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- (54) Benævnelse: **Apparat og fremgangsmåde til hurtig fremstilling af et tredimensionalt emballageprodukt**
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Description

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The invention relates to a device for the production by machine of a three-dimensional packaging product from a section of a single- or multi-layer paper web reshaped in a predetermined manner.

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In a device of a similar kind, as it is for example known from DE 10 2005 053 319 A1, the paper web is drawn from a paper web source, such as a rolled paper web. Thereby, the paper web is pre-shaped into a three-dimensional paper web section, for example by drawing a paper web from the interior of a role, whereby a spiral-shaped tube is formed. The three-dimensional paper web section can additionally be pre-shaped via a deformation device which is formed by a pair of embossing wheels. The embossing teeth of the embossing wheels introduce essentially in the middle area of the spiral-shaped tube a sequence of embossing valleys and embossing hills, so that the paper web section comprises two hollow crumple spaces arranged on the left and on the right laterally adjacent the embossing deformation zone extending in the longitudinal direction. A knife for tearing off the pre-shaped paper web section is arranged at a tube-formed housing disposal opening of the production device. The knife is stationary arranged at the tube-formed housing of the production device.

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In order to allow for an operator to produce the preassembled packing product in a predetermined length, the travelling drive means formed by the embossing tooth wheels has to be stopped to allow for an operator to regularly perform a tearing process. In this way, a discontinuous procedure for the production of pre-assembled packing products is provided.

US 2003/0087741 A1 discloses a method in a machine for the production of a packaging product. US 2010/0041534 A1 discloses a cushion conversion system.

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It is an object of the invention to overcome the disadvantages of the state of the art, particularly to provide a device for the production by machine of a three-dimensional packaging product which allows for a quick and economic production of a packaging product of equal quality.

This object is solved by the features of claim 1. Accordingly, a device for the production by machine of a three-dimensional packaging product from a section of a single or multi-layer paper web re-shaped in a predetermined manner is provided. Particularly, used paper can be used for the paper web which however forms an inhomogeneous structure due to its composition and does not comprise a very uniform deformation characteristic. The paper web can be drawn from a paper web role or a paper web leporello stack. From a paper web source, the paper web arrives at the production device. The production device comprises a pre-shaping station, which pre-shapes the paper web in that a three-dimensional packaging product having a hollow crumple space extending in the direction of the web is formed. The pre-shaping is thereby provided in that the paper web can be drawn from the interior of the paper web role, whereby a spiral-shaped paper tube is formed. In case of the spiral form of the paper tube adjacent spiral sections partly overlap wherein the overlapping degree depends on how big the drawing force is with which the paper web is drawn from the inside of the paper web role. According to the invention, is the paper web pre-shaped in the pre-shaping station in that a two-dimensional paper web section can be drawn from the paper web source and at least a longitudinal edge strip of the paper web section can be folded or rolled towards a middle area of the paper web section, wherein afterwards, the middle area can be plastically deformed via an embossing wheel pair so that additionally a sequence of embossing valleys and embossing hills can be introduced in the longitudinal direction of the paper web section. In the pre-shaping station, the paper web is going to be brought into the three-dimensional cushion form which comprises at least one hollow crumple space in order to provide the desired dampening and cushioning function.

A separation station follows the pre-shaping station in the conveying or travelling direction of the paper web which separates the paper web section into the desired length of the packaging product from the pre-shaped leading paper web. According to the invention, the separation station has a rotary cutter which cutting edge or blade is oriented transverse respectively in right angles to the direction of travel of the paper web section. The blade is extending transverse to the direction of travel of the paper web. The blade extends particularly linearly. The blade is arranged parallel with respect to the rotational axis of the rotary cutter and rotates along a cylindrical rotational path respectively orbit, which the travel path of the paper web crosses essentially tangential or slightly according to a secant so that the paper web is cut via a cutting stroke in the passing engagement point of the blade at the tangential position or the secant area. Preferably, the circulation or rotational speed of the blade essentially equals the travelling

speed of the paper web during a cutting stroke, is slightly bigger or slightly smaller than the travelling speed of the paper web. Preferably, the blade is oriented perpendicular with regard to the direction of travel wherein the paper web section leaves the pre-shaping station in the direction of travel. A particularly circular rotational path of the blade is determined in that the blade upon circulating crosses a travel path of the paper web section and thereby completely cuts the paper web section in a transverse direction.

