveying means and the spacer means may be coupled to jointly fall down and either the spacer means or the conveying means may come into contact with a cardboard while the respective other component is stopped before contacting a cardboard. Through that coupling between the spacer means and the conveying means, the cardboard conveyor that conveys the cardboards from the cardboard buffer storage to the food product supply area may always act on the same number of cardboards since whenever a cardboard has been conveyed to the food product supply area, the cardboard buffer storage may be refilled with a subsequent cardboard from the cardboard store while an overfilling of the cardboard buffer storage may be prevented.

[0054] Further, the conveying means may be constant-

ly driven during operation. Since the conveying means may be brought out of contact with the cardboards stored in the cardboard store when the predetermined number of cardboards is stored in the cardboard buffer storage, no further cardboard may be moved into the cardboard buffer storage by the conveying means. Hence, activations and deactivations of the conveying means are not necessary to prevent the conveying means from overfilling the cardboard buffer storage and a simple control of the cardboard dispensing apparatus may be achieved.

[0055] The spacer means may, e.g., be configured as a spacer roll, a spacer belt or a gliding surface. In particular, the spacer means may be configured such that while it rests on the uppermost cardboard stored in the cardboard buffer storage, said uppermost cardboard may be conveyed to the food product supply area by the cardboard conveyor. This may in particular be accomplished by reducing frictional forces between the spacer means and the uppermost cardboard that prevent the cardboard from being moved, e.g. by configuring the spacer means as a spacer roll.

[0056] According to some embodiments, the offset between the spacer means and the conveying means may define a stack height of the cardboards stored in the cardboard buffer storage. In particular, the offset between a lower side of the spacer means facing the cardboards and a lower side of the conveying means facing the cardboards may determine the stack height of a stack of cardboards stored in the cardboard buffer storage when the spacer means rests on the cardboards in the cardboard buffer storage. Thus, through this offset, also a number of cardboards to be stored in the cardboard buffer storage may be predetermined. In particular, the offset may be slightly less than the stack height of a stack of cardboards of the predetermined number, such that the spacer means contacts the cardboards in the cardboard buffer storage when the predetermined number is reached but the conveying means does not contact the cardboards in the cardboard store. In particular, the difference between the stack height and the offset may be less than the thickness of a cardboard.

[0057] According to some embodiments, the spacer means may be adjustable regarding its position in the height direction, in particular relative to the conveying means. By adjusting the position of the spacer means in the height direction, also the offset between the spacer means and the conveying means may be adjustable, such that the stack height of the stack of cardboards stored in the cardboard buffer storage when the spacer means contacts the uppermost cardboard of said stack of cardboards may be adjusted. Accordingly, the number of cardboards stored in the cardboard buffer storage in that situation may be determined by adjusting the position of the spacer means. This enables to customize the number of cardboards stored in the cardboard buffer storage and change that number, e.g., depending on the material of the cardboards and/or the food products that are processed.

[0058] In particular, the height direction may extend vertically.

[0059] According to some embodiments, the spacer means may be configured as an eccentric cam or an eccentric roll. By turning such an eccentric cam or an eccentric role, the position of the spacer means may, thus, be adjusted.

[0060] According to some embodiments, the cardboard store may include a lifting device for lifting the cardboard stack.

[0061] Further, the extracting device may be operable between an upper position and a lower position and the lifting device may be configured to move the extracting device from the lower position to the upper position, in particular by pressing the cardboard stack against the cardboard extracting device. For example, the extracting device may be movable between the lower position and the upper position by a pivoting movement or by a linear movement or a combination thereof. For example, when the cardboard stack in the cardboard store is lifted and contacts the cardboard extracting device, in particular a conveying means of the cardboard extracting device, the cardboard extracting device may be moved towards the upper position. In some embodiments, the extracting device may be moved to the upper position at the start of operation.

[0062] According to some embodiments, the cardboard dispensing apparatus may include a measuring device for detecting the upper position and the lower position.

[0063] Further, the cardboard dispensing apparatus may include a controller that is configured to control the lifting device for lifting the cardboards in the cardboard store in response to a signal of the measuring device indicating the lower position and to stop the lifting device in response to a signal of the measuring device indicating the upper position. Hence, the lifting device may be controlled to keep the cardboard extracting device between the lower position and the upper position. Further, the lifting device may be regulated to keep the cardboard extracting device between the lower position and the upper position. For example, after moving the extracting device to the upper position at the start of operation, due to a movement of the uppermost cardboard or a group of cardboards into the cardboard buffer storage, the cardboard extracting device may move towards or to the lower position, indicating that the cardboard stack should be lifted to enable operation of the cardboard extracting device.

[0064] According to some embodiments, the cardboard extracting device may be movable between the lower position and the upper position by a pivoting movement and may comprise a pivoting lever, the pivoting lever contacting a respective sensor of the measuring device in the upper position and the lower position. For example, the sensors may be configured as mechanical contact sensors, magnetic sensors or distance sensors.

[0065] Further, the cardboard extracting device may

include a belt drive. The belt drive may be configured to drive a pulley that is connected to the conveying means for moving the cardboards from the cardboard store into the cardboard buffer storage. Further, the conveying means may be configured to pivot around the driven pulley between the upper position and the lower position. In particular, the conveying means may be configured as a conveying roll that, accordingly, may be drivable through the belt drive.

[0066] According to some embodiments, the cardboard extracting device may be configured to, during operation of the cardboard dispensing apparatus, extract at least one further cardboard from the cardboard store and move the at least one further cardboard into the cardboard buffer storage.

[0067] In particular, the cardboard extracting device may be configured to move at least one further cardboard from the cardboard store into the cardboard buffer storage after the cardboard conveyor has removed at least one cardboard from the cardboard buffer storage to provide the at least one cardboard at the food product supply area. By such an operation, the number of cardboards in the buffer storage may be kept constant or kept in a predetermined range and the cardboard conveyor may convey the cardboards from the cardboard buffer storage to the food product supply area under constant conditions.

[0068] The cardboard extracting device may, thus, be configured to refill the cardboard buffer storage during operation. In particular, the cardboard extracting device may be configured to move a respective uppermost cardboard into the cardboard buffer storage after a cardboard has been conveyed to the food product supply area or the cardboard extracting device may be configured to move a group of cardboards from the cardboard store into the cardboard buffer storage after several, in particular a group of cardboards of the same number of cardboards, has been conveyed to the food product supply area.

[0069] The cardboard dispensing apparatus may comprise a controller that is configured to control the cardboard extracting device for moving at least one further cardboard into the cardboard buffer storage. Such a controller may, e.g., comprise a microcontroller and/or a CPU (Central Processing Unit).

[0070] According to some embodiments, the cardboard conveyor may include an upper conveyor that is arranged above the cardboards stored in the cardboard buffer storage. The cardboard buffer storage may, further, include a pressing device that is configured to selectively press the cardboards stored in the cardboard buffer storage against the upper conveyor for removing the cardboards from the cardboard buffer storage.

[0071] In particular, the pressing device may be controlled for selectively, periodically and/or intermittently press the cardboards against the upper conveyor, such that the respective uppermost cardboard may be removed due to the friction between its upper side and the

upper conveyor. The upper conveyor may, e.g., include a conveyor belt or a conveyor band. By intermittently or periodically pressing the cardboards against the upper conveyor, the upper conveyor may be driven constantly or - timed with the pressing device - intermittently or periodically during operation, while through the periodic activation of the pressing device, subsequent respective uppermost cardboards stored in the cardboard buffer storage may be successively pressed against the upper conveyor to be successively removed from the cardboard buffer storage. The periodic pressing of the cardboards may thus determine the rate at which cardboards are removed from the cardboard buffer storage and provided at the food product supply area. As has been mentioned, the pressing device may e.g. be controlled to press the cardboards against the upper conveyor in response to a signal from a measurement device indicating that a further cardboard has been moved into the cardboard buffer storage.

[0072] According to some embodiments, the cardboard buffer storage may include a blocking means that is arranged to block a joint movement of the uppermost cardboard of the cardboards stored in the cardboard buffer storage and a subsequent cardboard. In particular, the blocking means may define a gap through which the uppermost cardboard may be removable from the cardboard buffer storage. For example, the gap may have a size of approximately the thickness of a cardboard to ensure that only one cardboard may be conveyed to the food product supply area at a time. Hence, disruptions of the operation due to several cardboards being jointly removed from cardboard buffer storage may be prevented.

[0073] According to some embodiments, the blocking means may include a blocking roll, wherein the blocking roll may in particular be drivable for moving a subsequent cardboard back into or towards the cardboard buffer storage. Thus, in case a subsequent cardboard erroneously moves jointly with the uppermost cardboard that is to be conveyed to the food product supply area, said subsequent cardboard may be moved back to the cardboard buffer storage and prevented from being conveyed to the food product supply area or from leaving the cardboard buffer storage. To achieve this, the blocking roll may in particular rotate against a direction of the movement of the uppermost cardboard to the food product supply area. The blocking roll may further have a friction-increasing surface, in particular a rubber surface or a silicon surface. The surface may also be structured for providing increased friction to reliably move a subsequent cardboard backwards.

[0074] According to some embodiments, the upper conveyor may include a continuous conveyor band or at least one continuous conveyor belt for removing a cardboard from the cardboard buffer storage and/or for conveying the cardboards to the food product supply area. For example, the upper conveyor may be redirected between the cardboard buffer storage and the food product

supply area to also redirect a movement of the cardboards that have been removed from the cardboard buffer storage. E.g., through such a redirection, the cardboards may be moved upwards to the food product supply area and through a transition of conveyor bands of a conveying apparatus providing the food products.

[0075] The cardboard conveyor may, according to some embodiments, include at least one lower conveyor, in particular a conveyor band or a conveyor belt, for conveying the cardboards removed from the cardboard buffer storage to the food product supply area. In particular, the lower conveyor and the upper conveyor may jointly convey the cardboards that have been removed from the cardboard buffer storage to the food product supply area. For example, the lower conveyor and the upper conveyor may form a gap, such that the cardboards may be contacted from two sides and conveyed to the food product supply area.

[0076] According to some embodiments, the cardboard buffer storage may include a pressing device that presses the cardboards stored in the cardboard buffer storage against the upper conveyor to remove the cardboards from the cardboard buffer storage. As the cardboards leave the cardboard buffer storage, the cardboards may be received by the lower conveyor. The lower conveyor may, in particular jointly with the upper conveyor, convey the cardboards to the food product supply area. The upper conveyor may be continuous or include several, successively arranged conveying bands or conveying belts.

[0077] According to some embodiments, the upper conveyor and the lower conveyor may form a gap through which the cardboards may be conveyed to the food product supply area. Hence, cardboards removed from the cardboard buffer storage may be moved into the gap between the upper conveyor and the lower conveyor to be conveyed to the food product supply area. The gap formed between the upper conveyor and the lower conveyor may be of a thickness of the cardboards or slightly less, such that both the upper conveyor and the lower conveyor may exert frictional forces to move the cardboards to the food product supply area.

[0078] According to some embodiments, the upper conveyor and the lower conveyor may be driven by a common drive. Further, the upper conveyor and the lower conveyor may, during operation, be driven constantly. Alternatively, the upper conveyor and/or the lower conveyor may also be driven intermittently during operation, e.g. only at times when a cardboard is actually conveyed. In particular, the upper conveyor and the lower conveyor may be driven at the same speed.

[0079] According to some embodiments, the cardboard dispensing apparatus may include a measuring device that is configured to detect a front end of a cardboard that has been removed from the cardboard buffer storage, in particular when the front end reaches the lower conveyor. For example, the cardboard dispensing apparatus may include a light barrier positioned such that

the front end of the cardboard may be detected just before it reaches the lower conveyor. A signal of said measuring device may, e.g., be used to control a pressing device for spacing the cardboards stored in the cardboard buffer storage from the upper conveyor. The cardboard, which in particular may still be partly arranged in the cardboard buffer storage, may then be completely removed from the cardboard buffer storage and conveyed to the food product supply area by the upper conveyor and the lower conveyor.

[0080] According to some embodiments, the cardboard dispensing apparatus may include a controller. The controller may be configured to, during operation of the cardboard dispensing apparatus, constantly or timed with the pressing device - intermittently or periodically drive the upper conveyor of the cardboard dispensing apparatus, periodically control the pressing device for pressing the cardboards stored in the cardboard buffer storage against the upper conveyor to remove a respective uppermost cardboard from the cardboard buffer storage, and periodically control the cardboard extracting device for moving at least one further cardboard into the cardboard buffer storage.

