High-performance packaging method for packaging, in particular small-sized, products, and high-performance packaging device, in particular for performing the method

The present invention relates to a high-performance packaging method for packaging, in particular small-sized, products, preferably confectionary, such as hard or soft caramels, pralines or similar, and a high-performance packaging device, in particular for performing the method, and a high-performance packaging machine or comprising at least one packaging machine arrangement consisting of a plurality of packaging machines with such a packaging device.

What is aimed at in the field of high-performance packaging machines operating in particular according to the continuous principle and used for small-sized products, such as confectionary, which, depending on the product in question and the desired appearance, are packed in a great variety of different folds, such as packet, envelope or sachet folds, or e.g. packages with a twist wrap or a double twist wrap, are a quick change of format and an easy process changeover with respect to different folding modes on the one hand and higher performances on the other. These performances are, at present, in the range of 1,500 to 2,000 packed articles per minute.

Such solutions are known, e.g. with different configurations of the packaging machines in question, from the applicant's DE 10 2008 019 605 A1 and also from DE 10 2005 017 329 A1.

In the case of these fast-running machines, further increases in performance are only possible to a limited extent, due to mass forces of rotating masses, a precise synchronization of product feed and product separation as well as packing stuff feed, the derivation of control movements for the product-clamping pairs of holding jaws, holding-means clamping units, such as packing stuff tongs, and the control of the packaging units themselves, normally on the basis of stationary shafts and rotating cam followers.

Hence, it is the object of the present invention to provide a high-performance packaging method for packaging, in particular small-sized, products, which allows a substantial increase in the packaging performance, in particular in the field of continuously operating packaging machines. Furthermore, a high-performance packaging device, in particular for performing the method, and a packaging machine as well as a packaging machine arrangement comprising at least one such packaging device are to be provided.

As regards the high-performance packaging method, this object is achieved by the features of claim 1 of the present invention, as regards the high-performance packaging device it is achieved by the features of claim 19 of the present invention, as regards the packaging machine it is achieved by claim 33, and as regards the high-performance packaging machine arrangement it is achieved by claim 34. Preferred embodiments of the invention are the subject matters of the subclaims.

According to the present invention, the new high-performance packaging method is characterized in that a plurality of product flows are guided through the packaging device, preferably in parallel, preferably simultaneously and preferably in the same feed direction.

According to a preferred embodiment, a product flow is no longer guided through a packaging machine or a packaging device, which is especially a packaging machine or a packaging device operating according to the continuous principle, in which the products are packed by means of at least one, normally by means of a plurality of rotating heads, but according to the present invention at least a pair of preferably at least partially parallel product flows, so that the packaging performance of the hitherto used packaging machines doubles or multiplies depending on the number of products flows that can be guided through the high-performance packaging device preferably simultaneously and preferably substantially in parallel.

It follows that also more than two product flows can be guided through the packaging device and packed. In particular in combination with different feed principles, e.g. removal from a separating plate or linear feed from a feed belt or feed chain, but also in the case of identical feed modes, also a merging of product flows or a separation of the latter or the transfer of individual articles of a product flow to another product flow may be provided, in particular in the case of a combination of a clocked, discontinuous procedure with a continuous procedure and/or in the case of the combined use of a plurality of packaging devices in one or a plurality of packaging machines or packaging machine arrangements.

This high-performance packaging method is absolutely independent of the folding mode selected for packaging the product or of the number of heads or wheels used within the framework of the preferred, continuous principle. This means that, according to the present invention, the principle can be used for a single-head or dual-head machine as well as for three-head or multi-head machines (a different number of heads may here also be provided for each product flow). In particular a rotating removal wheel comprising a plurality of sets of removal units, each set

being assigned to a product flow, or a plurality of removal wheels comprising each a set of removal units, assigned to a respective product flow, are here provided.

Accordingly, the necessary product/packing-material holding elements are provided for each product flow in the additional process steps, i.e. in cases where a transfer device (gripper wheel) is used, suitable pairs of holding jaws having packing-material clamping means assigned thereto are provided for each product flow, or sets of packaging units are provided in the downstream packaging mechanism for each product flow, so that a plurality of products is conveyed and packed in parallel, preferably in the same way, in each process stage. The product flows are preferably of the same kind. They may, however, also consist of different products, which are packed in different packaging processes, folding or wrapping modes.

Within a packaging device, the products of a product flow may be packed intermittently and those of another product flow may be packed continuously, preferably simultaneously. According to a preferred embodiment, also a packaging device operating according to the continuous principle (continuous flow of products) may be linked in line with a discontinuously operating packaging device/packaging machine.

According to the present invention, a combination of continuously guiding packaging devices and discontinuously guiding units may be provided, in a manner increasing the performance in general, for all the multi-lane product flows or only for a part of these product flows. The intermittent units may e.g. be units for providing an outer packaging, stack packers with stacking devices, closure units, such as longitudinal or transverse sealing units, in particular on a thermal or ultrasonic basis, preferably for sealing the flaps of tubular bag packagings or the like, and also end closing units (cold and hot sealing) or adhesive-assisted bonding (closing) of packing materials, where necessary also by means of ultrasound. The multi-lane, preferably simultaneous/parallel processing of at least two product flows leads to an extreme increase in performance as regards the provision of fully packed products, no matter whether these products are individual products or products combined for the purpose of obtaining a collective package, such as packed sticks of gum.