The blade preferably circularly circulates a rotational axis of the rotary cutter which is oriented essentially parallel to the blade and/or perpendicular to the direction of travel.

The length of the blade equals preferably at least the width of the travel path and is particularly longer than a width of the travel path so that by engaging the blade with the travel path a complete separation of the paper web upon a simultaneous movement of the paper web can be provided. The blade can be arranged at a longitudinal particularly rectangular cutting blade.

The entrance of the blade in the travel path as well as the exit therefrom upon crossing the paper web section shall be realized in a course of a few degrees of the rotational movement of the blade so that approximately just no tangential contacting of the travel path by the blade is carried out, but a crossing. In a preferred embodiment of the invention, a drive for travelling or conveying of the paper web section as well as a drive for the rotary cutter is provided. The drive for the travelling of the paper web section can for example be formed by a pair of embossing wheels, which embossing teeth embossingly plastically deform the paper web section before the engagement of the rotary cutter in order to increase the stiffness of the packaging product. The embossing teeth form a sequence of embossing valleys and embossing hills which define a deformation zone of the packaging product. The deformation zone continuously extends in a longitudinal direction, essentially in the middle area of the packaging product from a leading short edge to a trailing short edge.

The travelling speed is essentially realized by the circumferential speed of the embossing wheels. A conveying or travelling drive as well as the drive for the rotary cutter is aligned with respect to each other such that the travelling motion of the paper web section and the rotation of the blade are each carried out interruption-free and continuous. According to the invention, the deformation procedure of the embossing wheels, namely the

travelling of the pre-shaped paper web section through the production device, can be carried out continuous and interruption-free, also when the paper web section is cut by the rotary cutter. Preferably, the circumferential speed of the blade is aligned with the circumferential speed of the embossing wheels such that the travelling speed of the paper web section through the production device essentially equals the circumferential speed of the blade.

Particularly, the drives can be controlled such that the travelling speed is slightly smaller than the circumferential speed, particularly of the outer edge of the knife during a cutting engagement with the paper web section. In this way, it is assured that at least during a cutting procedure, the paper web section is slightly pre-tensioned in order to facilitate the cutting process and that after the cutting, the separated paper web section leaves the production device quicker than the following paper web section arrives at the rotary cutter.

In a preferred embodiment of the invention, the rotary cutter comprises a cutting pad which forms a rotational movement, but along an opposing rotary path which turns in an opposing rotary direction with regard to the rotational path of the blades. Accordingly, the rotational movement of the cutting pad is synchronized with the rotational movement of the blade such that in the event of the crossing of the travelling path by the blade, the cutting pad of the blade is also arranged directly opposite and engages the blade. Upon engagement of the blade with the cutting pad, the edge of the blade protrudes into the cutting pad. In this way, it is assured that the paper web section lying on top of the cutting pad, the paper web section formed by several paper layers, is completely and radially cut.

Preferably, the pad is made from an elastic rubber material, which is preferably not damaged by the introduction of the sharp blade. However, also other soft and flexible materials can be used for the cutting pad. Rather, the cutting pad must be able to provide counter-forces for the complete cutting respectively separation of the paper web section via the blade. The blade is preferably toothed.

