(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 815 877 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.12.2014 Bulletin 2014/52

(51) Int Cl.:
B31B 1/16 *(2006.01)* ***B31B 1/25*** *(2006.01)*

(21) Application number: **13172333.0**

(22) Date of filing: **17.06.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) Apparatus and method for producing packaging blanks

(57) There is provided an apparatus and method for producing packaging blanks for consumer goods from a continuous web of material. The packaging blanks (100) may be blanks for inner liners for smoking article packaging. The apparatus comprises a cutting roller (201), a counter roller (202) and an impressing element (206). The cutting roller is for cutting the continuous web of material along a plurality of cut lines to form blanks. The counter roller is adjacent the cutting roller. The impressing element is on either the cutting roller or the counter roller, and is arranged to cooperate with the other of the cutting roller and the counter roller as the continuous web of material is transported between the cutting roller and the counter roller, to produce at least one fold line (110-113) in each of the blanks.

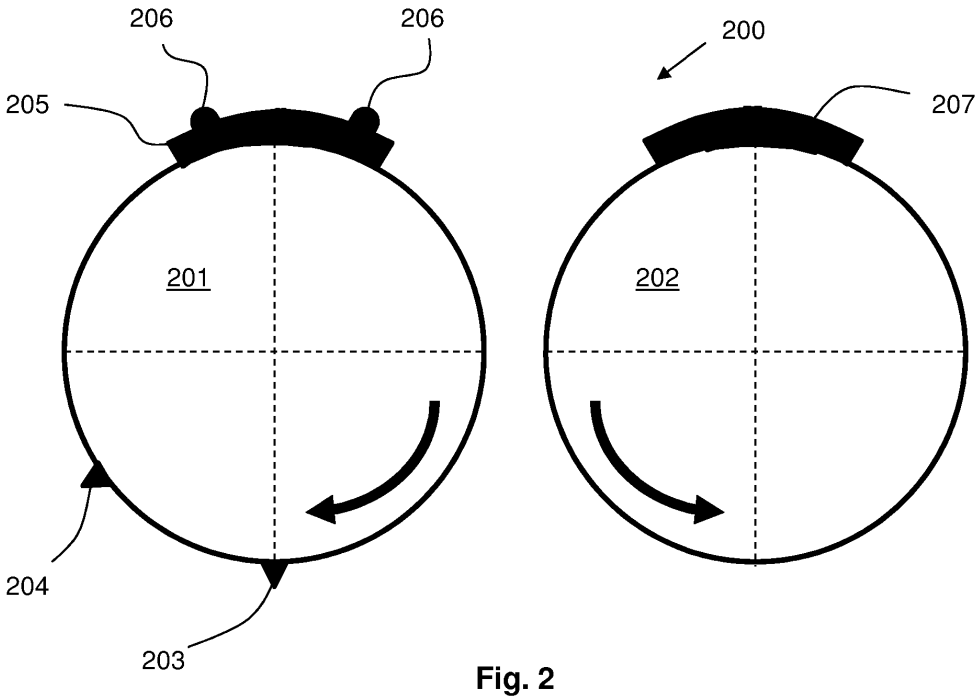

Fig. 2

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Description

[0001] The present invention relates to an apparatus and method for producing packaging blanks. Particularly, but not exclusively, the present invention relates to an apparatus and method for producing blanks for inner liners for smoking article packaging.

[0002] It is known to package consumer goods in packs formed from folded laminar blanks. For example, smoking articles such as cigarettes and cigars, are commonly sold in hinge lid containers, which comprise a box for housing the smoking articles and a lid connected to the box about a hinge line extending across the back wall of the container. A bundle of smoking articles is typically enclosed by an inner liner of thin packaging material, for example paper, aluminium foil or metallized paper.

[0003] Inner liners are typically constructed from laminar blanks, that are cut from a continuous web of material provided from a bobbin. The inner liner is then folded around a consumer good, or a plurality of consumer goods, to form a bundle. During that process, dedicated areas of the inner liner become walls of the bundle. Typically, the inner liner is wrapped around the consumer goods in a U-shaped manner.

[0004] US patent US-6523682-B1 describes a blank for an inner liner for cigarette packaging. The blank includes impressed lines between the bottom wall and the front and back walls, thereby defining the fold lines when the blank is wrapped in a U-shaped manner around the cigarettes. US-6523682-B1 also describes an apparatus for producing the blank. However, the apparatus disclosed in US-6523682-B1 requires complex synchronization between an impressing roller and a cutting roller, arranged downstream of the impressing roller, to produce the desired fold lines.

[0005] It would be desirable to provide an improved method and apparatus for producing packaging blanks, in which fold lines may be applied to the packaging blanks in a simplified manner.

[0006] According to a first aspect of the invention, there is provided apparatus for producing packaging blanks from a continuous web of material, the apparatus comprising: a cutting roller for cutting the continuous web of material along a plurality of cut lines to form blanks and a counter roller adjacent the cutting roller. Further, an impressing element is provided on either the cutting roller or the counter roller. The impressing element is arranged to cooperate with the other of the cutting roller and the counter roller as the continuous web of material is transported between the cutting roller and the counter roller, to produce at least one fold line in each of the blanks.

[0007] The application of fold lines to the blanks creates a pre-defined crease and ensures that the blanks fold at the proper locations along the fold lines, and not in other areas where folding is not desired. Ensuring proper folding positions reduces the risk of damage during the folding process to consumer goods contained within the finished packaging, in particular, reducing the risk of damage to the ends of smoking articles. The apparatus requires a cutting roller and a cooperating counter roller, so cutting the continuous web into blanks and producing the fold lines in the blanks may be performed using only two cooperating rollers. This significantly simplifies the apparatus compared with prior art arrangements, in which the cutting is performed at a different stage from the application of the fold or crease lines. In particular, the apparatus of the invention requires fewer rollers than prior art arrangements. Because the cutting of the continuous web of material and the impressing of the fold lines is performed at the same stage in the manufacturing process, the cut lines and fold lines may be well aligned. There is very little chance for misalignment, as there may be in prior art arrangements in which the cutting and the application of fold or crease lines take place at different stages. In some embodiments in which the impressing element is removable, the apparatus is particularly flexible and can be easily adjusted to account for different desired fold line patterns, by simply replacing the impressing element.

[0008] The term "blank" used throughout this specification refers to a piece of material ready to be folded into a finished object. Preferably, the blank is a piece of laminar material in the form of a sheet. The blanks produced by the apparatus of the invention are preferably used in packaging for consumer goods. The consumer goods may be smoking articles. The blanks produced by the apparatus of the invention are preferably used as blanks for inner liners for bundles of smoking articles within a pack. The term "web" is used to refer to a continuous sheet-like material out of which blanks may be formed, for example by cutting pieces of the web. Typically, the web of material is stored on bobbins and unwound from the bobbins during manufacture of the blanks.

