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Sdahl(10) **Pub. No.: US 2021/0002012 A1**(43) **Pub. Date: Jan. 7, 2021**(54) **TOOL SYSTEM FOR A PACKAGING
DEVICE****B65B 47/06** (2006.01)**B65B 25/00** (2006.01)(71) Applicant: **Stampac GmbH**, Kempten (DE)(52) **U.S. Cl.**CPC **B65B 49/14** (2013.01); **B65B 25/005**
(2013.01); **B65B 47/06** (2013.01); **B65B 61/06**
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(57)

ABSTRACT

The invention relates to a tool system for use in a packaging device for packaging food products, particularly hollow chocolate articles, with film packaging, wherein said packaging device comprises a plurality of processing units for processing the film packaging, having at least three tool parts, specifically a tool middle part as well as a tool bottom part and a tool top part, which can interact during operation such that processing may take place. The function of the tool middle part is to receive at least one film semi-finished product of the film packaging being processed and convey it between individual processing units of said packaging device, wherein the tool middle part is capable of interacting with at least one further tool part of the tool system respectively, and each of said further tool parts is a tool part of one of the processing units serving to process the film semi-finished product from reception thereof on the tool middle part to completion thereof as film packaging. The tool middle part has at least one interface which allows it to be compatible with at least one tool part of each of said processing units.

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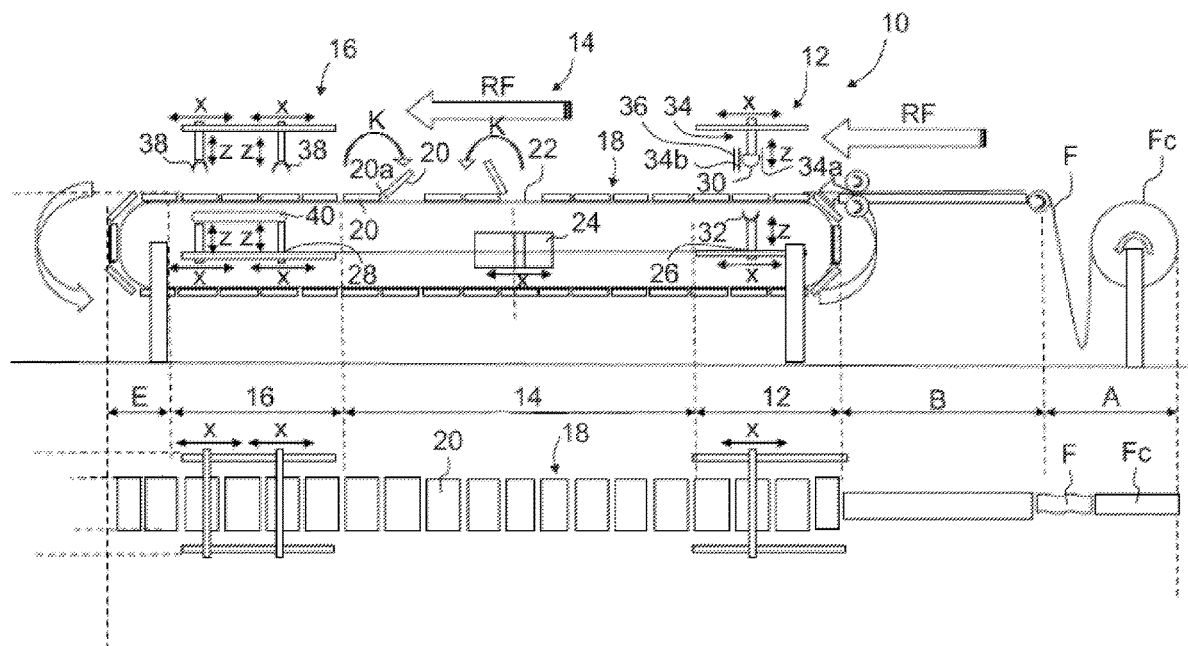
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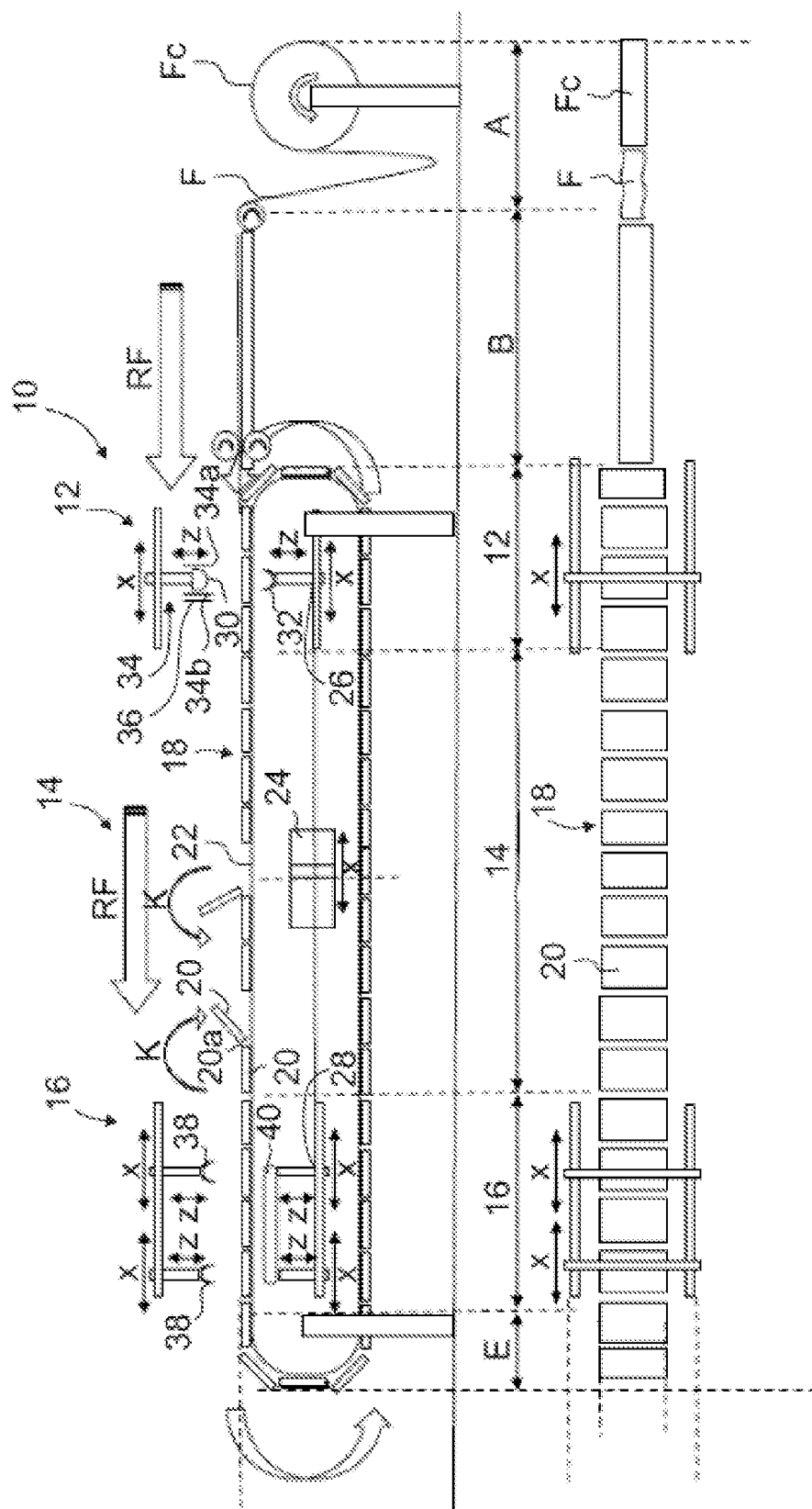
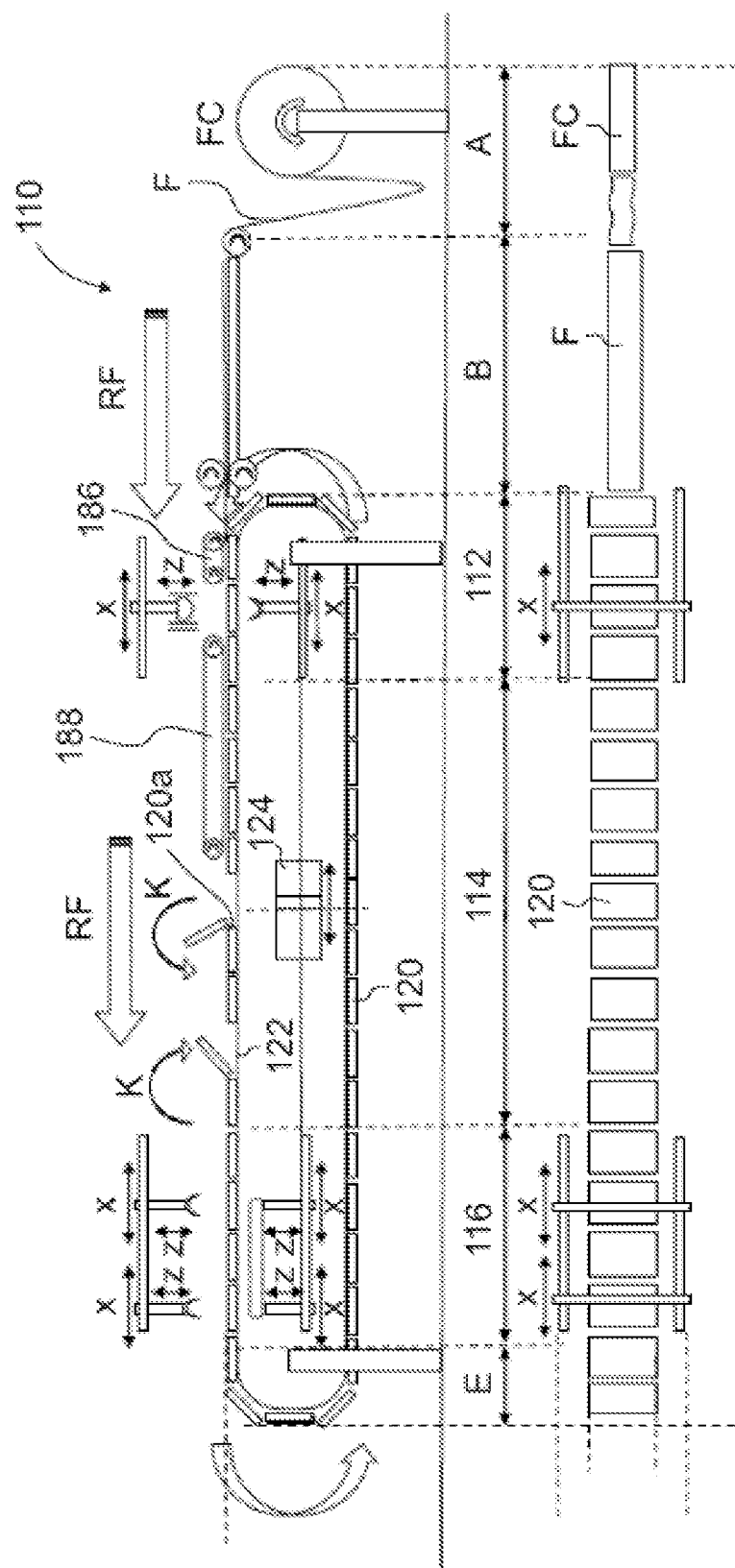
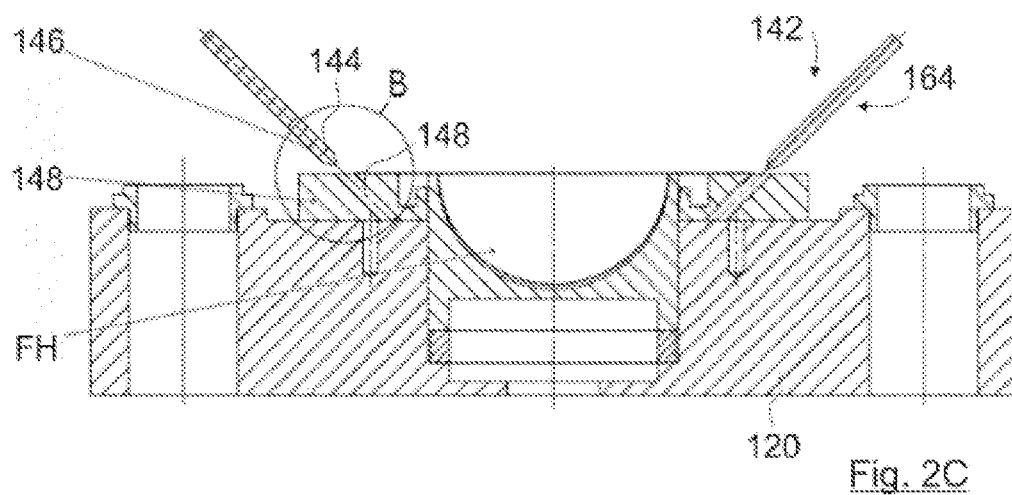
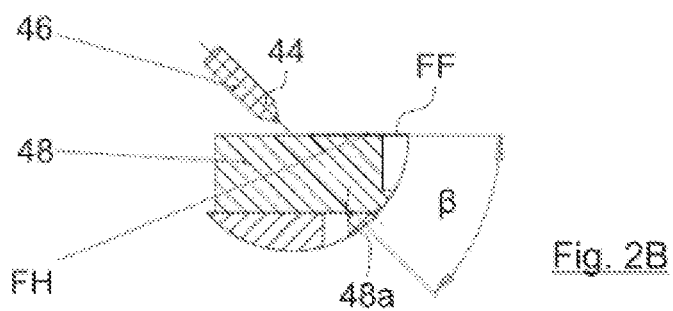
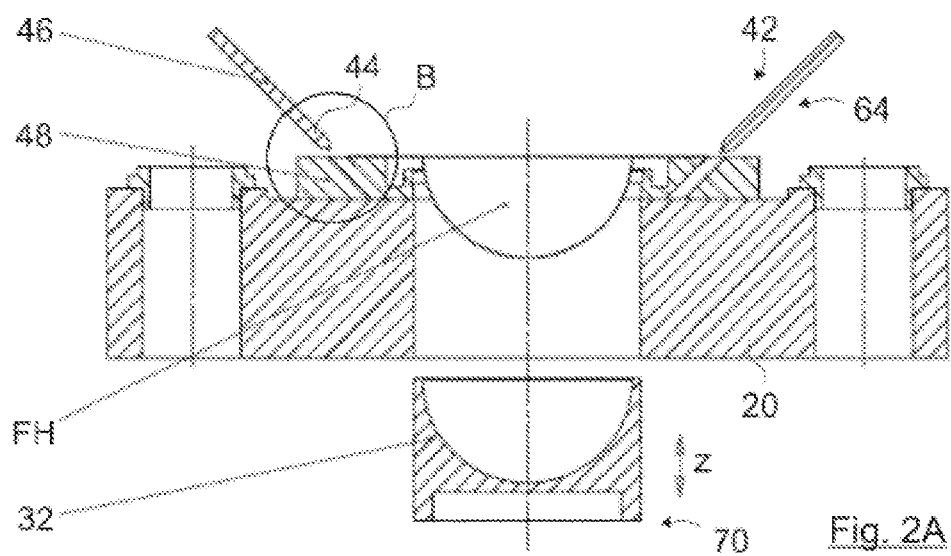
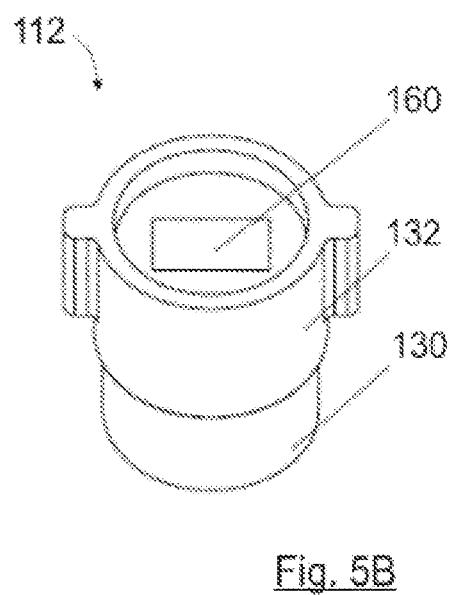
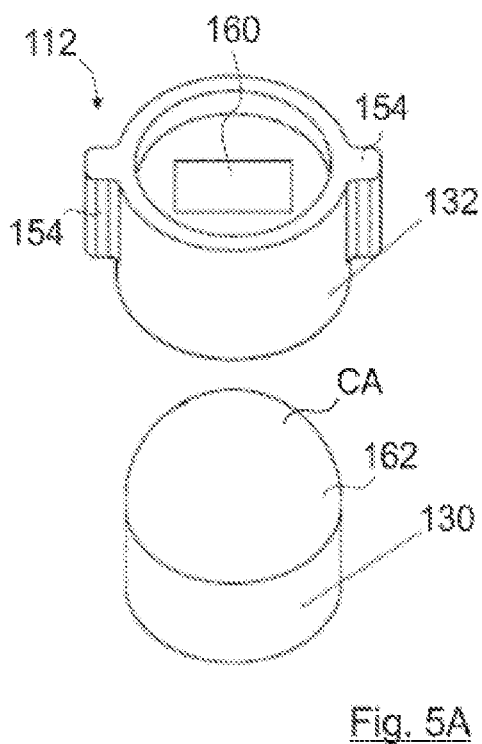
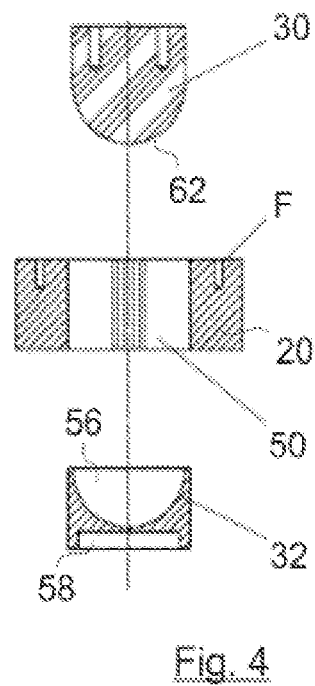
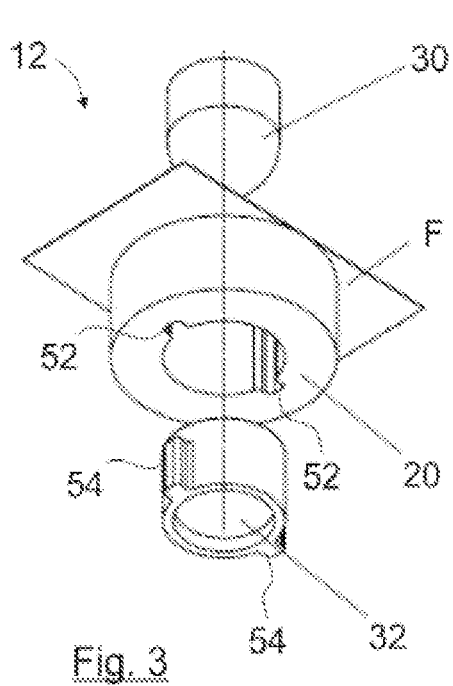