In a preferred embodiment of the invention, the rotary cutter comprises a drive carrier which particularly describes the same rotational path as the blade, wherein the carrier comes into a driving engagement of the paper web section before the cutting

engagement of the blade. Accordingly, the carrier can be arranged upstream with respect to the blade in its movement direction such that a partial section of the pre-shaped paper web arranged downstream with respect to the carrier is pre-tensioned, wherein particularly the carrier maintains the tension, respectively the tensile stress, as long as the blade cuts respectively separates the paper web section.

The carrier or a carrier counterpart can also be provided at the cutting pad, among others.

It shall be clear that also a further carrier can be arranged such that said further carrier comes into a driving engagement with a paper web section after the cutting engagement of the blade. In this way, it is assured that the following paper web section is guided into the separation station whereby the risk of a faulty travelling in the separation station is reduced.

According to a preferred embodiment of the invention, the carrier is formed by a perforation- and/or embossing-station. In a preferred embodiment of the perforation- and/or embossing-station, a punch or a punching stamp is arranged at the carrier of the blade, wherein a punching reception part is provided at the carrier of the cutting pad.

According to a further development of the invention, a circumferential speed particularly of the outer edge of the blade is bigger than the travelling speed of the paper web section at least exactly during the separation procedure. A higher circumferential speed of the blade ensures that after the cutting engagement, the cut paper web section is ejected from a crossing area of the blade with the travelling path of the paper web section from a trailing or following paper web section before the following travelling paper web section reaches the separating area.

According to a preferred embodiment of the invention, the rotary cutter is combined with a perforation- and/or embossing-station which carries out the same rotational movement as the blade and introduces at least one perforation- and/or embossing-point extending through overlapping paper web section layers adjacent a cutting edge of the packaging product.

According to a further development of the invention, the perforation- and/or embossing-station is a punching station. Further, the perforation- and/or embossing-station can

comprise one or more punches or punching stamps as well as one or more punching receptions. The punch is assigned to a corresponding die wherein the punch and the corresponding die are rotationally mounted such that the punch gearwheel-like turns into the corresponding die and turns out off the die respectively, in order to form the corresponding perforation. Preferably, the above-mentioned carrier is formed by the arrangement of the die and the punch.

According to a further development of the invention, a plurality of pairs of a punch and a corresponding die are mounted on two shafts, where particularly axial distances of the pairs are equal to each other and/or several pairs perforate simultaneously. It shall be clear that a shaft carrying a punch and/or a die can also carry the blade respectively the cutting pad. Preferably, all of the punches are arranged on the same shaft wherein the dies are attached to the opposing shaft.

According to a preferred embodiment of the invention, the same drive is provided for a rotary cutter of the perforation- and/or embossing-station so that the rotary cutter rotates with the same angular velocity as the perforation- and/or embossing-station. Accordingly, at least one embossing or punching stamp or at least one embossing or punching reception can be arranged in a leading and trailing manner, respectively, with regard to the blade of the rotary cutter in the rotational direction. In order to introduce at least one first embossing or perforation at the leading incision or cutting end of the packaging product with respect to the direction of travel of the paper web and, where appropriate, at least one second embossing or perforation at the trailing cutting or incision end of a trailing packaging product with respect to the direction of travel of the paper web.

Further, the invention relates to a method for the production by machine of a three-dimensional packaging product from a section of a single- or multi-layer paper web reshaped according to a predetermined manner. Firstly, a paper web is drawn from a paper web source and fed to a pre-shaping station as a two-dimensional product. There, the paper web is pre-shaped into a three-dimensional packaging product so that a hollow crumple space extending in the direction of the web is formed. Afterwards, the pre-shaped paper web section is fed into a separation station in which the paper web section is cut or separated into the desired length of the packaging product. According to the invention, the paper web section is separated from the paper web without the need of interrupting the travelling of the paper web section towards the pre-shaping station. Preferably, not even a reduction of the travelling speed towards the pre-shaping station

and within the pre-shaping station is necessary. The travelling speed can be maintained continuous through the entire production device.