[0009] The term "smoking articles" used throughout this specification should be inferred to mean, not only conventional cigarettes, in which the tobacco substrate is combusted, but also smoking articles, for example heated smoking articles, in which the substrate is heated and which rely on aerosol formation from the heated substrate, and distillation-based smoking articles, including those having a combustible heat source.

[0010] The term "longitudinal direction" in respect of the continuous web of material is used throughout this specification to refer to the direction of transport of the continuous web of material between the rollers. That is, the longitudinal direction is along the length of the continuous web of material. The term "longitudinal direction" in respect of a blank for a bundle or finished container is used throughout this specification to refer to a direction from bottom to top of the assembled bundle or container. The longitudinal direction of the continuous web is preferably the same as the longitudinal direction of each blank, although this need not be the case. The term "transverse direction", referring to both the continuous web of material and the blanks, refers to a direction perpendicular to the longitudinal direction.

[0011] The term "fold line" used throughout this specification refers to any weakened line in the blank corresponding to a line about which the blank will be folded into the finished object. The stiffness of the material is reduced along the fold line. For example, each fold line may be an indentation line, a scoring line, a creasing line, an embossed or debossed line, or a perforation line. The fold line need not be a very thin line, that is, having a width which is negligible compared with its length. The fold line may, for example, comprise a ridge or indentation with a width in a direction perpendicular to the length of the fold line.

[0012] The impressing element cooperates with the other of the cutting roller and the counter roller, that is, the roller which does not include the impressing element, to produce the at least one fold line in each of the plurality of blanks. When the impressing element is provided on the cutting roller, the impressing element is arranged to cooperate with the counter roller, to produce the at least one fold line in each of the blanks. Alternatively, when the impressing element is provided on the counter roller, the impressing element is arranged to cooperate with the cutting roller, to produce the at least one fold line in each of the blanks.

[0013] Preferably, in use, the impressing element cooperates with the other of the cutting roller and the counter roller to impress the at least one fold line, when an upstream cut line has been cut for a blank, but before a downstream cut line has been cut for the blank. That is, the upstream end of the blank in which the fold line is being produced is separate from the continuous web of material, but the downstream end of the blank is still joined to the continuous web of material. That is, the upstream cut line is cut, then the fold line is impressed, and then the downstream cut line is cut.

[0014] Preferably, the impressing element and the opposing roller, that is, the roller which does not include the impressing element, exert pressure against one another as the rollers rotate. The force between the two rollers results in a compressive force being applied to the continuous web of material between the impressing element and the opposing roller, so as to produce the at least one fold line.

[0015] Preferably, the impressing element is removably mounted on either the cutting roller or the counter roller. This allows the impressing element to be mounted on existing machinery. This also allows the impressing element to be easily replaced in order to adjust the desired fold line pattern in the finished blanks. The removable impressing element allows for a flexible apparatus that can be easily adjusted to account for different desired fold line patterns, by simply replacing the impressing element.

[0016] In a preferred embodiment, the impressing element is on the cutting roller. In that embodiment, the impressing element cooperates with the counter roller as the continuous web of material is transported between the cutting roller and the counter roller, to produce the at least one fold line in each of the blanks. Because the cutting and the impressing are performed by the same roller, the risk of misalignment between the cut lines and the fold lines in a finished blank is reduced.

[0017] Alternatively, however, the impressing element may be on the counter roller. In that case, the impressing element cooperates with the cutting roller as the continuous web of material is transported between the cutting roller and the counter roller, to produce the at least one fold line in each of the blanks.

[0018] The fold line may be any line along which the material is deformed or weakened so as to promote folding. The form of the fold line will depend on the structure of the impressing element and the cooperation between the impressing element and the opposing roller. For example, the fold line may depend on the force applied to the continuous web of material as it is transported between the cutting roller and the counter roller. This will depend on, for example, the relative positions of the cutting roller and the counter roller, and the size of the impressing element. The fold line may comprise a ridge, an indentation line, a score line, a line of perforations or any other suitable weakening line.

[0019] Preferably, the impressing element comprises at least one impressing protrusion for producing the at least one fold line when the impressing element cooperates with the other of the cutting roller and the counter roller.

[0020] Each impressing protrusion may comprise an elongate protrusion suitable for pressing a fold line or a portion of a fold line into the continuous web of material or a cut blank. Each impressing protrusion may impress a respective corresponding fold line. In that case, the impressing protrusion is preferably an elongate protrusion having a length corresponding to the desired length of the respective fold line. The impressing protrusion may have any suitable length corresponding to the desired length of the fold line. Alternatively, each impressing protrusion may impress only a portion of a fold line, such that several impressing protrusions together impress a whole fold line. In that case, each impressing protrusion may be an elongate protrusion and have a length corresponding to the desired length of the respective portion of the fold line. For example, a dashed fold line may be formed by a plurality of aligned elongate protrusions.

[0021] Each impressing protrusion may have any suitable cross sectional shape for impressing the corresponding fold line or fold line portion when the impressing element cooperates with the other of the cutting roller and the counter roller. The cross sectional shape is the shape in a direction perpendicular to the length of the protrusion and the corresponding fold line. The cross sectional shape of the protrusion will depend on the desired form of the corresponding fold line. For example, if the fold line is a line of perforations, the impressing protrusion may comprise one or more blades. For example, if the fold line is an indentation line, the impressing protrusion may comprise one or more elongate ridges for forming

the indentation when a force is applied. The cross sectional shape of the impressing protrusion may be, for example, but not limited to, triangular, semielliptical or semicircular. If the impressing protrusion has a triangular cross section, the distal vertex of the triangle may form a precise fold line when the impressing element cooperates with the other of the cutting roller and the counter roller.

[0022] Each impressing protrusion may have any suitable cross sectional height corresponding to the desired form of the corresponding fold line or fold line portion. The suitable cross sectional height may depend on the type of material in the continuous web. For example, stiffer materials may require a larger protrusion or protrusions so that, when the impressing element cooperates with the opposing roller, a fold line is properly formed. A less stiff material may only require a small protrusion or protrusions in order to properly form a corresponding fold line. The suitable cross sectional height may also depend on other factors, for example, but not limited to, the relative positions of the cutting roller and the counter roller and the force applied between the two rollers when they cooperate.

[0023] If more than one impressing protrusion is provided, the impressing protrusions may have the same or different properties, depending on the desired properties of the corresponding fold line or lines. The impressing protrusion or protrusions may be located at any suitable position corresponding to the desired position of the corresponding fold line or lines on the finished blank.

[0024] In one embodiment, the impressing element is arranged to impress the at least one fold line substantially parallel to the transverse direction of the continuous web of material.

