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(54) APPARATUS AND METHOD TO MAKE BLANKS

(57) Apparatus (20) to make blanks (30; 130) starting from a sheet (5) of material fed by feed means (1, 2) in a direction of feed (A), comprising etching and cutting means (3, 4) to perform etchings (31; 131) and/or longitudinal cuts (32; 132, 135) on the sheet (5), cropping means (8) that allow to shear the sheet (5) so as to separate the blank (30; 130) from it.

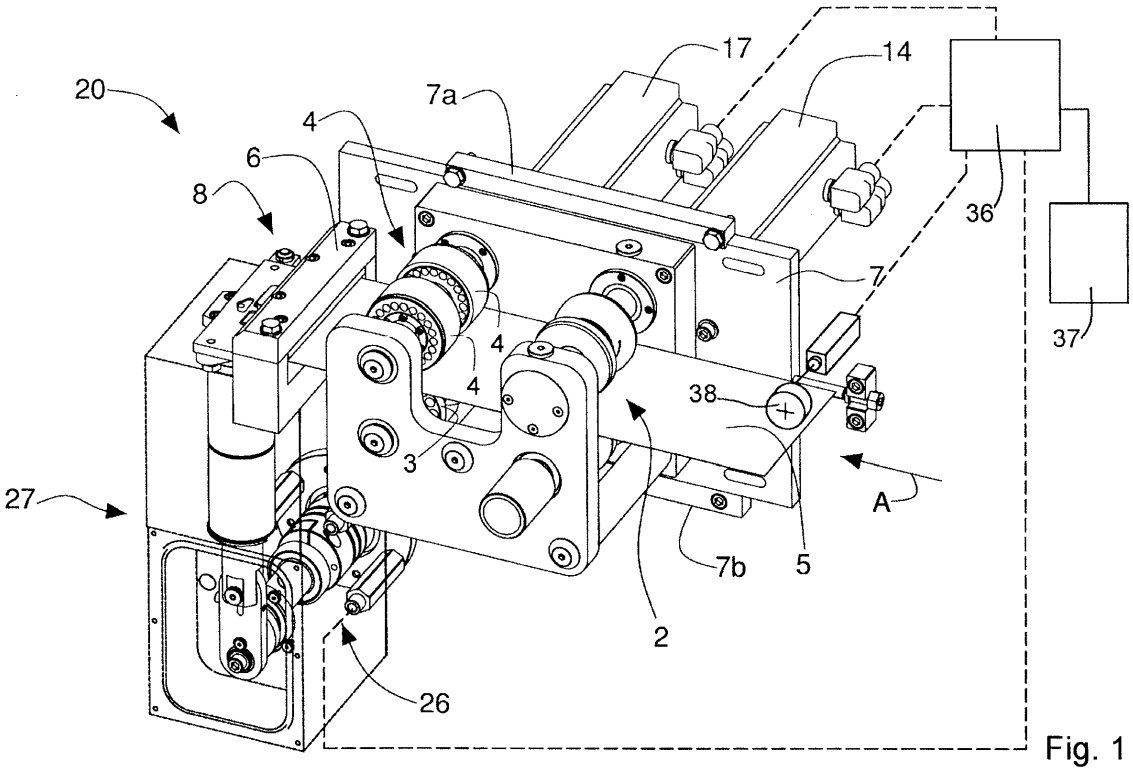

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The invention concerns an apparatus and method to make blanks, in particular of cardboard.

BACKGROUND OF THE INVENTION

[0002] Apparatuses to make cardboard blanks, starting from a sheet of cardboard unwound from a reel, are known. These known apparatuses can be the continuous or intermittent type: in the first case the sheet is made to move continuously and in the second with an intermittent step-wise motion.

[0003] The blanks achieved by the apparatus, once they have been folded by means of a folding apparatus, are intended to be internal wrappers for a packet of smoking articles.