It shall be clear that the method according to the invention can be carried out according to the functioning of the device according to the invention. Further, the device according to the invention can be configured such that the method according to the invention can be carried out.

Further features and aspects of the invention are mentioned in the sub-claims.

Further characteristics, advantages and features of the invention will become apparent through the following description of preferred embodiments of the invention, taking into account the accompanying drawings, in which:

Fig. 1 shows a perspective view of a part of a production device according to the invention;

Fig. 2 shows a top view of the part of the production device according to the invention according to fig. 1;

Fig. 3 a partly broken side view of the part of the production device according to the invention according to figs. 1 and 2;

Fig. 4a to 4e show several enlarged side views of a punching and separation station of the production device according to the invention according to figs. 1 to 3 in different operation positions; and

Fig. 5 shows a perspective view of a packaging product manufactured according to the invention.

In figures 1 to 3, the device according to the invention for the production by machine of the packaging product according to the invention as shown in figure 5 is partly shown. The production device according to the invention is generally indicated with the reference sign 101 wherein a handling station is not shown at which the longitudinal edge strips

13, 15 of the paper web sections unwound from the paper web role are turned over the middle area 17 extending in the longitudinal direction so that the paper web layers lying on top of each other are doubled. It shall be clear that the longitudinal edge strips 13, 15 are either rolled in or the free longitudinal edge lies on the middle area 17. At the handling station which is not shown and which can for example be formed in the shape of a tapering flat funnel in the travelling direction (longitudinal direction L), an attachment and/or deformation station 103 follows which main component is formed by a pair of opposing embossing wheels 105, 107 which are for example made of polyethylene. The embossing wheels 105, 107 are mounted such that their teeth gearwheel-like engage with each other so that the paper web section reaching in between is deformed under the formation of embossing hills and embossing valleys.

The embossing wheels 105, 107 are mounted on a frame, not shown in detail, wherein the bearing axes extend perpendicular with regard to the direction of the travel F so that the embossing wheels 105, 107 gearwheel-like run along each other.

15 The re-shaped paper web section (not shown) reaches the deformation station 103 upon leaving the handling station (not shown), namely via a housing shaft 111, which defines a rectangular axis opening 113. The housing shaft 111 has a correspondingly dimensioned passage 115 at a side of the embossing wheel wall, wherein the corresponding embossing wheel 105, 107 can reach through the passage 115. The dimension of the passage 115 is aligned with the dimension of the engaging embossing wheels 105, 107 such that a gap of a few millimetres is formed. In this way, undesired paper web jams at the deformation station 103 are prevented.

25 The housing shaft 111 defines an inner channel 121 which does not have any protrusions such that the rectangular opening cross section 113 continuously proceeds until a station exit 123 at which the housing shaft comprises outwardly bent end edges.

A perforation station 131 is arranged following in the direction of travel F which is essentially formed from a rotary perforation punch assembly 133 and a reception or receiving assembly 135.

30 The perforation punch assembly 133 and the reception assembly 135 are attached to drive shafts 137, 134 extending parallel to the bearing axes of the gear wheels 105, 107.

The drive shafts 137, 141 are independently driven from each other via a drive pinion 143 respectively 145. The drives are synchronized in that the perforation punch assembly 133 engages with the reception assembly 135 according to the same angular position.

- 5 The perforation punch assembly 133 as well as the reception assembly 135 each comprise five working discs 151 respectively 153 which are offset with respect to each other in a transverse direction Q perpendicular to the direction of the travel F so that a punching disc (151) lies between two reception or receiving discs (153) respectively, and vice versa.
- 10 In figure 3, the punching disc (151) of the perforation punch assembly 133 turns counterclockwise and comprises two perforation noses 155, 157 being circumferentially spaced to each other and radially outwardly rounded comprise cutting edges running in the circumferential direction.