Fig. 1A



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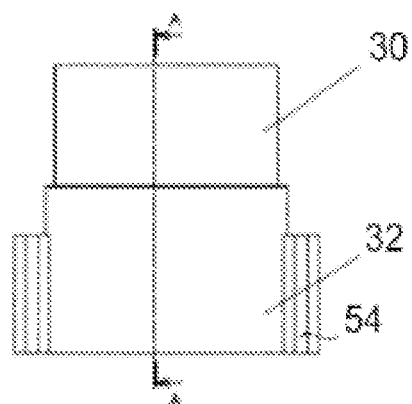


Fig. 6A

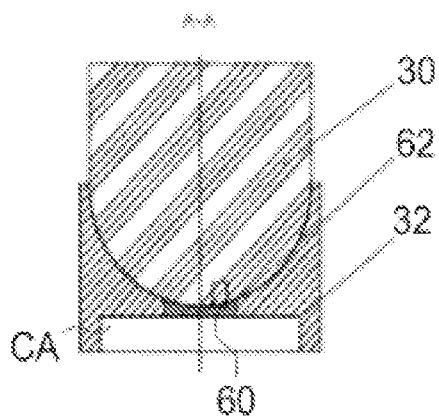


Fig. 6B

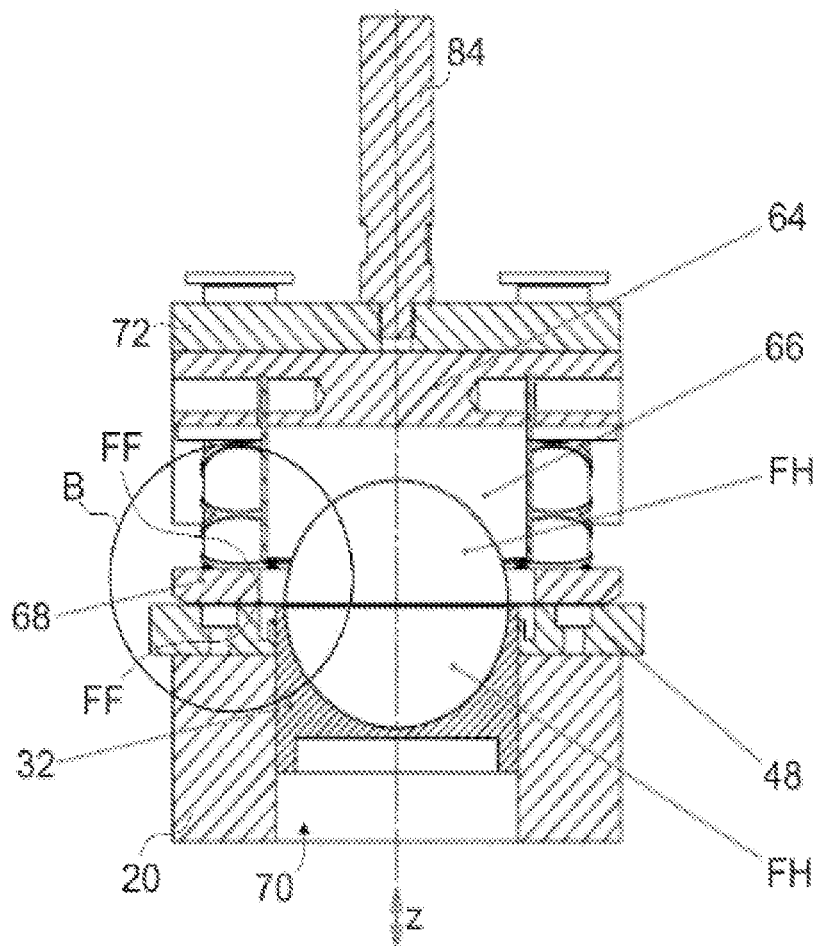


Fig. 7A

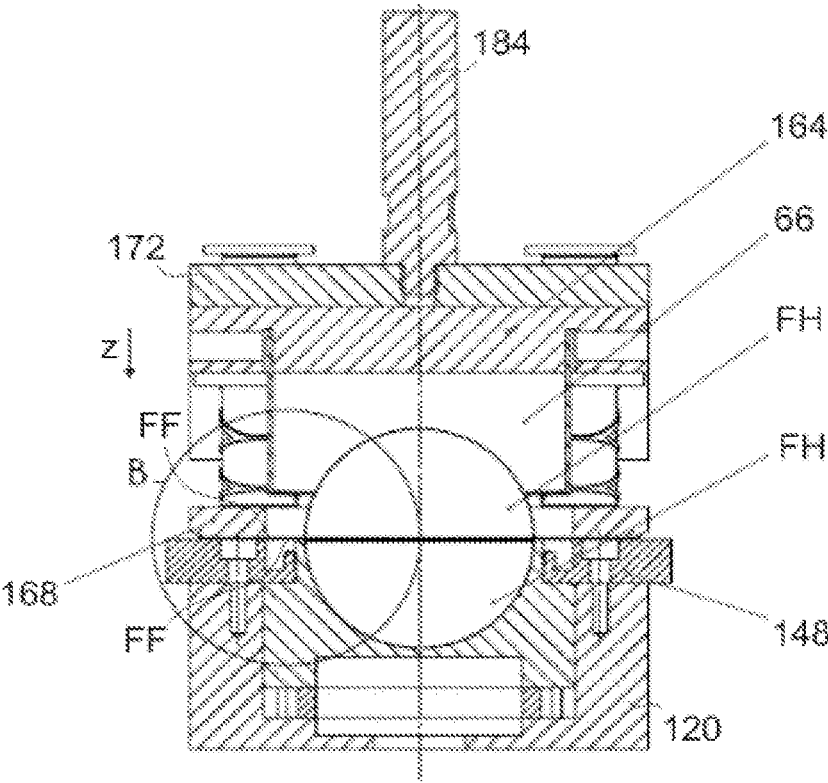


Fig. 7C

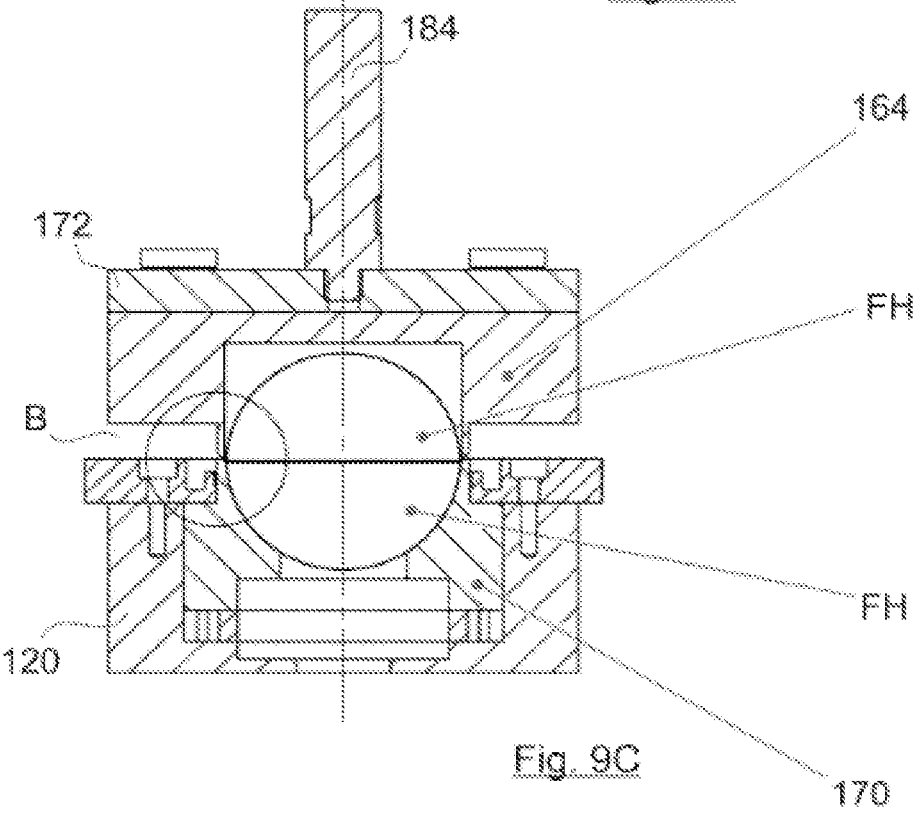


Fig. 9C

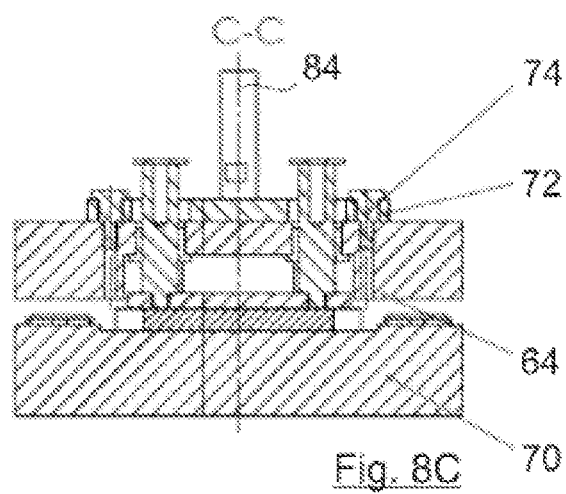
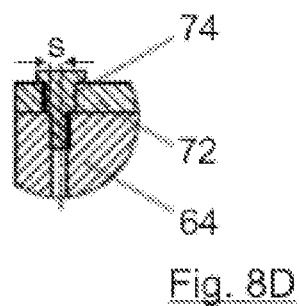
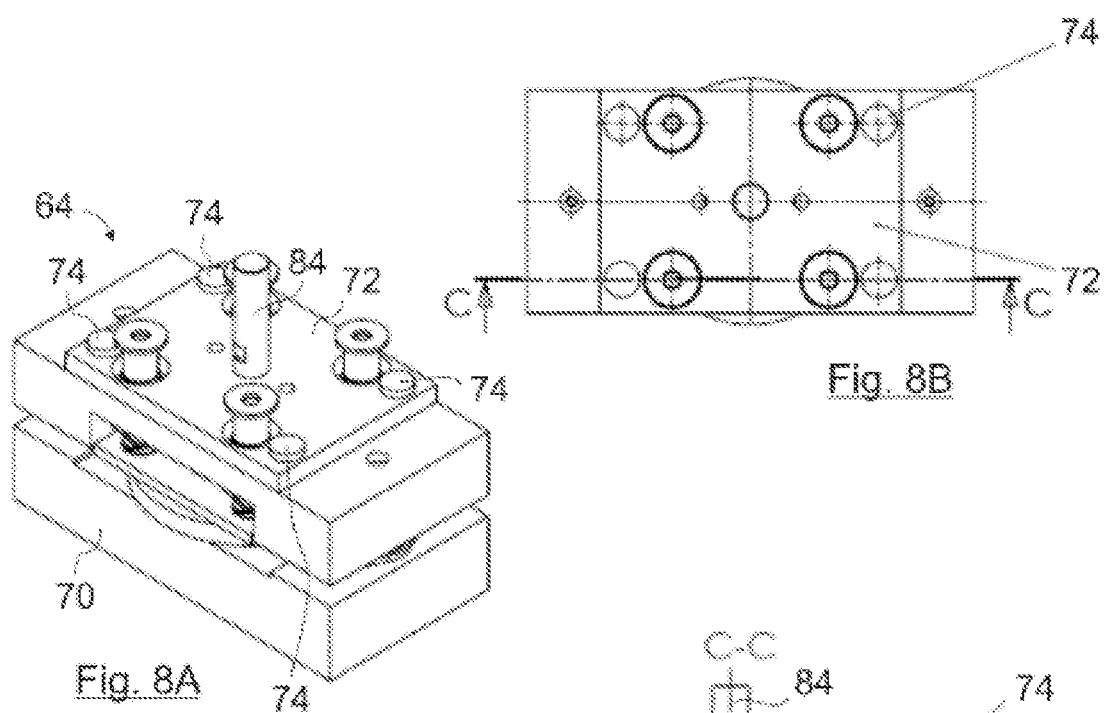
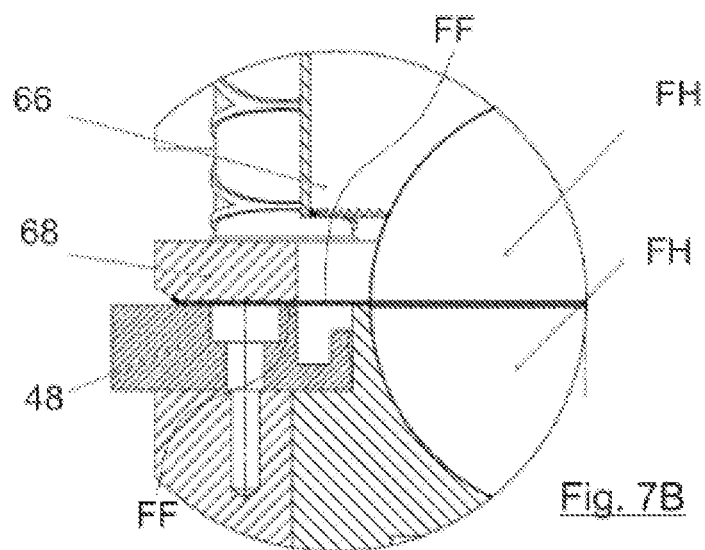