According to a preferred embodiment, the packing material is inserted, substantially radially, either into the removal device or the transfer device, and, in so doing, a leading end of the packing material band is clamped in position and a piece of packing material is cut off or a piece of

packing material is cut off in advance and fed to the respective removal wheel or a downstream gripper wheel or some other head of a packaging device.

Means that may be used as product and/or packing-material holding means are, in addition to mechanical packing stuff tongs, in particular in combination with product holding means also vacuum nozzles or similar vacuum-controlled holding units. If desired, such units may also be used in combination with one another.

According to a preferred embodiment, a packaging mechanism comprising respective sets of packaging units per product flow is followed by a discharge wheel by means of which the products, which are preferably guided in parallel, are advanced to a cooling or tempering line used as a conditioning unit for hot or cold sealing e.g. the end faces of the package so as to obtain in this way an sufficiently leak-proof, and possibly also smell-proof or aroma-sealed package.

In this way a preferably two-lane packaging system, which, may, however, also be configured as a multi-lane packaging system, is created. In the case of this system, the products may e.g. also be fed from a strand (continuous strand of material), the strands of material, which are guided in parallel in the direction of the removal wheel/removal wheels, being cut through upstream of the removal device by knives rotating e.g. at right angles to the strands of material, thus forming separated products, which are then removed and picked up, respectively, by the respective sets of removal units that are assigned to the product flow in question.

Also a separating plate (or a plurality of separating plates) may be provided upstream of the removal device as a separating means, one or a plurality of longitudinal conveying units being fed from said separating plate or plates so as to form the product flows.

The present invention allows to multiply the capacity and the performance of such packaging machines operating especially on the basis of the continuous principle, in the case of which the products are passed continuously through a packaging device. The packaging method according to the present invention may, however, also be applied to intermittently operating machines, while guiding a plurality of product flows preferably in parallel and providing respective product holding and conveying elements as well as packing-material holding elements per product flow or in a combination of both packaging principles (continuous/intermittent) for the plurality of product flows.

In addition, it is also possible to combine the two operating principles (continuous, intermittent) for the plurality of product flows with one another, i.e. to pack the products of one product flow continuously and the products of another product flow intermittently. This also with different products and folding modes for which the product flows are combined.

Processing of the product flows and the packaging strategy may also be different for different product flows within the packaging machine, i.e. one product flow may be packed via e.g. only two article-carrying heads (removal device, packaging mechanism), whereas the products of another product flow are packed via three or more article-carrying heads.

With respect to the combination of simultaneous - intermittent and continuous packaging as well as with respect to a packing-material-specific packaging strategy (e.g. "two-head principle"; "three-head principle"), the product and packing-stuff holding elements and possibly also the packing material feed means for the individual product flows are normally different from one another and adapted to the respective packaging strategy, to processing in a packing-material-specific number of heads or to different product types, products geometries and folding or wrapping modes (different formation of the package). It is also possible to feed products on several lanes to packaging devices/machines comprising only one head, i.e. the head or a plurality of preferably parallel single-head packaging devices have fed thereto a plurality of parallel product flows, and the head has fed thereto the not-packed products as well as the packing material adjacent to the product and the articles are fully packed within a rotation of the head through an angle $\alpha < 360°$ and discharged from the head.

It follows that the present invention relates to a high-performance packaging method for packaging, in particular small-sized, products, preferably confectionary, such as hard or soft caramels, pralines or similar, wherein the products are guided through at least one packaging device in a plurality of product flows, the products being preferably simultaneously guided through the at least one packaging device and/or fed to the packaging device.

According to a preferred embodiment, the product flows are fed to the packaging device in parallel, preferably simultaneously, and, in particular, the speed at which the products move through the processing device is substantially identical.

According to an advantageous embodiment, a single-lane feed of a product flow and a division of the same for forming a plurality of product flows passing through the packaging device are provided, said division taking preferably place upstream of or within the packaging device.

According to a preferred embodiment, the product flows are fed to the packaging device from a joint product stock, in particular a separating unit, or from separate product stocks, in particular separating units. The product flows are preferably fed to the packaging device from the same or from different directions, preferably in parallel.

According to a preferred embodiment, identical or different articles are guided in the product flows and/or said articles are packed in identical or in different packaging processes, folding or wrapping modes.

According to an advantageous embodiment, each of the plurality of product flows within the packaging device consists of separated products, which are preferably in the same packaging stage of the packaging process, preferably substantially parallel to one another, each product within a product flow in the packaging device having assigned thereto a piece of packing material, and, in particular, the packing material is fed into the packaging device at a high speed substantially radially in the form of a packing material band, which is held in the packaging device and from which a packing material segment is cut off, or packing material segments are cut off from a web of packing material prior to insertion into the packaging device, the packing material segments being fed to the packaging device substantially radially and in the form of separate segments.

Preferably, the products of a plurality of product flows are packed in a continuous and/or intermittent process and/or the product flows are processed with a different number of devices.

In particular, the products are fed on two lanes in parallel to a removal device of the packaging device with product pick-up means for the products of each of the product flows. When the products have been picked up, they have either immediately assigned thereto a packing material segment or the packing material is assigned to the products only in a subsequent gripper device, and the product together with the piece of packing material is fed, preferably in product flows that are guided in parallel, to a packaging mechanism of the packaging device provided with product/packing-material holding means, and the fully packed product (7) is discharged from the packaging device (1).