- The reception disc (153) of the reception assembly 135 carry two reception plates 161, 163 extending in the transverse direction which radial outer edge 165 and 167 running in a transverse direction Q comprises recesses 179 (figure 1) in which the perforation noses 155 respectively 157 can engage in order to perforate the paper web section (not shown).
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- A rotary cutter 173 is integrated into the perforation station 131, wherein it shall be clear that the rotary cutter 173 can also be realized separately without corresponding components of the perforation station 131. The rotary cutter 173 is provided for cutting the paper web section from the paper web and to form its trailing short edge 7, 11. The rotary cutter 173 comprises a cutting knife attached to the drive shaft 137 and comprising a blade or cutting edge 175 protruding between the perforation noses 155, 157. The blade is extending transverse, particularly perpendicular, and/or linearly with regard to the direction of travel. Preferably, the blade 175 radially protrudes approximately as for the perforation noses 155, 157. Further, the rotary cutter 173 comprises a soft cutting pad 177 which completely fills the space between the reception blades 161, 163. The radial outer side of the cutting pad 177 essentially terminates at the radial outer side of the radial outer edges 165, 167 of the perforation reception blades 161, 163.
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The perforation station 131 and the rotary cutter 173 have the following function:

As can be seen in the sequence of the drawings according to figures 4a to 4e, the perforation punch assembly 133 clockwise rotates whereas the reception assembly 135 is turned counterclockwise. As it is shown in figure 4a, the working discs 151, 153 which comprise recesses for a reduction in weight are provided linearly in order to form a passage channel 181 radially internally. In figure 4a, the passage channel 181 is shown with its biggest free width.

In figure 4a, the straight disc edge 183, 185 lying radially internally is arranged opposite to the curved disc edge 187, 191, wherein upon further rotating of the corresponding assembly (starting from figure 4a), the free width of the passage channel 181 continuously decreases. In figure 4b, the smallest free width of the passage channel 181 until then can be seen when the curved edge sections 187, 191 are arranged opposite to each other for the first time during a rotational movement.

The narrowing of the passage channel 181 causes an engagement of the discs 153, 156 with the paper web section, wherein upon further rotation until the position according to figure 4c, carrying forces are introduced into the paper web section in the direction of travel F.

The circumferential speed of the discs 153, 156 at the disc edge 187, 191 is chosen such that the carrying speed is slightly bigger than or equal to the travelling speed of the paper web sections determined or identified by the gear wheels 105, 107.

As can be seen in figure 4c, firstly, the leading perforation nose 155 engages the recess 171 of the perforation reception blade 161. Thus, the row of perforation slits 27 is introduced into the paper web section which just passed through. At the same time, the paper web section is carried due to the engagement of the perforation nose 155 with the perforation reception 171 so that the paper web section experiences a tension before the blade 175 engages the paper web section.

Upon further rotation of the respective assemblies 133, 135, the blade 175 engages the cutting pad 177 and temporally completely closes the passage channel 181 whereby the paper web section which just passed the rotary cutter 173 is separated from the paper

web. The trailing perforation nose 157 immediately engages the respective recess 179 of the reception blade 161, 163, whereby the row 25 of perforations 27 is already introduced into the area in the leading short edge 7, 11 of the packaging product 1.

Due to the engagement of the perforation noses 155, 157 in the respective reception 171 of the perforation reception blade 161 and due to the engagement of the blade 175 with the cutting pad 177, the paper web section which was just separated is discarded or rejected via a higher circumferential speed of the perforation station as well as the rotary cutter with regard to the travelling speed of the perforation tooth wheels 105, 107 out of the passage channel 181.

As can be seen in figure 4e, the radius of the discs 153, 156 from the perforation noses respectively the perforation receptions continuously decreases so that upon the rotational movement of the working discs 151, the distance between a guiding funnel 193 following the perforation station as well as the rotary cutter 173 in the direction of travel F decreases. The guiding funnel 193 which is tapering in the direction of travel F allows for a secure guiding of the separated paper web section which now forms the finished packaging product towards the exit 195 of the manufacturing or production device 101.