[0081] In particular, the controller may be configured to move at least one further cardboard into the cardboard buffer storage after at least one cardboard has been removed from the cardboard buffer storage. For example, the controller may control the cardboard extracting device for moving a cardboard from the cardboard store into the cardboard buffer storage after a cardboard, in particular the uppermost cardboard, has been removed from the cardboard buffer storage and/or conveyed to food product supply area. In such embodiments, the controller may in particular alternately control the pressing device for pressing the cardboards against the upper conveyor and the cardboard extracting device for moving a cardboard into the cardboard buffer storage. Thus, both the pressing device and the cardboard extracting device may be activated periodically with the time between two activations being equal for both components to keep the number of cardboards stored in the cardboard buffer storage constant. Further, the cardboard dispensing apparatus may include measuring devices for detecting a cardboard that has been moved into the cardboard buffer storage and for detecting a cardboard that has been removed, or at least that has been sufficiently removed, from the cardboard buffer storage to be conveyed to the food product supply area. The signals of those measuring devices may be used for controlling the cardboard extracting device and/or a lifting device of the cardboard store and/or the pressing device.

[0082] Alternatively, the controller may be configured to control the cardboard extracting device for jointly moving a group of cardboards into the cardboard buffer storage after a certain number of cardboards has been removed from the cardboard buffer storage. In such embodiments, the pressing device and the cardboard extracting device may not be activated alternately. Rather,

the pressing device may be activated several times to move several cardboards from a cardboard buffer storage to the food product supply area while the cardboard extracting device may only be activated after these cardboards have been successively removed from the cardboard buffer storage to provide a subsequent group of cardboards. Nevertheless, the activation of the cardboard extracting device may still occur periodically since the cardboard extracting device may always be activated after a predetermined number of cardboards has been removed from the cardboard buffer storage. Such an operation of the cardboard dispensing apparatus may in particular be performed in embodiments in which the cardboard extracting device includes a separation device for separating cardboards above an extraction height from cardboards below an extraction height and in which the separated cardboards are jointly moved into the cardboard buffer storage.

[0083] The controller of the cardboard dispensing apparatus may, e.g., include a microcontroller or a CPU (Central Processing Unit).

[0084] According to some embodiments, the controller may be configured to control the pressing device to space the cardboards stored in the cardboard buffer storage from the upper conveyor after the uppermost cardboard has been removed from the cardboard buffer storage. In particular, the controller may control the pressing device to space the cardboards from the upper conveyor in response to a signal from a measurement device being configured to detect a cardboard that has been removed from the cardboard buffer storage. Since the upper conveyor may be driven constantly or - timed with the pressing device - intermittently or periodically, by such a periodic activation and deactivation of the pressing device, the respective uppermost cardboards may be successively removed from a cardboard buffer storage. In particular, the pressing device may be movable in a vertical direction to press the uppermost cardboard against the upper conveyor or to space cardboards from the upper conveyor.

[0085] According to some embodiments, the controller may be configured to control the cardboard extracting device at the start of operation for moving the plurality of cardboards, in particular a predetermined number of cardboards, into the cardboard buffer storage. For example, a group of cardboards forming the plurality of cardboards may jointly be moved into the cardboard buffer storage at the start of operation or the cardboard extracting device may successively move the uppermost cardboards from the cardboard stack into the cardboard buffer storage until a predetermined number of cardboards is reached. For example, the controller may be configured to control the cardboard extracting device for moving ten cardboards, twenty cardboards, thirty cardboards or fifty cardboards into the cardboard buffer storage at the start of operation.

[0086] According to some embodiments, the cardboard store may include a lifting device for lifting the card-

board stack, wherein the controller may be configured to control the lifting device for lifting the cardboard stack by the thickness of a cardboard after the further cardboard has been moved into the cardboard buffer storage. In particular, this enables to move a single further cardboard into the cardboard buffer storage in order to keep the number of cardboards stored in the cardboard buffer storage constant, thus enabling the cardboard conveyor to act on the cardboards stored in the cardboard buffer storage under constant conditions.

[0087] Alternatively, the controller may be configured to control the lifting apparatus for lifting the cardboard stack by the height of a group of cardboards that are jointly moved into the cardboard buffer storage by the extracting device after the at least one further cardboard, in particular a group of cardboards, has been moved into the cardboard buffer storage. For example, a predetermined number of cardboards may be moved above an extraction height to be separated from the remaining cardboards of the cardboard stack and to be moved into the cardboard buffer storage. The lifting device may, e.g., be controlled for lifting the cardboard stack by the height of the cardboards forming a group of cardboards after a group of cardboards has been moved into the cardboard buffer storage, such that the predetermined number of subsequent cardboards forming the subsequent group of cardboards may be positioned above the extraction height.

[0088] Further, the controller may be configured, in some embodiments, to control the cardboard dispensing apparatus to perform the steps of the method disclosed hereinafter. The controller may also be configured to control the cardboard dispensing apparatus to perform the operations described above, in particular to control an extracting device having a separation device, a blocking member and an entrainer to perform the steps of separating a group of cardboards above an extraction height from cardboards below the extraction height in the cardboard stack, blocking the cardboards below the extraction height from moving towards the cardboard buffer storage, and moving the separated cardboards into the cardboard buffer storage.

[0089] The invention further relates to a method for providing cardboards for use as a food product bottom support or as a food product packaging element at a food product supply area where food products, in particular meat products or bacons, preferably slices of food products cut off by a slicing apparatus located upstream of the food product supply area, are provided by a conveying apparatus. The cardboards are provided using a cardboard dispensing apparatus, in particular a cardboard dispensing apparatus as disclosed herein, and the method comprises the steps:

- extracting a plurality of cardboards from a cardboard store and arranging the plurality of cardboards in a cardboard buffer storage,
- removing the cardboards from the cardboard buffer

storage and conveying the removed cardboards to the food product supply area.

[0090] In particular, the cardboards may be removed successively from the cardboard buffer storage and conveyed successively to the food product supply area.

[0091] In particular, the cardboard dispensing apparatus may comprise the cardboard store and the cardboard buffer storage. As has been mentioned, the provision of the cardboard buffer storage in which the plurality of cardboards is stored enables to convey cardboards to the food product supply area under constant conditions and, in particular, independent of the number of cardboards stored in the cardboard store. Thus, a stable operation of the cardboard dispensing apparatus and the provision of cardboards at a high rate may be achieved. In particular, a cardboard stack may be stored in the cardboard store.

[0092] According to some embodiments, the plurality of cardboards in the cardboard buffer storage may be restored by moving a further cardboard or a further group of cardboards from the cardboard store into the cardboard buffer storage after a cardboard or a group of cardboards has been removed from the cardboard buffer storage. In particular, the plurality of cardboards stored in the cardboard buffer storage may be restored before a subsequent cardboard is removed from the cardboard buffer storage to keep the number of cardboards stored in the cardboard buffer storage constant. Alternatively, a group of cardboards may be successively removed from the cardboard buffer storage before a subsequent group of cardboards may be moved from the cardboard store into the cardboard buffer storage to keep the number of cardboards stored in the cardboard buffer storage in a predetermined range.

[0093] According to some embodiments, for removing the cardboards from the cardboard buffer storage, the cardboards stored in the cardboard buffer storage are periodically pressed against an upper conveyor, in particular a conveyor band or a conveyor belt. Further, the upper conveyor may be constantly running or - timed with the pressing device - intermittently or periodically driven during operation. In particular, by pressing the cardboards against the upper conveyor, frictional forces may be transmitted from the upper conveyor to the uppermost cardboard stored in the cardboard buffer storage to remove the uppermost cardboard from the cardboard buffer storage and convey the uppermost cardboard to the food product supply area.

[0094] The cardboards may be pressed by a pressing device, wherein the pressing device may be controlled for spacing the cardboards from the upper conveyor after an uppermost cardboard has been removed from the cardboard buffer storage. The pressing device may, in particular, be controlled to space a cardboard subsequent to the uppermost cardboard from the upper conveyor once a front end of the uppermost cardboard is received by a lower conveyor arranged subsequent to

the cardboard buffer storage.

[0095] According to some embodiments, the cardboard dispensing apparatus may include a cardboard extracting device for moving the cardboards from the cardboard store into the cardboard buffer storage, wherein the cardboard extracting device may be controlled for periodically moving a subsequent cardboard from the cardboard store into the cardboard buffer storage as soon as an uppermost cardboard has been removed from a cardboard buffer storage. Alternatively, the cardboard extracting device may be controlled for periodically moving a group of cardboards comprising a predetermined number of cardboards from the cardboard store into the cardboard buffer storage. In particular, the cardboard extracting device may be controlled for moving a group of cardboards into the cardboard buffer storage once the predetermined number of cardboards has been removed from the cardboard buffer storage.

[0096] In embodiments in which the cardboard extracting device is controlled for moving a cardboard into the cardboard buffer storage as soon as a cardboard has been removed from the cardboard buffer storage, the period between subsequent activations of the cardboard extracting device and the pressing device may be equal but the activations may be phase shifted. Accordingly, a subsequent cardboard may be moved into the cardboard buffer storage as soon as a cardboard has been removed from the cardboard buffer storage. In case a group of cardboards is jointly moved into the cardboard buffer storage, the cardboard extracting device may also be controlled periodically but with a longer period than the pressing device, such that a group of cardboards may be successively removed from the cardboard buffer storage through several activations of the pressing device before a subsequent group of cardboards is moved into the cardboard buffer storage.

[0097] According to some embodiments, the cardboards may be lifted upwards in the cardboard store after the subsequent cardboard or the group of cardboards has been moved into the cardboard buffer storage. In particular, the cardboard store may include a lifting device for lifting the cardboards stored in the cardboard store. The cardboards may in particular be lifted by the thickness of a cardboard to move a subsequent cardboard into the cardboard buffer storage or by the thickness of a group of cardboards to enable a joint movement of the group of cardboards into the cardboard buffer storage.

[0098] The method may further comprise the steps disclosed above in relation to the operation of the cardboard dispensing apparatus.

[0099] The invention also relates to a food processing system including a slicing apparatus that is configured to cut off slices from a food product, in particular meat products or bacons, and that includes a conveying apparatus for conveying the slices to a food product supply area. The food processing system further includes a cardboard dispensing apparatus as disclosed herein.

[0100] A slicing apparatus may in particular include a food product conveying device that is configured to move food products into a slicing area in which a blade, in particular a rotating blade, may be arranged to cut off slices from the food products. The slices may be collected to form a portion of slices including one or a predetermined number of slices in a collection area, e.g. on a conveyor band. After a portion has been completed, the portion may be transported via one or several conveyor bands to the food product supply area, where the cardboards may be provided. In particular, the cardboards may be provided in a transition of two conveyor bands of the conveying apparatus from below while a portion is moved over the transition, such that the portion may be positioned on the cardboard. Thus, the cardboard may form a food product bottom support. Further, the cardboards may, after the portions have been positioned on the cardboards, be folded to form a food product packaging element. The cardboards and the associated portion may then be moved to a packaging machine, which may be comprised by the food processing system, for a joint packaging. The slicing apparatus may in particular be configured as a high-performance slicer, facilitating e.g. between 600 and 2000 cuts per minute.

[0101] According to some embodiments, the food processing system may include a second cardboard dispensing apparatus as disclosed herein. A controller of the food processing system may be configured to switch to the respective other of the cardboard dispensing apparatus and the second cardboard dispensing apparatus when the cardboard store of the cardboard dispensing apparatus or the second cardboard dispensing apparatus has been emptied. Thus, whenever the cardboard store of one of the cardboard dispensing apparatuses is emptied, the operation of the food processing system may continue by using the cardboards stored in the cardboard store of the respective other cardboard dispensing apparatus while the emptied cardboard store may be refilled. Thus, interruptions of the operation due to an emptied cardboard store may be prevented.

[0102] According to some embodiments, the conveying apparatus may include a folding means for folding the cardboards around the food product, in particular around a portion including one or several slices cut off a food product. Thus, the cardboards may serve as food product packaging elements at least partially surrounding an associated food product.

[0103] The food processing system may, according to some embodiments, further include a packaging machine and the conveying apparatus may be configured to convey the cardboards forming a food product bottom support or a food product packaging element and the associated slice or slices to the packaging machine, wherein the packaging machine may be configured to jointly package the conveyed cardboard and the associated slices. The packaging machine may, e.g., be configured as a thermoforming packaging machine and provide formed packages into which the portions may be

placed. Further, the packaging machine may provide a foil onto which the portions may be positioned. The packages or the foil may be closed by a further foil provided from above, e.g. by a sealing process.