[0025] For this purpose, preferably the impressing element comprises at least one elongate impressing protrusion substantially parallel to the transverse direction of the continuous web of material. Preferably, the at least one elongate impressing protrusion is substantially parallel to the axis of the roller which includes the impressing element. The impressing protrusion may have any suitable length, depending on the desired length of the corresponding fold line. For example, if the desired fold line extends across the entire width of the continuous web of material, the impressing protrusion or protrusions may extend across the entire width of the roller. Preferably, the transverse direction of the continuous web is the transverse direction of the blanks, such that the at least one fold line is also substantially parallel to the transverse direction of the finished blanks. If the blanks produced by the apparatus are used as blanks for inner liners for bundles of smoking articles, preferably the fold line that is substantially parallel to the transverse direction of the inner liner blank, is a fold line at the bottom of the finished folded inner liner. For example, the fold line may be between a panel of the inner liner that forms the bottom wall and panels of the inner liner that form front or back walls of the bundle of consumer goods.

[0026] In another embodiment, the impressing element is arranged to impress the at least one fold line substantially parallel to the longitudinal direction of the continuous web of material.

[0027] For this purpose, preferably the impressing element comprises at least one elongate impressing protrusion substantially parallel to the longitudinal direction of the continuous web of material. Preferably, the at least one elongate impressing protrusion extends along the circumference of the roller which includes the impressing element. The impressing protrusion may have any suitable length, depending on the desired length of the corresponding fold line. For example, if the desired fold line extends continuously along the longitudinal direction of the continuous web of material, the impressing protrusion or protrusions may extend around the entire circumference of the roller. Such an impressing protrusion or protrusions may create a continuous fold line in the continuous web. Preferably, the longitudinal direction of the continuous web is the longitudinal direction of the blanks, such that the at least one fold line is also substantially parallel to the longitudinal direction of the finished blanks. If the blanks produced by the apparatus are used as blanks for inner liners for bundles of smoking articles, preferably the fold line that is substantially parallel to the longitudinal direction of the inner liner blank, is a fold line at a side of the finished folded inner liner. For example, the fold line may be between a panel of the inner liner that forms the side wall of the bundle and panels of the inner liner that form front or back walls of the bundle of consumer goods.

[0028] The impressing element may be arranged to produce any desired number of fold lines in each of the blanks. For example, the impressing element may be arranged to impress one, two, three, four, five, six, seven, eight or more fold lines in each blank. If the impressing element comprises one or more impressing protrusions, the number of impressing protrusions may be the same as the number of desired fold lines. Alternatively, if one or more of the fold lines are formed by more than one impressing protrusion, the number of impressing protrusions may be greater than the number of desired fold lines. The impressing element may be arranged to impress all the fold lines in the finished blank, or some fold lines may be impressed at another stage in the manufacturing process.

[0029] In a preferred embodiment, the impressing element is arranged to produce at least two substantially parallel fold lines in each of the blanks. In that embodiment, preferably, the impressing element comprises two substantially parallel impressing protrusions for producing two substantially parallel fold lines in each of the blanks.

[0030] The at least two substantially parallel fold lines may be substantially parallel to the longitudinal direction or substantially parallel to the transverse direction. If the blanks produced by the apparatus are used as blanks for inner liners for bundles of smoking articles, preferably

the two substantially parallel fold lines are fold lines at the bottom of the finished folded wrapper. For example, one of the two substantially parallel fold lines may be a fold line between the panel of the inner liner that forms the bottom wall and a panel of the inner liner that forms the front wall, and the other of the two substantially parallel fold lines may be a fold line between the panel of the inner liner that forms the bottom wall and a panel of the inner liner that forms the back wall. Alternatively, the two substantially parallel fold lines may be fold lines at the sides of the finished folded wrapper. For example, one of the two substantially parallel fold lines may be a fold line between the panel of the inner liner that forms a first side wall and the panels of the inner liner that form the front and back walls, and the other of the two substantially parallel fold lines may be a fold line between the panel of the inner liner that forms a second side wall and panels of the inner liner that form the front and back walls.

[0031] The impressing element, and impressing protrusions if provided, may comprise any suitable material which can produce the at least one fold line when the impressing element cooperates with the opposing roller. Suitable materials include, but are not limited to, steel, plastics and ceramics.

[0032] Preferably, the apparatus further comprises a mating element on the other of the cutting roller and the counter roller, that is, the roller which does not include the impressing element, wherein the impressing element and the mating element are arranged to cooperate with one another as the continuous web of material is transported between the cutting roller and the counter roller, to produce the at least one fold line in each of the blanks.

[0033] If the impressing element is on the cutting roller, the mating element is on the counter roller, and if the impressing element is on the counter roller, the mating element is on the cutting roller. This allows the impressing element and the mating element to cooperate with one another to produce at least one fold line in each of the blanks. The mating element may be removably or fixedly mounted on the roller.

[0034] The mating element may comprise a deformable material or combination of materials, capable of deformation when compressive force is applied by the impressing element. Preferably, the deformation is elastic, such that the mating element returns to its original shape once the compressive force is no longer applied. Suitable materials include, but are not limited to, rubber, cork, plastic material, for example polyurethane, and combinations thereof.

[0035] Alternatively, the mating element may comprise an indent or depression having the same or a similar cross sectional shape as a portion of the impressing element. For example, if the impressing element comprises at least one impressing protrusion, the mating element may comprise at least one corresponding depression, which is arranged to cooperate with the impressing protrusion. In that case, the mating element need not comprise deformable material, although this is possible. The mating element may comprise steel or any other relatively hard material.

[0036] Preferably, the cutting roller comprises a cutting blade. The cutting blade may be positioned appropriately so as to cut the continuous web of material along the plurality of cut lines to form the blanks. Preferably, the cut lines are generally in the transverse direction of the continuous web of material. The cut lines may be any shape according to the desired shape of the cut lines and the finished blanks.

[0037] Preferably, the cutting roller is arranged to cut the continuous web of material to form the blanks without the creation of waste. That is, preferably, each of the plurality of cut lines corresponds to a first edge of the blank on one side of the cut line and a second edge, opposite the first edge, of the blank on the other side of the cut line. The first edge may be a trailing edge of a first blank. The second edge may be a leading edge of a subsequent blank when viewed in the longitudinal direction of the web. In other words, along the cut line, the shape of the first edge of one blank corresponds to the shape of the second edge of the adjacent blank. In this embodiment, the two adjacent blanks mate with each other along the cut line. Alternatively, each of the plurality of cut lines may correspond to an edge of only a single blank. In that case, there is a band of unused material between each blank.

[0038] In a preferred embodiment, the cutting roller is arranged to rotate at a first speed during cutting of the continuous web of material and at a second speed during formation of the at least one fold line, wherein the first speed is higher than the second speed. This allows high precision cut lines to be formed in the continuous web, thereby ensuring a clean cut for the edges of each blank. Alternatively, the cutting roller may be arranged to rotate at a constant speed.