The manufacturing device 101 can comprise a controlling and/or regulation means which is not shown and which synchronizes the rotational movements of the deformation station 103 and the perforation station. Therefore, for example a speed sensor can be provided at the deformation station as well as at the perforation station. The travelling speed shall be constant during the entire travelling, deformation and separation process. The circumferential speed of the perforation punch assembly 133 and the reception assembly 135 can vary, however, during the separation process can be slightly bigger than the travelling speed.

In figure 5, an embodiment of the pre-assembled packaging product according to the invention is generally indicated with the reference sign 1. The packaging product 1 exclusively consists of paper, in particular used paper, and is pre-assembled into a predetermined cushion shape. The packaging product 1 has two longitudinal sides 3, 5 lying opposite to each other and extending more or less linearly along the web or longitudinal direction L and two diametrically arranged short edges 7, 11 extending

essentially perpendicular with regard to the longitudinal direction L. For the production of the packaging product 1 according to the invention, in a first re-shaping step, a longitudinal edge strip 13, 15 is rolled or turned in towards a middle area 17 extending in the longitudinal direction L whereby near by the longitudinal sides 3, 5 random folds are formed.

The longitudinal edge strips 13, 15 can be rolled in or simply turned over such that the longitudinal edge is lying freely on the middle area 17. After the turning process, the paper web section, which is turned over reaches an embossing station in which a sequence of embossing valleys and embossing hills is introduced along the middle area 17. In this way, on the one hand, the packaging product 1 is stiffened and on the other hand, potential freely arranged longitudinal edges which are not turned over are fixingly perforated at the middle area. After the perforation along the middle area 17, lateral cavity cushions 21, 23 extending in the longitudinal direction L arrive. The cavity cushions 21, 23 provide the dampening characteristics of the packaging product.

In order to prevent an unfolding of the packaging product 1 starting from the short edges 7, 11 adjacent the respective short edge 7, 11, a row 25 of slit perforations 27 is provided essentially in a constant distance thereof. The slit perforation 27 forms slit edges which engage or interlock with each other under the different paper web section layers.

List of reference numerals

1	packaging product
3, 5	longitudinal sides
7, 11	short sides
13, 15	longitudinal edges strips
17	middle area
19	attachment or deformation zone
21, 23	cavity cushion
25, 33	row
27	slit perforations
101	manufacturing device
103	attachment and/or deformation station
105, 107	embossing or perforation wheels
111	housing shaft

	113	access opening
	115	passage
	121	inner channel
	131	perforation station
5	133	perforation punch assembly
	135	reception assembly
	137, 141	drive shafts
	143, 145	drive pinion
	151, 153	working discs
10	155, 157	perforation noses
	161, 163	reception blades
	165, 167	radial outer edge
	173	rotary cutter
	175	blade or knife
15	177	cutting pad
	179	recesses
	181	passage channel
	183, 185, 187, 191	disc edge
	193	guiding funnel
20	195	exit
	F	direction of travel
	L	web or longitudinal direction
	Q	transverse direction
25		