A preferred embodiment discloses that, after packing of the product, the packaging is guided, in particular in a thermally conditioned state, preferably along a cooling line or a heating line, for assisting the process of sealingly closing the packaging, in particular sealing the packing material.

Preferably, the products of at least two product flows, which are fed at least substantially in parallel and preferably from the same direction, in particular simultaneously, are picked up by the removal device preferably from a substantially horizontal providing plane and/or the products of the product flows are picked up substantially simultaneously from the removal device. An particular, a plurality of product flows, provided preferably in pairs, are fed to a plurality of removal devices, the products of the plurality of product flows, which are picked up by the plurality of removal devices, being in particular fed to a joint packaging mechanism provided for processing all the product flows fed thereto, or to a number of packaging mechanisms corresponding to the number of removal devices.

In particular, the products are separated from one another within the product flows upstream of the removal device assigned to the product flows, the product flows being preferably fed to the removal device in longitudinal conveying units or after having been separated through cutting off from a continuous strand of material, and/or the products can be rotated by 90° within the removal device or after having been transferred to the gripper device.

According to one embodiment of the present invention, the packing material is fed to the removal device on several lanes in correspondence with the number of product flows, preferably substantially radially, and is held, preferably clamped in position, adjacent to the products. In particular, the packing material may be fed on several lanes in correspondence with the number of product flows, preferably substantially radially, to a gripper device provided downstream of the removal device, said gripper device transferring the products, with the packing material assigned thereto, on several lanes to the downstream packaging mechanism.

According to an advantageous embodiment, a web of packing material locally covers a plurality of product flows, preferably substantially transversely to the latter, and/or, prior to being cut off from the web of packing material, a packing material segment is separated into a plurality of strips and subdivided, in particular, at least one, preferably two or more packing material feed means, in particular packing material rolls, are provided per product flow, and packing material

being preferably fed to the products at different positions in the direction of movement of the packing material flow.

Preferably, the products are taken from a product feed means or fed and are at least partially packed in a single head or a single device rotating preferably about a stationary axis of rotation, the product and the packing material being in particular fed to the head in common or in a time-shifted manner.

According to a preferred embodiment, the products of each product flow are initially processed substantially identically in a functionally identical or functionally similar device, said devices being preferably driven in a product-flow-specific manner, on the one hand discontinuously (intermittently) and, on the other hand, continuously, or a plurality of devices/heads configured for continuous operation and assigned to a plurality of product flows are driven intermittently.

According to the invention, the products of a product flow may be transferred, in particular by heads or wheels driven intermittently or continuously in a product-flow-specific manner, preferably of the same process stage, to another product flow, e.g. from continuous to discontinuous product processing, or vice versa.

The present invention also comprises a high-performance packaging device for packaging, in particular small-sized, products, preferably confectionary, such as hard or soft caramels, pralines or similar, in particular for performing one of the above-specified high-performance packaging methods, with processing of a plurality of product flows consisting of separated products, with at least one packaging mechanism comprising a plurality of packaging units, which consist of product/packing-material holding means, each packaging unit being assigned to a product flow of separated products.

Preferably, simultaneous processing of the product flows is provided, said product flows being guided substantially in parallel and/or in the same direction, in particular heads or wheels cooperating according to the principle of circles rolling on one another.

According to one embodiment, a removal device comprises at least one removal wheel, comprising a plurality of sets of removal units, which are preferably pivotable about pivot axes that are parallel to the, especially horizontal, axis of rotation of the removal wheel, each product flow

having assigned thereto a set of these removal units and said removal units consisting preferably of pairs of holding jaws or vacuum suction means arranged in pairs.

It will also be of advantage, when a removal device comprises a plurality of removal wheels, each provided with removal units that are supported thereon, preferably in a pivotable manner, the number of removal wheels corresponding to the number of product flows.

Preferably, a removal device is preceded by a plurality of longitudinal conveying units, such as conveyor belts, chains or the like, and each longitudinal conveying unit has preferably assigned thereto a product flow, or a plurality of product flows are fed to the removal device by at least one common longitudinal conveying unit.

In addition, there may be provided single-lane feeding of a packing stuff flow consisting of individual products and a product switch upstream of the removal device for producing a plurality of product flows consisting of separated products through the high-performance packaging device and/or feeding of strands of material as product flows, individual products being formed from said strands of material upstream of the removal device by, preferably rotating, knives and a separation treatment in a plane perpendicular to the feed direction, said individual products being removed as separate items by a respective set of removal units of one or several removal wheels.

According to a preferred embodiment, there is at least one packing stuff feed means for feeding packing material to the separated products either, in particular substantially radially, to the removal device or a transfer device located downstream of said removal device and configured as a gripper wheel, and/or packing material segments are held adjacent to a product in the removal device, in particular in the respective removal wheel, either prior to or after separation from a web of packing material, or are fed in a suitable manner to a transfer device, in particular gripper wheels, provided for each packing stuff flow downstream of the removal device.

The high-performance packaging device comprises preferably a packaging mechanism, which is rotatable about a parallel rotation axis with respect to a rotation axis of the removal device and/or the rotation axis of a gripper device and which comprises respective sets of packaging units each associated with a packing stuff flow.

In particular, the packaging mechanism has assigned thereto a multi-lane discharge device preferably configured as a discharge wheel and/or a conditioning line, in particular a cooling or heating line, arranged downstream of said discharge device and used for sealingly closing the packages, in particular for end face sealing.