[0039] The apparatus may be arranged to produce perforations in each of the blanks. For example, the apparatus may be arranged to produce one or more lines of perforations in each of the blanks. In one embodiment, the cutting roller comprises perforating means for producing perforations in each of the blanks. Alternatively, the perforating means may be provided on the counter roller.

[0040] The impressing and the perforating may be performed in any order and this will depend on the relative positions of the impressing element and the perforating means on the cutting roller. The perforating means may be arranged to perforate the continuous web of material before or after the fold lines are formed. Preferably, the perforating means is arranged to form the perforations when an upstream cut line has been cut for a blank, but before a downstream cut line has been cut for the blank. This may be before or after the fold lines are formed.

[0041] The counter roller may have any desired configuration and position which allows the impressing element to cooperate with the opposing roller as the contin-

uous web of material is transported between the cutting roller and the counter roller, to impress the at least one fold line in each of the plurality of blanks. The counter roller may comprise a deformable material or combination of materials, capable of deformation when compressive force is applied by the impressing element. Preferably, the deformation is elastic, such that the counter roller returns to its original shape once the compressive force is no longer applied. Suitable materials include, but are not limited to, rubber, cork, plastic material, for example polyurethane, and combinations thereof.

[0042] The continuous web may comprise any material suitable for producing the blanks. The continuous web may comprise any suitable packaging material for the consumer goods. Suitable materials include, but are not limited to, cardboard, paper, metalized paper, plastic, metal, or combinations thereof. Preferably, the continuous web of material is laminar material in the form of a sheet. Preferably, each blank formed from the continuous web is a piece of laminar material in the form of a sheet.

[0043] The continuous web of material may be provided from a bobbin. The continuous web of material may have any suitable length, width and thickness. Preferably, the length, width and thickness of the continuous web of material are suitable for use in conventional cutting machinery. Preferably, the length, width and thickness of the continuous web of material are suitable to produce blanks having the desired properties. Preferably, the width of the continuous web of material corresponds to the width of each blank. Alternatively, a strip of material may be cut off one or both sides of the continuous web of material during the production of the blanks. Alternatively, the width of the continuous web of material may correspond to the length of each blank. Preferably, the consumer goods are smoking articles and the packaging blanks are blanks for inner liners for smoking article packaging.

[0044] It is known to package consumer goods such as, for example, elongate smoking articles in containers formed from folded laminar blanks. For example, elongate smoking articles, such as cigarettes and cigars, are commonly sold in hinge lid packs having a box for housing the smoking articles and a lid connected to the box about a hinge line extending across the back wall of the container. An inner frame is often provided within the container. The box may comprise a box front wall, a box left side wall, a box right side wall, a box back wall and a box bottom wall. The lid may comprise a lid front wall, a lid left side wall, a lid right side wall, a lid back wall and a lid top wall. The inner frame may comprise an inner frame front wall, an inner frame right side wall and an inner frame left side wall. The front wall of the inner frame may extend above the top of the front wall of the box. The smoking articles within the container may be wrapped in an inner liner. The inner liner and smoking articles together form an inner bundle. Preferably, the inner frame is mounted between the box and the inner liner. Prior to first opening, the filled container may be wrapped in an outer wrapper.

[0045] The terms "front", "back", "upper", "lower", "side", "top", "bottom" and other terms used to describe relative positions of the components of containers refer to the container in an upright position with the lid at the top end and the consumer goods accessible from the upper end at the front. The terms "left" and "right" are used with reference to side walls of the container when the container is viewed from the front in its upright position. Where relative positions of the components of the inner liner and a bundle of consumer goods are described, these terms are made with reference to the position that the inner liner would have within a container. For example, where the consumer goods are smoking articles, "top" will typically be the side of the bundle where the filters of the smoking articles are located, where a filter is present.

[0046] Where the blanks produced by the apparatus of the invention are used in packaging for smoking articles, the blanks may be used as blanks for the container, for the inner frame, for the inner liner or for the outer wrapper. Preferably, however, the blanks are used as blanks for the inner liner. Preferably, the longitudinal direction of the inner liner corresponds to the longitudinal direction of the continuous web of material. Preferably, the fold lines comprise one or more of the line between the bottom wall and the front wall, the line between the bottom wall and the back wall, and the line between a side wall and the front and back walls of the bundle or container.

[0047] According to the first aspect of the invention, there is also provided apparatus for producing blanks for inner liners for smoking article packaging from a continuous web of packaging material, the apparatus comprising: a cutting roller for cutting the continuous web of packaging material along a plurality of cut lines to form inner liner blanks; a counter roller adjacent the cutting roller; and an impressing element on either the cutting roller or the counter roller; wherein the impressing element is arranged to cooperate with the other of the cutting roller and the counter roller as the continuous web of packaging material is transported between the cutting roller and the counter roller, to produce at least one fold line in each of the inner liner blanks.

[0048] According to a second aspect of the invention, there is provided a method for producing packaging blanks from a continuous web of material, the method comprising: transporting the continuous web of material between a cutting roller, for cutting the continuous web of material along a plurality of cut lines to form blanks, and a counter roller, wherein an impressing element is provided on either the cutting roller or the counter roller; the impressing element cooperating with the other of the cutting roller and the counter roller, as the continuous web of material is transported between the cutting roller and the counter roller, to produce at least one fold line in each of the blanks; and the cutting roller cutting the continuous web of material along the plurality of cut lines.

[0049] Preferably, the at least one fold line is formed when an upstream cut line has been cut for a blank, but before a downstream cut line has been cut for the blank.

[0050] In a preferred embodiment of the method according to the invention, the impressing element is on the cutting roller. In that embodiment, the impressing element cooperates with the counter roller, as the continuous web of material is transported between the cutting roller and the counter roller, to produce at least one fold line in each of the blanks. Alternatively, however, the impressing element may be on the counter roller.

[0051] The step of cooperating may comprise the impressing element cooperating with the other of the cutting roller and the counter roller, to produce the at least one fold line substantially parallel to the transverse direction of the continuous web of material. Alternatively or additionally, the step of cooperating may comprise the impressing element cooperating with the other of the cutting roller and the counter roller, to produce the at least one fold line substantially parallel to the longitudinal direction of the continuous web of material.

[0052] The impressing element may be arranged to produce any desired number and form of fold lines in each of the blanks.

[0053] Preferably, a mating element is provided on the other of the cutting roller and the counter roller, and the step of cooperating comprises the impressing element and the mating element cooperating with one another, as the continuous web of material is transported between the cutting roller and the counter roller, to produce the at least one fold line in each of the blanks.

[0054] In a preferred embodiment, the method comprises the step of the cutting roller rotating at a first speed during cutting of the continuous web of material and at a second speed during formation of the at least one fold line, wherein the first speed is higher than the second speed.