PATENTKRAV

1. Apparat til maskinel fremstilling af et tredimensionalt emballageprodukt (1) ud fra et på forudbestemt måde omformet afsnit af en enkelt eller flerlags-
5 papirbane, omfattende en for-formningsstation, som kan omforme papirbanen til et tredimensionalt emballageprodukt (1) med mindst et krøllehulrum, strækken-
de sig i banens retning, og en adskillelsesstation, der slutter sig til for-
formningsstationen i papirbanens bevægelsesretning, og som kan afskære et
papirbaneafsnit til den ønskede længde af emballageproduktet (1) ud fra den
10 for-formede papirbane, hvorved for-formningen dannes ved, at papirbanen kan aftrækkes fra en papirbanerulles inderside, hvorved der dannes et spiralformet papirrør, eller at papirbanen kan for-formes ved, at et todimensionalt papirba-
neafsnit kan aftrækkes fra en papirbanekilde i form af en papirbanerulle eller en
zig-zag-foldet papirbanestak, og mindst en langsgående kantstrimmel kan fol-
15 des eller oprulles, **kendetegnet ved, at**, efterfølgende, midterafsnittet kan de-
formerer plastisk ved hjælp af et par prægehjul på en måde, så der desuden i
papirbaneafsnittets længderetning kan frembringes en sekvens af prægedale
og prægebjerger, og at adskillelsesstationen omfatter en roterende kniv (173),
hvis klinge (175) er positioneret på tværs af bevægelsesretningen (F), i hvilken
20 papirbaneafsnittet forlader den for-formende station, hvorved en omløbsbane
for bladet (175) er arrangeret på en sådan måde, at bladet under rotation kryd-
ser en bevægelsesbane for papirbaneafsnittet.
2. Apparat ifølge krav 1, **kendetegnet ved, at** for-formningsstationen er dannet
25 som en flad tragt, der spidser til i transportretningen (F).
3. Apparat ifølge krav 1 eller 2, **kendetegnet ved, at** et drev for den roterende
kniv (173) justeres uafhængigt af et drev til transporten af papirbaneafsnittet på
en sådan måde, at bladet (175) adskiller papirbaneafsnittet under den afbrydel-
30 ses-fri, kontinuerlige bevægelse af papirbaneafsnittet.
4. Apparat ifølge krav 1, 2 eller 3, **kendetegnet ved, at** klingens (175) er tilordnet
til en skærepude (177), som navnlig beskriver en rotationsbane, der er modsat

rettet klingens (175) rotationsbevægelse, hvorved de roterende bevægelser af klingen (175) og skærepuden (177) er afstemt således, at klingen (175) under adskillelsen af papirbaneafsnittet kommer i indgreb med skærepuden (177).

5 5. Apparat ifølge et af de foregående krav, **kendetegnet ved, at** den roterende kniv (173) omfatter en medbringer, der navnlig beskriver samme rotationsbane som klingen (175), hvorved medbringeren kommer i driv-indgreb med papirbaneafsnittet før klingens (175) skæreindgreb, således at navnlig et delafsnit af det for-formede papirbaneafsnit bliver forspændt, hvorved medbringeren med
10 fordel opretholder spændingen, indtil skæreklingen (175) adskiller papirbaneafsnittet.

6. Apparat ifølge et af de foregående krav, **kendetegnet ved, at**, i det mindste under adskillelsesproceduren, klingens (175) periferihastighed er større end bevægelseshastigheden for papirbaneafsnittet, således at, navnlig efter skæreindgrebet, det adskilte papirbaneafsnit udstødes fra et område, i hvilket klingens (175) krydser papirbaneafsnittets bevægelsesvej.

7. Apparat ifølge et af de foregående krav, **kendetegnet ved, at** den roterende
20 kniv (173) er kombineret med en perforerings- og/eller prægningsstation (131), der udfører samme rotationsbevægelse som klingen (175) og frembringer et perforerings- og/eller prægningspunkt ved hjælp af overlappende papirbaneafsnitslag, som grænser op til adskillelseskanten for emballageproduktet.

25 8. Apparat ifølge krav 7, **kendetegnet ved, at** perforerings og/eller prægningsstationen (131) er en stansningsstation og/eller omfatter et eller flere stanses-templer tillige med en eller flere stansematrice, hvorved stemplet er tilordnet til en respektiv stansematrice, og/eller hvorved stemplet og den respektive stansematrice er monteret drejeligt på en sådan måde, at stemplet roterer ind i den
30 respektive stansematrice på samme måde som et tandhjul og roterer ud af stansematricen med henblik på dannelse af den respektive perforering.