According to a preferred embodiment, the packaging device comprises a plurality of removal devices having each assigned thereto a plurality of product flows, in particular parallel product flows provided in pairs, the removal devices being assigned to a packaging mechanism equipped with a number of sets of packaging units, the number of sets of packaging units corresponding to the number of packing stuff flows of the removal devices.

In particular, the high-performance packaging device comprises intermittently and continuously operating devices for identical or different product flows and/or an identical or a different number of packaging-effective devices for identical or different product flows and/or identical or different product and/or packing-material holding elements and/or device means, in particular of the packaging mechanism, for identical or different product flows.

Depending on the products in question, the packaging device is provided with a single head or a device rotating about a stationary axis of rotation for partially or fully packing the products of a plurality of product flows.

Preferably, transfer devices are provided between heads or wheels assigned to different product flows, in particular between product-flow-specific product/packing-material holding means, and/or a combination of functionally identical or functionally similar devices, such as removal, gripper or packaging devices, which are, however, driven differently in an intermittent and in a continuous manner for different product flows.

In particular, the high-performance packaging device comprises product/packing-material holding means, which are assigned to a plurality of product flows and which are preferably adapted to be connected to one another through transfer devices, provided in particular on a single rotating device, in particular a head or a wheel.

According to experience, a high-performance packaging machine is additionally provided, which comprises initially one high-performance packaging device of the type described hereinbefore or a packaging machine arrangement consisting of a plurality of such packaging machines.

In the following, the present invention will be explained in more detail making reference to an associated drawing. In said drawing, the figure shows in a schematic representation a high-performance packaging device for high outputs, in which the products to be packed are separated from a respective strand of material.

The high-performance packaging device 1 has supplied thereto, substantially in parallel, two strands of material 2 by feed rollers 3 and, upstream of a removal device 4, individual products 7 are separated from one another by rotating cutting knives 5, which are provided at right angles to the conveying direction of the strands of material 2 and driven by servomotors 6, said individual products 7 being supplied to the removal device 4 in pairs and preferably simultaneously and from the same direction. In this way, the products 7 define two parallel product flows A, B which are guided in parallel and preferably independently of one another through the packaging device 1.

The separated products 7 are here packed in a packet-folding mode, but any other folding mode or packaging mode may equally be used, in particular in dependence on the type of products.

Instead of separating the products from the strand of material, they can, of course, also be supplied to the removal device 4 via longitudinal guide units which are to be arranged in a manner corresponding to the representation of the strands of material 2. Another possibility is a supply of separated products making use of one or more product storage devices out of which the products are separated from one another in longitudinal guide units, and the products may also be guided in a product flow, which initially constitutes a single product flow and which is then divided into two or more product flows via a product switch upstream of the removal device 4. In this case, the supply speed would have to be chosen such that it is twice as high as the speed at which the products pass through the packaging device 1.

The figure shows the processing device here in a schematic representation and without the respective product holding elements (normally pairs of the holding jaws) as well as without the units for clamping packing material segments 8 within the processing device. The processing device is here also without any details concerning the product holding means and wrapping devices on a downstream packaging mechanism 10, since all the kinds of folding and technical realization means, which are e.g. the subject matter of DE 10 2008 019 605 A1 and DE 10 2005 017 329 A1 that have been referred to at the beginning, can here be chosen. The content of

these publications is herewith made the subject matter and the content of the present application by explicit reference and, as regards the technical realization of these means, these publications will be referred to as one possibility of realization.

The removal device 4 is here preferably configured such that it consists of two coaxial removal wheels 4a, 4b having provided thereon product holding means, which are here not shown and which may e.g. consist of removal units that are pivotable about own parallel axes with respect to the rotation axis of the removal wheels 4a, 4b, said removal units consisting each of a pair of holding jaws for product removal.

It is, however, also possible to arrange the two sets of removal units (each set of removal units is assigned to a product flow A, B) on both sides of a single removal wheel and to realize e.g. the drives of the pivotable removal units via coaxial stub axles. If a high degree of synchronization of the supply speed and of the separation of the individual products 7 can be guaranteed, the sets of removal units of the removal wheels 4a, 4b or, as an alternative, of a single removal wheel may also be controlled via a respective common drive. Higher flexibility and tolerance fields with respect to the control can, however, the accomplished by separate drives.

In the present case, the packaging device 1 is configured as a three-head machine (the decisive aspect is in each case the number of packaging-effective, article-carrying heads), a transfer device 9, which comprises two gripper wheels 9a, 9b, following the removal device 4 as a gripper device or transfer device; the respective holding means for products and packing material segments 8 fed into the transfer device are not shown in this case either. These product holding means are preferably pairs of holding jaws having associated therewith packing-material holding means (packaging stuff tongs), which are pivotable about own or coaxial axes with respect to the removal units or of holding jaws of the pairs of holding jaws of the removal wheels 9a, 9b.

The first and second sets of product pick-up means of the removal wheels 4a, 4b and of the gripper wheels 9a, 9b are in mesh with one another in the sense of wheels rolling on one another, as is normally the case with packaging machines operating according to the continuous principle. The directions of rotation of the removal wheels 4a, 4b and of the gripper wheels 9a, 9b, respectively, are indicated by arrows in the figure. In this case, the products 7 are rotated by 90° on their transport path through the gripper wheels 9a, 9b between pick-up from the removal wheels 4a, 4b and the insertion, i.e. the radial supply of packing material segments 8, as is again indicated by arrows in the drawing.