[0055] The method may further comprise the step of producing perforations in each of the blanks. This step may be performed by the cutting roller or by the counter roller or by a further, independent roller that is positioned either upstream or downstream of the cutting roller. The steps of cooperating and perforating may be performed in any order. Preferably, the step of producing perforations is performed when an upstream cut line has been cut for a blank, but before a downstream cut line has been cut for the blank.

[0056] The method may further comprise, after the step of cutting the continuous web of material, the step of separating the blanks in the longitudinal direction of the continuous web.

[0057] The method may further comprise the step of using the blanks in packaging for consumer goods.

[0058] The method may further comprise the step of folding each of the blanks along the at least one fold line. Each blank may be folded around the consumer goods. Alternatively, each blank may be folded and then filled with the consumer goods.

[0059] In a preferred embodiment, the blanks are used for consumer goods. Preferably, the consumer goods are smoking articles and the packaging blanks are blanks for inner liners for smoking article packaging. If the blanks are blanks for inner liners for smoking article packaging, the method may comprise the step of folding each of the blanks along the at least one fold line, around a collation of smoking articles.

[0060] According to the second aspect of the invention, there is also provided a method for producing blanks for inner liners for smoking article packaging from a continuous web of packaging material, the method comprising: transporting the continuous web of packaging material between a cutting roller, for cutting the continuous web of packaging material along a plurality of cut lines to form inner liner blanks, and a counter roller, wherein an impressing element is provided on either the cutting roller or the counter roller; the impressing element cooperating with the other of the cutting roller and the counter roller, as the continuous web of packaging material is transported between the cutting roller and the counter roller, to produce at least one fold line in each of the inner liner blanks; and the cutting roller cutting the continuous web of packaging material along the plurality of cut lines.

[0061] According to a third aspect of the invention, there is provided a blank, for example, an inner liner blank, formed according to the apparatus of the first aspect of the invention or the method of the second aspect of the invention.

[0062] According to the third aspect of the invention, there is also provided an inner liner blank for smoking article packaging formed according to the apparatus of the first aspect of the invention or the method of the second aspect of the invention.

[0063] According to a fourth aspect of the invention, there is provided a container, for example, for consumer goods such as smoking articles, the container comprising an inner liner formed from a blank formed according to the apparatus of the first aspect of the invention or the method of the second aspect of the invention.

[0064] According to the fourth aspect of the invention, there is also provided a container for smoking articles, the container comprising an inner liner formed from an inner liner blank formed according to the apparatus of the first aspect of the invention or the method of the second aspect of the invention.

[0065] According to a fifth aspect of the invention, there is provided an impressing element for apparatus for producing packaging blanks from a continuous web of material, the apparatus comprising a cutting roller for cutting the continuous web of material along a plurality of cut lines to form blanks and a counter roller adjacent the cutting roller, wherein the impressing element, when mounted on either the cutting roller or the counter roller, is arranged to cooperate with the other of the cutting roller and the counter roller, to produce at least one fold line in each of the blanks as the continuous web of material is transported between the cutting roller and the counter

roller.

[0066] According to the fifth aspect of the invention, there is also provided an impressing element for apparatus for producing blanks for inner liners for smoking article packaging from a continuous web of packaging material, the apparatus comprising a cutting roller for cutting the continuous web of packaging material along a plurality of cut lines to form inner liner blanks and a counter roller adjacent the cutting roller, wherein the impressing element, when mounted on either the cutting roller or the counter roller, is arranged to cooperate with the other of the cutting roller and the counter roller, to produce at least one fold line in each of the inner liner blanks as the continuous web of packaging material is transported between the cutting roller and the counter roller.

[0067] Features described in relation to one aspect of the invention may also be applicable to another aspect of the invention.

[0068] The invention will be further described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows an embodiment of a blank for an inner liner for smoking article packaging;
Figure 2 shows apparatus according to an embodiment of the invention;
Figure 3 shows the cutting roller of Figure 2 in more detail; and
Figure 4 is a velocity-time graph for the cutting roller of Figures 2 and 3.

[0069] As already discussed, the invention provides a method and apparatus for producing packaging blanks for consumer goods. In particular, the invention relates to an apparatus and method for producing blanks for inner liners for smoking article packaging. Figure 1 shows an embodiment of a blank 100 for such an inner liner suitable for smoking article packaging.

[0070] The blank 100 comprises bottom panel 101 joined to front panel 102 on one side and back panel 103 on the other side. A top end panel, opposite the bottom panel 101, comprises end folding tabs 104, 105. Similarly, narrow side panels, between front panel 102 and back panel 103, comprise side folding tabs 106, 107. In the region of the bottom panel 101, the side folding tabs 106, 107 merge into base folding tabs 108 and 109 respectively, which adjoin the bottom panel 101. Fold lines are shown as thin dotted lines in Figure 1.

[0071] The blank 100 also includes impressed lines which, in this embodiment, comprise a groove-like deformation of the packaging material of the blank. The impressed lines are shown as thick dotted lines in Figure 1. The blank 100 comprises two parallel, transversely directed impressed lines 110, 111. The transverse impressed lines 110, 111 separate the bottom panel 101 from the front panel 102 and the back panel 103 respectively. The transverse impressed lines 110, 111 form folding edges with a right-angled cross section, when the blank is folded around a collation of smoking articles. The blank 100 further comprises two parallel, longitudinally directed impressed lines 112, 113. The longitudinal impressed lines 112, 113 separate the side folding tabs 106, 107 and base folding tabs 108, 109 respectively from the remainder of the blank 100. The longitudinal impressed lines 112, 113 form folding edges with a right-angled cross section, when the blank is folded around a collation of smoking articles.

[0072] In the embodiment shown in Figure 1, the blank 100 further comprises a perforation line 114. Perforation line 114 provides a removable portion of the inner liner which may be removed by a user when the inner liner is opened for the first time.

[0073] The blank 100 comprises thin, packaging material suitable for wrapping smoking articles, for example paper or foil. The impressed lines 110, 111, 112 and 113 clearly define fold lines along which the inner liner should fold when the inner liner is wrapped around a collation of smoking articles. This ensures that the inner liner folds at the proper locations along the impressed lines, and not in other areas where folding is not desired. This reduces damage to smoking articles contained within the inner liner. For example, ensuring that the inner liners fold only where desired reduces the chance of the smoking articles becoming compressed or deformed, particularly at the tobacco rod end.

[0074] Figure 2 schematically shows apparatus according to an embodiment of the invention, for producing blanks for inner liners for smoking article packaging from a continuous web of packaging material. The blanks produced may be of the form illustrated in Figure 1. The apparatus 200 comprises cutting roller 201 and counter roller 202, adjacent the cutting roller. The cutting roller 201 includes a cutting blade 203 and a perforation blade 204. An impressing element 205 is mounted on the cutting roller 201. The impressing element 205 includes two substantially parallel elongate impressing protrusions 206 which extend along a direction parallel to the axis of the cutting roller 201. The cutting roller 201 and impressing element 205 will be described further with reference to Figure 3. The counter roller 202 includes a mating element 207 designed to cooperate with the impressing element 205 during operation of the apparatus.