[0004] An internal wrapper, or so-called "collar", is characterized by a predefined length (L), measured longitudinally and depending on the packet to which the internal wrapper will be associated. In the state of the art, the length (L) of the internal wrappers made by the above apparatuses with intermittent functioning assumes only two values, that is, it can only be equal to 32 mm or 36 mm. It should be noted that such apparatuses allow to make blanks of a length equal to the predefined length of the internal wrapper.

[0005] Known apparatuses with continuous functioning comprise unwinding rolls, etching rolls and a cropper, disposed in succession along a direction of feed of the sheet.

[0006] The unwinding rolls are two mutually contra-rotating rolls, having axes of rotation substantially orthogonal to the direction of feed, which feed the sheet toward the etching rolls. The latter are also two contra-rotating rolls, having axes of rotation substantially orthogonal to the direction of feed. Unlike the unwinding rolls, the etching rolls are not the same as each other, since only one of the rolls comprises cutter elements, on one of its external surfaces, to make the etchings and/or cuts on the sheet, intended in particular to form lines of folding and closing fins in the blanks. The other roll, without cutter elements, guarantees the correct feed of the sheet, acting as an abutment and contrast to the shearing force which the cutter elements exert on the sheet while making the etchings and/or cuts.

[0007] The etching roll, provided with the cutter elements is divided into a number of pre-established angular portions, each of which extends circumferentially for a length equal to L. During the rotation of the etching rolls, each angular portion etches and/or cuts a single blank, therefore, during the complete rotation of the etching rolls, a number of blanks equal to the number of angular portions of the etching roll provided by the cutter elements, are etched and/or cut successively and continuously.

[0008] Once the etching rolls have etched and/or cut the sheet, the latter moves toward the cropper, which comprises blades which shear the sheet almost orthogonally to the direction of feed so as to obtain the blank. In known apparatuses, functioning continuously, the cropper is generally conformed as a pair of other contra-rotating rolls on which suitable cutters are provided. It should be noted that the cutter elements with which the etching roll is provided are disposed and conformed depending on the desired length (L) of the blank. For this reason, during use, it is necessary to replace the etching roll every time that, with the above-mentioned known apparatus, blanks of a different length (L) from the previous ones are made. In other words, when the apparatus makes 32 mm blanks for example, and subsequently for a different production batch, 36 mm blanks have to be made, or vice versa, an operator has to replace the pair of etching rolls of the apparatus with another pair of etching rolls provided with the respective cutter elements suitable to make the blanks of a different production batch. The rolls have different diameters and the device has different interaxes with different drive systems. This is due to the fact that as the length L of the blank varies, the amplitude of each angular portion of the etching roll provided with cutter elements changes, and therefore so does the diameter of the roll, which determines a change in the distance between the respective axes of rotation of the etching rolls.

[0009] A further disadvantage of known apparatuses is that they are not very flexible.

[0010] This entails another disadvantage which characterizes known apparatuses which, as they are subject to long downtimes to allow the replacement of the etching rolls, are subject to a reduction in productivity.

[0011] Moreover, it must be taken into consideration that at present new types of packets for smoking articles are spreading rapidly on the market. These new types of packets, of different shapes and sizes, comprise internal wrappers of different lengths (L), which lengths are no longer limited only to the two standard lengths of traditional packets, that is, 32 mm and 36 mm.

[0012] This makes known apparatuses very expensive, because each different length of the blanks needs a different pair of etching rolls, which considerably increases the cost of known apparatuses.

[0013] Known apparatuses with intermittent functioning comprise unwinding rolls structurally similar to those of known apparatuses with continuous functioning as described above, and downstream of the latter, in succession, an etching device and a cropping device. The latter are both provided with mobile blades with alternate motion between a lowered position in which they do not interact with the sheet and a raised position in which they cut the sheet when it is stationary. These apparatuses, compared to the above described continuous functioning apparatuses, have the further disadvantage of having lower productivity and also have the same disadvantages, inasmuch as the etching device must be replaced

each time that a blank of a different length L is to be produced. Furthermore, in these apparatuses the blades of the cutter elements wear much more rapidly and therefore have to be replaced more often, thus increasing the costs of the apparatus and further reducing the productivity due to the machine downtimes for maintenance.