Fig. 9B

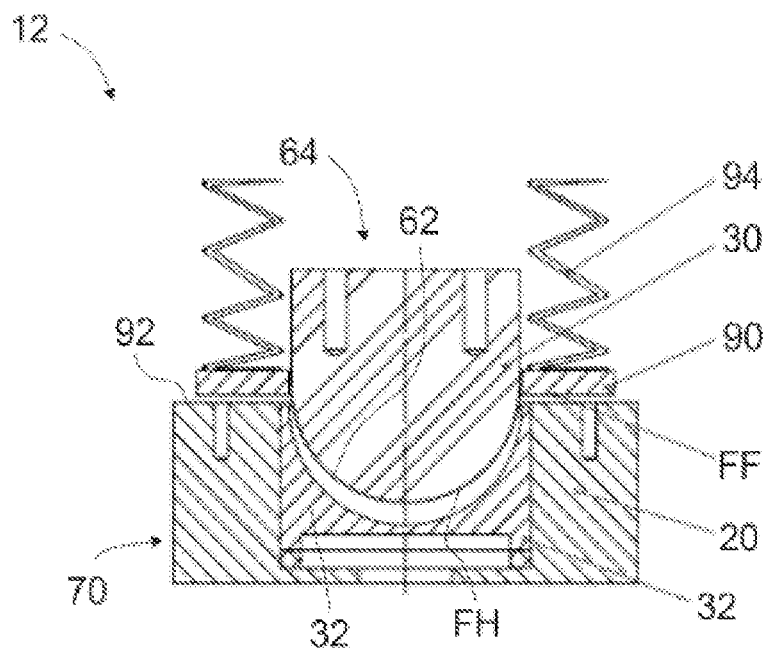


Fig. 10A

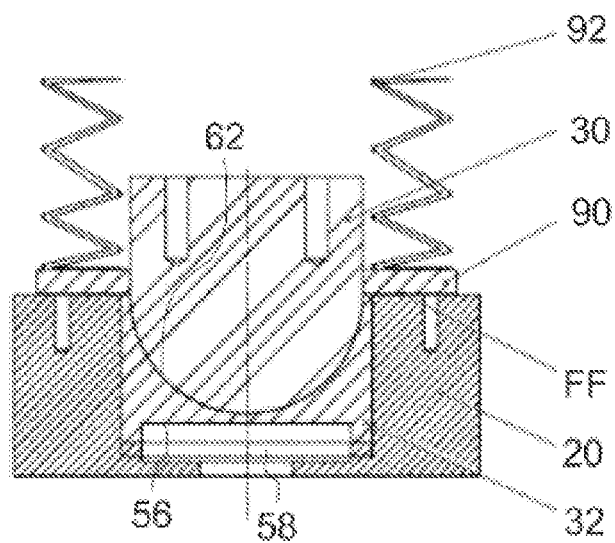


Fig. 10B

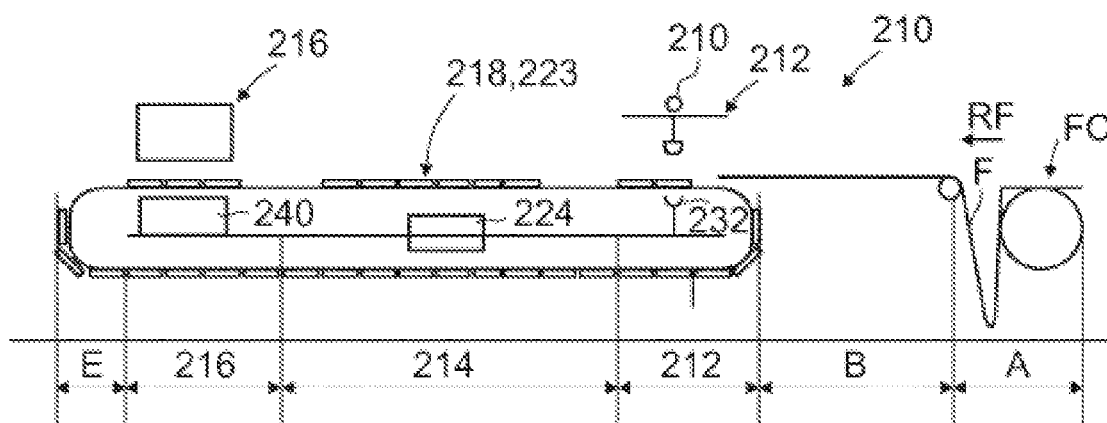


Fig. 11

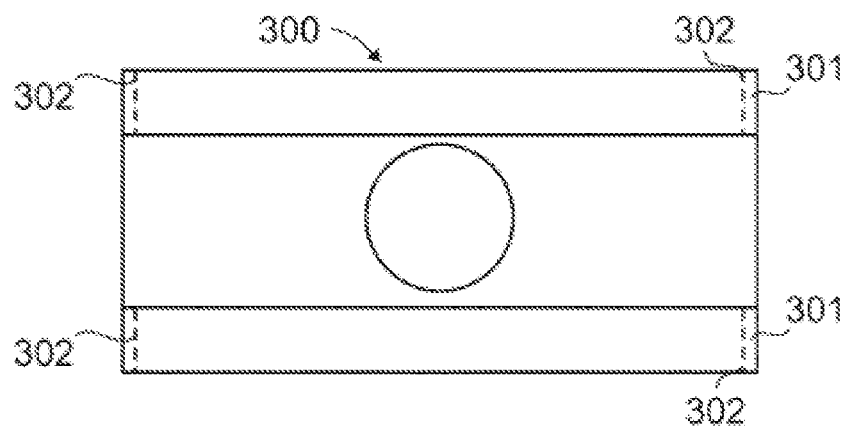


Fig. 12A

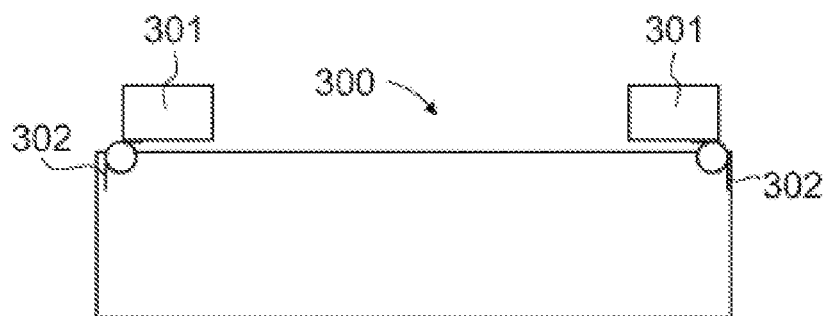
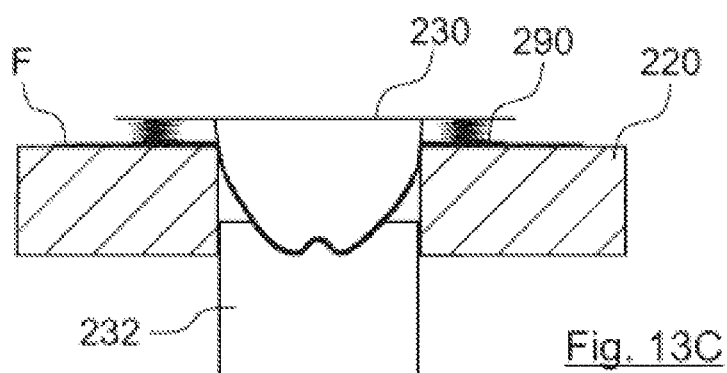
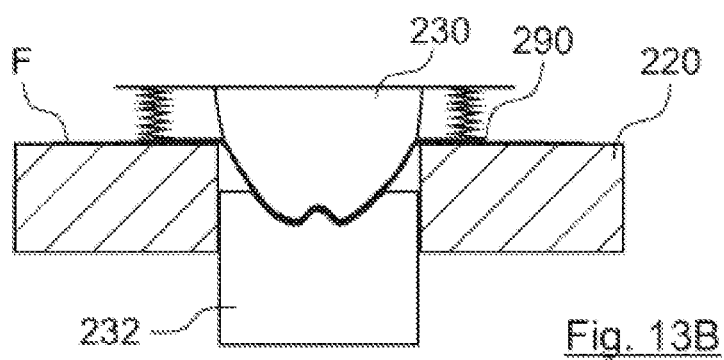
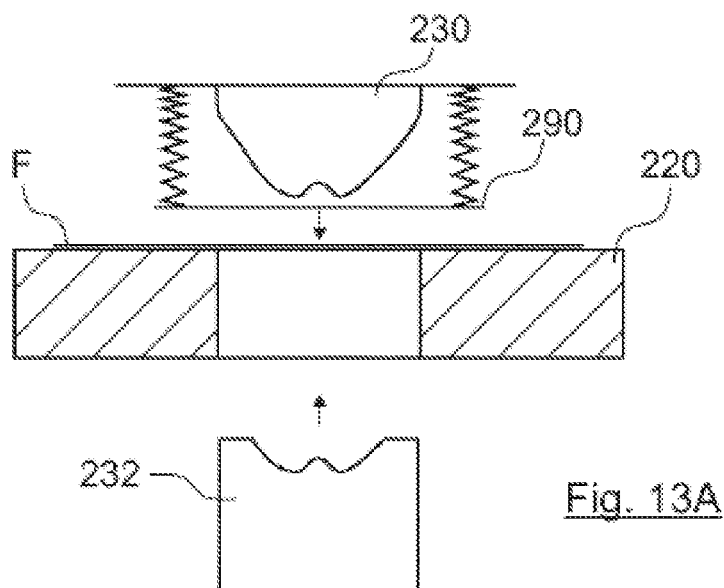


Fig. 12B



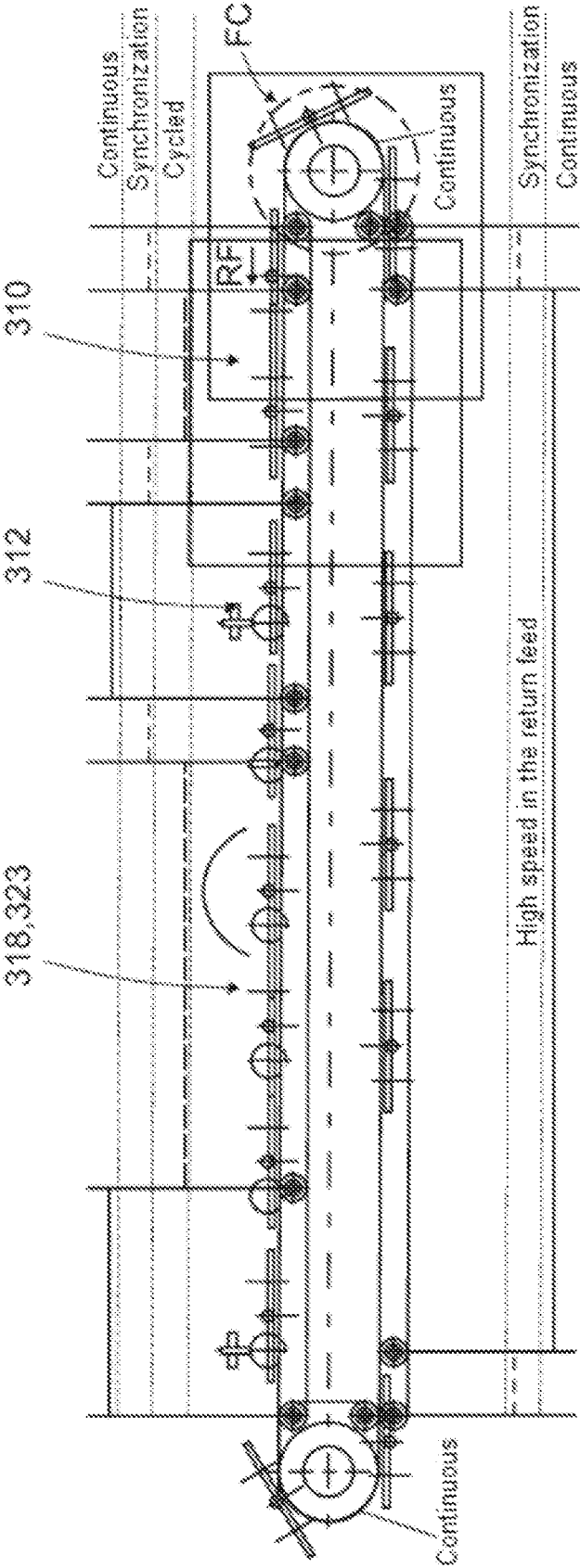


Fig. 14



Fig. 15

TOOL SYSTEM FOR A PACKAGING DEVICE

[0001] The invention relates to a tool system for use in a packaging device for packaging foodstuff products, in particular hollow chocolate bodies, by means of a film packaging, as well as to a corresponding packing device. The invention furthermore relates to a method and to a shaping unit for shaping shaped film parts of a film packaging of foodstuff products, in particular of hollow chocolate bodies, by means of a shaping unit which comprises a bearing face for a film to be deformed, at least one punch having a shape-imparting external contour, as well as at least one die having an internal recess.

[0002] Packaging devices typically have a plurality of processing units for processing the packaging. For example, publication WO 2017/144664 A1 thus describes a method and device for packaging a hollow chocolate figure using a plurality of processing units.

[0003] At the start of the processing path, the machine has a film-providing unit in which a coil of film is rotatably suspended and by way of a controlled drive can be discontinuously driven so as to facilitate the drawing-off of a film strip from the coil of film. A pre-cutting station in which the film strip is cut into four film pieces by a precutting blade which is raised and lowered in a controlled manner per operating cycle is described as the next processing unit.

[0004] Subsequently, the film pieces with the aid of a transfer slide which has vacuum film grippers and moves in a reciprocating manner in the horizontal in the direction of the processing path are moved below a punch device which, as the next processing unit, is provided so as to be downstream of the pre-cutting station in the direction of the processing path. The film pieces in the punch device are shaped so as to form film semi-shells, fixed, and trimmed in a further processing procedure. In this way, the film semi-shells, apart from the body in the shape of a semi-shell, are imparted an annular film flange which is adjacent to said semi-shell-shaped body.

[0005] Each of the film semi-shells is retrieved from the shaping die of the punch device by means of a 3D shaped suction unit which is suspended on a movable slide device, moved to a standby device and deposited thereon. The standby device is disposed so as to directly follow the punch device in the direction of the processing path, and has film semi-shell receptacles corresponding to the number of film semi-shells.

[0006] The packaging device described in publication WO 2017/144664 A1 furthermore has a foodstuff processing unit having an indexing table on which film holding devices are disposed. The foodstuff processing unit additionally comprises a placing device, a folding unit, and an adjoining device. The indexing table when in operation rotates discontinuously in the clockwise direction and has a plurality of pairs of in each case two of the film holding devices which can be folded onto one another. A gripping device which by means of convex 3D shaped suction units is capable of receiving the shaped film semi-shells from the standby device and to deposit said film semi-shells in the film holding devices at a specific position of the indexing table (initial position) is provided for placing items on the indexing table. Said film semi-shells are then moved to a placing position in which the placing device places foodstuff product into one of the film semi-shells by rotating the indexing table by a quarter rotation. In a subsequent folding position of the

indexing table, the holding device which supports the non-populated film half-shells is then folded by means of a pivot arm of the folding unit such that the flanges of the two film semi-shells after this folding procedure by way of the folding unit bear on one another so as to be flush and in mutual alignment. The film flanges are subsequently joined by means of the adjoining unit after the indexing table has again being rotated by a quarter rotation to the joining position.

[0007] In the initial position of the indexing table, the joined film semi-shells are finally received by convex grippers such that said film semi-shells can be transported to the product discharge device and the film holding devices are repopulated with shaped film half-shells.

[0008] The packaging device described has indeed proven to be a solution which works well in practice. However, a disadvantage of this solution is to be seen in that transport devices, or conveyor units, respectively, which enabled transportation between the processing units have always to be provided between the individual processing units such as the pre-cutting station, the punch device, and the indexing table. The complexity of the entire system is significantly increased on account thereof. This furthermore affects the costs of the packaging device.

[0009] Furthermore, the stability of the process can be compromised and the reject rate can be increased in each of said transport procedures on account of the film intermediate products (also referred to semi-finished film products) being received or deposited in an untidy manner at the individual processing units. Finally, the packaging method described in WO 2017/144664 A1 is a discontinuous method which is disadvantageous in terms of the cycle time and the efficiency. Moreover, the durability of a machine in the case of a discontinuous operation is typically significantly shorter in comparison to a continuous operation since the decelerating and accelerating is associated with increased wear.

[0010] Publication DE 10 2015 220 738 A1 furthermore describes the construction of a pre-cutting unit for severing and providing film sections of a foodstuff packaging film strip, while publication EP 2 765 081 A1 describes a processing unit which describes the shaping, the cutting, and the joining of two film semi-shells so as to form a populated overall packaging in a processing unit. Patent document DE 10 2015 101 417 B4 in turn relates to a specific folding and beading method for reliably joining two film semi-shells so as to form an overall film packaging, while NL 279067 A discloses a device for folding and joining together two film semi-shells.

[0011] In general, the forming of thin films or foils (with or without coating), for example from aluminum, paper, or plastics material, having a thickness of, for example, 8 μm to approximately 40 μm is not a deep-drawing procedure as is known, for example, from forming sheet metal in the automotive industry. Instead, this herein is a folding procedure in which the film/foil is pushed into a die by a punch. The film/foil herein is shaped by folding and the final shape thereof is thus formed. Consequently, only minor flow procedures up to approximately 10% take place, but not any flow procedures as are known from the forming of sheet metal, for example.

[0012] A method for producing cup-type containers from a thin metal strip is known from the prior art, in particular from publication DE 24 20 680 A1, in which method a container having a resistance moment which increases from

the base by way of the lateral wall to the container rim is generated by means of a corresponding device. It is achieved on account thereof that folding by embossing which in the region of the lateral walls of the container increases toward the top is provided.

[0013] The shaping procedure and the cutting procedure are effected by the same device which, besides a die on the tool lower part and a punch on the tool upper part, also has a cutting blade on the tool upper part and an elastically mounted cutting ring on the tool lower part. The desired piece of foil is first cut from the metal strip in a single operating stroke and is then formed. The punch is configured in multiple stages, having a male precursor punch and a compression ring. The hollow die shape into which the punch plunges so as to deform the metal strip, is likewise provided with a stepped recess. In said hollow die shape, a first conical recess region which in terms of the internal contour thereof corresponds to the external contour of the male precursor punch, by way of a step transitions to a second annular recess region which in terms of the internal contour thereof corresponds to the external contour of the compression ring.

[0014] A punch device having two shaping units and trimming units for trimming the shaped film semi-shells arranged next to one another is described also in WO 2017/144664 A1. As is also the case in DE 24 20 680 A1, cutting and forming in this solution also takes place in a single operating stroke, but in the reverse sequence. To this end, the punch is elastically attached to the tool upper part, while the cutting device is rigidly connected to the latter.

[0015] Furthermore, EP 2 765 081 A1 describes a device and a method for producing a film packaging for foodstuff products.

[0016] Forces which are so high that the film/foils to be formed can tear may arise between the forming tools during the forming procedure. In order for this not to happen, sufficiently thick films are used in practice so as to keep the reject rate low in production. Consequently, the material costs increase. Moreover, higher forming forces are required for forming thicker films/foils which can have a negative effect on the durability of the machines. Furthermore, the machines must be more stable from the outset, so as to be able to apply higher forces, which moreover increases the machine costs.

[0017] A forming station for producing nursing pads which has a shaping tool which for shaping the shaped body from a material web interacts with a conveyor device for the material web is known from DE 10 2007 030 008 A1, wherein the shaping tool is moved conjointly with the material web at least during a dwelling time required for shaping the shaped body.

[0018] DE 10 2008 034 996 A1 describes a device for hot-forming and press-hardening a semi-finished product from steel using a die and a punch with a shape-imparting section, said die and said punch being movable in relation to one another. The punch herein is attached to the press tappet and movable in relation to said press tappet, and the die is attached to the press table.

[0019] A draw press for drawing packaging containers from thin metal sheets or plastics material films is described in DE 19 59 573 A.

[0020] A method for producing cold-formed shaped packages having at least one depression from a metal/plastics material composite is known from CH 691 445 A5, wherein

the composite is held between a blank holder and a dye, and the die has at least one forging opening, and a punch is driven into the forging openings of the die, and the composite herein is deformed so as to form the shaped package having one or a plurality of depressions.

[0021] It is an object of the present invention to refine known solutions from the prior art, in particular to provide a packaging device as well as a method and a shaping unit for shaping shaped film parts with low complexity.

[0022] Accordingly, the present invention proposes a tool system having the features of claim 1 as well as a packaging device having the features of claim 9.

[0023] The tool system according to the invention as claimed in claim 1 is provided for use in a packaging device for packaging foodstuff products, in particular hollow chocolate bodies, by means of a film packaging. The packaging device herein, as in WO 2017/144664 A1, comprises a plurality of processing stations of which some processing stations are in particular provided for processing the film packaging. The latter processing stations are accordingly such processing units which directly engage on the film packaging, or the intermediate products (semi-finished film products), respectively, that is to say are processing units for cutting, shaping, and joining the semi-finished film products.

[0024] According to the invention, the tool system comprises at least three tool parts, specifically a tool central part as well as a tool lower part and a tool upper part which when in operation are capable of interacting in a processing manner. The tool central part herein serves for receiving and conveying at least one semi-finished film product of the film packaging to be processed between individual processing units of the packaging device. It is furthermore provided according to the invention that the tool central part is capable of interacting in each case with at least one further tool part (that is to say the tool lower part or the tool upper part) of the tool system, wherein the further tool part is in each case a tool part of one of the processing units which serve for processing the semi-finished film product from receiving the latter on the tool central part to the completion thereof as a film packaging. To this end, the tool central part has at least one interface by means of which said tool central part is compatible with at least one tool part of each of said processing units.

[0025] The advantage of the invention as claimed in claim 1 thus lies in that the tool lower part and the tool upper part are in each case to be assigned to one processing unit, for example form tool parts of a cutting unit, of a joining unit, or of a shaping unit, while the tool central part having a received semi-finished film product passes through all said processing units and thus renders unnecessary the transfer of the semi-finished film product between the individual processing units using additional transport devices, as is known from the prior art.