[0104] The invention further relates to a cardboard dispensing apparatus according to independent claim 13, wherein the cardboard extracting device includes a separation device configured to separate only a respective uppermost cardboard of the cardboard stack by lifting the uppermost cardboard with respect to the remaining cardboards of the cardboard stack, the separation device comprising a suction device configured to apply a negative pressure to a rear upper portion of a respective uppermost cardboard for lifting at least a rear end portion thereof, and

wherein the cardboard extracting device comprises an entrainer, in particular a pusher, the entrainer being configured to move the respective uppermost cardboard into the cardboard conveyor by engaging the lifted rear end portion thereof.

[0105] The combination of a suction device and an entrainer ensures that only the uppermost cardboard is lifted, preferably by applying the negative pressure at a middle rear portion, so that the entrainer may move the uppermost cardboard directly from the cardboard stack into the cardboard conveyor. A cardboard buffer storage and the associated installations may therefore be dispensed with.

[0106] The entrainer may be configured as a pusher configured to engage the rearward edge of the uppermost cardboard and to push the cardboard relative to the remaining cardboards of the cardboard stack into the cardboard conveyor.

[0107] With respect to possible embodiments of the entrainer regarding function and structure, reference is also made to the entrainer as disclosed herein in connection with the corresponding other embodiment of a cardboard dispensing apparatus.

[0108] The suction device of the separation device may be movable between a passive position and a separation position.

[0109] According to some embodiments, a blocking member may be provided, the blocking member being movable between a release position and a blocking position, wherein the blocking member, when in the blocking position, is configured to block a movement of the remaining cardboards located below a respective uppermost cardboard. With respect to possible embodiments of the blocking member regarding function and structure, reference is also made to the blocking member as disclosed herein in connection with the corresponding other embodiment of a cardboard dispensing apparatus.

[0110] According to some embodiments, the cardboard extracting device may comprise at least one hold-down element positioned laterally with respect to the suction device and configured to hold a respective lateral rear end portion of the uppermost cardboard down below the height level of the lifted rear end portion thereof. In

particular, the cardboard extracting device may comprise at least two hold-down elements positioned on both sides of the suction device.

[0111] The combination of the suction device and at least one hold-down element creates a curvature in the rear end portion of the uppermost cardboard and thereby forces at least the respective lateral rear end portion thereof to move relative to the next-lower cardboard, thereby preventing the next-lower cardboard to be entrained by the uppermost cardboard when the uppermost cardboard is moved into the cardboard conveyor. When the rear end portion of the uppermost cardboard is lifted, in particular in a middle region of the rear end portion, the hold-down element holds the respective lateral rear end portion down at a lower level, which results in the lateral rear end portion being pulled through the gap between the hold-down element and the next-lower cardboard, thereby eliminating any adhesive forces between the uppermost cardboard and the next-lower cardboard.

[0112] The invention further relates to a method according to independent claim 16, the method comprising applying a negative pressure to a respective uppermost cardboard for lifting at least a rear end portion thereof, engaging the lifted rear end portion of the uppermost cardboard for moving it towards the food product supply area, and conveying the uppermost cardboard to the food product supply area.

[0113] The method may in particular comprise blocking a movement of the remaining cardboards located below a respective uppermost cardboard.

[0114] Alternatively or additionally, the method may comprise holding a respective lateral end portion of the uppermost cardboard down below the height level of the lifted rear end portion thereof. In particular, the method comprises holding down the uppermost cardboard at two lateral end portions situated on both sides of where the negative pressure is applied.

[0115] The invention further relates to a cardboard dispensing apparatus, wherein a cardboard extracting device as defined in claims 13 to 15 and as for example shown in Figs. 4A and 4F is configured to move cardboards from a cardboard store into a cardboard buffer storage, in particular into a cardboard buffer storage as disclosed herein, or is configured to move cardboards from a cardboard buffer storage, in particular from a cardboard buffer storage as disclosed herein, into a cardboard conveyor. Analogously, the invention further relates to a method similar to the method of claim 16 but with the difference that after engaging the rear end portion of the uppermost cardboard by applying the negative pressure thereto, the uppermost cardboard is moved from a cardboard store into a cardboard buffer storage, in particular into a cardboard buffer storage as disclosed herein, or is moved from a cardboard buffer storage, in particular from a cardboard buffer storage as disclosed herein, into a cardboard conveyor.

[0116] Those apparatuses and methods are herewith claimed as independent aspects of the invention in ad-

dition to the subject matters of the independent claims. As regards embodiments of these aspects, reference is made to embodiments of the other aspects of the invention, in particular to the subject matter of the dependent claims.

[0117] In that which follows, embodiments of the invention are exemplarily described with reference to the drawings. The drawings show:

- 10 Fig. 1 a schematic overview of a food processing system including a slicing apparatus for cutting food products into slices, a conveying apparatus for conveying portions including one or several slices to a food product supply area, a cardboard dispensing apparatus and a second cardboard dispensing apparatus for providing cardboards at the food product supply area serving as a food product bottom support or a food product packaging element, and a packaging machine for jointly packaging portions of the food products and the associated cardboard,
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- 20 Figs. 2A and 2B a respective schematic illustration of the cardboard dispensing apparatus having a cardboard store in which cardboards are stored, a cardboard extracting device for moving cardboards from the cardboard store into a cardboard buffer storage, and a cardboard conveyor for removing the cardboards from the cardboard buffer storage and conveying the cardboards to the food product supply area,
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- 30
- 35 Figs. 3A and 3B a respective illustration of an alternative construction of the cardboard extracting device of the cardboard dispensing apparatus, and
- 40
- 45 Figs. 4A to 4F an illustration of another alternative construction of the extracting device of the cardboard dispensing apparatus.
- 50
- 55

[0118] Fig. 1 shows a food processing system 59 that comprises a slicing apparatus 97 for cutting a food product 17' into slices 21. The slicing apparatus 97 comprises a food product conveyor 101 that transports the food product 17' to a slicing area 107 in which a blade 105, in particular a rotating blade 105, is arranged that cuts off the slices 21 from the food product 17'. The slices 21 are collected on a conveying apparatus 99 and portions 19 including several slices 21 are built, which, after comple-

tion, are conveyed to a packaging machine 103 that provides packages 109 in which the portions 19 may be packaged.

[0119] In the shown embodiment, food products 17' are thus processed by creating portions 19 including several slices 21 that are, in turn, automatically packaged in packages 109 to be sold to the consumer. However, it is in general also possible to package the entire food product 17' or to cut the food product 17' into pieces and package one or more pieces in a package 109. Further, it is also possible to form and package portions 19 only including a single slice 21.

[0120] Between the slicing apparatus 97 and the packaging machine 103, the portions 19, that constitute processed food products 17, are conveyed to a food product supply area 15 that is located at a transition 16 between two conveyor bands 18 of the conveying apparatus 99. The food processing system 59 includes a cardboard dispensing apparatus 11 that is configured to provide cardboards 13 at the food product supply area 15 by moving the cardboards 13 through the transition 16 as the food products 17 or portions 19 are moved over the transition 16. Thus, the slices 21 of a portion 19 may be positioned on a respective cardboard 13, such that the cardboard 13 may form a food product bottom support and the cardboard 13 and the associated food product 17 or portion 19 may jointly be conveyed to the packaging machine 103 and packaged in the package 109.

[0121] By providing cardboards 13 as a food product bottom support, a later consumer may, e.g., take out the portion 19 from the package 109 in a simple manner and present the portion 19 on the cardboard 13 for consumption. Further, the cardboards 13 may, in particular by a folding means not shown in the figure, be folded around a portion 19 to form food product packaging element at least partially surrounding the portion 19. This may, e.g., be used to provide information printed on the cardboard 13 to the consumer.

[0122] The cardboard dispensing apparatus 11 is described in more detail with reference to Figs. 1, 2A and 2B.

[0123] In order to provide the cardboards 13 at the food product supply area 15, the cardboard dispensing apparatus 11 includes a cardboard store 23 in which cardboards 13 forming a cardboard stack 24 are stored. However, the cardboards 13 are not conveyed directly from the cardboard store 23 to the food product supply area 15 but between the cardboard store 23 and the food product supply area 15, a cardboard buffer storage 29 storing a plurality of cardboards 25 is arranged. To provide the cardboards 13 at the food product supply area 15, the cardboard dispensing apparatus 11 includes a cardboard conveyor 31 that is configured to remove the cardboards 13 from the cardboard buffer storage 29 and move the cardboards 13 to the food product supply area 15. Thus, the cardboards 13 are moved along a movement direction M from the cardboard store 23 via the cardboard buffer storage 29 to the food product supply area 15.

[0124] In order to move cardboards 13 from the card-

board stack 24 into the cardboard buffer storage 29, the cardboard dispensing apparatus 11 includes a cardboard extracting device 27 that is configured to extract cardboards 13 from the cardboard store 23 and move the cardboards 13 into the cardboard buffer storage 29. The cardboard extracting device 27 includes a conveying means 71 that is configured as a conveying roll and that is driven through a belt drive 67. As illustrated in Fig. 2A, an uppermost cardboard 33 of the cardboard stack 24 in the cardboard store 23 may be brought into contact with the conveying means 71, such that, through frictional forces between the conveying means 71 and the uppermost cardboard 33, the uppermost cardboard 33 may be moved from the cardboard store 23 into the cardboard buffer storage 29.

[0125] In order to remove cardboards 13 from the cardboard buffer storage 29, the cardboard conveyor 31 includes an upper conveyor 63 and the cardboard buffer storage 29 includes a pressing device 53 that is movable upwards and downwards as indicated by the arrow C. Thus, by lifting the pressing device 53, an uppermost cardboard 35 of a stack 39 of cardboards 13 stored in the cardboard buffer storage 29 may be pressed against the upper conveyor 63 and, due to frictional forces between the uppermost cardboard 35 and the upper conveyor 63, the uppermost cardboard 35 may be removed from the cardboard buffer storage 29 (see fig. 2A).

[0126] In order to ensure that only a single cardboard 13 is removed from the cardboard buffer storage 29, a blocking means 79 is provided that jointly with a stationary upper element (Fig. 1; not shown in Figs. 2A and 2B) forms a gap 51 through which the uppermost cardboard 35 is moved as it leaves the cardboard buffer storage 29. The size of the gap 51 may be chosen similar to the thickness of the cardboard 13, such that that only the uppermost cardboard 35 can be removed from the cardboard buffer storage 29 while a movement of the remaining cardboards in the movement direction M is blocked by the blocking means 79. A movement of a subsequent cardboard 13 due to friction between the uppermost cardboard 35 and the subsequent cardboard 13 may, thus, be prevented.

[0127] When the uppermost cardboard 35 is removed from the cardboard buffer storage 29, it is received by a lower conveyor 52 of the cardboard conveyor 31 that, jointly with the upper conveyor 63, forms a gap such that the cardboard 35 may be transported between the upper conveyor 63 and the lower conveyor 52 to the food product supply area 15. In particular, the upper conveyor 63 and the lower conveyor 62 may be driven by a common drive and/or both exert frictional forces on the cardboard 35 to move the cardboard 35 to the food product supply area 15. As illustrated in Fig. 1, the upper conveyor 63 may be continuous and redirected to move the cardboards 13 upwards and through the transition 16. However, it is also possible to provide an upper conveyor 63 including several conveying bands or conveying belts to enable a redirection of the cardboards.

[0128] Further, the cardboards 13 may be successively removed from the cardboard buffer storage 29 by periodically controlling the pressing device 53 for pressing the cardboards 13 upwards while the upper conveyor 63 and/or the lower conveyor 52 may be driven constantly or - timed with the pressing device - intermittently or periodically during operation. In order to control the activation and deactivation of the pressing device 53, a measuring device 83 is provided that is configured to detect a front end 77 of the uppermost cardboard 35 having been removed from the cardboard buffer storage 29. Thus, the measuring device 83 may detect when the uppermost cardboard 35 is received by the lower conveyor 52 and enters the gap 51 such that the cardboard 35 may be conveyed to the food product supply area 15 without the pressing device 53 exerting any pressure towards the upper conveyor 63. Accordingly, a controller 55 of the cardboard dispensing apparatus 11 may, in response to a signal from the measuring device 83, control the pressing device 53 for spacing the cardboards 13 stored in the cardboard buffer storage 29 from the upper conveyor 63. For example, the measuring device 83 may be configured as a light barrier and/or perform a measurement L to detect the cardboard 35.