[0014] One purpose of the present invention is to provide an apparatus which is more flexible than known apparatuses.

[0015] A further purpose of the present invention is to provide an apparatus which has high productivity and does not require long and frequent downtimes of the machine to allow the operator to equip the apparatus for different production.

[0016] A derived purpose of the invention is to keep constant the diameter of the etching rolls, replacing only the cutter means which will cover different angles in relation to the different measurements.

[0017] Another purpose of the invention is to provide an apparatus which is both more economical than known apparatuses and can be controlled and managed even from remote.

SUMMARY OF THE INVENTION

[0018] According to embodiments, an apparatus to make blanks starting from a sheet of material fed by feed means in a direction of feed is provided. In one embodiment, said apparatus comprises etching and cutting means suitable to perform etchings and/or longitudinal cuts on said sheet, parallel to said direction of feed, and cropping means suitable to shear said sheet so as to separate said blank from it. The etching and cutting means comprise at least a first roll to which at least a second roll, parallel to said first roll, is associated. Said at least a first roll has an external surface. Said at least a first roll is provided with cutter means on said external surface. Said cutter means comprises one or more cutters made in correspondence with an angular portion of said first roll. Said one or more cutters have a circumferential length correlated to a length of said blank.

[0019] According to further embodiments, a method for making blanks starting from a sheet of material is provided. In one embodiment, the method comprises:

at least a feed step during which said sheet is made to advance, according to an intermittent step-wise motion, by means of feed means fed step-wise in a direction of feed;
an etching and/or cutting step, during which etchings and/or longitudinal cuts are made, parallel to said direction of feed, on said sheet by means of etching and cutting means;
and a separation step, during which said blank is separated from said sheet by means of cropping means.

[0020] Said etching and/or cutting is performed by at least a first roll associated to a second roll parallel to said first roll, using cutter means provided on an external surface of said first roll. Said cutter means comprise one or more cutters made in correspondence with an angular portion of said first roll. Said one or more cutters have a circumferential length correlated to a length of said blank.

[0021] According to still further embodiments, a method for making blanks starting from a sheet of material is provided. In one embodiment, the method comprises: at least a feed step during which said sheet is made to advance, according to an intermittent step-wise motion, by means of feed means fed step-wise in a direction of feed;
an etching and/or cutting step, during which etchings and/or longitudinal cuts are made, parallel to said direction of feed, on said sheet by means of etching and cutting means comprising at least a first roll provided with cutter means and associated to a second roll parallel to said first roll;
and a separation step, during which said blank is separated from said sheet by means of cropping means.

[0022] Said etching and/or cutting step occurs during said feed step and comprises:

a first sub-step in which said first roll and said second roll rotate from an initial angular position to a final angular position and said cutter means etch and/or cut said sheet longitudinally in correspondence with a cutting zone, during a specific tangency sub-step of said first roll with said second roll, another sub-step in which said first roll and said second roll rotate from said final angular position to an angular position of disengagement, in which said cutter means are disengaged from said sheet and do not etch and/or cut said sheet.

[0023] After reaching the disengagement position, the first roll and second roll rotate to return to the initial angular position and, during the rotation of said first roll to return to the initial angular position, said feed means are rotated in a direction inverse to the previous one, in such a manner as to retract said sheet by a quantity substantially equal to that performed during the rotation of said first roll from said final angular position to said disengagement position,

[0024] Said feed means and therefore said sheet, are stopped and kept stationary in a pause position until said first roll reaches said initial angular position.

[0025] These and other features, aspects and advantages of the present disclosure will become better understood with reference to the following description, the drawings and appended claims. The drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present subject matter and, together with the description, serve to explain the principles of the disclosure.