[0026] On account of the tool central part being compatible with at least one tool part of each of these processing units, said tool central part can pass through all said processing units for processing the semi-finished film product from receiving the latter on the tool central part up to the completion thereof as a film packaging without an additional transfer being necessary. At the same time, the tool central part per se can be a functional carrier and interact with one of the tool parts so as to process the semi-finished film product.

[0027] Each processing unit of the packaging device which in the context of the present invention serves for processing the film packaging thus represents per se a tool system according to the invention, having at least one tool lower part and one tool upper part which are assigned to the processing unit, as well as a tool central part which for processing the semi-finished film product received thereon can be moved into the processing unit and subsequently can be conveyed out of the latter.

[0028] In the context of the present invention the term film packages is used throughout. The film herein can be composed of plastics materials such as, for example, PVC, metallic materials such as, for example, aluminum, or of composite materials. Moreover, the film/foil in the initial state, that is to say at room temperature, does not have to be flexible but may have a certain stiffness and may be heated continuously or once for improved processing.

[0029] It can furthermore be provided that the tool central part can be driven by means of a conveyor unit, wherein the tool central part can in particular comprise a film carrier which is assigned to the at least one semi-finished film product.

[0030] It can be particularly advantageous herein for the conveyor unit, at least in portions thereof, to be configured as a continuously operating conveyor unit.

[0031] By driving the tool central part by means of a continuous conveyor unit, a continuous operation of a corresponding packaging device can be provided, the processing units of said packaging device being configured as tool systems according to the invention. An improved cycle time is achieved on account thereof, which besides the advantage of a lower reject rate enables in particular higher output.

[0032] An additional or alternative embodiment of the invention can lie in that the conveyor unit, at least in portions thereof, is configured as a discontinuously operating conveyor unit. The shaping of the semi-finished film products can in particular be simplified in this way, since the two parts which move relative to one another do not have to be moved when forming, wherein the less critical loading of the film carriers can take place during a transportation procedure.

[0033] A particularly dynamic movement of the film carriers is possible when the conveyor unit herein has a linear drive installation for the tool central part, and a very high flexibility in terms of the operation of the conveyor unit results herein.

[0034] It can furthermore be provided that at least one tool part of the tool system, in particular the tool lower part and/or the tool upper part, is mounted so as to float in at least one direction transverse to the processing direction. In particular, the at least one tool part of the tool system can also be mounted so as to float in a plane transverse to the processing direction, for example perpendicular to the latter.

[0035] On account of the multi-part tool system it is necessary for the tool parts to be converged in a very precise manner in the individual processing units so as to achieve tidy and reliable processing. In order to compensate for slightly poor positioning of the tool parts relative to one another, a floating mounting can be provided in the case of one or a plurality of the tool parts of the tool system. It can in particular be provided, for example, that the tool central part represents the leading system, that is to say the reference, and that the tool lower part and the tool upper part are

aligned with the tool central part. In this embodiment, the floating mounting can be provided on the tool lower part and/or the tool upper part.

[0036] This can be achieved, for example, with the aid of an adapter plate which is connected to the tool lower part, or the tool upper part, respectively, in such a manner that said adapter plate permits a relative movement transversely to the processing direction of the tool. The processing direction herein describes the direction in which the tool parts, that is to say in particular the interacting tool parts of the tool system, are moved in a processing step so as to enable processing of the semi-finished film product. In the case of a shaping unit or cutting unit, this can in particular be a stroke movement.

[0037] In order to facilitate the tool parts of the tool system converging during a processing step, it can furthermore be provided that at least one tool part, in particular the tool lower part and/or the tool upper part, have/has joining bevels. It can furthermore be provided that, alternatively or additionally to the joining bevels, guiding aids, for example in the form of a projecting structure on one of the tool parts which is capable of plunging into a communicating receptacle structure on another of the tool parts, are provided so as to ensure a reliable alignment of the tool parts during a processing step.

[0038] According to one refinement of the invention it can be provided that the tool lower part and/or the tool upper part of a processing unit are at least in portions able to be moved in a reciprocating manner along the conveying direction of the tool central part. This measure also serves in particular to enable a continuous operation of such a packaging device which utilizes tool systems according to the invention as processing units. The processing steps of shaping, cutting, and joining thus typically take place within a specific time window, a relative movement between the tool central part and the tool lower part and the tool upper part being disadvantages within said time window. The tool central part thus has to be stationary relative to the tool lower part and the tool upper part of the processing unit at least for the duration of the respective processing step.

[0039] A discontinuous operation in which the indexing table (WO 2017/144664 A1) is stationary during the respective processing step, for example, is proposed in the prior art. Consequently, the stoppage of the indexing table is also governed by the longest processing time, on account of which an additional time loss is created.

[0040] According to the refinement of the invention, a continuous operation without undesirable downtime can be achieved on account of the mobility of the tool parts of a processing unit along the conveying direction of the tool central part (at least across a predefined distance).

[0041] The drive of the tool central part herein can run at a speed of 20 m/min up to 30 m/min, for example. Of course, devices in which the drive runs at a higher speed than 30 m/min or at a lower speed than 20 m/min are also conceivable.

[0042] Depending on the processing time in a processing unit, the distance travelled which the tool part of the processing unit, that is to say the tool lower part and/or the tool upper part, that is in each case to be conjointly moved can also be set by the speed at which the drive of the tool central part runs. Conveying back the tool part (s) of the processing unit which during the processing procedure is/are moved conjointly with the tool central part in the conveying

direction of the latter can herein take place by means of a separate drive or by way of a resetting installation, for example, which utilizes in particular an elastic mechanism for the returning action. Helical springs or the like are conceivable to this end, for example.

[0043] As has already been mentioned at the outset, the invention also relates to a packaging device for packaging foodstuff products, in particular hollow chocolate bodies, by means of a film packaging which comprises at least two shaped film parts, as claimed in the features of claim 9.

[0044] The packaging device herein has a number of processing units for processing the semi-finished film products of the film packaging, said processing units being constructed as tool systems as claimed in the features of claim 1, specifically: a cutting unit for cutting-to-size the semi-finished film products, shaping unit for shaping the semi-finished film products, and a closing unit for connecting the semi-finished film products so as to form a closed housing for the foodstuff product received. Moreover, the packaging device comprises a conveyor unit for conveying the semi-finished film products of the film packaging to be processed between the individual processing units of the packaging device. It is provided according to the invention that the conveyor unit has a number of driven film carriers for receiving the semi-finished film products of the film packaging to be processed, wherein each film carrier has at least one interface by means of which said film carrier is compatible with at least one tool part of each of the processing units which serve for processing the semi-finished film product from receiving the latter on the film carrier to the completion thereof as a film packaging.

[0045] The processing units which serve directly for processing the semi-finished film products of the film packages are all constructed as a tool system as claimed in claim 1, as has already described in the context of the tool system according to the invention, so that the film carriers of the conveyor unit which correspond to the tool central part of the tool system is compatible with each of the processing units.

[0046] To the extent that further processing units which do not serve directly for processing the semi-finished film products, for example a loading unit for selectively populating the shaped film parts, or a folding unit for selectively folding the non-populated shaped film parts onto a shaped film part which is in each case populated, are provided the film carriers can thus be compatible with said processing units to the extent that the film carrier can pass through said processing units and the semi-finished film product received therein can be correspondingly processed.

[0047] It can thus be provided, for example, that two neighboring film carriers are in each case connected to one another by way of a folding mechanism, and that film carrier that carries in each case a non-populated shaped film part is folded in a folding unit so as to fold said non-populated shaped film part onto the populated shaped film part, and is subsequently folded back. It can also be provided that each second film carrier is provided with a marking of any type which indicates that said film carrier is or is not to be populated. In this way, populating supported by a robot, for example with the aid of the delta robot, can be in particular expediently facilitated.

[0048] It can furthermore be provided that the conveyor unit is configured as a continuous conveyor unit and comprises in particular a revolving conveyor belt, a revolving

conveyor chain, or a rotating conveyor plate. Continuous conveying of the film carriers between the processing regions is achieved on account thereof. In general terms, the conveyor unit thus has a revolving carrier system for the film carriers and thus for the semi-finished film products received therein. The film carriers herein can be fastened to the associated, continuously revolving, carrier system in the most varied of ways. In the case of film carriers which are connected in pairs by way of a folding mechanism it is conceivable, for example, to fasten only that film carrier which is populated with a foodstuff product in the loading unit and is thus not folded by the folding unit.

[0049] The carrier system can furthermore be produced from the most varied materials. It is thus conceivable for example for a conveyor belt or a conveyor chain of plastics material to be provided. The choice of metal chains or metal belts can also be expedient. In the case of a rotating conveyor plate it can furthermore be provided that the film carriers are disposed in an annular manner only in an external encircling region, and the remainder of the conveyor plate is provided with clearances for saving weight. Here too, the most varied materials can be used, of course.

[0050] In order for the folding film carrier to be secured in the initial position thereof, that is to say in a position in which said film carrier can be loaded with a piece of film, on the carrier system, a form-fitting or a force-fitting type of connection can be provided. It is thus conceivable, for example, a releasable form-fit to be provided by way of a releasable latching connection, said form-fit in the folding unit being able to be released by a corresponding effort in terms of force, and after folding being able to be restored when folding back. Alternatively, it is also conceivable for a magnetic connection or a hook-and-loop connection to be provided as a force-fitting connection between the film carrier and the associated carrier system of the conveyor unit, said force-fitting connection in turn being readily releasable and at the same time securing the film carrier in the initial position thereof.

[0051] In an alternative embodiment of the packaging device it can be provided that the conveyor unit is configured as a discontinuous conveyor unit, in particular as a linear drive installation, and at least in portions enables a discontinuous conveying of the film carriers between the processing units. In this way, the advantages of a discontinuous operation as have already been discussed above can be utilized above all during the forming procedure of the semi-finished film product, while the transporting and the loading thereof can take place in the continuous operation. In this case, a central drive provided in the case of a continuously operating conveyor unit would be dispensed with.

[0052] According to one refinement of the invention, it can be provided for the tool system as well as for the packaging device that the at least one interface of the tool central part, or of the film carrier, respectively, comprises a receptacle region, and that at least one tool part of one of the processing units of the packaging device is able to be occasionally received in the receptacle region of the tool central part, or of the film carrier, respectively, wherein the receptacle region of the tool central part, or of the film carrier, respectively, has in particular an internal contour which communicates with a corresponding external contour of the respective tool part of the respective processing unit.

[0053] The at least one interface provided serves to enable the compatibility of the tool central part, or of the film carrier, respectively, with the tool parts of the processing units. The interface herein can inter alia comprise a receptacle region in which a tool part of the associated processing unit is at least in part received occasionally in the receptacle region, that is to say when the tool central part, or the film carrier, respectively, has reached a region of a specific processing unit. For example, a die can thus be moved into such a receptacle region and out of the latter so as to interact with a punch of the shaping unit.

[0054] In order to guarantee defined and reliable receiving, it can be provided that the internal contour of the receptacle region is adapted to the corresponding external contour of the respective tool part. It can also be ensured in this way that processing can take place only in a desired position of the tool parts relative to one another, or of the film carrier relative to the tool parts, of a processing unit. On account thereof, a wrong positioning can lead to an interruption of the processing operation without rejects first having to be produced and detected to this end.

[0055] Of course, further interfaces in a different design embodiment can additionally also be provided, said further interfaces being adapted to the different tool parts of the different processing units.

[0056] In one specific embodiment it can be provided that the tool central part, or the film carrier, respectively, is configured so as to be substantially plate-shaped having a substantially central passage opening as the receptacle region, wherein an encircling shaping region having a chamfer of approximately 45 degrees in terms of an angle can in particular be provided in the region of the central passage opening, said shaping region opening into the passage opening.

[0057] The plate-shaped configuration of a tool central part, or of a film carrier, respectively, enables a planar bearing portion to be provided on one of the end sides of the plate-shaped construction, this being the end side on which a film blank can be deposited. A passage opening which in terms of the bearing portion is substantially central can furthermore serve toward processing tool parts of a processing unit, for example a punch and a die, being able to act directly or indirectly on the film blank from both sides of the film blank (for example through the central passage opening of the plate-shaped construction) so as to process said film blank. For example, only one tool part herein can be received in the central passage opening. Alternatively, both tool parts, that is to say the tool upper part and the tool lower part, can at least in portions also be conjointly received in said central passage opening during the processing step.

[0058] A conceivable refinement can lie in that a shaping region in the manner of a chamfer of approximately 45 degrees in terms of an angle which opens into the passage opening can be additionally provided in the region of the central passage opening. A chamfer which in terms of the inclination thereof deviates therefrom can of course also be expedient; for example, an encircling chamfer of approximately 30 degrees in terms of an angle, 60 degrees in terms of an angle, or any degree therebetween, can thus be provided. The shaping region having such a chamfer in the manner of a joining bevel facilitates the converging of the tool parts of the tool system, on the one hand, and on the other hand, in combination with a corresponding shaping punch, for example, can be utilized for bringing to bear, or

bending, respectively, the semi-finished film product in this region. As will be explained in more detail hereunder, a periphery which forms in the joining planes of the two shaped film parts, for example, can thus act in a visually irritating manner, depending on the choice of the packaging geometry. In order for this effect to be reduced, the remaining periphery can be brought to bear in a peripheral bearing method in a dedicated processing step, for example after the joining of the shaped parts and in a final trimming cut. To this end, a corresponding encircling shaping region can be provided in a simple manner, said shaping region opening into the passage opening, for example. Of course, it is also conceivable for such a shaping region to be provided on the tool central part, or the film carrier, respectively, at a predefined spacing from the passage opening.

[0059] It can furthermore be provided that the at least one interface of the tool central part, or of the film carrier, respectively, has an encircling cutting groove and/or at least two tensioning recesses. The advantage of a corresponding cutting groove lies in that the latter can interact with a communicating cutting blade of a cutting unit in such a manner that tidy peripheral trimming can take place before or after joining the semi-finished film products.

[0060] With the aid of at least two tensioning recesses it is thus possible to enable particularly simple and reliable fixing of a film blank, or of a semi-finished film product, respectively, on the film carriers or the tool central parts, respectively. It is thus known that the minor weight of a film blank in conjunction with the relatively large area of a packaging film renders said packaging film particularly susceptible to slipping during transportation. Therefore, known methods utilize a vacuum for transporting the film blanks by way of vacuum conveyor belts or the like, for example. However, the solutions have the disadvantage that they require extensive additional mechanical equipment, on account of which the complexity and the costs are again increased.

[0061] As opposed thereto, it is proposed that the film blank during transportation is braced in relation to the tool central part, or the film carrier, respectively, in a portion which is not otherwise utilized, that is to say not in the region of the shaped portion which is later to receive the foodstuff product. To this end, the further interface of the tool central part, or of the film carrier, respectively, has at least two tensioning recesses into which communicating shaping punches can be moved. The film which bears between the shaping punch and the associated tensioning recess on the tool central part, or the film carrier, respectively, is in this way pushed into the associated tensioning recess and braces the film blank in relation to the tool central part. A form-fit in which the two connecting partners, i.e. the film and the tensioning recess, engage in one another and prevent any releasing is created on account thereof.

[0062] The tensioning recesses can in particular be set at an angle to the film plane, that is to say that the longitudinal extent of said tensioning recesses to this end is inclined at an angle of 30 to 60 degrees such that the film is encompassed by the tool central part. In a particularly simple embodiment, the tensioning recesses are formed by bores having a circular cross-section, the longitudinal axis of said bores being inclined in an optimal manner in relation to the film plane as an angle of 30 degrees to 60 degrees. The tensioning recesses, or the longitudinal axes thereof, respectively, can in particular enclose therebetween an angle of approximately 60 to 120 degrees. Alternative variants of design

embodiment, for example one or a plurality of tensioning recesses having a cross section with a more complex contour and a shaping punch having a corresponding mating contour are of course likewise conceivable, as a tensioning recess which are set at an angle deviating therefrom, i.e. less than 30 degrees in terms of an angle or more than 60 degrees in terms of an angle, in relation to the film plane.

[0063] An alternative or additional solution can lie in that the packaging device furthermore has a securing assembly for fixing the semi-finished film products of the film packaging during transportation between the processing units, wherein the securing assembly for securely clamping the semi-finished film products of the film packaging between said securing assembly and the film carriers of the conveyor unit is disposed above the conveyor unit. The securing assembly can comprise different components for clamping, for example thin metal sheets or belt strips which above the film carriers of the conveyor unit run at the speed of the conveyor unit so as to avoid friction between the semi-finished film product and the securing assembly. Securing of the semi-finished film products is not required in the region of the processing units, which is why the securing assembly can be interrupted in the region of the processing units.

[0064] It can furthermore be provided that the at least one interface of the tool central part, or of the film carrier, respectively, has a separately configured functional ring which can in particular comprise the encircling shaping region and/or the encircling cutting groove and/or the tensioning recesses. It is furthermore also conceivable for the functional ring to be provided additionally to a receptacle region which is configured as a central passage opening. It can be provided in this case that the functional ring is disposed to as to be substantially concentric with the central passage opening. It is also conceivable for the functional ring in terms of the internal contour thereof to be adapted to the external contour of the passage opening.

[0065] By providing a separately configured functional ring it is possible for the tool central part, or the film carrier, to be adapted in a simple and rapid manner to different parameters of the packaging device, and in the case of a releasable attachment to the tool central part, or the film carrier, respectively, also to be converted in a simple manner. Furthermore, further functions, for example reducing or increasing the friction, adapting the required stiffness or elasticity, and the like, can be assigned to the functional ring on account of a corresponding choice of material for the functional ring.

[0066] As has already been mentioned above, it can moreover be provided that the packaging device furthermore has at least one shaping punch having a corresponding shaping contour which communicates with the shaping contour of the encircling shaping region or with a shaping contour of the tensioning recesses so that the at least one shaping punch at least in portions is capable of plunging into the encircling shaping region or into one of the tensioning recesses.

[0067] It can moreover be provided that the conveyor unit of a packaging device according to the present invention has in particular a drive system with a sensor mechanism for establishing the position of the driven film carriers and/or for establishing the distance travelled by the driven film carriers. This represents a second measure to enable that the individual tool parts can be precisely converged during the processing steps. Pre-positioning the tool parts relative to

one another as accurately as possible is possible with the aid of a corresponding sensor mechanism.