The supply of packing material into the gripper wheels 9a, 9b is effected by suitable packing stuff feed means 11 (only one of them being shown here). The packing material is either inserted as a packing material band radially adjacent to suitable packing-material holding means and the products holding means, is held in position (clamped) and the packing material segments 8 are then separated from the packing material band, or the packing material segments 8 are introduced in the gripper wheels 9a, 9b in a state in which they have already been separated from the packing material band.

It goes without saying that, if the sets of removal units in the removal device 4 are arranged on a common removal head or removal wheel, also the sequence of the additional packaging-effective heads or wheels consists of only one respective head or wheel, e.g. one gripper wheel as a gripper device 9 with product/packing-material holding means arranged in duplicate.

The products are transferred from the gripper wheels 9a, 9b in a condition in which they have already been partially wrapped (U-shaped fold of packing material around the products 7) to downstream packaging wheels 10a, 10b of a packaging mechanism 10, in which the wrapping process is completed and the products are fully packed, here in packet fold.

In the present embodiment, the packaging mechanism 10 is additionally followed by a discharge device 12 comprising discharge wheels 12a, 12b for transferring the products to a cooling or heating line 13, where the end faces of the packages are sealingly closed, depending on the characteristics and the conditioning of the packing material film, so that the products can then be discharged from the high-performance packaging device 1, as shown, on two lanes and closed in a packet fold mode.

The number of packaging-effective heads can be chosen at random and may also be chosen differently for the respective product flows. This also applies to the kind of folds and product packages, i.e. the structural design of the respective product holding means and control means and the packing-material holding means associated with the product holding means (consisting normally of pivotable pairs of holding jaws). The packing material may e.g. also be directly fed radially into the removal device 4 in a suitable manner, the respective removal wheel or removal head or the removal wheels 4a, 4b having then provided therein the respective packing material holding means (pivotable packing material tongs), as is e.g. the subject matter of DE 10 2005 017 329 A1. The gripper device 9 would no longer be necessary in this case, i.e. the removal

device 4 operates directly in combination with the packaging mechanism 9. If necessary, a separate dispensing and/or conditioning device for sealing packing material segments is provided for each product flow.

It follows that, depending on the folding complexity or on other requirements, it is also possible to provide a smaller or larger number of packaging-effective heads and additional or auxiliary devices (such as sealing lines, discharge devices or the like) (e.g. single-head machine or two- to five-head machine).

In addition, guiding a plurality of product flows through the packaging device 1 is not limited to two product flows A, B, but also more than two product flows may be guided through the packaging device 1 in parallel, while providing a suitable number of packaging-effective heads and product-supply and separating units.

In addition, it is also possible to provide a plurality of removal devices 4 such that they operate in a direct process sequence for only one packaging mechanism, provided that the latter is equipped with a corresponding multiplicity of sets of packaging stations in accordance with the sum of packing material flows, making, if necessary, also use of respective gripper devices between the removal devices and the packaging mechanism.

Due to the way in which the present invention guides a plurality of product flows A, B in parallel, preferably simultaneously and independently of one another, and due to the arrangement of the respective packaging-effective devices, the packaging performance of such a packaging device, which is to be completed so as to obtain a packaging machine, can, in comparison with conventional packaging machines, be multiplied, this kind of packaging machine exhibiting simultaneously a high degree of integration and compactness.

The respective packaging-effective heads or wheels of the same process stage, which are preferably arranged coaxially and which rotate about rigid axles and are associated with each product flow, are preferably provided with a drive regime and control elements of their own (e.g. by providing hollow axles and stub axles on which the respective control cams for the product holding means and the packing-material holding means are arranged), so as to account for tolerances in product supply and product processing between the respective product flows (here A, B). The product flows A, B may be guided through the packaging device at different speeds, provided that the individual stations are spatially separated into independent wheels, as outlined

in the schematic representation, i.e. the speeds of the respective heads or wheels assigned to the product flows, such as the removal wheels 4a, 4b, the gripper wheels 9a, 9b or the packaging wheels 10a, 10b, are preferably controllable independently.

However, the product flows may consist not only of identical products but also of products that are different from one another, so that the removal device and/or the gripper device and/or the packaging mechanism (which may also consist of a plurality of successive heads, so can the gripper device which may also be divided into a plurality of successive heads) have provided therein different product and/or packing-material holding means for the individual product flows and, within the packaging device, different products can be packed in parallel in different folding modes or product packages and can simultaneously be guided through the packaging device.

Hence, the present invention provides a vey variable concept for a substantial increase in the performance of packaging machines of the type especially used for small-sized confectionary, so that packaging performances can be accomplished which are several times higher than those of conventional packaging machines and so that packaging performances of 2,500 to 6,000 products per minute can be achieved, when such a packaging machine is configured to have two lanes or three lanes. The product flows A, B and the means associated therewith may be integrated in a single packaging machine, so that all the associated auxiliary units need not be provided more than once, a packaging machine with a multi-lane packaging device in the interior thereof leading thus to high compactness in combination with a multiplication of the performance. It is, however, also possible to provide, in connection with a plurality of substantially parallel and/or simultaneously guided product flows, a plurality of packaging machines, in particular in a continuously intermittent (discontinuous) longitudinally linked manner.

It is also possible to provide a plurality of product flows on a common longitudinal conveying unit, e.g. a feed belt on a removal device comprising a plurality of removal wheels corresponding to the number of product flows or a plurality of removal units corresponding to the number of product flows.