[0129] As may also be seen in Fig. 2A, the cardboards 13 stored in the cardboard buffer storage 29 partly overlap cardboards 13 stored in the cardboard store 23 and, when the pressing device 53 is controlled to space the cardboards 13 stored in the cardboard buffer storage from the upper conveyor 63, rest with their rear ends 75 on a ramp 57 between the cardboard store 23 and the cardboard buffer storage 29. Since the cardboards 13 are spaced from the upper conveyor 63, a further cardboard 13 may, in particular after the uppermost cardboard 35 has been removed from the cardboard buffer storage 29 completely, be extracted from the cardboard store 23 and moved into the cardboard buffer storage 29 by the cardboard extracting device 27. This may be performed through the conveying means 71, that may exert frictional forces to the uppermost cardboard 33 stored in the cardboard store 23 to move the cardboard 33 into the cardboard buffer storage 29. Since the uppermost cardboard 33 of the cardboard stack 24 is moved over the ramp 57 into the cardboard buffer storage 29, it may be positioned underneath the cardboards 13 already stored in the cardboard buffer storage 29.

[0130] Thus, after the uppermost cardboard 35 has been removed from the cardboard buffer storage 29, a subsequent cardboard 13, the uppermost cardboard 33 of the cardboard stack 24, may be moved from the cardboard store 23 into the cardboard buffer storage 29 to restore the plurality 25 of cardboards 13 in the cardboard buffer storage 29. Accordingly, whenever a cardboard 13 is removed from the cardboard buffer storage 29, the same number of cardboards 13 is stored in the cardboard buffer storage 29 and the cardboards 13 may be removed under constant conditions. In particular, the conditions under which the cardboard conveyor 31 acts on the card-

boards 13 to convey the cardboard 13 to the food product supply area 15 are independent of the number of cardboards stored in the cardboard store 23. Thus, a stable and reliable operation of the cardboard dispensing apparatus 11 and the provision of cardboards 13 at the food product supply area 15 at high rates may be accomplished.

[0131] Since, in this embodiment, the number of cardboards stored in the cardboard buffer storage 29 is always restored after a cardboard 13 has been removed from the cardboard buffer storage 29, the pressing device 53 may be activated periodically to press the cardboards 13 stored in the cardboard buffer storage 29 against the upper conveyor 63. In order to control the activation of the pressing device 53, a further measurement device 83 is provided that, through a measurement L, is configured to detect the cardboards 13 stored in the cardboard buffer storage 29, in particular a height of the stack 39 of cardboards 13 stored in the cardboard buffer storage 29. In particular, the measurement device 83 may be configured to detect rear ends 75 of the cardboards 13 and thus, detecting when a subsequent cardboard 13 has been correctly moved into the cardboard buffer storage 29. The measurement device 83 may, e.g., comprise a light barrier and/or a distance sensor.

[0132] In order to prevent the cardboard extracting device 27 from overfilling the cardboard buffer storage 29 or move a further cardboard 13 into the cardboard buffer storage 29 even though no cardboard 13 has been removed, the cardboard extracting device 27 includes a spacer means 73 that, via a coupling 91, is connected to the conveying means 71 and supported on the floor 111 via a support 85 of the cardboard dispensing apparatus 11. The conveying means 71 and the spacer means 73 are arranged offset to each other with respect to a height direction H.

[0133] Fig. 2B illustrates the cardboard dispensing apparatus after a cardboard 13 has been moved into the cardboard buffer storage 29 to restore the plurality 25 of cardboards 13. In this situation, the spacer means 73 rests on the rear ends 75 of the cardboards 13 stored in the cardboard buffer storage 29 such that the conveying means 71 does not reach the subsequent cardboard 13 stored in the cardboard store 23. A subsequent cardboard 13 may, thus, only be moved into the cardboard buffer storage 29 after the uppermost cardboard 35 of the cardboards 13 stored in the cardboard buffer storage 29 has been removed from the cardboard buffer storage 29 by activating the pressing device 53. After the uppermost cardboard 35 has been removed, the spacer means 73 and the conveying means 71 jointly fall downwards and the offset between those components is chosen such that the conveying means 71 then contacts the uppermost cardboard 33 of the cardboard stack 24 while the spacer means 73 does not come into contact with the cardboards 13 stored in the cardboard buffer storage 29 (see Fig. 2A). Thus, the uppermost cardboard 33 of the cardboard stack 24 may be moved into the cardboard

buffer storage 29. The conveying means 71 may in particular be driven constantly, such that a cardboard 13 may immediately be moved into the cardboard buffer storage 29 as soon as the height of the cardboards 13 stored in the cardboard buffer storage 29 falls below the offset between the spacer means 73 and the conveying means 71.

[0134] Further, the spacer means 23 is configured as an eccentric roll and mounted rotatably around an axis 113. By changing the position of the spacer means 73, the offset between the spacer means 73 and the conveying means 71 may be adjusted and a height of the stack 39 of cardboards 13 stored in the cardboard buffer storage 29 at which the spacer means 73 contacts the cardboards 13 may be defined. Thus, by adjusting the position of the spacer means 73, a number of cardboards 13 to be stored in the cardboard buffer storage 29 or the number of the plurality 25 of cardboards 13 may be defined, and, during operation, this number may be kept constant. In particular, at the start of operation, the thus predetermined number of cardboards 13 may be moved into the cardboard buffer storage 29 until the spacer means 73 comes into contact with the cardboards 13 and prevents the conveying means 71 from contacting the cardboards 13 stored in the cardboard store 23. During operation, after each cardboard 13 that has been removed from the cardboard buffer storage 29, a subsequent cardboard 13 may be automatically moved from the cardboard store 23 into the cardboard buffer storage 29.

[0135] In order to enable the cardboard extracting device 27 to act on the cardboards 13 stored in the cardboard store 23 while the cardboard stack 24 is emptied, the cardboard dispensing apparatus 11 includes a lifting device 65 that is configured to lift the cardboard stack 24 upwards in a height direction H. The cardboard extracting device 27 is, in general, operable between an upper position and a lower position and the lifting device 65 is configured to move the cardboard extracting device 27 to the upper position by pushing the cardboard stack 24 upwards. To be movable between the upper position and the lower position, the cardboard extracting device 27 is pivotable around a pivot axis D3, around which also a pulley 68 of the belt drive 67 is drivable.

[0136] To ensure that the cardboard extracting device 27 is positioned in a position where operation is possible, i.e. between the upper position and the lower position, the cardboard extracting device 29 includes a pivot lever 89 that extends downward and contacts a respective sensor 87 when the cardboard extracting device 27 reaches the upper position or the lower position. The controller 55 may in particular be configured to control the lifting apparatus 67 for lifting the cardboard stack 24 when the sensors 87 detect the lower position and stop the lifting apparatus 65 when the upper position is detected, such that the position of the cardboard extracting device 27 may be kept between those two positions. The cardboard extracting device 27 may in particular also pivot during

operation when cardboards 13 are moved from the cardboard store 23 into the cardboard buffer storage 29 or from the cardboard buffer storage 29 towards the food product suppl area 15, such that a correction of the position might be necessary. The sensors 87 may, e.g., be configured as mechanical contact sensors.

[0137] Figs. 3A and 3B show an alternative construction of the cardboard extracting device 27. While the cardboard extracting device 27 shown in Figs. 2A and 2B is configured to immediately move a further cardboard 13 into the cardboard buffer storage 29 after a cardboard 13 has been removed from the cardboard buffer storage 29, the cardboard extracting device 27 shown in Fig. 3A and 3B is in particular configured to jointly move a group 37 of cardboards 13 into the cardboard buffer storage 29. In particular, in such embodiments, a group 37 of cardboards 13 may be moved into the cardboard buffer storage 29 after a group of the same number of cardboards 13 has been removed from the cardboard buffer storage 29. This enables to keep the number of cardboards 13 stored in the cardboard buffer storage 29 in a predetermined range, thus providing, similarly to the other construction, constant conditions for the cardboard conveyor 31, in particular, independent of the number of cardboards 13 stored in the cardboard store 23.

[0138] The extracting device 27 shown in Figs. 3A and 3B includes a separation device 41 that is configured to separate cardboards 13 above an extraction height E from cardboards 13 below the extraction height E. As may be seen, the lifting device 65 may lift the cardboard stack 24 upwards, such that several cardboards 13 forming a group 37 may be positioned above the extraction height E.

[0139] In order to separate that group 37 from cardboards 13 below the extraction height E, the separation device 41 is movable from a passive position P, in which the separation device 41 is positioned adjacent the cardboard stack 24 and the cardboard stack 24 may be lifted by the lifting apparatus 65, to a separation position S in which the separation device 41 acts on the cardboards 13 above the extraction height E (see Fig. 3B). In this embodiment, the separation device 41 is pivotable around a pivot axis D2 to move from the passive position P to the separation position S. Due to that movement of the separation device 41 from the passive position P to the separation position S, rear ends 75 of the cardboard 13 stored in the cardboard store 23 may be elevated by the separation device 41 and thus separated from cardboards 13 below the extraction height E.

[0140] Further, the cardboard extracting device 27 includes a blocking member 43 that is movable between a release position R shown in Fig. 3A and a blocking position B shown in Fig. 3B. In the blocking position B, the blocking member 43 exerts a pressure on the cardboards 13 below the extraction height E, thus preventing the cardboards 13 from being moved towards the cardboard buffer storage 29. To move from the release position R to the blocking position B, the blocking member

43 is pivotable around a pivot axis D1.

[0141] In order to move the separated cardboards 49 forming the group 37 of cardboards 13 into the cardboard buffer storage 29, the cardboard extracting device 27 includes an entrainer 45 that is configured as a pusher 47. The pusher 47 may be linearly movable and act on the rear ends 75 of the separated cardboards 49 to push the group 37 of cardboards 13 over the ramp 57 and underneath the cardboards 13 already stored in the cardboard buffer storage 29 (see also figs. 1, 2A and 2B). In particular, the entrainer 45 may be movable by a belt drive 67.

[0142] The blocking member 43 and the separation device 41 are further coupled via a motion link 81 of the blocking member 43 into which a pin 93 connected to the separation device 41 extends. Thus, a movement of the blocking member 43 may be transmitted to the separation device 41 and vice versa, such that the separation device 41 may be moved from the passive position P to the separation position S when the blocking member 43 is moved from the release position R to the blocking position B, and vice versa. In addition, the motion link 81 is configured such that the separation device 41 contacts the rear ends 75 of the cardboards 13 above the extraction height E to separate the cardboards 13 from the cardboards 13 below the extraction height E before the blocking member 43 reaches the cardboard stack 24. Thus, the space needed for the blocking member 43 to reach the cardboards 13 below the extraction height E may firstly be created by the separation device 41.

[0143] Further, the blocking member 43 may be biased towards the blocking position B, e.g. by a spring not shown in the figures. However, in order to keep the blocking member 43 in the release position R, the entrainer 45 is configured to, in a start position A shown in Fig. 3A, block a movement of the blocking member 43 by contacting a pin 94. In order to initiate the separation of the cardboards 13 and the blocking of cardboards 13 below the extraction height E, the entrainer 45 may be moved to a pushing position F shown in Fig. 3B, thus enabling a movement of the blocking member 43 and, thus, of the separation device 41. The entrainer 45 may stop in the pushing position F and, after the group 37 of cardboards 13 has been separated from cardboards 13 below the extraction height E, may be moved along the movement direction M to move the group 37 of cardboards 13 into the cardboard buffer storage 29. Afterwards, the entrainer 45 may be moved against the movement direction M to contact the pin 94 and move the blocking member 43 back to the release position R and the separation device 41 back to the passive position P. After this, the lifting device 65 may be controlled for lifting the cardboard stack 24 upwards until a subsequent group 37 of a predetermined number of cardboards 13 is positioned above the extraction height E. Then, the procedure described above of separating those cardboards 13 from cardboards 13 below the extraction height E and moving the group 37 of cardboards 13 into the cardboard buffer storage 29 may be repeated.