[0068] In particular when the conveyor unit furthermore has a drive unit for moving in a reciprocating manner one tool part of a processing unit at least in portions along the conveying direction of the film carrier, the correspondingly driven tool part of a processing unit with the aid of said drive unit, by means of the position data provided by the sensor mechanism, can be aligned to the driven film carrier with great positional accuracy.

[0069] It can finally be provided that the shaping unit of the packaging device has a punch having a shape-imparting external contour and die having an internal recess which has an internal contour which communicates with the shape-imparting external contour of the punch, wherein the punch and/or the die at least in portions have/has an elastic insert.

[0070] In particular when the punch has a region which includes a geometry which is difficult to shape such as, for example, small projections, corners, and edges, there is a high risk that a (comparatively thin) film could tear in said regions. This can be traced back to the fact that the punch usually first comes in contact with such projecting contours of the film, and a locally delimited impingement of the film with high pressure takes place on account of the projecting contour. The film experiences the maximum elongation during forming specifically in such regions. Typical examples of such geometries which are difficult to shape are, for example, the faces of figures which contain a multiplicity of in some instances very intense transitions between contours.

[0071] On account of a corresponding elastic insert being provided in such a region, the pressure acting on the film in this region is reduced, and the risk of the film tearing is thus reduced.

[0072] A conceivable design embodiment of such an insert can comprise, for example, an insert from an elastic plastics material, or an elastomer, respectively. A design embodiment with foam material, for example foam rubber, or with silicone, is also conceivable.

[0073] It is furthermore conceivable that the elastic insert slightly projects from the remaining shaping contour of the punch and/or the die such that it is ensured that the insert is first to come in contact with the film to be formed and on the corresponding shaping counter piece. In this way, in particular when using an insert from the elastomer or silicone, a significant increase in the friction (increased static friction) can also be achieved in this region, besides the effect of a reduced hardness and thus reduced stress on account of pressure. It is prevented on account of the increased friction that the film is excessively stretched specifically in this region having the geometries which are difficult to shape. This also leads to the risk of the film tearing in this region being reduced.

[0074] The insert can furthermore be attached to the punch and/or the die so as to be replaceable. It is guaranteed on account of the replacement capability that the shaping unit can be rapidly repaired again by way of a simple replacement also in the case of wear, in particular by virtue of brittleness in the case of an elastomer or silicone used. The elastic insert herein can be attached in a form-fitting manner to the die or the punch, for example. Conceivable variants of design embodiment comprise a knob-shaped structure on the insert and communicating recesses on the punch or the die, respectively. In particular when using an elastomer or sili-

cone as a material, the insert can also be press-fitted into a corresponding recess and be held therein in a force-fitting manner (as a result of the increased friction on the bearing regions of the punch or the die).

[0075] A simple and reliable embodiment of the securing assembly results when the latter in an advantageous refinement of the invention has at least one clamping element and at least one spring element which presses the clamping element in the direction of the film carriers. A further advantage of this solution lies in that damage to the film, or to the semi-finished film product, respectively, is avoided on account of such an embodiment of the securing arrangement.

[0076] In order to effect reliable opening of the clamping element and thus the release of the film carrier, it can furthermore be provided that the securing assembly has at least one gate guide which is operatively connected to the at least one clamping element in such a manner that opening of the clamping element counter to the force of the spring element can be effected by means of the gate guide.

[0077] A further possibility of securing the semi-finished film product lies in configuring this securing assembly such that the semi-finished film products of the film packages during transportation on the film carrier are secured by folding over the film peripheries on the film carrier. The film peripheries herein are brought to bear on the film carrier in such a manner, for example at an angle of 90°, that said film peripheries cannot slip during transportation on the film carrier.

[0078] The invention furthermore proposes a method having the features of claim 24.

[0079] Accordingly, in a first shaping step the at least one punch and the at least one die for shaping the film are converged, wherein the first minimum spacing between the punch external contour and the die internal contour in the converged state is larger than the thickness of the film to be deformed, and in at least one further shaping step the at least one or a second punch and the at least one or a second die for shaping the pre-shaped film portion are further converged, wherein the second minimum spacing between the punch external contour and the die internal contour is smaller than the first minimum spacing.

[0080] The first minimum spacing can be chosen depending on the forming properties and the friction properties of the material to be formed, and be double the thickness of the film to be deformed, for example.

[0081] In the method according to the invention the film to be deformed, whether or not said film is pre-cut, is deformed in a multi-staged method, that is to say in a plurality of thus at least two operating strokes. In the first step, in which the substantial part of the forming is performed, the friction between the film and the forming tool parts is significantly reduced on account of the minimum spacing provided between the punch and the die. Accordingly, the risk of the film tearing in this operating step can be notably reduced. In at least one further step the pre-shaped film is then post-shaped, or brought to the desired final shape, respectively. The shaping tools herein are moved relative to one another in the usual manner, that is to say that only the punch can be moved relative to the die, the die be moved relative to the punch, or both tool parts moved relative to one another.

[0082] On account of the film already being substantially pre-shaped, only minor forming or folding, respectively, has

to be performed in the further step such that the frictional forces usually arising herein do not entail a high risk of the film tearing.

[0083] In principle, it is of course also conceivable for more than two shaping steps, that is to say three or four shaping steps, for example, to be carried out. However, a plurality of shaping steps require a longer processing time, which in turn can have a negative effect on the production costs and the production quantity. Moreover, the additional advantage in comparison to a method having two shaping steps is potentially no longer that large that this would entail a notable benefit in relation to the longer processing times.

[0084] When mention is made of shaping steps or operating strokes, respectively, this does not mean that the shaping tools have to be returned to the respective initial position thereof between the first shaping step and the further shaping step. Instead, the shaping tools used in the first shaping step, after a short interruption, or remaining in the respective position at a first mutual minimum spacing, respectively, can be moved from said position to the second position thereof at a second smaller mutual minimum spacing. Resetting to the initial position may be required only in the case of a conceivable changeover of the shaping tools used.

[0085] In the context of the present invention the term film packages is used throughout. The film herein can be composed of plastics materials such as, for example, PVC, metallic materials such as, for example, aluminum, or of composite materials. Moreover, the film/foil in the initial state, that is to say at room temperature, does not have to be flexible but may have a certain stiffness and may be heated continuously or once for improved processing.

[0086] According to one refinement of the present invention it can be provided in the first shaping step the first punch is used, and in the second shaping step a second punch is used, wherein the first punch and the second punch have substantially identical external contours but the first punch is smaller than the second punch by a predefined factor.

[0087] Furthermore, it can additionally or alternatively be provided that in the first shaping step a first die is used, and in the second shaping step a second die is used, wherein the first die and the second die have substantially identical external contours but the first die is larger than the second die by a predefined factor.

[0088] It is also conceivable for different punches to be used with one and the same die in the method, or for different dies to be used with one and the same punch in the method, or for a plurality of different die/punch pairs to be used in the method.

[0089] It can moreover be provided that the shaping unit furthermore has a blank holder, wherein the blank holder in the first forming step from the bearing face of the shaping unit has a minimum spacing which is larger than the thickness of the film blank to be deformed, and wherein the blank holder in a further shaping step is brought to contact a flange portion of the film that surrounds the pre-shaped film portion such that said flange portion of the film is held in a force-fitting manner between the blank holder and the bearing face of the shaping unit.

[0090] The blank holder herein, in the further, in particular the last, shaping step assumes the usual function of a blank holder, specifically fixing the film to be deformed in a peripheral region which is not to be formed by the punch and the die of the shaping unit. On account of the blank holder

being held at a distance from the bearing face and thus also from the film to be deformed, the friction occurring during forming of the film between the film and the tool parts can thus be further reduced in the first shaping step.

[0091] For example, the blank holder during the first shaping step herein can be held from the bearing face at a minimum spacing which is a multiple of the thickness of the film to be deformed, for example 2 times, three times, or five times the thickness of the film to be deformed. Here too, the minimum spacing can be chosen as a function of the forming properties and friction properties of the material to be formed.

[0092] According to a further aspect of the invention, a method having the features of claim 28 can also contribute to alleviating the disadvantages known from the prior art.

[0093] In order to hold the blank holder in a simple manner at a predefined distance from the bearing face and thus from the film to be deformed, spacer pieces or spacer projections or the like which in a first shaping step are disposed between the blank holder and the bearing face of the shaping unit can be provided. For example, axial spacer projections (in terms of the axial stroke movement of the tool parts of the shaping unit) can be disposed on the blank holder or on the bearing face, and in the first shaping step be supported on the bearing face or on the blank holder. Furthermore, the bearing face or the blank holder can in each case have recesses into which the spacer projections are capable of plunging in a further shaping step. To this end, the blank holder in a further shaping step can be displaced or rotated relative to the bearing face. The spacer projections in the displaced position or the rotated position can engage in the communicating recess such a manner that the desired contact of the blank holder can be achieved.

[0094] In the case of more than two shaping steps, intermediate positions of the blank holder can also be achieved in the intermediate steps between the first and the last shaping step, for example by way of a plurality of radially offset recesses of dissimilar plunging depth, wherein the spacer projections are capable of engaging in recesses of dissimilar depth, depending on the rotation of the blank holder relative to the bearing face.

[0095] Furthermore, it can additionally or alternatively be provided that at least one die and/or at least one punch at least in portions have/has an elastic insert.

[0096] In particular when the punch has a region which includes a geometry which is difficult to shape such as, for example, small projections, corners, and edges, there is a high risk that a (comparatively thin) film could tear in said regions. This can be traced back to the fact that the punch usually first comes into contact with such projecting contours of the film, and a locally delimited impingement of the film with high pressure takes place on account of the projecting contour. The film experiences the maximum force effect, in particular elongation during forming specifically in such regions. Typical examples of such geometries which are difficult to shape are, for example, the faces of figures which contain a multiplicity of in some instances very intense transitions between contours.

[0097] On account of a corresponding elastic insert being provided in such a region, the pressure acting on the film in this region is reduced and the risk of the film tearing is thus reduced.

[0098] A conceivable design embodiment of such an insert can comprise, for example, an insert from an elastic plastics

material, or an elastomer, respectively. A design embodiment with foam material, for example foam rubber, rubber or with silicone, is in particular conceivable.

[0099] It is furthermore conceivable that the elastic insert slightly projects from the remaining shaping contour of the punch and/or the die such that it is ensured that the insert is first to come in contact with the film to be formed and on the corresponding shaping counter piece. In this way, in particular when using an insert from in the elastomer or silicone, a significant increase in the friction (increased static friction) can also be achieved in this region, besides the effect of a reduced hardness and thus reduced stress on account of pressure. It is prevented on account of the increased friction that the film is excessively stretched specifically in this region having the geometries which are difficult to shape. This also leads to the risk of the film tearing in this region being reduced.

[0100] The insert can furthermore in particular be attached to the punch and/or the die so as to be replaceable. It is guaranteed on account of the replacement capability that the shaping unit can be rapidly repaired again by way of a simple replacement also in the case of wear, in particular by virtue of brittleness in the case of an elastomer or silicone used.

[0101] The elastic insert herein can be attached in a form-fitting manner to the die or to the punch, for example. Holding structures can be provided herein on the insert or on the receptacle, said holding structures enabling a communicating holding structure on the receptacle or the insert to engage behind the former in a form-fitting manner. Conceivable variants of design embodiment comprise, for example, a knob-shaped or mushroom-shaped structure on the insert and communicating recesses on the punch or on the die, respectively.

[0102] In particular when using an elastomer or silicone as a material, the insert can also be press-fitted into a corresponding recess and be held therein in a force-fitting manner (as a result of the increased friction on the bearing regions of the punch or the die).

[0103] Apart from the above, the present invention also relates to a shaping unit for shaping shaped film parts of a film packaging of foodstuff products, in particular of hollow chocolate bodies, having the features of claim 31.

[0104] The invention furthermore also relates to a method for shaping shaped film parts of a film packaging of foodstuff products as claimed in claim 36.

[0105] On account of the punch being moved in the direction of the die as well as the die being moved in the direction of the punch in the shaping method, and the die being moved in the direction of the punch in such a manner that the die contacts the film already prior to reaching a lower reversal point of the punch, a deformation of the film is achieved already at an earlier point in time than usual, specifically before reaching the lower reversal point, on account of which substantially lower blank-holding forces result and a simpler embodiment of the entire tool is enabled. On account thereof, the film carrier can inter alia be embodied having a very simple two-dimensional contour which describes the figure to be packed, instead of having a three-dimensional contour for each film carrier, which by virtue of the fact that the film carrier is used in multiples in the shaping unit leads to a significant saving in costs. A further advantage of the solution according to the invention lies in that, by virtue of the lower blank-holding forces and

the lower stress to the film resulting on account thereof, damage to the latter can be significantly reduced or precluded, respectively.

[0106] In one advantageous refinement of this method can be provided that, once the die has contacted the film, the punch and the die are moved in the same direction, wherein the film is fixed between the punch and the die. Particularly critical regions of the film can be reliably shaped on account thereof. Furthermore, there is in this method the possibility of controlling the punch such that the latter, after plunging into the film carrier, is moved back conjointly with the die so as to facilitate pre-shaping of the film by the die.

[0107] The present invention moreover relates also to a packaging device having the features of claim 38. Such a packaging device comprises: cutting unit for cutting-to-size the semi-finished film products, a shaping unit for shaping the semi-finished film products, and a closing unit for connecting the semi-finished film products so as to form a closed housing for the foodstuff product received. The packaging device moreover comprises a conveyor unit for conveying the semi-finished film products of the film packaging to be processed between the individual processing units of the packaging device.

[0108] Such a packaging device can furthermore have a number of processing units for processing the semi-finished film products of the film packaging, said processing units being configured as tool systems having at least 3 tool parts, specifically at least one tool central part as well as a tool lower part (for example the die) and a tool upper part (for example a punch) which when in operation are capable of interacting.

[0109] Furthermore, in such a packaging device the conveyor unit can utilize the tool central part in the form of a film carrier for receiving and conveying at least one semi-finished film product of the film packaging to be processed between the individual processing units of the packaging device. It can moreover be provided that the tool central part is capable of interacting with in each case at least one further tool part (that is to say the tool lower part or the tool upper part) of the tool system, wherein the further tool part is in each case a tool part of one of the processing units which serve for processing the semi-finished film product from receiving the latter on the tool central part to the completion thereof as a film packaging. To this end, the tool central part has at least one interface by means of which said tool central part is compatible with at least one tool part of each of said processing units.

[0110] The advantage of this design embodiment thus lies in that the tool lower part and the tool upper part are in each case to be assigned to one processing unit, for example form tool parts of a cutting unit, of a joining unit, or of a shaping unit, while the tool central part having a received semi-finished film product passes through all said processing units and thus renders unnecessary the transfer of the semi-finished film products between the individual processing units using additional transport devices, as is known from the prior art.

[0111] On account of the tool central part being compatible with at least one tool part of each of these processing units, said tool central part can pass through all said processing units for processing the semi-finished film product from receiving the latter on the tool central part up to the completion thereof as a film packaging without an additional transfer being necessary. At the same time, the tool central

part per se can be a functional carrier and interact with one of the tool parts so as to process the semi-finished film product.

[0112] The processing units of the packaging device which in the context of this variant of design embodiment serve directly for processing the semi-finished film products of the film packaging can all be constructed as a tool system having at least one tool lower part and one tool upper part which are assigned to the processing unit, as well as a tool central part which for processing the semi-finished film product received thereon can be moved into the processing unit and subsequently can be conveyed out of the latter. The film carriers of the conveyor unit which correspond to the tool central part of the tool system herein can be compatible with each of the processing units.

[0113] To the extent that further processing units which do not serve directly for processing the semi-finished film products, for example a loading unit for selectively populating the shaped film parts, or a folding unit for selectively folding the non-populated shaped film parts onto a shaped film part which is in each case populated, are provided the film carriers can thus be compatible with said processing units to the extent that the film carrier can pass through said processing units and the semi-finished film product received therein can be correspondingly processed.

[0114] It can thus be provided, for example, that two neighboring film carriers are in each case connected to one another by way of a folding mechanism, and that film carrier that carries in each case a non-populated shaped film part is folded in a folding unit so as to fold said non-populated shaped film part onto the populated shaped film part, and is subsequently folded back. It can also be provided that each second film carrier is provided with a marking of any type which indicates that said film carrier is or is not to be populated. In this way, populating supported by a robot, for example with the aid of the delta robot, can in particular be expediently facilitated.

[0115] It can furthermore be provided that the conveyor unit is configured as a continuous conveyor unit and comprises in particular a revolving conveyor belt, a revolving conveyor chain, or a rotating conveyor plate. Continuous conveying of the film carriers between the processing regions is achieved on account thereof and thus an improved cycle time which, besides the advantage of a lower reject rate, enables in particular a higher output.

[0116] In general terms, the conveyor unit thus has a revolving carrier system for the film carriers and thus for the semi-finished film products received therein. The film carriers herein can be fastened to the associated, continuously revolving, carrier system in the most varied of ways. In the case of film carriers which are connected in pairs by way of a folding mechanism it is conceivable, for example, to fasten only that film carrier which is populated with a foodstuff product in the loading unit and is thus not folded by the folding unit.

[0117] The carrier system can furthermore be produced from the most varied materials. It is thus conceivable for a conveyor belt or a conveyor chain of plastics material to be provided. The choice of metal chains or metal belts can also be expedient. In the case of a rotating conveyor plate it can furthermore be provided that the film carriers are disposed in an annular manner only in an external encircling region, and

the remainder of the conveyor plate is provided with clearances for saving weight. Here too, the most varied materials can be used, of course.

[0118] In order for the folding film carrier to be secured in the initial position thereof, that is to say in a position in which said film carrier can be loaded with a piece of film, on the carrier system, a form-fitting or a force-fitting type of connection can be provided. It is thus conceivable, for example, a releasable form-fit to be provided by way of a releasable latching connection, said form-fit in the folding unit being able to be released by a corresponding effort in terms of force, and after folding being able to be restored when folding back. Alternatively, it is also conceivable for a magnetic connection or a hook-and-loop connection to be provided as a force-fitting connection between the film carrier and the associated carrier system of the conveyor unit, said force-fitting connection in turn being readily releasable and at the same time securing the film carrier in the initial position thereof.

[0119] It can furthermore be provided that at least one tool part of the tool system, in particular the tool lower part and/or the tool upper part, is mounted so as to float in at least one direction transverse to the processing direction.