Another possibility is to combine the principle of multi-lane guiding of preferably independent product flows through a packaging device with the concept of a modular structural design of such a packaging device, as explained e.g. in DE 10 2008 019 605 A1, so that fast adaptations to format changes, product changes and a change of folding types can be carried out, e.g. by exchanging the feed units or the packaging mechanism.

A packaging machine may comprise one or a plurality of packaging devices. An array comprising a plurality of packaging machines may also be combined so as to establish a packaging machine arrangement.

It is also possible to provide, in combination with the guiding of a plurality of product flows through one or a plurality of packaging devices, a method combination and/or device combination of a continuous packaging process/packaging device with a discontinuous, intermittent packaging process/packaging device in succession. The product flows may be guided in essentially the same direction or in different directions, preferably also in 180° opposed directions, through a plurality of packaging mechanisms operating preferably substantially in parallel.

Finally, also a single-head machine can be realized, especially in the case of less complicated products or folding or wrapping modes.

This head may, for example, also have supplied thereto the product and the packing material simultaneously, e.g. by a pusher device, or by jointly providing them in the traveling path of a circulating gripper of the head, followed by a part of the folding operation for packaging the product and e.g. full packaging of the same in a discharge section subsequent to the head.

It goes without saying that the product and the packing material may also be supplied separately to the head, or the head may be provided as a combination of a removal and/or gripper and/or packaging head for at least partially packing the product.

It is also possible to accomplish all the method steps, starting with the removal of the product from a supply and separating unit and ending with discharge of the fully packed product, i.e. in particular the complete packaging of the product, by means of a single head or wheel, which is provided with the respective product holding means and packing-material holding means and which preferably has not only supplied thereto the packing material in a substantially radial direction but has also associated therewith in a downstream circumferential direction the respective wrapper-forming devices, such as folding sheets and the like, for forming the packaging (e.g. also rotating heads associated in parallel so as to form twist-wrap or double-twist-wrap packages). Also such a removal and packaging head that is integrated to a maximum extent (i.e. combination of a removal device and a packaging mechanism) (possibly also with transfer means between these two elements) may have assigned thereto a product supply on a plurality

of lanes or in a plurality of product flows, so that the packaging head is preferably configured after the fashion of a cylinder or a roll with a corresponding plurality of product holding means and packing-material holding means.

This head may also have supplied thereto the product and the packing material in common, e.g. by a pusher device, so that the head substantially defines a packaging head for partially or fully packaging the product or the products supplied in a plurality of product flows.

If a plurality of heads or wheels (e.g. two- or three-head packaging machines) are used, the principle of continuously guiding at least one product flow through the packaging device may additionally be combined with the principle of intermittently or discontinuously guiding and processing a further product flow in cooperation with other product holding means or packing-material holding means.

Guiding a plurality of product flows through the packaging device allows a series of devices for a product flow (consisting of continuously operating units (heads or wheels)) to be combined with a series of devices for another product flow (consisting of intermittently operating units (heads or wheels)), this combination allowing preferably also a transfer of products of a product flow from a device (head or wheel) assigned to said product flow into a device (head or wheel or respective product holding means and packing-material holding means) arranged in particular in parallel within the joint packaging device (packaging machine), e.g. also in the sense of discharging products of a product flow whose packaging differs from that of other products in the same product flow or e.g. in a neighboring product flow (e.g. in the case of outer packagings).

The principle of the multi-lane guiding of preferably independent product flows through a packaging device may also be combined with the concept of a modular structural design of such a packaging device, as explained e.g. in DE 10 2008 019 605 A1, so that, e.g. by an exchange of the feed units or of the packaging mechanism, possible adaptations to format changes, product changes and a change of folding types can be carried out.

The present invention relates to a high-performance packaging method for packaging, in particular small-sized, products, preferably confectionary, such as hard or soft caramels, pralines or similar, and a high-performance packaging device, in particular for performing the method, as well as a high-performance packaging machine including such a packaging device. According to the present invention, a plurality of product flows are guided, preferably in parallel, through a

packaging device, which preferably for at least one product flow, non-preferably for all the product flows, provides for packaging of the products pertaining to said product flow/product flows in a continuous process.

Claims

1. A high-performance packaging method for packaging, in particular small-sized, products, preferably confectionary, such as hard or soft caramels, pralines or similar, **characterized in that** the products (7) are guided through at least one packaging device (1) in a plurality of product flows (A, B).

2. The high-performance packaging method according to claim 1, **characterized in that** the products (7) are, preferably simultaneously, guided through the at least one packaging device and/or supplied to the packaging device (1).

3. The high-performance packaging method according to claim 1, **characterized in that** the product flows (A, B) are fed to the packaging device (1) in parallel, preferably simultaneously, and that, in particular, the speed at which the products (7) move through the processing device (1) is substantially identical.

4. The high-performance packaging method according to at least one of the preceding claims 1 to 3, **characterized by** a single-lane feed of a product flow and by a division of the same for forming a plurality of product flows passing through the packaging device, said division taking preferably place upstream of or within the packaging device (1).

5. The high-performance packaging method according to at least one of the preceding claims 1 to 4, **characterized in that** the product flows are fed to the packaging device from a joint product stock, in particular a separating unit, or from separate product stocks, in particular separating units, and that the product flows (A, B) are preferably fed to the packaging device (1) from the same or from different directions, preferably in parallel.