[0144] As is further shown in Fig. 1, the food processing system 59 includes a second cardboard dispensing apparatus 61 that is configured as described before and may also be used to provide cardboards 13 at the food product supply area 15. This enables the controller 55 to switch from the cardboard dispensing apparatus 11 to the second cardboard dispensing apparatus 61 once the cardboard store 23 of the cardboard dispensing apparatus 11 has been emptied, or vice versa. Thus, the respective emptied cardboard store 23 may be refilled while the operation may be continued using the respective other cardboard dispensing apparatus 11 or 61.

[0145] Figs. 4A to 4F show an alternative construction of the cardboard extracting device 27 which with respect to function and structure corresponds to the cardboard extracting device 27 shown in Figs. 3A and 3B, except for the separation device 41 as will be described below. Another difference is that while the dispensing apparatus of the cardboard extracting device 27 of Figs. 3A and 3B comprises a cardboard buffer storage, the cardboard extracting device 27 being used to move the cardboards 13 from the cardboard store 23 to that cardboard buffer storage, here, i.e. in the embodiment of Figs. 4A to 4F, a cardboard buffer storage is dispensed with and the cardboard extracting device 27 is configured to move the cardboards 13 - one after another - directly into the cardboard conveyor 31 which then conveys the cardboards 13 to the food product supply area 15 (Figs. 4D and 4E).

[0146] However, as already mentioned elsewhere, the cardboard extracting device 27 as shown in Fig. 4A to 4F may alternatively be used to move cardboards 13 from the cardboard store not directly into a cardboard conveyor but into a cardboard buffer storage, in particular into a cardboard buffer storage as disclosed herein. Additionally or alternatively, the cardboard extracting device 27 as shown in Figs. 4A to 4F may be used to move cardboards 13 from a cardboard buffer storage, in particular from a cardboard buffer storage as disclosed herein, into a cardboard conveyor.

[0147] While Figs. 4A to 4E show a sectional view of the cardboard extracting device 27 in a vertical mid plane V (Fig. 4F), Fig. 4F is a rear view of the cardboard extracting device 27.

[0148] Here, the separation device 41 comprises a suction device 119 comprising a suction cup connected via a vacuum line 127 to a vacuum source (not shown). The suction device 119 is movable between a lower position (Fig. 4A) and an upper position (Fig. 4B). In the lower position, the suction device 119 is situated above a middle rear end portion 121 (Fig. 4B) of the uppermost cardboard 13 of the cardboard stack 24 in the cardboard store 23.

[0149] At both sides of the suction device 119 is positioned a respective down-hold element 123 (Fig. 4D bis 4F). The lower end of each down-hold element 123 is positioned slightly above a respective lateral rear end portion 125 of the uppermost cardboard 13 that is positioned laterally with respect to the middle rear end portion

121 where the suction device 119 interacts with the uppermost cardboard 13. The down-hold elements 123 may touch the uppermost cardboard 13, and the down-hold elements 123 may also exert a certain pressure on the uppermost cardboard 13. However, that pressure must not be so high that the uppermost cardboard 13 is prevented from slipping relative to the next-lower cardboard 129 when it is lifted by moving the suction device 119 - with vacuum applied - from the lower position of Fig. 4A into the upper position of Fig. 4B.

[0150] As explained elsewhere, by lifting the middle rear end portion 121 of the uppermost cardboard 13 (Fig. 4B, 4D and 4F), while at the same time holding the neighboring lateral areas of the cardboard 13 on a lower level, a curvature in the rear end portion of the uppermost cardboard 13 is produced (Fig. 4F) whereby the lateral rear portions of the cardboard 13 are pulled through the gaps between the hold-down elements 123 and the next-lower cardboard 129, thereby eliminating any adhesive forces between the uppermost cardboard 13 and the next-lower cardboard 129.

[0151] Analogous to the embodiment shown in Figs. 3A and 3B, once the middle rear end portion 121 has been lifted to a sufficient amount, blocking elements 43 are pivoted about pivot axis D1 from the release position (Figs. 4A and 4B) to the blocking position B (Figs. 4C to 4F) and a belt drive 67 is activated to move an entrainer 45 attached to the belt drive 67 and which acts on the rear edge of the lifted portion 121 of the uppermost cardboard 13 so as to push that cardboard 13 into the cardboard conveyor 31 (Figs. 4C and 4E).

[0152] The cardboard conveyor 13 then conveys the cardboard 13 to the food product supply area 15.

[0153] This process is repeatedly carried out as demanded by the operation of the food processing system explained elsewhere, with the respective former next-lower cardboard 129 being the next uppermost cardboard 13.

Reference numbers

[0154]

11	cardboard dispensing apparatus
13	cardboard
15	food product supply area
16	transition
17,17'	food product
18	conveying band
19	portion
21	slice
23	cardboard store
24	cardboard stack
25	plurality of cardboards
27	cardboard extracting device
29	cardboard buffer storage
31	cardboard conveyor
33	uppermost cardboard

35	uppermost cardboard
37	group of cardboards
39	stack of cardboards
41	separation device
5 43	blocking member
45	entrainer
47	pusher
49	separated cardboards
51	gap
10 52	lower conveyor
53	pressing device
55	controller
57	ramp
59	food processing system
15 61	second cardboard dispensing apparatus
63	upper conveyor
65	lifting device
67	belt drive
68	pulley
20 71	conveying means
73	spacer means
75	rear end
77	front end
79	blocking means
25 81	motion link
83	measurement device
85	support
87	sensor
89	pivot lever
30 91	coupling
93	pin
94	pin
97	slicing apparatus
99	conveying apparatus
35 101	food product conveyor
103	packaging machine
105	blade
107	slicing area
109	package
40 111	floor
113	axis
119	suction device
121	middle rear end portion
123	hold-down element
45 125	lateral rear end portion
127	vacuum line
129	next-lower cardboard
A	start position
B	blocking position
50 C	arrow
D1, D2, D3	pivot axis
E	extraction height
F	pushing position
H	height direction
55 L	measurement
M	moving direction
P	passive position
R	release position

S separation position
V vertical plane

Claims

1. A cardboard dispensing apparatus (11) for providing cardboards (13) for use as a food product bottom support or as a food product packaging element at a food product supply area (15) where food products (17, 17') are provided by a conveying apparatus (99), in particular meat products or bacons, preferably slices (21) of food products cut off by a slicing apparatus (97) located upstream of the food product supply area (15),

the cardboard dispensing apparatus (11) comprising:

- a cardboard store (23) for storing cardboards (13) that form a cardboard stack (24) in the cardboard store (23),
- a cardboard extracting device (27) for extracting cardboards (13) from the cardboard store (23),
- a cardboard buffer storage (29) for storing a plurality of cardboards (25), and
- a cardboard conveyor (31) for conveying the cardboards (13) from the cardboard buffer storage (29) to the food product supply area (15),

wherein the cardboard extracting device (27) is configured to extract cardboards (13) from the cardboard store (23) and move the cardboards (13) into the cardboard buffer storage (29), and wherein the cardboard conveyor (31) is configured to remove the cardboards (13) from the cardboard buffer storage (29) and convey the cardboards (13) to the food product supply area (15).

2. Cardboard dispensing apparatus (11) in accordance with claim 1,

wherein the cardboard extracting device (27) is configured to successively extract a respective uppermost cardboard (33) from the cardboard stack (24) and move the respective uppermost cardboard (33) from the cardboard stack (24) into the cardboard buffer storage (29); or wherein the cardboard extracting device (27) is configured to jointly extract a group (37) of cardboards (13) comprising a predetermined number of cardboards (13) from the cardboard stack (24) and move the group (37) of cardboards (13) jointly from the cardboard stack (24) into the cardboard buffer storage (29).

3. Cardboard dispensing apparatus (11) in accordance with claim 1 or 2,

wherein the cardboard extracting device (27) includes a separation device (41) that is movable between a passive position (P) and a separation position (S), wherein the separation device (41) is configured to separate cardboards (13) of the cardboard stack (24) above an extraction height (E) from cardboards (13) of the cardboard stack (24) below the extraction height (E), in particular wherein the cardboard extracting device (27) comprises a blocking member (43), the blocking member (43) being movable between a release position (R) and a blocking position (B), wherein the blocking member (43), in the blocking position (B), is configured to block a movement of cardboards (13) below the extraction height (E) towards the cardboard buffer storage (29).

4. Cardboard dispensing apparatus (11) in accordance with claim 3, wherein the cardboard extracting device (27) comprises an entrainer (45), in particular a pusher (47), the entrainer (45) being configured to move the separated cardboards (49) into the cardboard buffer storage (29).

5. Cardboard dispensing apparatus (11) in accordance with any one of the preceding claims, wherein the cardboard extracting device (27) is configured to, during operation of the cardboard dispensing apparatus (11), extract at least one further cardboard (13) from the cardboard store (23) and move the at least one further cardboard (13) into the cardboard buffer storage (29).

6. Cardboard dispensing apparatus (11) in accordance with any one of the preceding claims,

wherein the cardboard conveyor (31) includes an upper conveyor (63), the upper conveyor (63) being arranged above the cardboards (13) stored in the cardboard buffer storage (29), and wherein the cardboard buffer storage (29) includes a pressing device (53) that is configured to selectively press the cardboards (13) stored in the cardboard buffer storage (29) against the upper conveyor (63) for removing the cardboards (13) from the cardboard buffer storage (29).

7. Cardboard dispensing apparatus (11) in accordance with claim 6,

wherein the cardboard dispensing apparatus

(11) includes a controller (55), the controller (55) being configured to, during operation of the cardboard dispensing apparatus (11),

- constantly or - timed with the pressing device - intermittently or periodically drive the upper conveyor (63) of the cardboard dispensing apparatus (11),
- periodically control the pressing device (53) for pressing the cardboards (13) stored in the cardboard buffer storage (29) against the upper conveyor (63) to remove an uppermost cardboard (35) from the cardboard buffer storage (29), and
- periodically control the cardboard extracting device (27) for moving at least one further cardboard (13) into the cardboard buffer storage (29).

8. A method for providing cardboards (13) for use as a food product bottom support or as a food product packaging element at a food product supply area (15) where food products (17, 17'), in particular meat products or bacon, preferably slices (21) of food products cut off by a slicing apparatus (97) located upstream of the food product supply area (15), are provided by a conveying apparatus,

wherein the cardboards (13) are provided using a cardboard dispensing apparatus (11), in particular a cardboard dispensing apparatus (11) according to any one of the preceding claims, the method comprising the steps:

- Extracting a plurality of cardboards (25) from a cardboard store (23) and arranging the plurality of cardboards (25) in a cardboard buffer storage (29),
- removing the cardboards (13) from the cardboard buffer storage (29) and conveying the removed cardboards (13) to the food product supply area (15).

9. Method according to claim 8, wherein the plurality of cardboards (25) in the cardboard buffer storage (29) is restored, after a cardboard (13) or a group (37) of cardboards (13) has been removed from the cardboard buffer storage (29), by moving a further cardboard (13) or a further group (37) of cardboards (13) from the cardboard store (23) into the cardboard buffer storage (29).

10. Method according to claim 8 or 9, wherein, for removing the cardboards (13) from the cardboard buffer storage (29), the cardboards (13) stored in the cardboard buffer storage (29) are periodically pressed against an upper conveyor (63), in

particular against a conveyor band or a conveyor belt.

11. Method according to any one of claims 8 to 10,

wherein the cardboard store (23) includes a cardboard extracting device (27) for moving the cardboards (13) from the cardboard store (23) into the cardboard buffer storage (29), wherein the cardboard extracting device (27) is controlled for periodically moving a subsequent cardboard (13) from the cardboard store (23) into the cardboard buffer storage (29) once a cardboard (13) has been removed from the cardboard buffer storage (29); or wherein the cardboard extracting device (27) is controlled for periodically moving a group (37) of cardboards (13) comprising a predetermined number of cardboards (13) from the cardboard store (23) into the cardboard buffer storage (29), in particular after the predetermined number of cardboards (13) has been removed from the cardboard buffer storage (29), in particular wherein the cardboards are lifted upwards in the cardboard store (23) after the subsequent cardboard (13) or the group (37) of cardboards (13) has been moved into the cardboard buffer storage (29).

12. Food processing system (59) including a slicing apparatus (97) that is configured to cut off slices (21) from a food product (17), in particular meat products or bacons, a conveying apparatus (99) for conveying the slices (21) to a food product supply area (15), and including a cardboard dispensing apparatus (11) according to any one of claims 1 to 7,

in particular wherein the food processing system includes a second cardboard dispensing apparatus (61) according to any one of claims 1 to 7, wherein a controller (55) of the food processing system (59) is configured to switch to the respective other of the cardboard dispensing apparatus (11) and the second cardboard dispensing apparatus (61) when the cardboard store (23) of the cardboard dispensing apparatus (11) or the second cardboard dispensing apparatus (61) has been emptied.