[0120] On account of the multi-part tool system it is necessary for the tool parts to be converged in a very precise manner in the individual processing units so as to achieve tidy and reliable processing. In order to compensate for slightly poor positioning of the tool parts relative to one another, a floating mounting can be provided in the case of one or a plurality of the tool parts of the tool system. It can in particular be provided, for example, that the tool central part represents the leading system, that is to say the reference, and that the tool lower part and the tool upper part are aligned with the tool central part. In this embodiment, the floating mounting can be provided on the tool lower part and/or the tool upper part.

[0121] This can be achieved, for example, with the aid of an adapter plate which is connected to the tool lower part, or the tool upper part, respectively, in such a manner that said adapter plate permits a relative movement transversely to the processing direction of the tool. The processing direction herein describes the direction in which the tool parts, that is to say in particular the interacting tool parts of the tool systems, are moved in a processing step so as to enable processing of the semi-finished film product. In the case of a shaping unit or cutting unit, this can in particular be a stroke movement.

[0122] In order to facilitate the tool parts of the tool system converging during a processing step, it can furthermore be provided that at least one tool part, in particular the tool lower part and/or the tool upper part, have/has joining bevels. It can furthermore be provided that, alternatively or additionally to the joining bevels, guiding aids, for example in the form of a projecting structure on one of the tool parts which is capable of plunging into a communicating receptacle structure on another of the tool parts, are provided so as to ensure a reliable alignment of the tool parts during a processing step.

[0123] According to one refinement of this variant it can be provided that the tool lower part and/or the tool upper part of a processing unit are at least in portions able to be moved in a reciprocating manner along the conveying direction of the tool central part. This measure also serves in particular to enable a continuous operation of such a packaging device

which utilizes tool systems according to the invention as processing units. The processing steps of shaping, cutting, and joining thus typically take place within a specific time window, a relative movement between the tool central part and the tool lower part and the tool upper part being disadvantages within said time window. The tool central part thus has to be stationary relative to the tool lower part and the tool upper part of the processing unit at least for the duration of the respective processing step.

[0124] A discontinuous operation in which the indexing table (WO 2017/144664 A1) is stationary during the respective processing step, for example, is proposed in the prior art. Consequently, the stoppage of the indexing table is also governed by the longest processing time, on account of which an additional time loss is created.

[0125] According to the refinement of the invention, a continuous operation without undesirable downtime can be achieved on account of the mobility of the tool parts of a processing unit along the conveying direction of the tool central part (at least across a predefined distance).

[0126] The drive of the tool central part herein can run at a speed of 20 m/min up to 30 m/min, for example. Of course, devices in which the drive runs at a higher speed than 30 m/min or at a lower speed than 20 m/min are also conceivable.

[0127] Depending on the processing time in a processing unit, the distance travelled which the tool part of the processing unit, that is to say the tool lower part and/or the tool upper part, that is in each case to be conjointly moved can also be set by the speed at which the drive of the tool central part runs. Conveying back the tool part (s) of the processing unit which during the processing procedure is/are moved conjointly with the tool central part in the conveying direction of the latter can herein take place by means of a separate drive or for example by way of a resetting installation, respectively, which utilizes in particular an elastic mechanism for the returning action. Helical springs or the like are conceivable to this end, for example.

[0128] According to one refinement, it can be provided for the tool system as well as for the packaging device that the at least one interface of the tool central part, or of the film carrier, respectively, comprises a receptacle region, and that at least one tool part of one of the processing units of the packaging device is able to be occasionally received in the receptacle region of the tool central part, or of the film carrier, respectively, wherein the receptacle region of the tool central part, or of the film carrier, respectively, has in particular an internal contour which communicates with a corresponding external contour of the respective tool part of the respective processing unit.

[0129] The at least one interface provided serves to enable the compatibility of the tool central part, or of the film carrier, respectively, with the tool parts of the processing units. The interface herein can inter alia comprise a receptacle region in which a tool part of the associated processing unit is at least in part received occasionally in the receptacle region, that is to say when the tool central part, or the film carrier, respectively, has reached a region of a specific processing unit. For example, a die can thus be moved into such a receptacle region and out of the latter so as to interact with a punch of the shaping unit.

[0130] In order to guarantee defined and reliable receiving, it can be provided that the internal contour of the receptacle region is adapted to the corresponding external

contour of the respective tool part. It can also be ensured in this way that processing can take place only in a desired position of the tool parts relative to one another, or of the film carrier relative to the tool parts, of a processing unit. On account thereof, a wrong positioning can lead to an interruption of the processing operation without rejects first having to be produced and detected to this end.

[0131] Of course, further interfaces in a different design embodiment can additionally also be provided, said further interfaces being adapted to the different tool parts of the different processing units.

[0132] In one specific embodiment it can be provided that the tool central part, or the film carrier, respectively, is configured so as to be substantially plate-shaped having a substantially central passage opening as the receptacle region, wherein an encircling shaping region having a chamfer of approximately 45 degrees in terms of an angle can in particular be provided in the region of the central passage opening, said shaping region opening into the passage opening.

[0133] The plate-shaped configuration of a tool central part, or of a film carrier, respectively, enables a planar bearing portion to be provided on one of the end sides of the plate-shaped construction, this being the end side on which a film blank can be deposited. A passage opening which in terms of the bearing portion is substantially central can furthermore serve toward processing tool parts of a processing unit, for example a punch and a die, being able to act directly or indirectly on the film blank from both sides of the film blank (for example through the central passage opening of the plate-shaped construction) so as to process said film blank. For example, only one tool part herein can be received in the central passage opening. Alternatively, both tool parts, that is to say the tool upper part and the tool lower part, can at least in portions also be conjointly received in said central passage opening during the processing step.

[0134] A conceivable refinement can lie in that a shaping region in the manner of a chamfer of approximately 45 degrees in terms of an angle which opens into the passage opening can be additionally provided in the region of the central passage opening. A chamfer which in terms of the inclination thereof deviates therefrom can of course also be expedient; for example, an encircling chamfer of approximately 30 degrees in terms of an angle, 60 degrees in terms of an angle, or any degree therebetween, smaller than 30 degrees in terms of an angle or larger than 60 degrees in terms of an angle, can thus be provided. The shaping region having such a chamfer in the manner of a joining bevel facilitates the converging of the tool parts of the tool system, on the one hand, and on the other hand, in combination with a corresponding shaping punch, for example, can be utilized for bringing to bear, or bending, respectively, the semi-finished film product in this region. As will be explained in more detail hereunder, a periphery which forms in the joining planes of the two shaped film parts, for example, can act in a visually irritating manner, depending on the choice of the packaging geometry. In order for this effect to be reduced, the remaining periphery can be brought to bear in a peripheral bearing method in a dedicated processing step, for example after the joining of the shaped parts and in a final trimming cut. To this end, a corresponding encircling shaping region can be provided in a simple manner, said shaping region opening into the passage opening, for example. Of course, it is also conceivable for such a shaping

region to be provided on the tool central part, or the film carrier, respectively, at a predefined spacing from the passage opening.

[0135] It can furthermore be provided that the at least one interface of the tool central part, or of the film carrier, respectively, has an encircling cutting groove and/or at least two tensioning recesses. The advantage of a corresponding cutting groove lies in that the latter can interact with a communicating cutting blade of a cutting unit in such a manner that tidy peripheral trimming can take place before or after joining the semi-finished film products.

[0136] With the aid of at least two tensioning recesses it is thus possible to enable particularly simple and reliable fixing of a film blank, or of a semi-finished film product, respectively, on the film carriers or the tool central parts, respectively. It is thus known that the minor weight of a film blank in conjunction with the relatively large area of a packaging film renders said packaging film particularly susceptible to slipping during transportation. Therefore, known methods utilize a vacuum for transporting the film blanks by way of vacuum conveyor belts or the like, for example. However, the solutions have the disadvantage that they require extensive additional mechanical equipment, on account of which the complexity and the costs are again increased.

[0137] As opposed thereto, it is proposed that the film blank during transportation is braced in relation to the tool central part, or the film carrier, respectively, in a portion which is not otherwise utilized, that is to say not in the region of the shaped portion which is later to receive the foodstuff product. To this end, the further interface of the tool central part, or of the film carrier, respectively, has at least two tensioning recesses into which communicating shaping punches can be moved. The film which bears between the shaping punch and the associated tensioning recess on the tool central part, or the film carrier, respectively, is in this way pushed into the associated tensioning recess and braces the film blank in relation to the tool central part. A form-fit in which the two connecting partners, i.e. the film and the tensioning recess, engage in one another and prevent any releasing is created on account thereof.

[0138] The tensioning recesses can in particular be set at an angle to the film plane, that is to say that the longitudinal extent of said tensioning recesses to this end is inclined at an angle of 30 to 60 degrees such that the film is encompassed by the tool central part. In a particularly simple embodiment, the tensioning recesses are formed by bores having a circular cross-section, the longitudinal axis of said bores being inclined in an optimal manner in relation to the film plane as an angle of 30 degrees to 60 degrees. The tensioning recesses, or the longitudinal axes thereof, respectively, can in particular enclose therebetween an angle of approximately 60 to 120 degrees. Alternative variants of design embodiment, for example one or a plurality of tensioning recesses having a cross section with a more complex contour and a shaping punch having a corresponding mating contour are of course likewise conceivable, as a tensioning recess which are set at an angle deviating therefrom in relation to the film plane.

[0139] An alternative or additional solution can lie in that the packaging device furthermore has a securing assembly for fixing the semi-finished film products of the film packaging during transportation between the processing units, wherein the securing assembly for securely clamping the semi-finished film products of the film packaging between

said securing assembly and the film carriers of the conveyor unit is disposed above the conveyor unit. The securing assembly can comprise different components for clamping, for example thin metal sheets or belt strips which above the film carriers of the conveyor unit run at the speed of the conveyor unit so as to avoid friction between the semi-finished film product and the securing assembly. Securing of the semi-finished film products is not required in the region of the processing units, which is why the securing assembly can be interrupted in the region of the processing units.

[0140] It can furthermore be provided that the at least one interface of the tool central part, or of the film carrier, respectively, has a separately configured functional ring which can in particular comprise the encircling shaping region and/or the encircling cutting groove and/or the tensioning recesses. It is furthermore also conceivable for the functional ring to be provided additionally to a receptacle region which is configured as a central passage opening. It can be provided in this case that the functional ring is disposed to as to be substantially concentric with the central passage opening. It is also conceivable for the functional ring in terms of the internal contour thereof to be adapted to the external contour of the passage opening.

[0141] By providing a separately configured functional ring it is possible for the tool central part, or the film carrier, to be adapted in a simple and rapid manner to different parameters of the packaging device, and in the case of a releasable attachment to the tool central part, or the film carrier, respectively, also to be converted in a simple manner. Furthermore, further functions, for example reducing or increasing the friction, adapting the required stiffness or elasticity, and the like, can be assigned to the functional ring on account of a corresponding choice of material for the functional ring.

[0142] As has already been mentioned above, it can moreover be provided that the packaging device furthermore has at least one shaping punch having a corresponding shaping contour which communicates with a shaping contour of the encircling shaping region or with a shaping contour of the tensioning recesses so that the at least one shaping punch at least in portions is capable of plunging into the encircling shaping region or into one of the tensioning recesses.

[0143] It can moreover be provided that the conveyor unit of a packaging device according to the present invention has in particular a drive system with a sensor mechanism for establishing the position of the driven film carriers and/or for establishing the distance travelled by the driven film carriers. This represents a second measure to enable that the individual tool parts can be precisely converged during the processing steps. Pre-positioning the tool parts relative to one another as accurately as possible is possible with the aid of a corresponding sensor mechanism.

[0144] In particular when the conveyor unit furthermore has a drive unit for moving in a reciprocating manner one tool part of a processing unit at least in portions along the conveying direction of the film carrier, the correspondingly driven tool part of a processing unit with the aid of said drive unit, by means of the position data provided by the sensor mechanism, can be aligned to the driven film carrier with great positional accuracy.

[0145] The present invention furthermore relates to a packaging device having the features of claim 39.

[0146] On account of the conveyor unit herein provided to be divided into discontinuously operated portions, continu-

ously operated portions, and portions in which synchronizing of the discontinuously operated portions and the continuously operated portion takes place, not only is a speed of the conveyor unit which is optimal to each point in time, or in each portion, respectively, achieved, but on account of the synchronization it is also ensured that the continuous movement transitions to the discontinuous movement without any excessive acceleration and nevertheless at a high output, and vice versa. On account thereof, the advantages of the discontinuous operation discussed above can be utilized above all during the forming procedure of the semi-finished film product, while transporting and loading the semi-finished film product can take place in the continuous operation.

[0147] One particular advantageous embodiment of this packaging device can lie in that the conveyor unit has pliable drive elements for forming the continuously operated portions, the discontinuously operated portions, and the portions in which the synchronizing of the discontinuously operated portions and the continuously operated portions takes place. Said pliable drive elements such as, for example belts, represent a simple and reliable possibility of implementing the described synchronization between the individual portions of the conveyor unit.

[0148] When the pliable drive elements herein are able to be actuated by means of electronically actuated electric motors such as servo motors, for example, particularly simple and reliable controlling of the entire method for packaging the foodstuff products that is able to be carried out by way of the packaging device thus results.

[0149] Further features and advantages of the invention are derived from the description hereunder of an exemplary embodiment of the invention as well as from the dependent claims.

[0150] The invention is described in more detail hereunder with reference to the appended figures. The figures show a plurality of features of the invention in combination with one another. Of course, the person skilled in the art will also be able to consider said features independently and to optionally combine said features so as to form further expedient sub-combinations without having to take an inventive step to this end.

[0151] The present invention is not limited to foodstuff products but can also be used in packaging devices for packaging products of all manner.

[0152] In the figures, in each case in a schematic manner:

[0153] FIGS. 1A, 1B show in a very schematic lateral illustration and a plan view a packaging device according to the invention having a shaping unit according to the invention in different embodiments;

[0154] FIG. 2A shows an exemplary tool system of the packaging device according to the invention according to FIGS. 1A and 1B for crimping and for securing for transportation a semi-finished film product on a film carrier;

[0155] FIG. 2B shows a detailed view of detail B according to FIG. 2A or 2C;

[0156] FIG. 2C shows a variant of the tool system according to FIG. 2A;

[0157] FIG. 3 shows an isometric illustration of a further exemplary embodiment of a tool system of the packaging device according to the invention according to FIGS. 1A and 1B;

[0158] FIG. 4 shows a sectional illustration of the tool system according to FIG. 3;

[0159] FIGS. 5A, 5B show the interaction between the tool lower part and the tool upper part of a tool system according to FIGS. 3 and 4 in the shaping procedure;

[0160] FIGS. 6A, 6B show a lateral view and a sectional view of the tool system according to FIGS. 5A and 5B;

[0161] FIG. 7A shows a sectional view of a further exemplary tool system of the packaging device according to the invention in a section illustration;

[0162] FIG. 7B shows a detailed view of detail B according to FIG. 7A or 7C;

[0163] FIG. 7C shows an alternative design variant of the tool system according to FIG. 7A;

[0164] FIG. 8A shows an isometric illustration of a further exemplary tool system of the packaging device for illustrating the floating mounting of one of the tool parts of the tool system;

[0165] FIG. 8B shows a plan view of the tool system according to FIG. 8A;

[0166] FIG. 8C shows a sectional illustration along the section line C-C according to FIG. 8B;

[0167] FIG. 8D shows a detailed view of a detail D of FIG. 8C;

[0168] FIG. 9A shows a further exemplary embodiment of a tool system of the packaging device according to the invention according to FIGS. 1A and 1B for placing a peripheral portion of the packaging;

[0169] FIG. 9B shows a detailed view of detail B according to FIG. 9A or 9C;

[0170] FIG. 9C shows an alternative variant of design of the tool system according to FIG. 9A;

[0171] FIGS. 10A, 10B show a sectional illustration of a shaping unit according to the invention in a first shaping step (FIG. 10A) and in a further final shaping step (FIG. 10B);

[0172] FIG. 11 shows an alternative embodiment of the tool system of the packaging device;

[0173] FIGS. 12A, 12B show an alternative embodiment of a securing assembly for fixing the semi-finished film products;

[0174] FIGS. 13A-13C show a plurality of steps in a further method for shaping shaped film parts of the film packaging;

[0175] FIG. 14 shows a further alternative embodiment of the tool system and of the packaging device; and

[0176] FIG. 15 shows a detail from FIG. 14.

[0177] FIGS. 1A and 1B show a very schematic illustration of a packaging device according to the invention having a shaping unit according to the invention in a lateral illustration and a plan view. FIG. 1B herein shows an alternative variant of design embodiment of the packaging device according to FIG. 1A, which is why identical features are provided with the same reference signs but said reference signs are prefixed with the numeral "1".

[0178] A strip-shaped film F is unwound from a coil of film F_C in a first region A in the conveying direction R_F (illustrated on the right in FIG. 1), the so-called unwinding region A.

[0179] An aluminum foil, an aluminum foil which is laminated for example with a sealing layer, paper capable of shaping which is optionally laminated with a sealing layer, or plastic film can be used for example as the film/foil material. The film herein does not have to be flexible at room temperature but may also display the illustrated flexibility only in higher temperature ranges. In this case, thermal action on the film by way of heating elements or the like can

already take place in the unwinding region A or in a region B which in the conveying direction R_F adjoins said unwinding region A, presently referred to as the relaxing region B. Alternatively, it is of course likewise conceivable for plastic material plates or the like to be used instead of a coil of film for conveying material. Said plastics material plates or the like can likewise be thermally heated in the first region A or the region B which in the conveying direction R_F adjoins said first region A and can be shaped thereby.

[0180] The coil of film in the embodiment illustrated is pushed onto a mandrel. Said mandrel is in particular unilaterally mounted such that a rapid changeover can take place at the end of the film. The coil of film is pushed against a detent. The role can be fixed by a second clamping ring. After unwinding a loop of foil (shown in the unwinding region A of FIG. 1) the film F is introduced into the packaging device 10. This is required in order to keep the film without tension since said film would otherwise potentially tear. The loop size, or the sagging of the film F, respectively, in the unwinding region A can be determined by way of a sensor, for example.

[0181] The film F is intended to relax in a straight line in the entry region of the packaging device 10, that is to say in the relaxation region B. To this end, said film is laterally guided across a predetermined length such that slight oblique positioning in the run-in of the film can be corrected.