[0075] As shown in Figure 2, in this embodiment, the cutting roller 201 rotates in a clockwise direction and the counter roller 202 rotates in an anticlockwise direction. During operation, a continuous web of suitable packaging material (not shown in Figure 2) is drawn between the cutting roller 201 and the counter roller 202 in a downwards direction. As the continuous web is fed between the cutting roller 201 and the counter roller 202, the cutting blade 203 cuts the web along a plurality of cut lines. Each cut line forms the trailing end of one inner liner blank and the leading end of the subsequent inner liner blank. In this embodiment, this corresponds to the right and left ends of the blank shown in Figure 1. As the web is fed between the cutting roller 201 and the counter roller 202,

the perforation blade 204 perforates the packaging material to form the perforation line 114 shown in Figure 1. As the web is fed between the cutting roller 201 and the counter roller 202, the impressing element 205 on the cutting roller 201 aligns with the mating element 207 on the counter roller 202. The impressing protrusions 206 preferably comprise hard material, for example steel, and the mating element 207 preferably comprises deformable material, for example rubber. The separation between the cutting roller 201 and counter roller 202 is set as desired so that the impressing protrusions 206 and the mating element 207 together apply a compressive force to the intervening material to produce fold lines in each of the blanks. In this embodiment, the impressing protrusions 206 and mating element 207 cooperate to form impressed lines 110, 111 in the blank shown in Figure 1.

[0076] Figure 3 shows the cutting roller 201 of Figure 2 in more detail. As already discussed, impressing element 205 is mounted on the cutting roller 201. The impressing element 205 includes two substantially parallel elongate impressing protrusions 206. Each impressing protrusion 206 extends in a direction substantially parallel to the axis of the roller 201. The length of each protrusion 206 corresponds to the length of the corresponding fold lines 110, 111. In this embodiment, because fold lines 110, 111 do not extend across the entire width of the blank, the impressing protrusions 206 also do not extend across the entire width of the cutting roller 201.

[0077] In the embodiment shown in Figures 2 and 3, the impressing element 205 is removably mounted on the cutting roller 201. This is advantageous because it allows the impressing element to be easily replaced in order to adjust the desired fold line pattern in the finished blanks or to exchange tools that are subject to regular wear. However, it is possible for the impressing element to be permanently fixed to the cutting roller. In addition, the impressing element 205 may alternatively be mounted (fixedly or removably) to the counter roller 205. In that case, the mating element may be mounted (fixedly or removably) to the cutting roller 202. Or, for example if the roller opposing the roller on which the impressing element 205 is mounted comprises deformable material, no separate mating element may be provided.

[0078] In the embodiment shown in Figures 2 and 3, the impressing protrusions 206 extend substantially parallel to the transverse direction of the continuous web of material and the finished blanks. Therefore, the impressing protrusions 206 produce fold lines 110, 111 which are also substantially parallel to the transverse direction of the blanks. In this case, in order to create the blank shown in Figure 1, the impressed lines 112, 113 (which extend in the longitudinal direction) must be produced separately, either downstream or upstream of the apparatus 200.

[0079] In addition, it is possible for impressing protrusions to be provided which extend substantially parallel to the longitudinal web of material and the finished blanks. In that case, the impressing protrusions would partially or fully extend around the circumference of the roller, rather than parallel to the roller axis. For example, in order for impressed lines 112, 113 to be applied, two impressing protrusions may be provided, substantially parallel to each other and to the circumference of the roller. Since impressed lines 112, 113 extend along the entire length of each blank, the impressing protrusions would extend substantially around the entire circumference of the roller (with the exception of the blade area). Such longitudinally directed impressing protrusions may be provided on the same roller or on a different roller from the transversely directed impressing protrusions.

[0080] The positions of the cutting blade 203, perforation blade 204 and impressing element 205 on the cutting roller are set as desired according to the desired position of the perforation line and the impressed lines on each blank. In this embodiment, the cutting roller 201 does not rotate at a constant speed but, in fact, rotates at a first, higher speed during cutting and a second, lower speed during formation of the fold lines. This is shown in Figure 4, which is a velocity-time graph for the cutting roller 201. In this embodiment, the cutting roller 201 rotates once (360 degrees rotation) as a length of the continuous web corresponding to the length of a blank is transported between the cutting roller 201 and counter roller 202. The time taken for one 360 degrees rotation is shown by time 401 in Figure 4. The roller 201 alternates between higher rotation speed 403 and lower rotation speed 405. During rotation at higher speed 403, the cutting blade 203 cuts a cut line in the web. This is shown at time 407 in Figure 4. During rotation at lower speed 405, the impressing protrusions 206 and mating element 207 form the impressed lines in the web. This is shown in Figure 4 at time 411 for the first impressing protrusion and time 413 for the second impressing protrusion.

[0081] The higher rotation speed 403 during cutting of the continuous web of material allows the cut lines to be formed more accurately, due to the relative movement of the cutting blade with respect to the advancing web of material that the speed difference between cutting blade and the continuous web creates. When a downstream cut line is made, the high rotation speed allows the cut blank to be quickly released from the web in a downwards direction. On the other hand, the lower rotation speed during the formation of the impressed lines is adequate for crease line formation. Preferably, tangential speed of the impressing protrusions 206 at the lower speed 405 is substantially equal to the movement speed of the web, such that the relative movement in a longitudinal direction between impressing protrusions 206 and web is substantially zero.

[0082] As discussed, in this embodiment, the cutting roller 201 rotates once (360 degrees rotation) as a length of the continuous web corresponding to the length of a blank is transported between the cutting roller 201 and counter roller 202. However, any suitable amount of rotation is possible. For example, the cutting roller may rotate only half a rotation (about 180 degrees rotation)

as a length of the continuous web corresponding to the length of a blank is transported between the rollers. In that case, there are preferably provided two cutting blades, two perforation blades and two impressing elements. The blades and elements are positioned and the rotation speeds are set appropriately according to the desired configuration of the blank.

Claims

1. Apparatus for producing packaging blanks from a continuous web of material, the apparatus comprising:

   a cutting roller for cutting the continuous web of material along a plurality of cut lines to form blanks;
   a counter roller adjacent the cutting roller; and
   an impressing element on either the cutting roller or the counter roller;
   wherein the impressing element is arranged to cooperate with the other of the cutting roller and the counter roller as the continuous web of material is transported between the cutting roller and the counter roller, to produce at least one fold line in each of the blanks.

2. Apparatus according to claim 1, wherein the impressing element is removably mounted on either the cutting roller or the counter roller.