13. A cardboard dispensing apparatus (11) for providing cardboards (13) for use as a food product bottom support or as a food product packaging element at a food product supply area (15) where food products (17, 17') are provided by a conveying apparatus (99), in particular meat products or bacons, preferably slices (21) of food products cut off by a slicing apparatus (97) located upstream of the food product supply area (15),

the cardboard dispensing apparatus (11) comprising:

- a cardboard store (23) for storing cardboards (13) that form a cardboard stack (24) in the cardboard store (23),
- a cardboard extracting device (27) for extracting cardboards (13) from the cardboard store (23), and
- a cardboard conveyor (31) for conveying the cardboards (13) to the food product supply area (15),

wherein the cardboard extracting device (27) is configured to extract cardboards (13) from the cardboard store (23) and move the cardboards (13) into the cardboard conveyor (31), wherein the cardboard extracting device (27) includes a separation device (41) configured to separate only a respective uppermost cardboard (13) of the cardboard stack (24) by lifting the uppermost cardboard (13) with respect to the remaining cardboards (13) of the cardboard stack (24), the separation device (41) comprising a suction device (119) configured to apply a negative pressure to a rear upper portion of a respective uppermost cardboard (13) for lifting at least a rear end portion (121) thereof, and wherein the cardboard extracting device (27) comprises an entrainer (45), in particular a pusher (47), the entrainer (45) being configured to move the respective uppermost cardboard (13) into the cardboard conveyor (31) by engaging the lifted rear end portion (121) thereof.

- 14.** Cardboard dispensing apparatus (11) in accordance with claim 13, wherein the cardboard extracting device (27) comprises a blocking member (43), the blocking member (43) being movable between a release position (R) and a blocking position (B), wherein the blocking member (43), in the blocking position (B), is configured to block a movement of the remaining cardboards (13) located below a respective uppermost cardboard (13).

- 15.** Cardboard dispensing apparatus (11) in accordance with claim 13 or 14,

wherein the cardboard extracting device (27) comprises at least one hold-down element (123) positioned laterally with respect to the suction device (119) and configured to hold a respective lateral rear end portion (125) of the uppermost cardboard (13) down below the height level of the lifted rear end portion (121) thereof, in particular wherein the cardboard extracting device (27) comprises at least two hold-down

elements (123) positioned on both sides of the suction device (119).

- 16.** A method for providing cardboards (13) for use as a food product bottom support or as a food product packaging element at a food product supply area (15) where food products (17, 17'), in particular meat products or bacon, preferably slices (21) of food products cut off by a slicing apparatus (97) located upstream of the food product supply area (15), are provided by a conveying apparatus,

wherein the cardboards (13) are provided using a cardboard dispensing apparatus (11), in particular a cardboard dispensing apparatus (11) according to any one of claims 13 to 15, the method comprising the steps:

- applying a negative pressure to a respective uppermost cardboard (13) for lifting at least a rear end portion (121) thereof,
- engaging the lifted rear end portion of the uppermost cardboard (13) for moving it towards the food product supply area (15), and
- conveying the uppermost cardboard (13) to the food product supply area (15)

in particular wherein the method further comprises:

- blocking a movement of the remaining cardboards (13) located below a respective uppermost cardboard (13), and/or
- holding a respective lateral rear end portion (125) of the uppermost cardboard (13) down below the height level of the lifted rear end portion (121) thereof, in particular wherein the uppermost cardboard (13) is held down at two lateral rear end portions situated on both sides of where the negative pressure is applied.

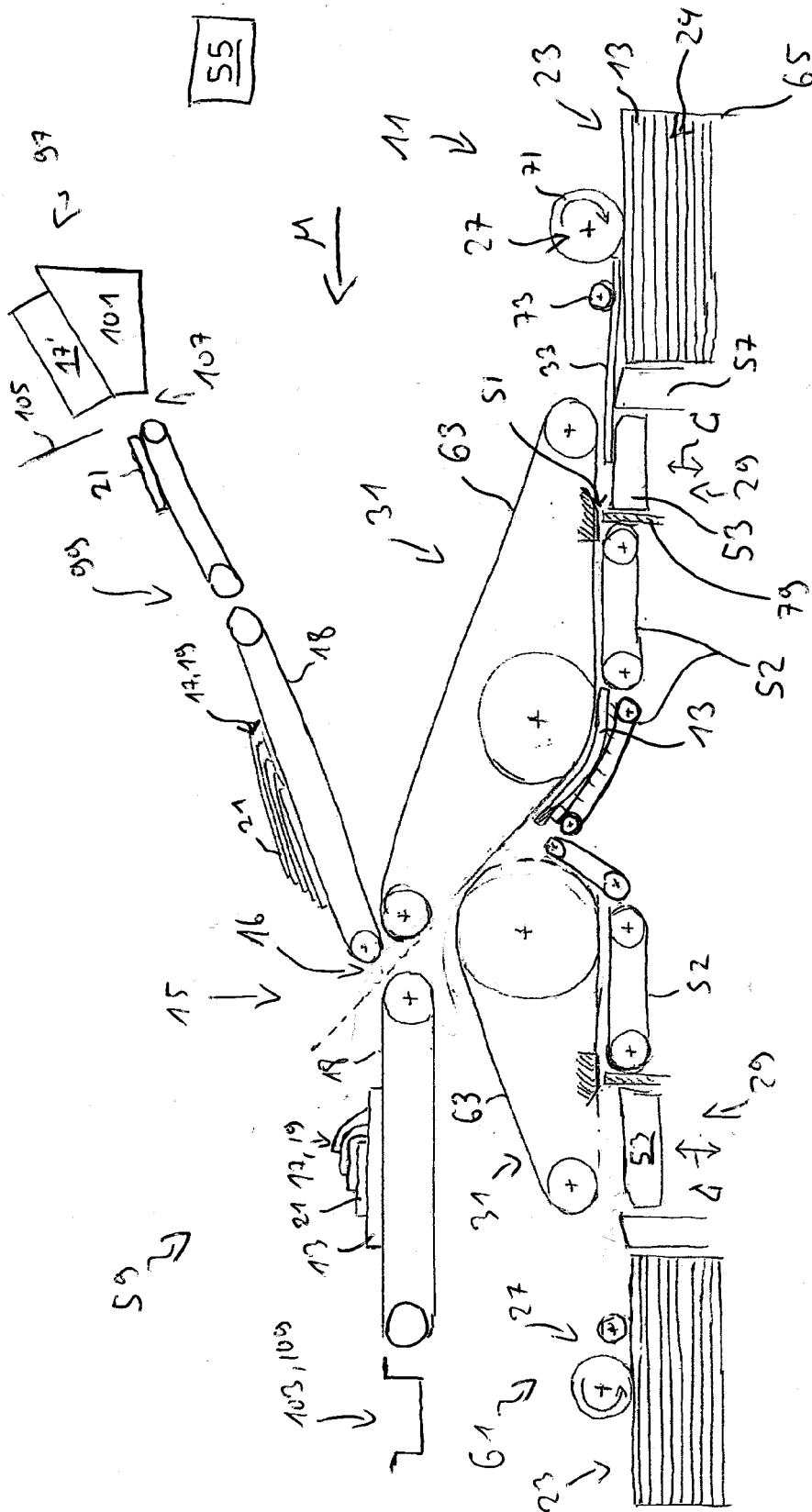
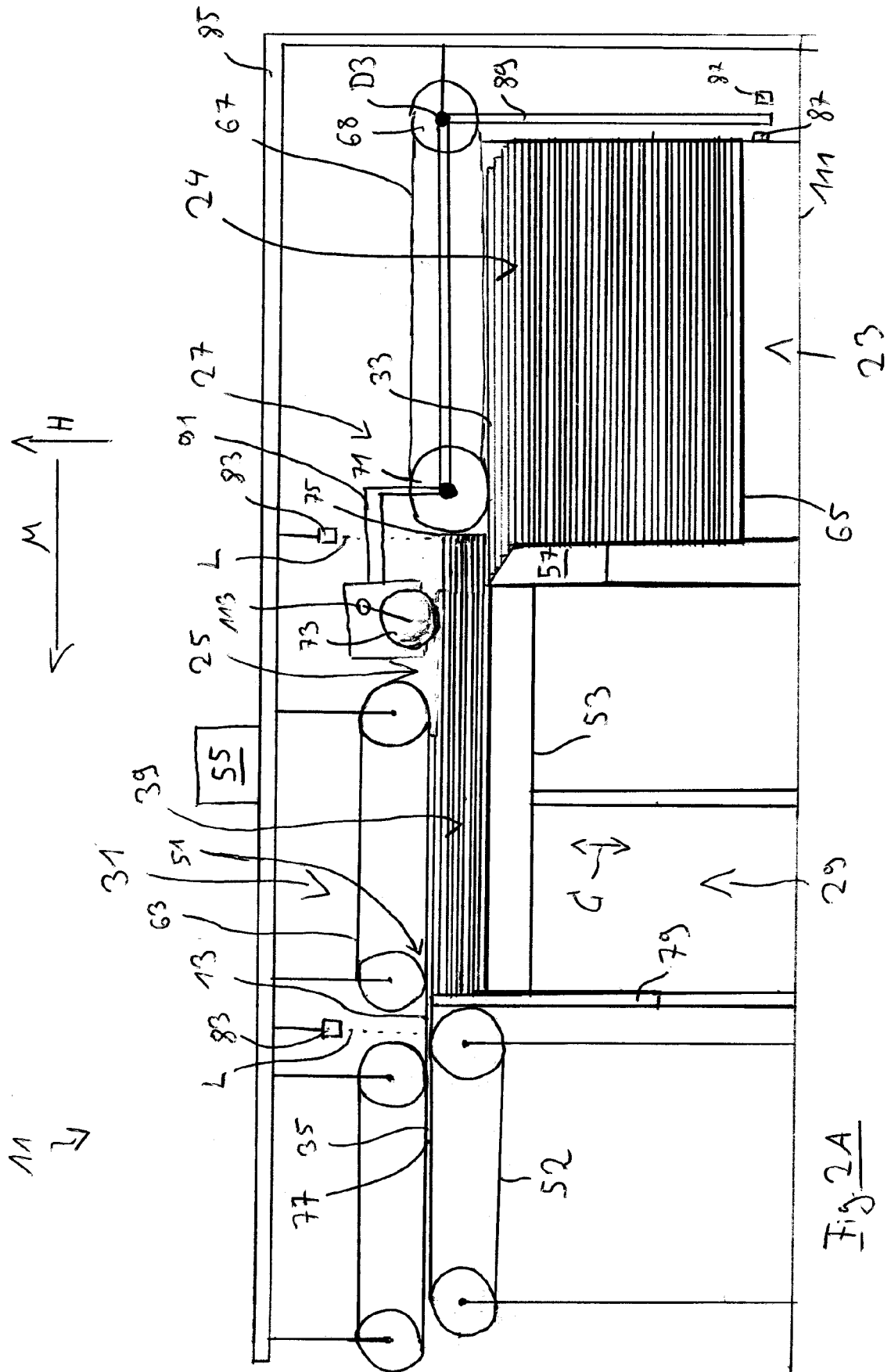