[0182] A printing mark sensor can optionally be provided at the end of the relaxation region B, said printing mark sensor identifying the position of the film running through. Depending on the position, the film can then be accelerated or decelerated. In the embodiment shown, this takes place with the aid of two film rollers (schematically illustrated on the left side in the relaxation region B of FIG. 1), the film F running between said two film rollers. The conveying speed of the film F in the region of said film rollers can be transmitted as a reference speed to a downstream conveying unit 18 of the packaging device 10.

[0183] Alternatively, the film can also be decelerated or accelerated by way of fixing strips or belt strips 186, 188, respectively, which can run above the conveyor unit 18, for example (cf. also FIG. 1B).

[0184] The film F by way of the conveyor unit 18 is subsequently conveyed through the packaging device 10. The film F conjointly with the conveyor unit 18 herein runs through the units mentioned hereunder: shaping unit 12, unit for populating and folding 14, and closing unit 16.

[0185] The conveyor unit 18 comprises a number of film carriers 20 which by way of a revolving conveyor system, for example a conveyor belt, a conveyor chain, or else a rotating conveyor plate, are continuously conveyed through the packaging device 10. In the embodiment illustrated, a conveyor chain 22 to which the film carriers 20 are attached is provided.

[0186] As is shown in the region of the unit for populating and folding 14 in FIG. 1, two neighboring film carriers 20 can in each case be connected to one another in pairs by way of a folding joint 20a. In this case, it is sufficient for the, for example leading, film carrier 20 to be fixedly connected to the revolving conveyor system, that is to say for example the conveyor chain 22, while the respective trailing film carrier 20 which by way of the folding joint 20a can be folded onto the leading film carrier 20 (indicated by the two folding arrows K) can be releasably attached to said conveyor chain

22. Desired folding of one of the film carriers, as will yet be described in more detail hereunder, is enabled in this way.

[0187] There are a plurality of possibilities for fixing the film F, or the semi-finished film products F_H , respectively, which are fastened to the respective film carriers **20** during transportation. It is thus possible for said film F, or said semi-finished film products F_H , respectively, to be fixed, for example, by way of a generated vacuum. The individual film carriers herein have suction borders, for example, by way of which the film can be suctioned. The vacuum can be generated by way of a vacuum blower or the like which is assembled below the film carrier (not illustrated).

[0188] Alternatively or additionally, the film pieces in the shaping unit **12** can be embossed into the film carriers **20** by cutting and/or shaping, that is to say connected in a form-fitting manner to said film carriers **20**. Reference will be made in more detail to this solution hereunder with reference to FIGS. 2A to 2C.

[0189] Alternatively or additionally, a further possibility lies in attaching guides (cf. FIG. 1B) above the film, or the semi-finished film products, respectively, and outside the processing region of the tools. The guides can comprise, for example, thin metal sheets or belt strips **186**, **188** which are fixedly assembled on the machine frame. The belt strips **186**, **188** run in particular at the same speed as the film carriers **20**.

[0190] The film runs below said guides and above the film carriers. The guide is correspondingly omitted in the respective processing units such that said guides cannot collide with the processing tools.

[0191] In the illustration shown in FIG. 1B the film F runs between the respective belt strips **186**, **188** and the conveyor unit **118** and by the belt strips is pushed against the film carriers **120** in such a manner that said film F cannot slip or fly away during transportation. As soon as the semi-finished film products F_H have been populated with products in the region **14** and conjointly folded or joined, respectively, to form a foil packaging, separate guiding is no longer absolutely necessary. The shaped packaging is securely held on the film carrier by gravity (as a result of the received product).

[0192] In the shaping unit **12**, to which further reference will be made in more detail with reference to FIGS. 3 to 6B and 10A, 10B, the substantially planar film F is segmented, that is to say a piece of film is cut from the film web. This is achieved with the aid of a segment cutting blade **34** which is capable of moving in a stroke movement Z relative to the film carrier **20**. The cut-off piece of film, or semi-finished film product F_H , respectively, bears on the continuously moving film carrier **20** and runs into the processing region of the shaping tool which is composed of a shaping punch **30** and a communicating die **32**. In order to reduce the formation of creases in the shaping procedure, a blank holder (not presently illustrated) which clamps the film F between itself and the bearing face of the film carrier **20** can additionally be provided.

[0193] In principle, it is also conceivable for the shaping procedure to be carried out before the film is segmented. In this case, it is not the segment blade **34a** which in the conveying direction R_F is disposed upstream of the shaping punch **30** but a cutting blade **34b** which is disposed downstream of said shaping punch **30** that serves to this end. After the shaping procedure, the pre-shaped film, whether or not segmented, can also be finally cut, that is to say that the

pre-shaped semi-finished film product F_H having the desired final contour is cut out from the film with the aid of a schematically illustrated final cutting blade **36**. In the variant having a cutting unit, as described with reference to FIGS. 7A to 7C, the step of final cutting is however performed in the region of the closing unit **16**, that is to say after the semi-finished products have been populated and folded. In principle, it is also conceivable for the step of the cutting into segments to be carried out as the last processing step, that is to say after the shaping and the final cutting.

[0194] When the step of final cutting is carried out in the region of the shaping unit **12**, the final cutting can thus be carried out in the same stroke, that is to say by way of the same stroke movement Z by way of which the shaping has also been carried out.

[0195] As can likewise be clearly seen in FIG. 1, the processing tools of the shaping unit **12**, that is to say the combination composed of the shaping punch **30** and the die **32**, as well as the cutting blades **34** and **36**, are not only held so as to be movable in the stroke direction Z but also in the direction X, that is to say that said processing tools can move conjointly with the film carriers **20** which are being continuously moved in the direction of the conveying direction R_F . In order for such a movement to be enabled, a drive which in the exemplary illustration of FIG. 1 is provided with the reference sign **24** and enables a movement in the direction X can in particular be provided. To this end, the drive **24** can be connected to slides of the respective processing tools by way of force engagement points **26** and **28**, as is schematically illustrated in FIG. 2, for example.

[0196] Alternatively or additionally, the resetting action of the processing tools can in particular also take place by means of an elastic resetting unit (not illustrated).

[0197] The unit for populating/unfolding **14** is only illustrated by implication in the illustrated embodiment of FIG. 1. The pre-shaped semi-finished film products F_H after the shaping can be selectively populated manually or automatically with foodstuff products or products of all manner in said region **14**, that is to say that each second semi-finished film product F_H is populated in the case of the illustrated embodiment. In a further step, the non-populated semi-finished film products by means of the foldable film carrier **20** are then in each case folded onto the populated semi-finished film products, wherein the received product per se serves for centering the semi-finished film product F_H that has been folded, and the now emptied film carriers can then be folded back onto the conveyor system in a further reverse folding step. In this way, the two semi-finished film products F_H are converged and form a common housing for the product received therein (cf. also FIG. 7A, for example).

[0198] The two semi-finished film products are connected to one another in the processing unit which adjoins in the conveying direction R_F , i.e. the closing unit **16**. The closing of the pre-assembled packaging in the form of the two semi-finished film products, that is to say the mutual connecting or joining, respectively, can take place in a mechanical as well as a thermal manner. A combination of said two methods is also conceivable. In terms of the mechanical closing, reference is made inter alia to a method according to publication AT 221906 B. In terms of a thermal method, reference is made, for example, to publication DE 1 211 913 B. A combined method in the context of joining metal components in the automotive industry is known, for example, from publication US 2012/0204412 A1.

[0199] In the embodiment shown of FIG. 1A, a closing mold 38 as a tool upper part having a counterpart 40 as a tool lower part is shown in an exemplary manner.

[0200] In the retrieving region E which adjoins in the conveying direction R_F , the completely packed products can finally be retrieved. Here too, different approaches to solutions are conceivable, for example said products in the revolving action of the film carriers can fall onto a slide or the like. Alternatively, said products can of course also be retrieved in a manual or automated manner.

[0201] FIGS. 2A and 2C show two variants for a tool system according to the invention for crimping or bracing, and thus fixing a semi-finished film product F_H on a film carrier 20. Accordingly, the same features are provided with the same reference signs, but said reference signs in the second embodiment are prefixed with the numeral "1".

[0202] In the embodiment illustrated of FIGS. 2A and 2B a tool system 42 according to the invention in three parts is shown having a tool upper part 64, a tool lower part 70, and the film carrier 20, wherein the film carrier 20 forms the tool central part. In the embodiment illustrated, the bearing face of the film carrier 20 is formed by a functional ring 48 which can be occupied with dissimilar functional portions. One of said functional portions can be seen in the inclined recess 48a into which a shaping punch 46 of the tool upper part 64 is capable of plunging. An encircling film flange F_F at least partially bears thereon in the region of the recess 48. When the shaping punch 46 by way of the shaping tip 44 is now introduced into the recess 48a, the film flange F_F partially bearing thereon is introduced into the recess 48a by said shaping punch 46, this leading to the film flange F_F being braced. On account of the recess 48a being inclined in relation to the film bearing plane at an angle β (cf. FIG. 2B), and said deformation of the film flange F_F being performed on two opposite sides of the encircling flange F_F , reliable form-fitting fixing of the semi-finished film product F_H on the film carrier 20 is achieved.

[0203] The embodiment of FIG. 2C differs from that of FIG. 2A in that the tool lower part 170 is differently received in the tool central part, that is to say the film carrier 120. On account thereof, it is in particular to be demonstrated that this specific solution for crimping or bracing the semi-finished film product on the film carrier for improved fixing is to be considered to be separate from the specific design embodiment of the film carrier and of the tool central part 170. Of course, this aspect of the invention is also conceivable so as to be separate from the remaining aspects of the invention, in particular from the design embodiment of the tool system, from the assembly for shaping by way of a blank holder, and from the specific shaping method, and can accordingly also be used in devices of other configuration or in the context of a single-stage shaping method.

[0204] The shaping unit 12 of the packaging device 10 according to the invention is shown in more detail in FIG. 3 and the following FIGS. 4 to as well as in FIGS. 10A and 10B. Said shaping unit 12 is likewise configured as a tool system in three parts having a tool upper part in the form of the shaping punch 30, having a tool lower part in the form of the die 32, and a tool central part in the form of a film carrier 20. A film F which is to be formed with the aid of the shaping punch 30 and the associated die 32 bears on the film carrier 20. It can likewise be clearly seen in FIG. 3 that the film carrier 20 has a central passage opening 50 which forms a receptacle region for the tool lower part, that is to say the

die 32. In order for oriented receiving to be enabled, orientation receptacles 52 in which the communicating projections 54 on the die 32 can be received and secured against any rotation of the die relative to the film carrier are furthermore provided.

[0205] For reasons of simplification, the illustration of the film carrier 20 has been dispensed with in FIGS. 5A to 6B. It can be seen in FIG. 4 that the die 32 on the shaping upper side thereof has a shaping recess 56, the internal contour of the latter being substantially adapted to a shape-imparting external contour 32 of the punch 30. Moreover, said die 32 on the non-shaping lower side thereof is provided with a holder receptacle 58 for connecting to a holder which initiates the necessary stroke movement Z (cf. FIG. 1).

[0206] For reasons of simplification, the illustration of the film carrier 20 has been dispensed with in FIGS. 5A to 6B. It can be seen in FIG. 4 that the die 32 on the shaping upper side thereof has a shaping recess 56, the internal contour of the latter being substantially adapted to a shape-imparting external contour 62. Moreover, said die 32 on the non-shaping lower side thereof is provided with a holder receptacle 58 for connecting to a holder which initiates the necessary stroke movement Z (cf. FIG. 1).??

[0207] Moreover, a shaping method according to the invention which can be expediently used in the context of the packaging device 10 according to the invention and the tool system according to the invention as well as separately therefrom with any known shaping unit is shown in FIGS. 10A and 10B.

[0208] In a first step (cf. FIG. 10A) the punch 30 and the die 32 for shaping the film are moved relative to one another, that is to say that the punch 30 is in particular moved into the die 32 to a specific degree, wherein the minimum spacing between the punch external contour 62 and the die internal contour 56 in the converged state is larger than the thickness of the film to be deformed. It can be seen in the illustration shown that the film has already been pre-shaped so as to form a semi-finished film product F_H , wherein a film flange F_F which radially surrounds the pre-shaped region of the semi-finished film product F_H within the die 32 bears on the lower side of a blank holder 90.

[0209] Other than is usual in the prior art, the blank holder 90 in the first shaping step has a minimum spacing from the bearing face 92 of the shaping unit 12 such that the film flange F_F is not clamped between the bearing face 92 and the contact face of the blank holder 90. Like the minimum spacing between the punch external contour 62 and the die internal contour 56 in the converged state, this also results in reduced friction and thus reduce stress to the film, on account of which the risk of the film tearing can be reduced even when a comparatively thin film is used.

[0210] The blank holder 90 and the punch 30 are moved to the usual shaping position only in a further shaping step (in the illustration shown a final second shaping step), in which shaping position the spacing from the respective contact partners or shaping partners, that is to say the bearing face 92, or the shaping recess 56, respectively, is smaller than the minimum spacing in the first shaping step, for example corresponds substantially to the film thickness of the film to be deformed.

[0211] The blank holder 90 in the embodiment shown is held so as to be repositionable by means of an elastic spring system 94 and, by means of spacers (spacer pieces, spacer

projections, or the like) not illustrated can be held at the desired spacing from the bearing face **92**, for example.

[0212] One and the same punch/die pair is used for the two-stage shaping procedure in the embodiment shown. However, it is likewise conceivable for a plurality of dies or punches, or a plurality of dissimilar die/punch pairs having dissimilar dimensions, to be used so as to achieve the desired effect of the pre-shaping in step **10A** and of the final shaping in step **10B**.

[0213] A further detail of the present invention is shown in FIGS. **5A** to **6B**. The die **32**, or **132**, respectively, in the embodiment illustrated thus possesses an elastic insert **60**, or **160**, respectively, which is to serve for improved forming of in particular such shaped regions (critical area **CA**) which have intense transitions between contours.

[0214] Also this aspect of the invention, like the multi-staged shaping method described above, or the provision of a blank holder which in a first shaping step is not brought in contact with the film flange F_F , is also conceivable in the context of such tool systems which are not configured in three parts and in which the film carrier **20** in particular does not form part of the tool system, which is why the features in FIGS. **5A** and **5B** have been provided with the same reference signs as in the other figures, said reference signs however being prefixed with the numeral “1”.

[0215] A further exemplary embodiment of a tool system according to the invention of the packaging device is shown in FIGS. **7A** to **7C**. This tool system relates to the final cutting of the semi-finished film product F_H with the aid of a cutting blade **66** having an encircling cutting contour. The cutting blade **66** is attached to the tool upper part **64** and by way of a stroke movement in the direction **Z** is moved onto the tool central part in the form of the film carrier **20**. The film carrier **20** in the embodiment illustrated has an additional functional ring **48** which bears on the film carrier **20** and forms the bearing face for the semi-finished film products, or the encircling film flanges F_F of the latter, respectively. An encircling cutting groove **82** into which the cutting blade **66** is capable of plunging is provided as a functional portion on the functional ring **48**. In principle, it is also conceivable for the cutting groove **82** to be configured directly on the film carrier **20**.

[0216] Furthermore shown is a blank holder **68** which is capable of tensioning the film flanges F_F , which bear on one another, of the semi-finished film products F_H , which bear on one another, in relation to the functional ring **48**. To this end, the blank holder **68** in a known manner is held so as to be sprung on the tool upper part **64**, specifically such that said blank holder comes to bear preferably on the film flanges F_F in a tensioning manner before the cutting blade **66** is capable of plunging into the cutting groove **82**.

[0217] The embodiment of FIG. **7C** differs from that of FIG. **7A** only in that the tool lower part **170** is received directly on the film carrier **120**. Accordingly, the features in FIGS. **7A** and **7C** are provided with the same reference signs, but the latter are prefixed with the numeral “1” in FIG. **7C**. The aspect of the invention described in the context of FIGS. **7A** to **7C** is of course also conceivable in the context with such tool systems which are not configured in three parts and in which the film carrier in particular does not form part of the tool system. This aspect of the invention is of course also conceivable so as to be separate from the remaining aspects of the invention, in particular from the assembly for shaping by way of a blank holder and the

specific shaping method, and can accordingly also be used in devices of other configuration or in the context with a single-stage shaping method.

[0218] As can be better seen in FIG. **7B**, in a detailed illustration of the detail **B** according to FIG. **7A** or **7C**, the flange portion F_F of the upper semi-finished film product F_H and the flange portion F_F of the lower semi-finished film product F_H in the processing step of final cutting bear on one another in a planar manner and can in this way be finally cut in a common processing step. This has the advantage that there are not two semi-finished film products which have to be finally cut, on the one hand. On the other hand, it is however also achieved on account thereof that the procedure of final cutting takes place only once the product to be received is already received in the film packaging and is protectively enclosed by the latter. This is in particular an advantage in the context of foodstuff products because an encapsulation of film particles which may arise in the cutting process can be reliably precluded.

[0219] The step of final cutting herein can take place before or after the mechanical and/or thermal connecting of the semi-finished film products F_H . The final cutting can expediently take place before the connecting, in particular in the case of purely mechanical connecting of the semi-finished film products, for example by beading or edge crimping, while the final cutting can take place before as well as after the connecting in the case of thermal connecting, for example by sealing.

[0220] It can furthermore be provided that the sealing is carried out before the edge crimping or beading, respectively. It can moreover be provided that a sealing layer is applied to only one side.

[0221] FIGS. **8A** to **8D** show in an exemplary manner how a floating mounting of at least one of the tool parts of a tool system according to the invention can be embodied, this floating mounting enabling an improved alignment of the tool parts during a processing step. A tool system having a tool upper part **64** and the tool lower part **70** is thus shown in an exemplary manner in FIG. **8A**. For reasons of simplification, the illustration of the tool central part has presently been dispensed with.

[0222] The tool upper part **64** by way of an adapter plate **72** is connected to a pushrod **84** which initiates the processing movement. The pushrod **84** and the adapter plate **72** herein are fixedly connected to one another, for example integrally configured, welded, or otherwise fixedly joined to one another. The tool upper part **64** is thus attached to the adapter plate **72** by means of four bolts **74**. A clearance play of, for example, 0.5 mm is provided herein between the respective bolts **74** and the associated receptacle of the adapter plate **72**, said clearance play enables a corresponding compensation of tolerances in the event of positioning errors between the tool upper part **64** and the tool lower part **70**. This can be derived in particular from the detailed illustration of FIG. **8D**. The floating mounting herein enables a compensation of tolerances in a plurality of directions transverse to the processing movement, present in a plane perpendicular to the processing direction.