3. Apparatus according to claim 1 or claim 2, wherein the impressing element is on the cutting roller.

4. Apparatus according to any preceding claim, wherein the impressing element comprises at least one impressing protrusion for producing the at least one fold line when the impressing element cooperates with the other of the cutting roller and the counter roller.

5. Apparatus according to any preceding claim, wherein the impressing element is arranged to impress the at least one fold line substantially parallel to the transverse direction of the continuous web of material.

6. Apparatus according to any preceding claim, further comprising a mating element on the other of the cutting roller and the counter roller, wherein the impressing element and the mating element are arranged to cooperate with one another as the continuous web of material is transported between the cutting roller and the counter roller, to produce the at least one fold line in each of the blanks.

7. Apparatus according to any preceding claim, wherein the cutting roller is arranged to rotate at a first speed during cutting of the continuous web of material and at a second speed during formation of the at least one fold line, wherein the first speed is higher than the second speed.

8. Apparatus according to any preceding claim, wherein the cutting roller or the counter roller comprises perforating means for producing perforations in each of the blanks.

9. Apparatus according to any preceding claim, wherein the consumer goods are smoking articles and the packaging blanks are blanks for inner liners for smoking article packaging.

10. A method for producing packaging blanks from a continuous web of material, the method comprising:

    transporting the continuous web of material between a cutting roller, for cutting the continuous web of material along a plurality of cut lines to form blanks, and a counter roller, wherein an impressing element is provided on either the cutting roller or the counter roller;
    the impressing element cooperating with the other of the cutting roller and the counter roller, as the continuous web of material is transported between the cutting roller and the counter roller, to produce at least one fold line in each of the blanks; and
    the cutting roller cutting the continuous web of material along the plurality of cut lines.

11. A method according to claim 10, comprising the step of the cutting roller rotating at a first speed during cutting of the continuous web of material and at a second speed during formation of the at least one fold line, wherein the first speed is higher than the second speed.

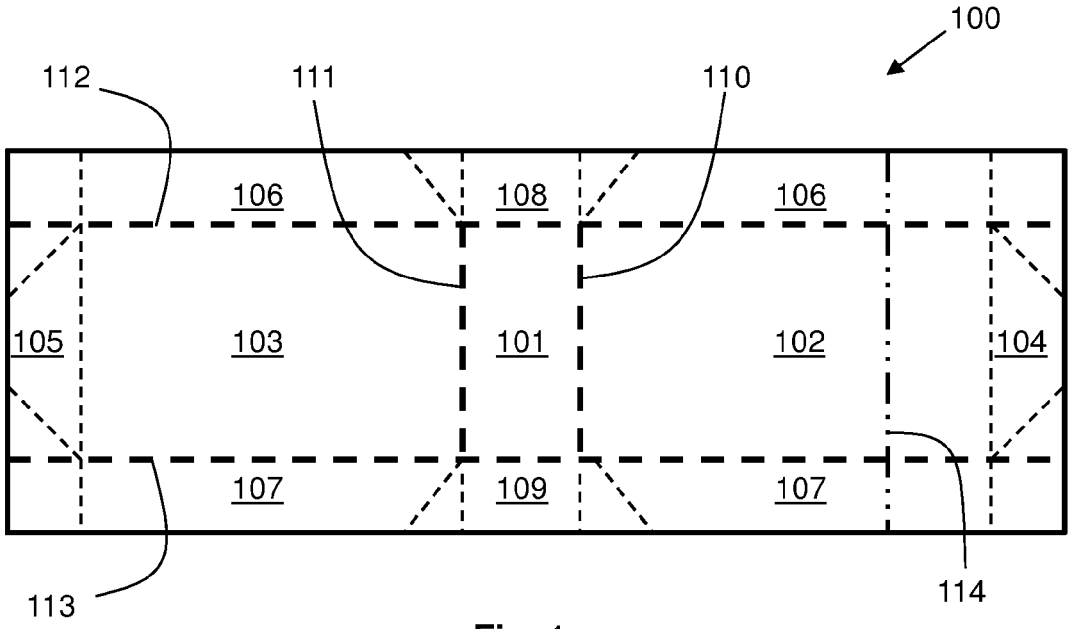
12. A method according to claim 10 or claim 11, wherein the consumer goods are smoking articles and the packaging blanks are blanks for inner liners for smoking article packaging.

13. A blank formed according to the apparatus of claims 1 to 9 or the method of claims 10 to 12.

14. A container, the container comprising an inner liner formed from a blank formed according to the apparatus of claims 1 to 9 or the method of claims 10 to 12.

15. An impressing element for apparatus for producing packaging blanks from a continuous web of material, the apparatus comprising a cutting roller for cutting the continuous web of material along a plurality of cut lines to form blanks and a counter roller adjacent the cutting roller,

wherein the impressing element, when mounted on either the cutting roller or the counter roller, is arranged to cooperate with the other of the cutting roller and the counter roller, to produce at least one fold line in each of the blanks as the continuous web of material is transported between the cutting roller and the counter roller.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114

Fig. 1

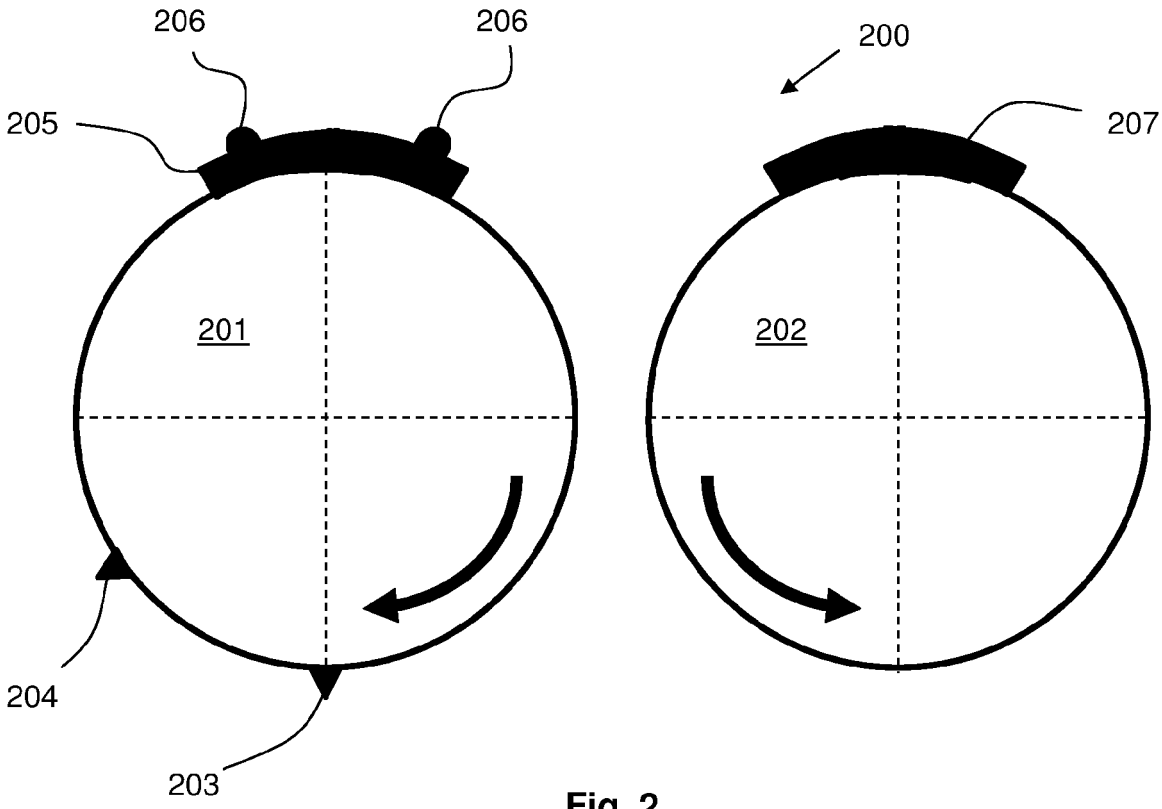
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Fig. 2