Fig. 1



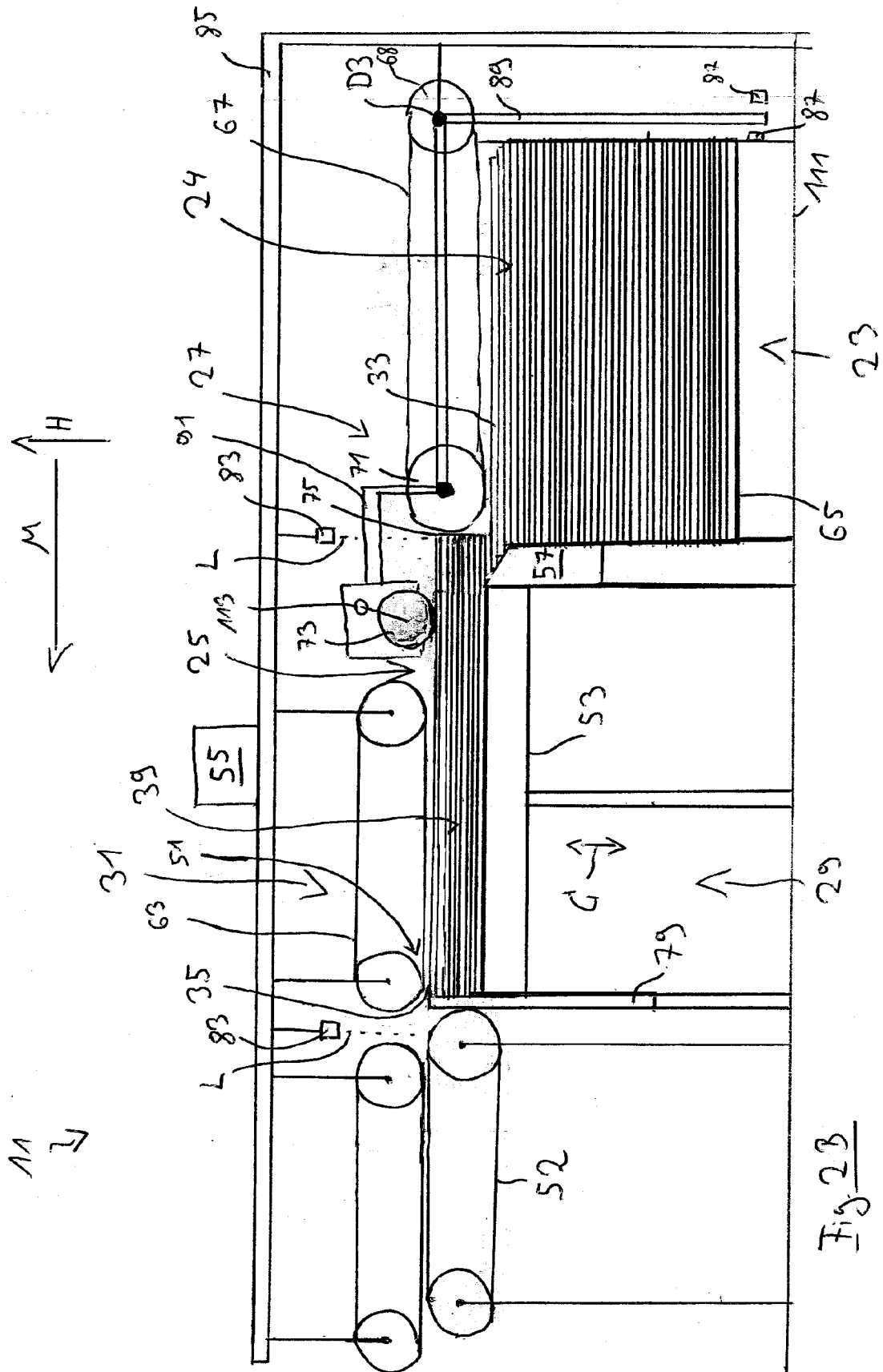
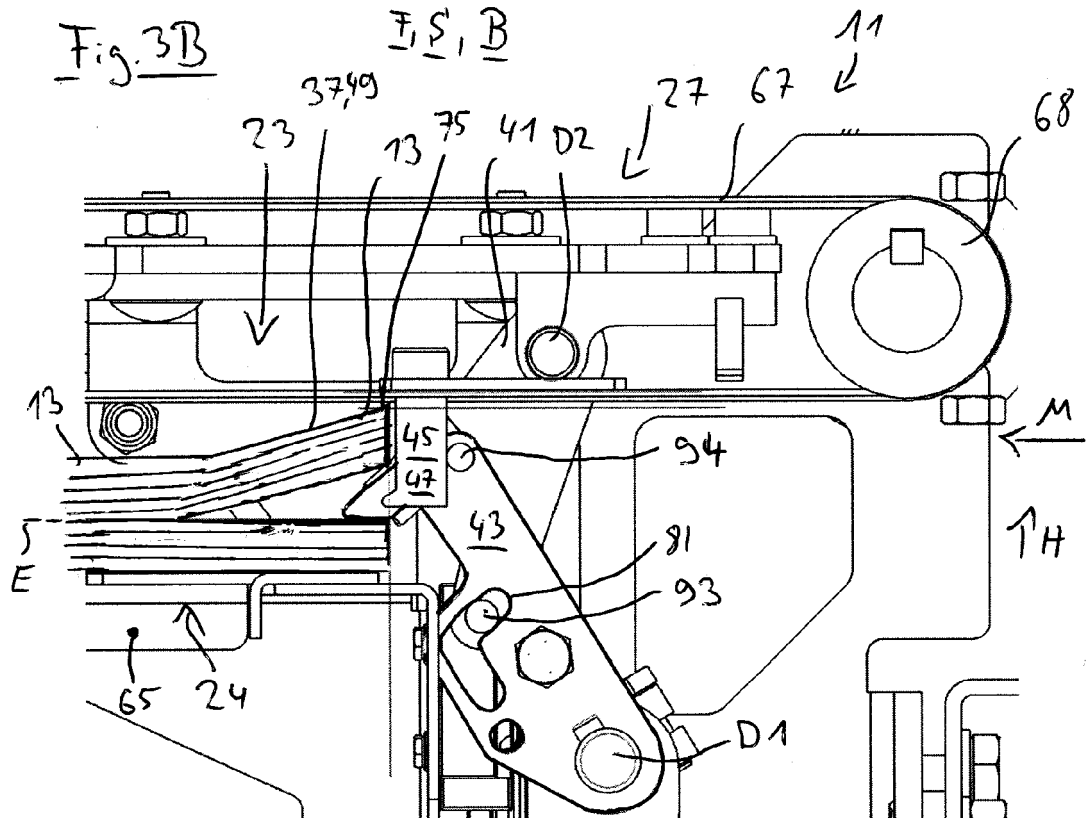
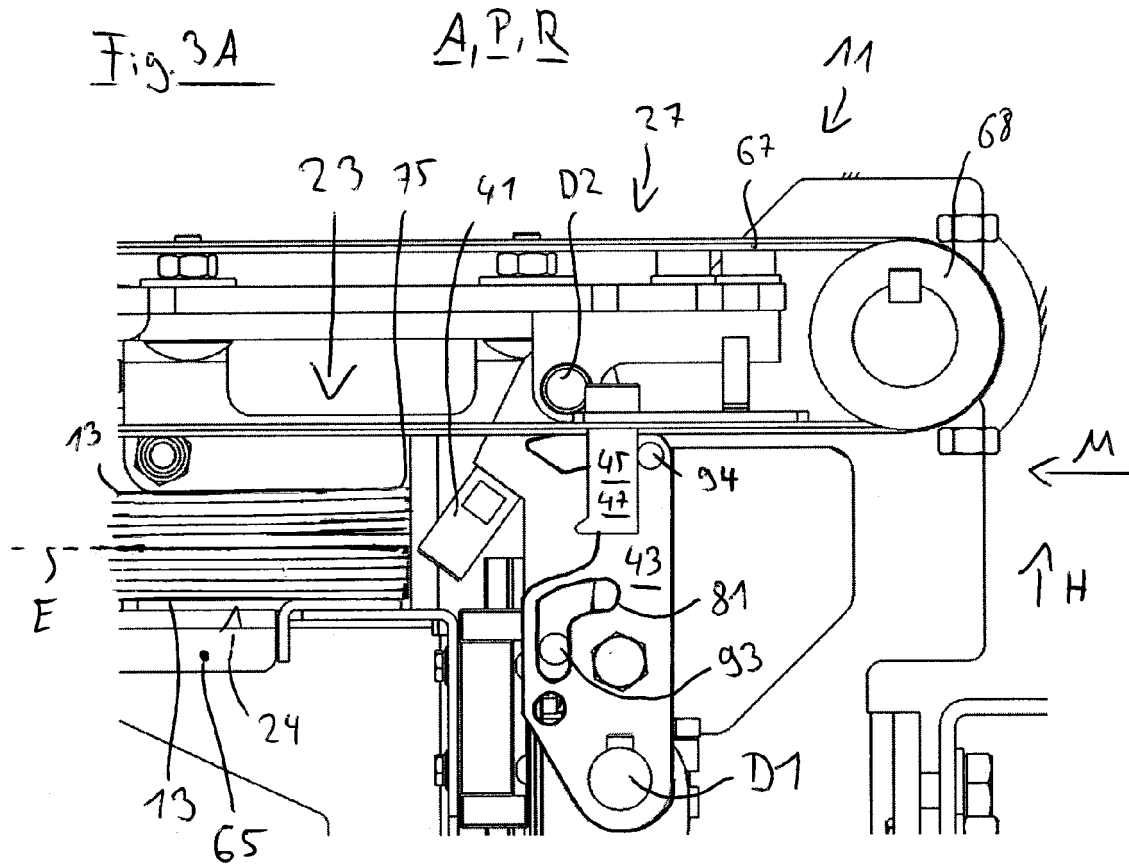
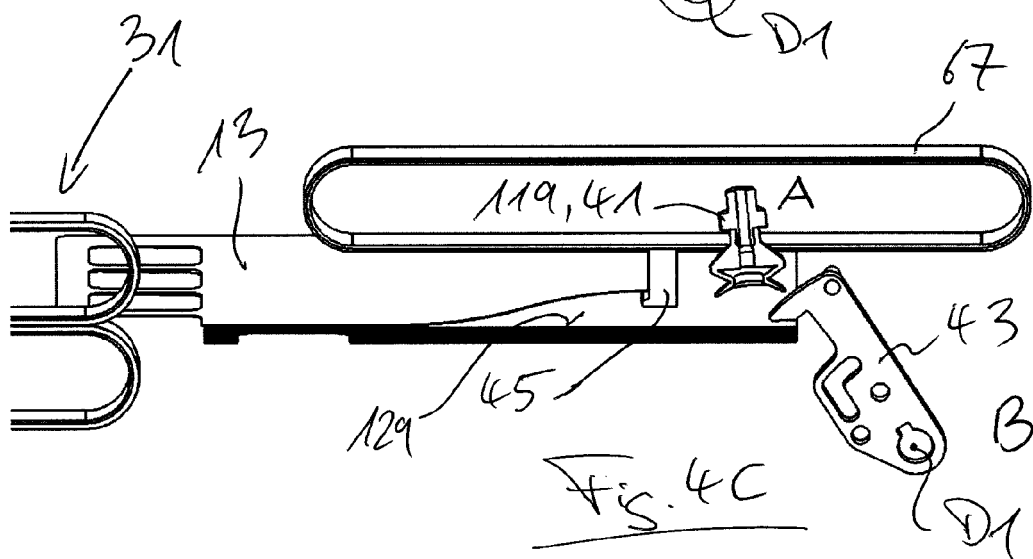
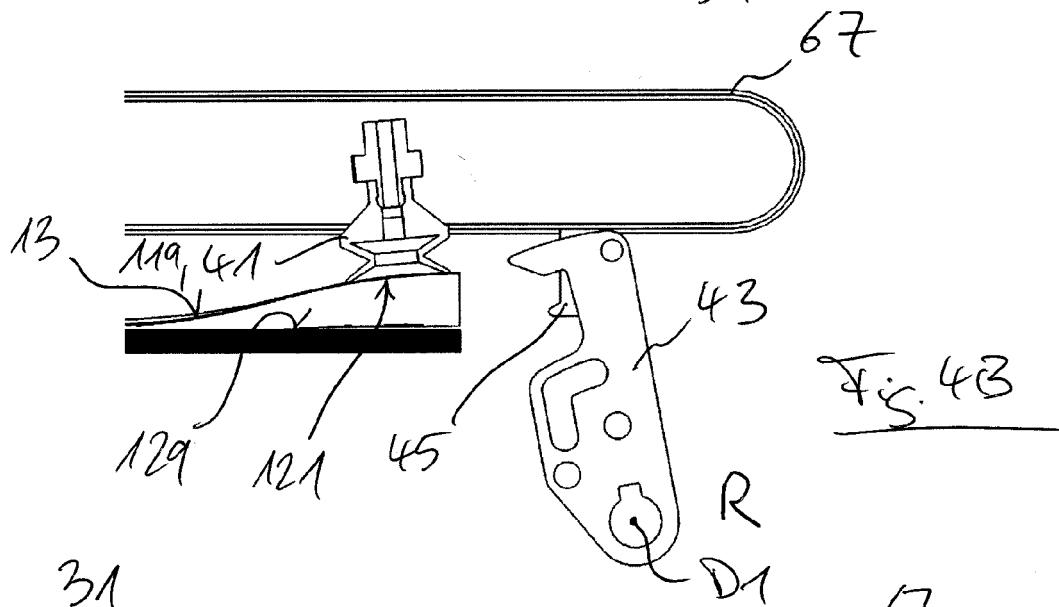
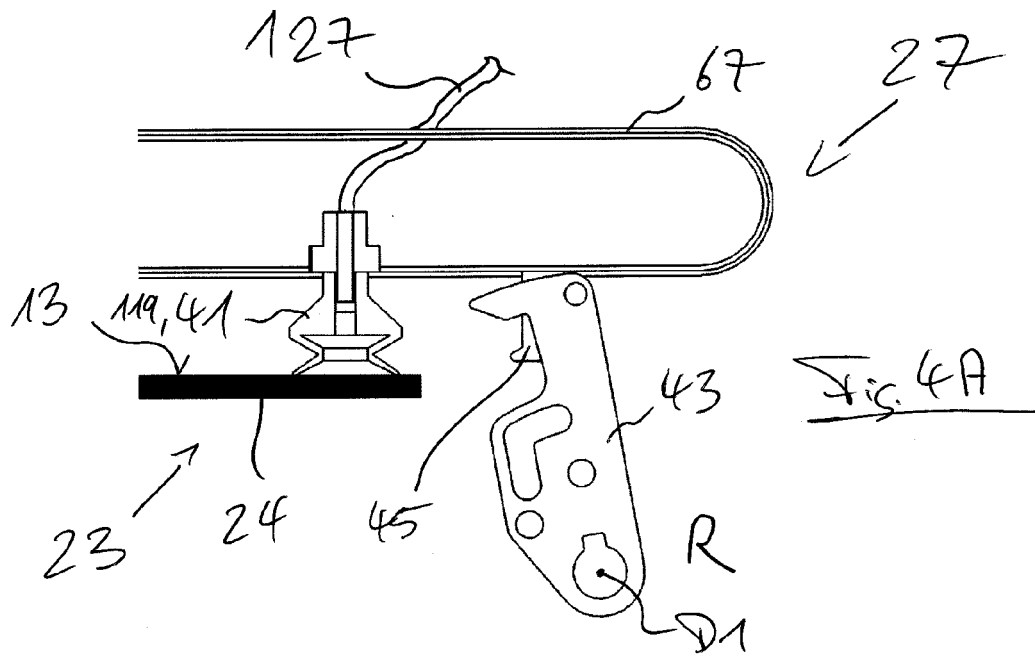
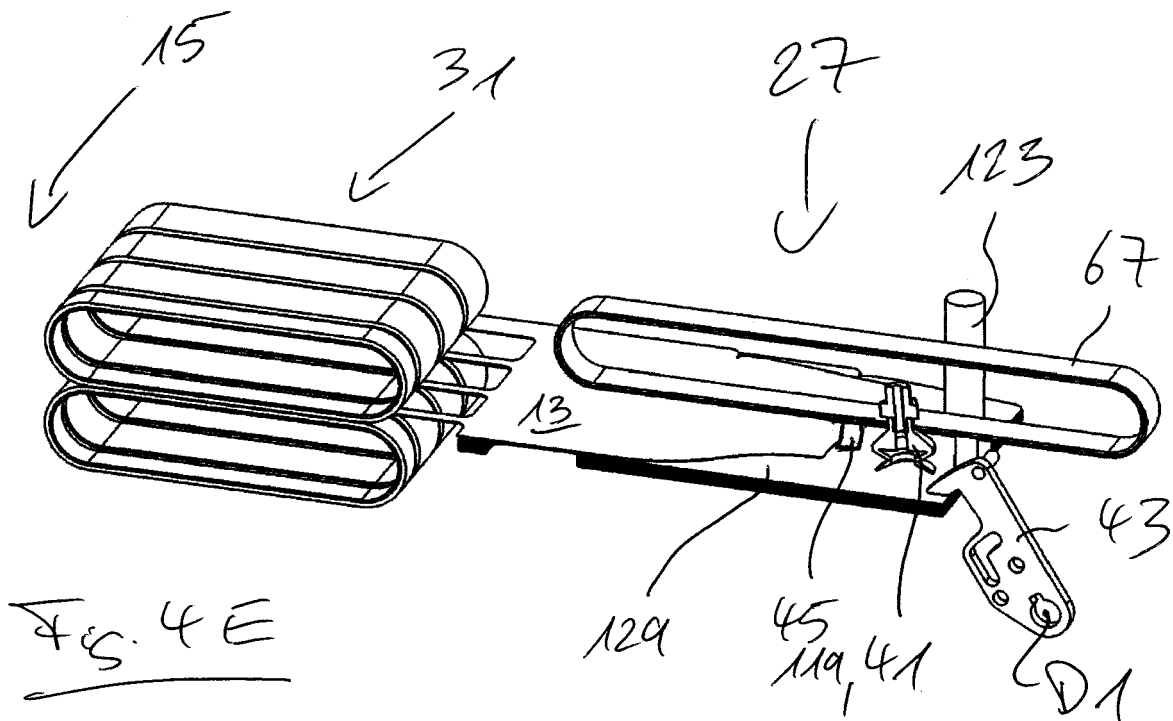
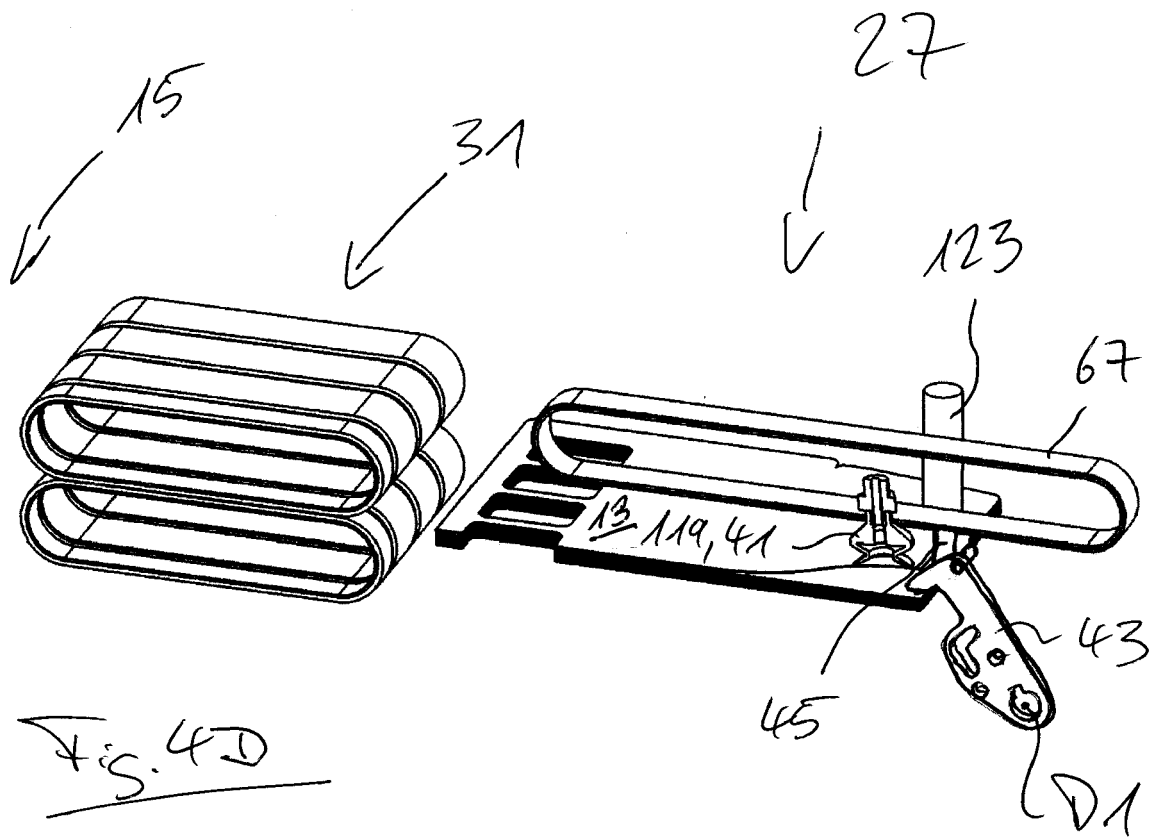