9. Apparat ifølge krav 8, **kendetegnet ved, at** adskillige par af et stansestempel og en dertil svarende matrice er arrangeret på to aksler, hvorved navnlig de aksiale afstande mellem parrene har samme størrelse, og eller en flerhed af par perforerer samtidigt.

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10. Apparat ifølge et af de foregående krav 7 til 9, **kendetegnet ved, at** den roterende kniv (173) roterer med samme vinkelhastighed som perforerings- og/eller prægningsstationen (131), hvorved navnlig med hensyn til klingens (175) på den roterende kniv (173) i rotationsretningen, mindst eet stempel eller mindst

10 én matrice er arrangeret i henholdsvis foran- og bagved-mode med henblik på at frembringe mindst en første perforering på skæreeenden af emballageproduktet (1) i transportretningen (F) for papirbanen, og, i givet fald, mindst én anden perforering i skæreeenden for et efterfølgende emballageprodukt (1), som er efterløbende i papirbanens bevægelsesretning (F).

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11. Apparat ifølge et af de foregående krav, **kendetegnet ved, at** den forformende station omformer papirbanen til et tredimensionalt emballageprodukt (1) med to laterale, hule krøllerum, der strækker sig i banens retning.

20 12. Apparat ifølge et af de foregående krav, **kendetegnet ved, at** den forformende station omfatter en foldningsstation, som folder mindst een, navnlig begge langsgående kantstrimler hen imod midterafsnittet, og/eller en prægningsstation, navnlig arrangeret nedstrøms for foldningsstationen, med et par prægehjul, der frembringer en sekvens af prægedale og prægebjerge i papirbaneafsnittets midterafsnit.

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13. Apparat ifølge et af de foregående krav, **kendetegnet ved, at** forformningsstationen omfatter en foldningsstation, der folder mindst én, navnlig begge langsgående kantstrimler hen imod midterafsnittet, og en nedstrøms

30 fastgørelses- og deformationsstation (103), hvorved papirbaneafsnittet når fra foldningsstationen via en husskakt (111) ind i monterings- og/eller deformationsstationen (103), der omfatter en passende dimensioneret passage (115) på

væggen, som grænser op til prægehjulene, og gennem hvilken det respektive prægehjul kan gribe ind.

14. Apparat ifølge krav 8, **kendetegnet ved, at** passagens (115) dimensioner er
5 tilpasset til dimensionen af prægehjul, der griber gennem den på en sådan måde, at der dannes en spalte på nogle få millimeter.

15. Fremgangsmåde til fremstilling af en maskine for et tredimensionalt emballageprodukt ud fra et afsnit af en enkelt- eller flerlagspapirbane, som er for-
10 formet på forudbestemt måde, hvorved papirbanen trækkes fra en papirbanekilde i form af en papirbanerulle eller en zig-zag-foldet papirbanestak, og papirbanen for-formes til et tredimensionalt emballageprodukt med henblik på dannelse af et hult krøllerum, som strækker sig i banens retning, og det for-formede papirbaneafsnit skæres fra den for-formede papirbane til den ønskede længde af
15 emballageproduktet, hvorved papirbaneafsnittet adskilles fra papirbanen uden at afbryde papirbanens bevægelse under for-formningen,

- kendetegnet ved, at** papirbanen for-formes **ved at** papirbanen trækkes fra papirbanerullens inderside, hvorved der dannes et spiralformet papirrør, eller at papirbanen for-formes **ved, at** et todimensionalt papirbaneafsnit trækkes fra en
20 papirbanekilde, og mindst én langsgående kantstrimmel foldes eller oprulles hen imod papirbaneafsnittets midterafsnit, og at midterafsnittet efterfølgende deformeres plastisk på en sådan måde, at der ydermere sker frembringelse af en sekvens af prægedale og prægebjerge i papirbaneafsnittets længderetning.

