[0223] If potential positioning errors or tolerances are to be compensated in a tool system in three parts, in particular in such a tool system in which the tool central part is formed by a film carrier **20**, the tool upper part as well as the tool lower part can thus be provided with a corresponding floating mounting. It can furthermore also be expedient for

joining bevels which enable easier converging and positioning of the individual tool parts relative to one another to be provided. Further measures, such as guiding projections, which are capable of plunging into corresponding recesses which are in each case on another one of the tool parts, so as to ensure secure positioning during the processing procedure, are of course likewise conceivable.

[0224] FIGS. 9A to 9C finally show a further exemplary embodiment of a tool system in three parts of the packaging device according to the invention. The latter in the embodiment illustrated herein is a placing device 76 by means of which a projecting periphery of the already joined packaging in the form of the semi-finished film products F_H can be placed at a predefined angle so as to simplify the handling of the joined packaging. To this end, an encircling shaping region 80, or 180, respectively, into which a communicating shaping punch 78, or 178, respectively, is capable of plunging so as to correspondingly place the projecting periphery of the semi-finished film products F_H is provided on the tool lower part 70 or on the film carrier 20 or an associate functional ring 48. To this end, an inclination angle α is provided on the shaping punch 78 and the corresponding shaping region 80.

[0225] FIGS. 9A and 9C show two variants for a tool system according to the invention for placing. Accordingly, the same features are provided with the same reference signs, but said reference signs in the second embodiment are prefixed with the numeral "1".

[0226] The embodiment of FIG. 9C differs from that of FIG. 9A only in that the tool lower part 170 is differently received in the tool central part, that is to say the film carrier 120. On account thereof it is in particular to be demonstrated that the specific solution for placing the film periphery is to be seen as being separate from the specific design embodiment of the packaging device, of the tool system, and in particular of the film carrier 120 and of the tool central part 170. This aspect of the invention is of course also conceivable as being separate from the remaining aspects of the invention, in particular from the design embodiment of the tool system, of the assembly for shaping by way of a blank holder, and from the specific shaping method, and can accordingly also be used in devices of other configuration or in the context with a single-stage shaping method.

[0227] The placing device 76 for placing the projecting periphery can be embodied such that the projecting periphery is not completely placed but that a peripheral portion is disregarded. On account thereof, the contacting contour of the packaging would not be circular but open at the location where the periphery is not to be placed. In other words, the placing periphery, or the placing shape, respectively, is interrupted in the case of a tear-open facility achieved on account thereof, and the periphery, or the tear-open facility, respectively, projects toward the outside. A user-friendly tear-open facility which projects from the package product such that said tear-open facility can be readily gripped by a user results in this way. The placing device 76 can also be disposed outside the machine from where said placing device 76 by means of suitable installations, in particular handling installations such as, for example, multi-axis robots, linear infeed installations or similar, can be moved to the desired location. The placing device 76 can moreover be designed such that said placing device 76 can set itself to different contours of the packaging, or can be set to different contours of the packaging, respectively. This can be

achieved, for example, by means of suitable sprung or resilient elements, respectively, which are able to adapt to different contours.

[0228] FIG. 11 in a very schematic manner shows an alternative embodiment of the tool system of the packaging device. The features which correspond to the features from FIG. 1A herein are provided with the same reference signs, but the latter are however prefixed with the numeral "2".

[0229] As opposed to the continuously operating conveyor unit 18 according to FIG. 1A, or the continuously operating conveyor unit 118 according to FIG. 1B, the conveyor unit 218 according to FIG. 11 at least in portions thereof is configured as a discontinuously operating conveyor unit 218. In the present case, the conveyor unit 218 is embodied so as to be discontinuous in the region of the shaping unit 212, that is to say that said conveyor unit 218 operates discontinuously in the region of the shaping unit 212, or is discontinuously operated in the region of the shaping unit 212, respectively. On account thereof, the processing of the semi-finished film products F_H by means of the tool system is simplified, and the wear on the tool system is reduced.

[0230] In the exemplary embodiment illustrated, the conveyor unit 218 has a very schematic indicated linear drive installation 223 for the individual tool central parts, said linear drive installation 223 being able to be configured and operated in a manner known per se. Very high speeds when transporting the semi-finished film products F_H can be achieved on account of the linear drive installation 223. At the same time, each tool central part can be separately actuated such that it is very easy to stop the tool central parts in the region of the shaping unit 212 such that the forming of the semi-finished film products F_H can be carried out in a simpler manner than in a completely continuous operation. In the other regions of the packaging device 210, for example in the loading region, the tool central parts can be moved continuously and potentially at higher speeds and/or accelerations than in the exemplary embodiments described with reference to FIGS. 1A and 1B, such that no delays result in the processing of the film F. Despite the separate actuation of the tool central parts, the latter can of course be mutually synchronized, for example by means of the control installation (not illustrated) so as to guarantee a flawless operation. Other drives which enable a discontinuous operation of the conveyor unit 218 at least in portions of the latter can also be used instead of the linear drive installation 223. For example, the at least partial use of pneumatic cylinders or hydraulic cylinders is also possible. In this embodiment, the central drive 24 which is provided in the continuously operating conveyor unit 18, or 118, respectively, would be dispensed with, or be replaced by the linear drive installation 223, respectively.

[0231] An alternative embodiment of a securing assembly 300 for fixing the semi-finished film products F_H is illustrated in FIGS. 12A and 12B. The securing assembly 300 has a clamping element 301 and at least one spring element 302 which presses the clamping element 301 in the direction of the film carriers 20, 120. In the present case, respective clamping elements 301 which by way of in each case two spring element 302 are pressed in the direction of the film carriers 20, 120 are provided on two opposite sides of the tool central part. The spring elements 302 in the present case are leg springs which by way of one leg are supported on the tool central part and by way of the other leg are supported on the clamping element 301.

[0232] The securing assembly 300 can furthermore have a gate guide (not illustrated) or similar which is operatively connected to the at least one clamping element 301, or preferably to both clamping elements 301, respectively, in such a manner that opening of the respective clamping element 301 counter to the force of the spring element 302 can be effected by means of the gate guide. Targeted opening of the securing assembly 300 is achieved on account thereof. For example, the connection between the gate guide and the clamping element 301 can take place by way of a tappet (not illustrated) which acts on the clamping element 301 and opens the latter counter to the force of the spring elements 302.

[0233] In a manner not illustrated, opening or releasing, respectively, the clamping element 301 counter to the force of the spring elements 302 by means of actuators or other suitable installations is however also conceivable.

[0234] A further possibility for securing the semi-finished film product F_H can lie in that the semi-finished film products F_H of the film packaging during transportation on the film carrier 20, 120 are secured by folding the film peripheries on the film carrier 20, 120. The film peripheries herein are placed on the film carrier 20, 120 at an angle of 90°, for example, such that said film peripheries cannot slip during the transportation on the film carrier 20, 120. As opposed to the crimping of the semi-finished film product F_H to the film carrier 20, 120 described above, the semi-finished film product F_H herein is not penetrated but simply folded on the peripheries thereof. A combination of crimping and folding of the peripheries is likewise possible.

[0235] A further method for shaping shaped film parts of the film packaging from the film F is illustrated in FIGS. 13A, 13B, and 13C. The tool system to be used to this end can correspond to the tool system already described above. Therefore, the features corresponding to the features from FIG. 1A are provided with the same reference signs, the latter however being prefixed with the numeral “2”.

[0236] In the method illustrated in FIGS. 13A, 13B, and 13C, in a first shaping step the at least one punch 230 and the at least one die 232 for shaping the film F are moved relative to one another, wherein the punch 230 is moved in the direction of the die 232, and the die 232 is also moved in the direction of the punch 230. In other words, the punch 230 and the die 232 are converged. The punch 230 and the die 232 herein are movable in a completely mutually independent manner, to which end suitable drives can be used. The film carrier 220 however remains stationary.

[0237] Furthermore, the die 232 can be moved in the direction of the punch 230 in such a manner that the die 232 comes in contact with the film F already prior to the punch 230 reaching a lower reversal point. As soon as the die 232 is in contact with the film F the latter begins to deform such that said film is pre-shaped on account of the contact with the die 232. Furthermore, the film F in this way is pushed upward which leads to a further reduction in the required blank holding forces which are exerted by a blank holder 290. Moreover, fixing of the position of the film F prior to the latter being deformed can be achieved by way of the die 232, on account of which an improvement of the position and the orientation of the printed image results. Of course, the die 232 does not have to be contoured exactly as illustrated in FIGS. 13A, 13B, and 13C, and can also be used in smooth shapes, or shapes which are smoother than the shape illustrated, respectively.

[0238] In this context, the punch 230 can moreover be controlled such that said punch 230 upon plunging into the film carrier 220 is moved back again so as to facilitate the described deformation of the film F by the die 232. The possibility of implementing more complex shapes of the film packaging additionally results on account thereof, since the film F can be formed from two sides. The retraction of the punch 230 moreover enables the film material to move in the direction of the die 232 so as to facilitate the described deformation by the die 232. The upward movement of the punch 230 described can also be triggered or facilitated, respectively, by the die 232 when the force acting on the die 232 is greater than the force acting on the punch 230.

[0239] FIG. 14 in a schematic manner shows a further alternative embodiment of the tool system of the packaging device. The features corresponding to the features from FIG. 1A are again provided with the same reference signs, the latter however being prefixed with the numeral “3”.

[0240] As opposed to the continuously operating conveyor unit 18 according to FIG. 1A, or the continuously operating conveyor unit 118 according to FIG. 1B respectively, the conveyor unit 318 according to FIG. 14, in a manner similar to the conveyor unit 218 according to FIG. 11, at least in portions thereof is configured as it is continuously operating conveyor unit 318. In the present case, the conveyor unit 318, in a manner similar to the conveying unit 218 according to FIG. 11, is embodied so as to be discontinuous in the region of the shaping unit 312, that is to say that said conveyor unit 318 operates discontinuously in the region of the shaping unit 312, or is discontinuously operated in the region of the shaping unit 312, respectively, on account of which the processing of the semi-finished film products F_H by means of the tool system is again simplified, and the wear on the tool system is reduced.

[0241] Between the portions in which the conveyor unit 318 is discontinuously operated and the portions in which the conveyor unit 318 is continuously operated, the conveyor unit 318 also has portions in which synchronizing of the discontinuously operated portions and the continuously operated portions takes place, that is to say in which a transition from the discontinuously operated portions to the continuously operated portions is implemented. In the upper region and in the lower region of FIG. 14, the continuously operated portions of the conveyor unit 318 are illustrated by solid lines, the portions in which the synchronization takes place are illustrated by short dashed lines, and the discontinuously operated, or cycled, respectively, portions of the conveyor unit 318 are illustrated by long dashed lines.

[0242] In the exemplary embodiment illustrated of FIG. 14, the conveyor unit 318 has a plurality of pliable drive elements which in the present case are configured as belts 323 and which can be used for forming the continuously operated portions, the discontinuously operated portions, and the portions in which the synchronization of the discontinuously operated portions and the continuously operated portions takes place. Instead of being configured as belts 323, the pliable drive elements could also be configured as a chain or in any other suitable manner. The transition from one belt 323 to another belt 323, that is to say the synchronization, is illustrated in FIG. 15. The belts 323 are preferably guided about corresponding pulleys, wherein a form-fitting engagement between the belts 323 and the pulleys is preferable. The belts 323 can thus be, for example, timing belts, cam belts, or the like.

[0243] The pliable drive elements, in the present case thus the belts 323, enable a particularly simple transition between the continuously operated portions and the discontinuously operated portions of the conveyor unit 318, on account of which not only very high speeds when transporting the semi-finished film products F_H can be achieved but also a reliable operation of the conveyor unit 318 is guaranteed. The pliable drive elements can be actuated by means of respective servo motors so as to ensure that the procedure carried out by the conveyor unit 318, or the method carried out by said conveyor unit 318, respectively, is always under control. On account of the servo motors, the pliable drive elements can in principle be actuated in any arbitrary manner such that arbitrary synchronizing, in particular the synchronization desired in each case, is possible between the motions. Asynchronous motors having a corresponding electronic control system can also be used instead of servo motors.

[0244] In this way, each tool central part can also be separately actuated such that the tool central parts can be very simply stopped in the region of the shaping unit 312, on account of which the forming of the semi-finished film products F_H can be carried out in a simpler manner than in a completely continuous operation. In order for the tool central parts to be stopped, the belts 323 on the sides thereof that face said tool central parts can be provided with suitable elevations, depressions, or similar. In the other regions of the packaging device 310, for example in the loading region, the tool central parts can be moved continuously and potentially at higher speeds and/or accelerations than in the exemplary embodiments described with reference to FIGS. 1A and 1B, such that no delays result in the processing of the film F. In the embodiment of FIG. 14, the central drive 24 provided in the case of the continuously operating conveyor unit 18, or 118, respectively, could again be dispensed with.

[0245] The tool system described in FIG. 14 can in particular also be used in regions other than the packaging region.

[0246] All embodiments described herein can be combined with one another in an arbitrary manner to the extent that there are no obvious reasons denying specific combinations.

1. A tool system for use in a packaging device for packaging foodstuff products, in particular hollow chocolate bodies, by means of a film packaging, wherein the packaging device for processing the film packaging has a plurality of processing units comprising at least three tool parts, specifically a tool central part as well as a tool lower part and a tool upper part which when in operation are capable of interacting in a processing manner, wherein the tool central part serves for receiving and conveying at least one semi-finished film product of the film packaging to be processed between individual processing units of the packaging device wherein the tool central part is capable of interacting in each case with at least one further tool part of the tool system, wherein the further tool part is in each case a tool part of one of the processing units which serve for processing the semi-finished film product from receiving the latter on the tool central part to the completion thereof as a film packaging, and wherein the tool central part has at least one interface by means of which said tool central part is compatible with at least one tool part of each of said processing units, wherein the tool central part can be driven by means of a conveyor unit, wherein the conveyor unit at least in

portions thereof is configured as a continuously operating conveyor unit, and wherein the conveyor unit at least in portions thereof is configured as a discontinuously operating conveyor unit.

2. The tool system as claimed in claim 1,

characterized in that the tool central part comprises a film carrier which is assigned at least one semi-finished film product (F_H).

3-4. (canceled)

5. The tool system as claimed in claim 1

characterized in that the conveyor unit has a linear drive installation for the tool central part.

6. The tool system as claimed in claim 1,

characterized in that at least one tool part, in particular the tool lower part and/or the tool upper part is mounted so as to float in at least one direction transverse to the processing direction.

7. The tool system as claimed in claim 6,

characterized in that at least one tool part, in particular the tool lower part and/or the tool upper part has/have joining bevels so as to facilitate the tool parts of the tool system converging during a processing step.

8. The tool system as claimed in claim 1,

characterized in that the tool lower part and/or the tool upper part of a processing unit are at least in portions able to be moved in a reciprocating manner along the conveying direction (R_F) of the tool central part.

9-11. (canceled)

12. The tool system as claimed in claim 1,

characterized in that the at least one interface of the tool central part, or of the film carrier, respectively, comprises a receptacle region, and in that at least one tool part of one of the processing units of the packaging device is able to be received occasionally and in portions in the receptacle region of the tool central part, or of the film carrier, respectively, wherein the receptacle region of the tool central part, or of the film carrier, respectively, has in particular an internal contour which communicates with a corresponding external contour of the respective tool part of the respective processing unit.

13. The tool system as claimed in claim 12,

characterized in that the tool central part, or the film carrier is configured so as to be substantially plate-shaped having a substantially central passage opening as the receptacle region, wherein an encircling shaping region having a chamfer of approximately 45 degrees in terms of an angle can in particular be provided in the region of the central passage opening, said shaping region opening into the passage opening.

14. The tool system as claimed in claim 1,

characterized in that the at least one interface of the tool central part, or of the film carrier respectively, has an encircling cutting groove and/or at least two tensioning recesses.

15. The tool system as claimed in claim 1,

characterized in that the interface of the tool central part, or of the film carrier, respectively, has a separately configured functional ring which comprises in particular the encircling shaping region and/or the encircling cutting groove and/or the tensioning recesses.

16-38. (canceled)

39. A packaging device for packaging foodstuff products, in particular hollow chocolate bodies, by means of a film packaging which comprises at least two shaped film parts, wherein the packaging device has a number of processing units for processing the semi-finished film products of the film packaging, specifically:

- a cutting unit for cutting-to-size the semi-finished film products;
- a shaping unit for shaping the semi-finished film products;
- a closing unit for connecting the semi-finished film products so as to form a closed housing for the foodstuff product received; and
- a conveyor unit for conveying the semi-finished film products (FH) of the film **40** packaging to be processed between the individual processing units of the packaging device,

wherein the conveyor unit in portions thereof is configured as a continuously operating conveyor unit and in portions thereof is configured as a discontinuously operating conveyor unit, wherein portions in which synchronizing of the discontinuously operated portions and the continuously operated portions takes place are provided.

40. The packaging device as claimed in claim **39**, characterized in that the conveyor unit has pliable drive elements for forming the continuously operated portions, the discontinuously operated portions, and the portions in which the

synchronizing of the discontinuously operated portions and the continuously operated portions take place.

41. The packaging device as claimed in claim **40**, characterized in that pliable drive elements are able to be actuated by means of electronically actuated electric motors.

42. A method for packaging foodstuff products, in particular hollow chocolate bodies, by means of a film packaging which comprises at least two shaped film parts, wherein the packaging device has a number of processing units for processing the semi-finished film products of the film packaging, specifically:

- a cutting unit for cutting-to-size the semi-finished film products;
- a shaping unit for shaping the semi-finished film products;
- a closing unit for connecting the semi-finished film products so as to form a closed housing for the foodstuff product received; and

a conveyor unit for conveying the semi-finished film products of the film packaging to be processed between the individual processing units of the packaging device, wherein the conveyor unit in portions thereof is operated as a continuously operating conveyor unit and in portions thereof is operated as a discontinuously operating conveyor unit, wherein portions in which synchronizing of the discontinuously operated portions and the continuously operated portions takes place are provided.

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