[0026] The various aspects and features described in the present disclosure can be applied, individually, wherever possible. These individual aspects, for instance the

aspects and features described in the attached dependent claims, can be made subject of divisional patent applications.

[0027] It is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The invention will be better understood and executed with reference to the attached drawings, which show a non-restrictive example thereof.

- Fig. 1 is a perspective view of an apparatus according to the invention to make blanks;
- Fig.2 is a front view of the apparatus in fig. 1 in which some details have been removed to better illustrate others;
- Fig. 3 is an enlarged front view of a first version of a roll comprised in the apparatus of fig. 1 and provided with etching and cutting means;
- Fig. 4 is an enlarged front view of a second version of the roll in fig. 3;
- Fig. 5 is a lateral view of etching rolls comprising the roll in fig. 3;
- Fig. 6 shows blanks made using the apparatus in fig. 1 provided with the roll in fig. 3;
- Fig. 7 shows blanks made using the apparatus in fig. 1 provided with the roll in fig. 4;
- Figs. 8 to 11 are front views of the etching means of the apparatus according to the invention shown in subsequent functioning steps;
- Fig. 12 shows three time-movement Cartesian diagrams associated to different components of the apparatus in fig. 1.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0029] Reference will now be made in detail to the various embodiments of the invention, one or more examples of which are illustrated in the figures. Within the following description of the drawings, the same reference numbers refer to the same components. Generally, only the differences with respect to individual embodiments are described. Each example is provided by way of explanation of the invention and is not meant as a limitation of the invention. For example, features illustrated or described as part of one embodiment can be used on or in conjunction with other embodiments to yield yet a further embodiment. It is intended that the present invention includes such modifications and variations.

[0030] With reference to figs. 1 and 2, an apparatus 20 to make blanks 30, 130 (visible in figs. 6 and 7) is shown, starting from a sheet 5 of material, for example a sheet of cardboard. The sheet 5 is unwound from a reel 11 (fig. 2) and made to move forward through the apparatus 20 according to a direction of feed A (shown with an arrow in figs. 1 and 2).

[0031] The apparatus 1 comprises feed means 1, 2 in particular conformed as rolls, so-called "unwinding rolls" since they contact the sheet 5 and allow it to unwind from the reel 11 and to make it advance in the direction of feed A. The unwinding rolls 1, 2 are mutually contra-rotating, parallel and tangent with respect to each other, with an axis of rotation substantially orthogonal to the direction of feed A, and provided with respective contact surfaces 1a, 2a, intended to contact, during rotation, opposite sides of the sheet 5 so as to cause a drawing by friction of the latter.

[0032] In the version shown in the drawings, the unwinding rolls comprise four rolls. The latter comprise two rolls 1 supported in rotation by a drive shaft driven by first drive means 14, advantageously step-wise rotary motors, and two rolls 2 supported in rotation by a driven shaft, which is made to rotate by means of a motor transmission system, for example of the mechanical type with gears, which allows to transmit the motion of the drive shaft to the driven shaft, and consequently to the two rolls 2.

[0033] In one version, not shown, the unwinding rolls may comprise only two rolls, mutually contra-rotating around respective parallel axes of rotation, each roll being supported in rotation by a respective shaft.

[0034] The position of the two rolls 2 is adjustable, also automatically, in an initial set-up step of the apparatus 20, along a substantially vertical direction, depending on the thickness of the sheet 5 being worked, thus always guaranteeing contact between the rolls and the sheet. On the contrary, the position of the two rolls 1 is fixed in the apparatus 20. Therefore the possibility of adjusting the vertical position of the two rolls 2 allows the apparatus 20 to work sheets 5 with different thicknesses, and as a consequence to make blanks of different thicknesses.

[0035] According to a variant, the reciprocal position of the rolls 1 and 2 is adjusted automatically depending on the thickness of the sheet 5. This automatic positioning can be obtained with means which move one roll-bearing shaft with respect to the other, or by providing controlled pressure means which act on one or other of the roll-bearing shafts.