6. The high-performance packaging method according to at least one of the preceding claims 1 to 5, **characterized in that** identical or different articles (7) are guided in the product flows (A, B) and/or that said articles are packed in identical or in different packaging processes, folding or wrapping modes.

7. The high-performance packaging method according to at least one of the preceding claims 1 to 6, **characterized in that** each of the plurality of product flows within the

packaging device (1) consists of separated products (7), which are preferably in the same packaging stage of the packaging process, preferably substantially parallel to one another.

8. The high-performance packaging method according to at least one of the preceding claims 1 to 7, **characterized in that** each product (7) within a product flow (A, B) in the packaging device (1) has assigned thereto a piece of packing material, and that, in particular, the packing material is fed into the packaging device (1) at a high speed substantially radially in the form of a packing material band, which is held in the packaging device and from which a packing material segment (8) is cut off, or that packing material segments (8) are cut off from a web of packing material prior to insertion into the packaging device (1), the packing material segments (8) being fed to the packaging device (1) substantially radially and in the form of separate segments.

9. The high-performance packaging method according to at least one of the preceding claims 1 to 8, **characterized in that** the products (7) of a plurality of product flows are packed in a continuous and/or intermittent process and/or that the product flows are processed with a different number of devices.

10. The high-performance packaging method according to at least one of the preceding claims 1 to 9, **characterized in that** the products (7) are fed on two lanes in parallel to a removal device (4) of the packaging device (1) with product pick-up means for the products of each of the product flows (A, B), that, when the products (7) have been picked up, they have either immediately assigned thereto a packing material segment or that the packing material (8) is assigned to the products (7) only in a subsequent gripper device (a), and that the product (7) together with the piece of packing material is fed, preferably in product flows (A, B) that are guided in parallel, to a packaging mechanism (10) of the packaging device (1) provided with product/packing-material holding means for the products (7) of the product flow, and that the fully packed product (7) is discharged from the packaging device (1).

11. The high-performance packaging method according to at least one of the preceding claims 1 to 10, **characterized in that**, after packing of the product (7), the packaging is guided, in particular in a thermally conditioned state, preferably along a cooling line or a

heating line, for assisting the process of sealingly closing the packaging, in particular sealing the packing material.

12. The high-performance packaging method according to at least one of the preceding claims 1 to 11, **characterized in that** the products (7) of at least two product flows (A, B), which are fed at least substantially in parallel and preferably from the same direction, in particular simultaneously, are picked up by the removal device (4), preferably from a substantially horizontal providing plane, and/or that the products of the product flows are picked up substantially simultaneously by the removal device, and that in particular a plurality of product flows, provided preferably in pairs, are fed to a plurality of removal devices, the products of the plurality of product flows, which are picked up by the plurality of removal devices, being in particular fed to a joint packaging mechanism provided for processing all the product flows fed thereto, or to a number of packaging mechanisms corresponding to the number of removal devices.

13. The high-performance packaging method according to at least one of the preceding claims 1 to 12, **characterized in that** the products (7) are separated from one another within the product flows (A, B) upstream of the removal device (4) assigned to the product flows, the product flows (A, B) being preferably fed to the removal device (4) in longitudinal conveying units or after having been separated through cutting off from a continuous strand of material, and/or that the products (7) are rotated by 90° within the removal device (4) or after having been transferred to the gripper device (9).

14. The high-performance packaging method according to at least one of the preceding claims 1 to 13, **characterized in that** the packing material (8) is fed to the removal device (4) on several lanes in correspondence with the number of product flows (A, B), preferably substantially radially, and is held, preferably clamped in position, adjacent to the products (7), and that, in particular, the packing material is fed on several lanes in correspondence with the number of product flows (A, B), preferably substantially radially, to a gripper device (9) provided downstream of the removal device (4), said gripper device (9) transferring the products (7), with the packing material (8) assigned thereto, on several lanes to the downstream packaging mechanism (10).

15. The high-performance packaging method according to at least one of the preceding claims 1 to 14, **characterized in that** a web of packing material locally covers a plurality

of product flows, preferably substantially transversely to the latter, and/or that, prior to being cut off from the web of packing material, a packing material segment is separated into a plurality of strips and subdivided, and that, in particular, at least one, preferably two or more packing material feed means, in particular packing material rolls, are provided per product flow, and packing material is preferably fed to the products at different positions in the direction of movement of the packing material flow.

16. The high-performance packaging method according to at least one of the preceding claims 1 to 15, **characterized in that** the products are taken from a product feed means or fed and are at least partially packed in a single head or a single device rotating preferably about a stationary axis of rotation, the product and the packing material being preferably fed to the head in common or in a time-shifted manner.

17. The high-performance packaging method according to at least one of the preceding claims 1 to 16, **characterized in that** the products of each product flow are initially processed substantially identically in a functionally identical or functionally similar device, said devices being preferably driven in a product-flow-specific manner, on the one hand discontinuously (intermittently) and, on the other hand, continuously, or that a plurality of devices/heads configured for continuous operation and assigned to a plurality of product flows are driven intermittently.

18. The high-performance packaging method according to at least one of the preceding claims 1 to 17, **characterized in that** the products of a product flow are transferred, in particular by heads or wheels driven intermittently or continuously in a product-flow-specific manner, preferably of the same process stage, to another product flow, e.g. from continuous to discontinuous product processing, or vice versa.