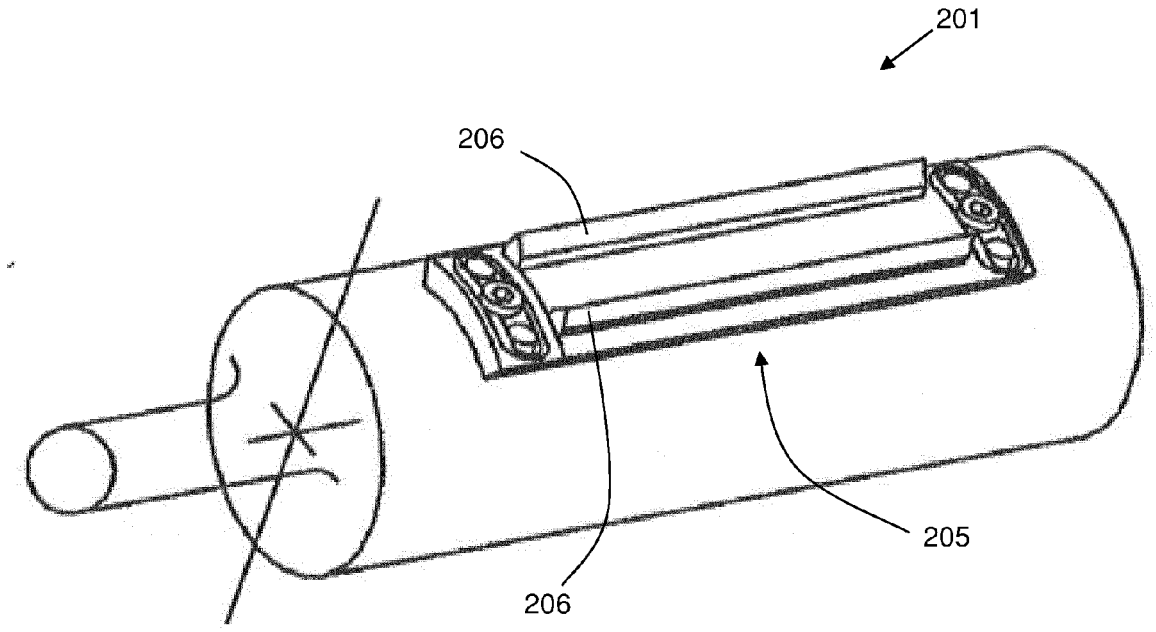

Fig. 3

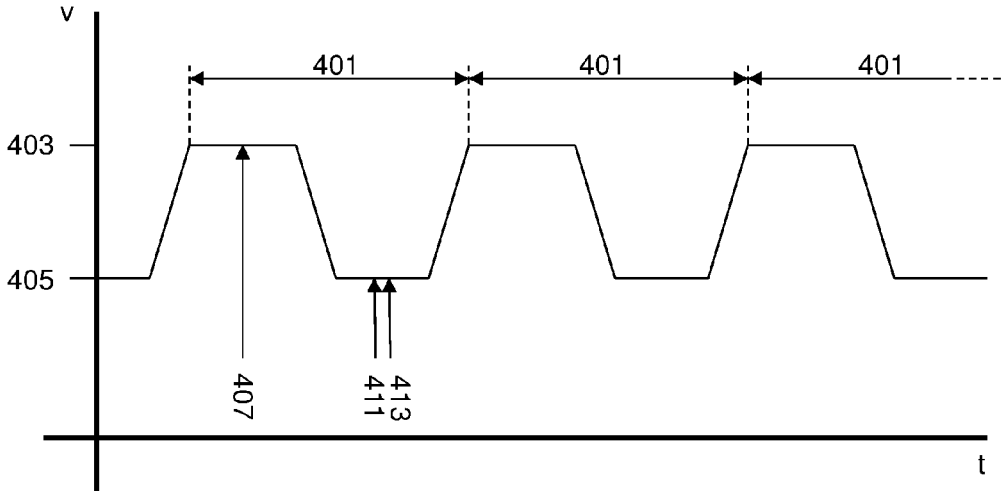

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 13 17 2333

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 934 231 A (CHESNUT W RICHARD [US] ET AL) 19 June 1990 (1990-06-19) * column 2, line 28 - line 60; figures 1, 3, 5, 7, 8 * -----	1,3-6,9, 10,12-14	INV. B31B1/16 B31B1/25
X	US 565 186 A (E. H. TAYLOR) 4 August 1896 (1896-08-04) * the whole document * -----	2,15	

TECHNICAL FIELDS SEARCHED (IPC)

B31B

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	24 October 2013	Sundqvist, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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European Patent Office
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Application Number
EP 13 17 2333

CLAIMS INCURRING FEES

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

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

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

LACK OF UNITY OF INVENTION

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

see sheet B

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

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

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

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

1-6, 9, 10, 12-15

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

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 13 17 2333

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

1. claims: 1-6, 9, 10, 12-15

   Removably mounted impressing element (claim 2 as dependent on claim 1; claims 3 to 6 and 12 listed here for being trivial; claim 9 listed here for the formal reason of not limiting claim 1 any further; claims 10, 13, 14 and 15 listed here for the formal reason of corresponding to claims 1 and 2, respectively).

   ---

2. claims: 7, 11

   Varying speed rotation (claim 7 as dependent on claim 1; claim 11 as dependent on claim 10).

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3. claim: 8

   Perforating means (claim 8 as dependent on claim 1).

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 17 2333

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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24-10-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4934231 A	19-06-1990	NONE	
US 565186 A	04-08-1896	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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