[0036] Therefore, the strength of contact between the unwinding rolls 1, 2 and the sheet 5 can also be adjusted, acting opportunely on an elastic element, not shown.

[0037] The apparatus 20 also comprises etching and cutting means 3, 4, disposed downstream of the feed means 1, 2 in the direction of feed A.

[0038] The etching and cutting means 3, 4 are mutually contra-rotating rolls, parallel to each other, having axes of rotation substantially orthogonal to the direction of feed A. The etching and cutting means 3, 4 comprise two first rolls 3 (figs. 1, 2 and 5), equal and coaxial with respect to each other, both having their own determinate external diameter D1 (figs. 3 and 4). The first two rolls 3 are rotatably supported by the same drive shaft made to rotate by drive means 17, advantageously step motors. The second two rolls 4, on the other hand, are rotatably sup-

ported by a single driven shaft, parallel to the drive shaft and made to rotate by means of a motion transmission system, for example of the mechanical type with gears, which allows to transmit the motion from the drive shaft to the driven shaft, and consequently to the second rolls 4 themselves.

[0039] In a version not shown, the etching and cutting means may only comprise two rolls, mutually contra-rotating around respective parallel axes of rotation, each roll being supported in rotation by a respective shaft.

[0040] The rolls 1, 2, 3 and 4 are mounted on a plate 7, interposed between them and the drive means 14, 17.

[0041] The drive means 14, 17, and possibly also other drive means 26, described hereafter, are governed by a control and command unit 36 (fig. 1) which can be associated to more complex programming and control means 37.

[0042] According to the invention, a sensor mean 38 can be provided suitable both to detect the presence of the sheet 5 and to possibly read its thickness, in order to control both the elastic pressure means (not shown) and the possible adjustment means of the interaxes of the rolls 1, 2, 3 and 4.

[0043] Each first roll 3 comprises a first portion 3a and a second portion 3b. The latter is conformed as an internal bar, which can be either solid or tubular and has a smaller diameter d than the external diameter D1 of the roll 3. The portion 3b of each first roll 3 is rotatably supported by the drive shaft. The first portion 3a is conformed substantially as a hollow body, substantially cylindrical for example, which at least partly wraps and surrounds the second portion 3b. In other words, the first portion 3a is substantially coaxial to the second portion 3b and extends longitudinally around the latter.

[0044] The first portion 3a is removably attached to the second portion 3b by means of suitable attachment means, of the known type and not shown, and therefore it is made to rotate by the drive shaft through the second portion 3b.

[0045] The first portion 3a of each first roll 3 is provided with cutter means 9 disposed on an angular portion 18 of an external surface 19 of the same first roll 3 in order to make cuts and/or etches on the sheet 5.

[0046] The two first rolls 3 and the two second rolls 4 are disposed so as to define, in correspondence to a zone of substantial tangency, a cutting zone in which the cutter means 9 etch and/or cut the sheet 5.

[0047] With reference to figs. 3 and 4 two different forms of embodiment of the first roll 3 are shown.

[0048] In a first form of embodiment of the present invention, shown in fig. 3, the first portion 3a is removably attached to the second portion 3b and comprises a very wide angular portion 18, for example 110°, on which the cutter means 9 are made, which comprise, in correspondence to a central part, a first substantially C-shaped cutter 21. The cutter means 9 also comprise second cutters 22 extending, mutually parallel, on the external surface 19, for a determinate circumferential length or extension L 1 and interrupted in correspondence to the central part of the angular portion 18 where the first cutter 21 is made. This is better seen in the lateral view 15 in fig. 5, while the function of the first cutter 21 and of the second cutters 22 will be explained in more detail hereafter.