19. A high-performance packaging device for packaging, in particular small-sized, products, preferably confectionary, such as hard or soft caramels, pralines or similar, in particular for performing the method according to at least one of the preceding claims 1 to 18, **characterized by** the processing of a plurality of product flows (A, B) consisting of separated products (7), with at least one packaging mechanism (10) comprising a plurality of packaging units, which consist of product/packing-material holding means, each packaging unit being assigned to a product flow (A, B) of separated products (7).

20. The high-performance packaging device according to claim 19, **characterized by** simultaneous processing of the product flows, which are guided substantially in parallel and/or in the same direction, in particular heads or wheels cooperating according to the principle of circles rolling on one another.

21. The high-performance packaging device according to claim 19 or 20, **characterized in that** a removal device (4), at least one removal wheel (4a, 4b), comprising a plurality of sets of removal units, which are preferably pivotable about pivot axes that are parallel to the, especially horizontal, axis of rotation of the removal wheel (4), each product flow (A, B) having assigned thereto a set of these removal units and said removal units consisting preferably of pairs of holding jaws or vacuum suction means arranged in pairs.

22. The high-performance packaging device according to at least one of the preceding claims 19 to 21, **characterized in that** a removal device (4) comprises a plurality of removal wheels (4a, 4b) each provided with removal units that are supported thereon, preferably in a pivotable manner, the number of removal wheels (4a, 4b) corresponding to the number of product flows (A, B).

23. The high-performance packaging device according to at least one of the preceding claims 19 to 22, **characterized in that** a removal device is preceded by a plurality of longitudinal conveying units, such as conveyor belts, chains or the like, and that each longitudinal conveying unit has preferably assigned thereto a product flow (A, B) or that a plurality of product flows (A, B) are fed to the removal device (4) by at least one common longitudinal conveying unit.

24. The high-performance packaging device according to at least one of the preceding claims 19 to 23, **characterized by** single-lane feeding of a packing stuff flow consisting of individual products and a product switch upstream of the removal device for producing a plurality of product flows consisting of separated products through the high-performance packaging device and/or feeding of strands of material (2) as product flows (A, B), individual products (7) being formed from said strands of material (2) upstream of the removal device (4) by, preferably rotating, knives (5) and a separation treatment in a plane perpendicular to the feed direction, said individual products (7) being removed as separate items by a respective set of removal units of one or several removal wheels (4a, 4b).

25. The high-performance packaging device according to at least one of the preceding claims 19 to 24, **characterized by** at least one packing stuff feed means (11) for feeding packing material (8) to the separated products (7) either, in particular substantially radially, to the removal device (4) or a transfer device (4) located downstream of said removal device (4) and configured as a gripper wheel (4a, 4b), and/or that packing material segments (8) are held adjacent to a product in the removal device, in particular in the respective removal wheel, either prior to or after separation from a web of packing material, or are fed in a suitable manner to a transfer device (9), in particular gripper wheels (9a, 9b), provided for each packing stuff flow downstream of the removal device (4).

26. The high-performance packaging device according to at least one of the preceding claims 19 to 25, **characterized by** a packaging mechanism (15), which is rotatable about a parallel rotation axis with respect to a rotation axis of the removal device (4) and/or the rotation axis of a gripper device (9) and which comprises respective sets of packaging units each associated with a packing stuff flow.

27. The high-performance packaging device according to at least one of the preceding claims 19 to 26, **characterized in that** the packaging mechanism (10) has assigned thereto a multi-lane discharge device preferably configured as a discharge wheel (12) and/or a conditioning line (13), in particular a cooling or heating line, arranged downstream of said discharge device and used for sealingly closing the packages, in particular for end face sealing.

28. The high-performance packaging device according to at least one of the preceding claims 19 to 27, **characterized by** a plurality of removal devices having each assigned thereto a plurality of product flows, in particular parallel product flows provided in pairs, the removal devices being assigned to a packaging mechanism equipped with a number of sets of packaging units, the number of sets of packaging units corresponding to the number of packing stuff flows of the removal devices.

29. The high-performance packaging device according to at least one of the preceding claims 19 to 28, **characterized by** intermittently and continuously operating devices for identical or different product flows and/or an identical or a different number of packaging-effective devices for identical or different product flows and/or identical or different prod-

uct and/or packing-material holding elements and/or device means, in particular of the packaging mechanism, for identical or different product flows.

30. The high-performance packaging device according to at least one of the preceding claims 19 to 29, **characterized by** a single head or a device rotating about a stationary axis of rotation for partially or fully packing the products of a plurality of product flows.

31. The high-performance packaging device according to at least one of the preceding claims 19 to 30, **characterized by** transfer devices between heads or wheels assigned to different product flows, in particular between product-flow-specific product/packing-material holding means, and/or a combination of functionally identical or functionally similar devices, such as removal, gripper or packaging devices, which are, however, driven differently in an intermittent and in a continuous manner for different product flows.

32. The high-performance packaging device according to at least one of the preceding claims 19 to 31, **characterized by** product/packing-material holding means, which are assigned to a plurality of product flows and which are preferably adapted to be connected to one another through transfer devices, provided in particular on a single rotating device, in particular a head or a wheel.

33. A high-performance packaging machine comprising at least one high-performance packaging device according to at least one of the preceding claims 19 to 32.

34. A high-performance packaging machine arrangement comprising at least one high-performance packaging machine according to claim 33, in particular comprising a plurality of linked high-performance packaging machines, with products passing through the high-performance packaging machines continuously and/or intermittently.