Fig. 23







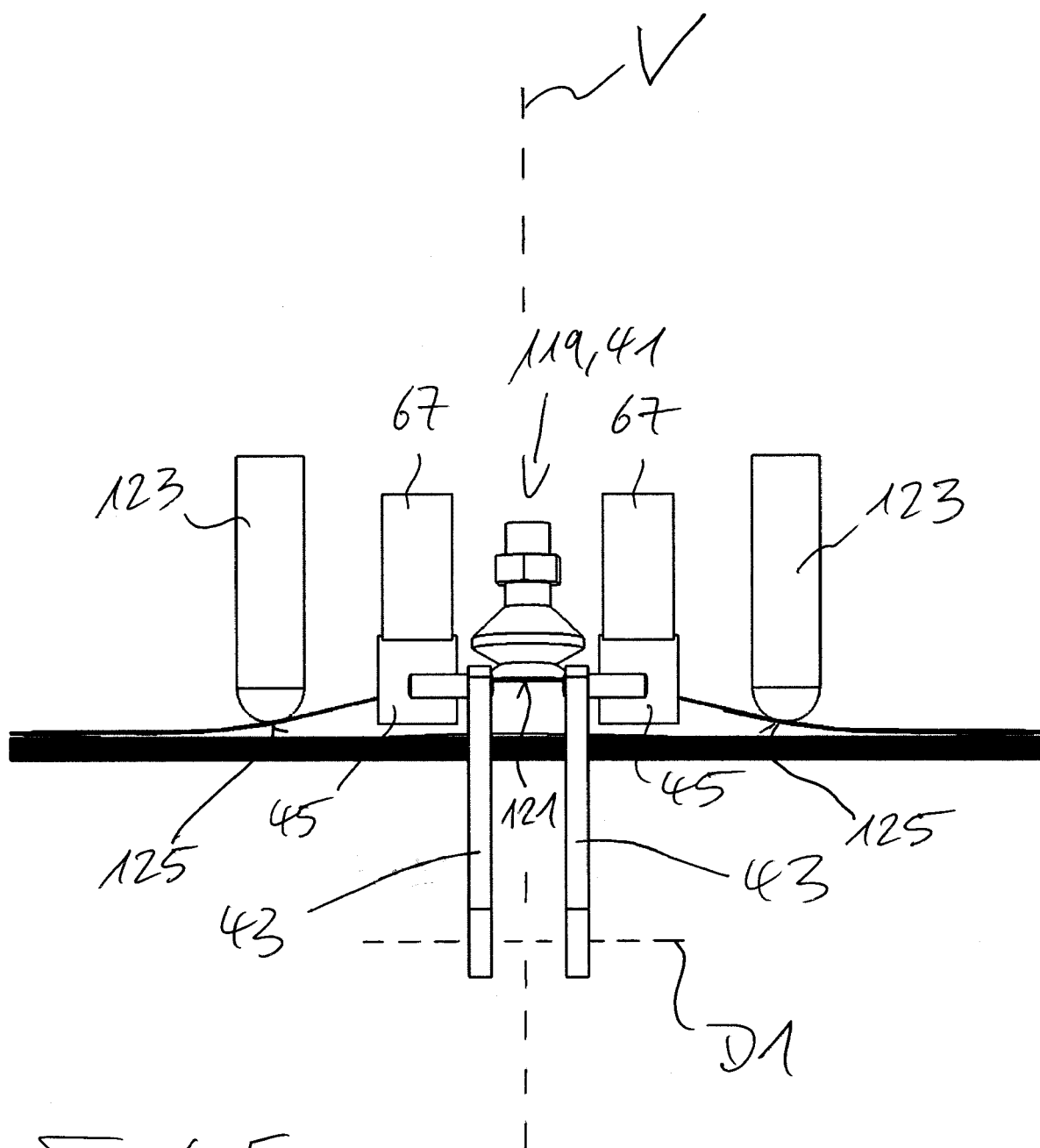


Fig. 4F



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 5188

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
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The Hague		19 December 2022	Athanasiadis, A
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-12

**Cardboard dispensing apparatus and method comprising a
buffer**

2. claims: 13-16

**Cardboard dispensing apparatus and method comprising a
separation device**

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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