[0049] In a second form of embodiment of the invention, shown in fig. 4, the first portion 3a is removably attached to the second portion 3b and comprises a very narrow angular portion 18, for example 45°, on which the cutter means 9 are made which comprise the first C-shaped cutter 21, and a plurality of third cutters 23, aligned and parallel with respect to each other, which extend on the external surface 19 for a determinate circumferential length or extension L2, less than the circumferential length L1 of the first and second cutters 21 and 22.

[0050] The cutter means 9 (that is, the first cutter 21, the second cutters 22 and the third cutters 23) project radially by a determinate height H beyond the external diameter D1 of the external surface 19 so as to be able to interact with the sheet 5 to be worked without the remaining parts of the external surface 19 interfering thus with the etching and cutting operations.

[0051] Moreover, it should be noted that the circumferential lengths or extensions L 1 and L2 of the angular portion 18, that is, the part of the surface provided with the cutters 21; 22 or 23 is less than or at most equal to a length L of the blanks 30, 130 (figs. 6 and 7).

[0052] Advantageously, the first portion 3a (figs. 3 and 4) of each first roll 3 can be easily removed from the corresponding second portion 3b and replaced by another, for example provided with different cutters 21, 22 and/or 23, having circumferential lengths equal to or different from L1 or L2, although the external diameter D1 remains the same, so that it is not necessary to vary, merely because of the replacement, the interaxis between the first rolls 3 and the second rolls 4.

[0053] The height H of each of the cutters 21, 22 and/or 23 can instead be varied, depending on the etching and/or cutting operations to be carried out on sheet 5.

[0054] Each second roll 4, of which one surface contacts a side of the sheet 5, acts as a contrast mean to contrast the action exerted by the first roll 3 on the sheet 5.

[0055] The position of the second roll 4 is adjustable in a substantially vertical direction approaching or moving away from the first roll 3. The adjustment allows on the one hand to work sheets 5 having different thicknesses, and on the other, once the thickness of the sheets and the height of the cutter means 9 are known, to define a desired amount of penetration of the latter into the sheets 5, so as to make etchings (if the cutter of the cutter means 9 does not pass through the sheet 5 for the whole of its thickness), or cuts (if the cutter of the cutter means 9 passes through the sheet 5 for the whole of its thickness).

[0056] Fig. 5 shows a lateral view of the etching means 3, 4 comprising the first roll shown in fig. 3, by which it is possible to make one blank 30, shown in fig. 6.

[0057] The blank 30 is provided with four lines pre-

pared for folding 31, hereafter defined as lines of intended folding, in correspondence to which the blank 30 will be folded to make an internal wrapper. In particular, the lines of intended folding 31 comprise two external lines of intended folding 31a and two lines of intended folding 31b.

[0058] The latter are made with etching means visible in figs. 3 and 5 comprising the first roll. Each internal line of intended folding 31 b comprises a pre-creasing and a closing fin 32 with which a lid of a packet for smoking articles to which the internal wrapper is associated will engage. In particular, the closing fin 32 is made using the cutter 21, and the pre-creasing of the internal lines of intended folding 31b is made using the other cutters 22. The external lines of intended folding 31 a are defined by a continuous pre-creasing, longitudinal and substantially parallel to that of the internal lines of intended folding 31 b. The pre-creasings of the external lines of intended folding 31 a are made, for example, using an alternative version of the feed means 1, 2 of the apparatus 20, not shown. In this version, unlike the feed means 1, 2 shown in figs. 1, 2 in which the respective contact surfaces 1a, 2a are smooth and mainly perform a drawing function on the sheet 5, etching elements are made on the contact surfaces 1a, 2a, for example in correspondence to a median portion thereof. In particular, the etching elements can be complementary in shape, that is, they are disposed so that, in correspondence to protrusions of the etching elements, they face recesses of the other etching elements, and vice-versa. In this way, during use, as well as moving the sheet 5 by drawing, the feed means 1, 2 also allow to carry out the continuous pre-creasing of the external lines of intended folding 31a.

[0059] The blank 30, and consequently the internal wrapper that can be obtained from it, have a length L, measured longitudinally and equal to 80 mm for example. The internal wrapper wraps the smoking articles on four sides, since the internal wrapper is obtained by folding the blank 30 along the four lines of intended folding 31.

[0060] With reference to fig. 7, a blank 130 is shown made with etching means 3, 4 comprising the first roll 3 shown in fig. 4. The blank 130 is provided with two longitudinal lines of intended folding 131, in correspondence to which the blank 130 will be folded to make an internal wrapper 133. Each line of intended folding 131 is formed by a plurality of cuts 135 separated by join points. Each line of intended folding 131, in a portion without the cuts 135 separated by the join points, comprises a closing fin 132 with which a lid of a packet for smoking articles to which the internal wrapper will be associated will engage. The closing fin 132 is made using the cutter 21 and the cuts 135 are made using the plurality of other cutters 23.

[0061] The blank 130, and consequently the internal wrapper 133 that can be obtained from it, have a length L, measured longitudinally and equal to 32 mm for example. The internal wrapper surrounds the smoking articles on three sides.

[0062] The apparatus 20 also comprises a cropper 8, disposed downstream of the etching and cutting means 3, 4 in the direction of feed A and shown in figs. 1 and 2. The cropper means 8 comprise blade means 8a mobile according to an alternate motion, and a fixed support 6 supporting a fixed blade 6a, disposed to cut the blank 30. 130 in cooperation with the blade means 8a.

[0063] The blade means 8a are driven between a lowered position in which they do not interact with the blank 30, 130 (shown in fig. 2) and a raised position in which they interact with the blank 30, 130 in order to separate each blank 30, 130 from the sheet 5 from which they have been obtained. The blade means 8a are driven by other drive means 26 which drive a connecting rod-handle mechanism 27 to which the blade means 8a are connected.

[0064] The latter define the profile and the length of the cut, features which it is possible to modify by replacing the blade means 8a.

[0065] It should be noted that, during their travel (which is fixed and dependent on the connecting rod-handle mechanism 27), the cropping means 8 make a cut which is substantially perpendicular to the direction of feed A along the cutting lines 34, 134 (shown in figs. 6 and 7) which separate two adjacent blanks. The cropping means 8 also comprise gripping means, of a known type and therefore not shown, such as suckers, which pick up the blank 30, 130 once it has been cut and separated from the sheet 5 in order to deliver it to a pick-up device located downstream of the apparatus 20.

[0066] In an initial set-up step of the apparatus 20, it is possible to adjust the position of the blade 6a with respect to the blade means 8a so as to make a high quality cut.

[0067] In order to make the cut correctly along the cutting lines 34, 134, the cropping means 8 must be positioned at a distance from the etching and cutting means 3, 4 (in particular from the tangency zone defined between the first rolls 3 and the second rolls 4) equal to the length L of the blank 30, 130 being worked, or to integer multiples of the length L.

[0068] In use, with reference to figs. 8 to 11, four successive configurations are shown which the etching and/or cutting means 3, 4 assume during the functioning of the apparatus 20.

[0069] The functioning method of the apparatus 20 that will now be described allows to obtain blanks 30, 130 starting from a sheet 5 of material, in particular cardboard. The method comprises a feed step during which the sheet 5 is fed forward, with an intermittent step-wise motion, by the feed means 1, 2 (that is, the unwinding rolls) and an etching and/or cutting step, simultaneous with the feed step, to obtain on the sheet 5 etchings 31, 131 and/or longitudinal cuts 32, 132, 135 by the etching and/or cutting means 3, 4. Subsequently, the method also comprises a separation step to separate a blank 30, 130 from the sheet 5 from which it is obtained, by means of the cropping means 8.

[0070] The cutter means 3, 4 comprise at least a first roll 3 and at least a second roll 4 which, for the entire

range of measurements provided, remain the same, that is, they keep the same external diameter D1, and only the cutter means 9 (cutters 21, 21 and/or 23) are replaced, which, depending on the sizes of the cut, will cover different angles in the rolls 3 and/or 4. The first rolls 3 are made to rotate as indicated by arrow R1, while the second rolls 4 are made to rotate as indicated by arrow R2, rotation R1 being opposite to the rotation R2.

[0071] In order to make the cuts and/or etchings, the method according to the present invention provides an assembly step, before the above steps, in order to removably connect the first portion 3a of the first rolls 3 to the second portion 3b, the first portion 3a being first provided with cutter means 9 to make the etchings 31; 131 and/or the longitudinal cuts 32; 132, 135.

[0072] In a first sub-step, while the sheet 5 is advancing in the direction of feed A by a quantity equal to the length L of the blank, the first rolls 3 and the second rolls 4 assume in succession the configurations shown in figs. 8 to 10, that is, they rotate between an initial angular position B (fig. 8) and a final angular position D (fig. 10). In fig. 8, the first rolls 3 are in the initial angular position B, where an initial end of their angular portion 18 contacts the lower face of the sheet 5 substantially in correspondence with the tangency zone between the first rolls 3 and the second rolls 4. In this way, the cutter means 9, protruding radially outside the external diameter of the external surface 19, are positioned so as to start to engage with the sheet 5. In this moment, points of the sheet 5 that will form the cutting lines 34, 134 on which the cropping means 8 will cut, are almost in correspondence with the tangency zone, in other words, it is important that one edge of the blank 30, 130 is substantially in correspondence with the tangency zone. Subsequently, the first rolls 3 and the second rolls 4 are rotated in direction R1, first reaching an intermediate angular position C (shown in fig. 9) and then the final angular position D, shown in fig. 10. In the intermediate angular position C the cutter means 9 engage with the sheet 5 to make the cuts 135 on it, the pre-creases that will form the lines of intended bending 31, 131, and the closing fins 32, 132. In the final angular position D, a terminal end of the angular portion 18 is almost aligned with the tangency zone, in correspondence with which the points of the sheet 5 are positioned which will define the cutting lines 34, 134, that is, the edge points of the blank 30, 130. In this step, the cutter means 9 have finished making the cuts, the pre-creases and the closing fins on the sheet 5, even if they are still engaged with the sheet, at least partly penetrating it.

[0073] After the first sub-step, the method comprises another sub-step in which the first rolls 3 and the second rolls 4 rotate from the final angular position D to a position of disengagement E, in which the cutter means 9 no longer engage with the sheet 5 and therefore do not etch and/or cut the sheet 5.

[0074] During the first sub-step and the second sub-step, the unwinding rolls 1, 2 have to move with the same law of motion as the first rolls 3 and the second rolls 4 to avoid ripping or lacerating the sheet 5. In this way, however, the unwinding rolls 1, 2 unwind from the reel 11 a greater quantity of material than the length L of the blank, in particular a quantity L' equal to the quantity unwound during the rotation of the first rolls 3 and the second rolls 4 from the final angular position D to the disengagement position E.

[0075] Therefore, after reaching the disengagement position E, while the first and second rolls 3, 4 rotate as indicated by arrow R1 to return to the initial angular position B, shown in fig. 8, the unwinding rolls 1, 2 invert their respective rotations (segment Z visible in the diagram in fig. 12) by a quantity equal to that by which they rotated during the rotation of the first and second rolls 3, 4 from the final angular position D to the disengagement position E, so as to retract the sheet 5 by a quantity L'.

[0076] When the unwinding rolls 1, 2 have inverted their rotation as described above, they are again ready to perform a new work cycle of the apparatus 20 and remain stationary, in a pause position S (shown in the diagram in fig. 12), until the first and second rolls 3, 4 again reach the initial angular position B.

[0077] During the pause step of the unwinding rolls 1, 2 in position S, while the first and second rolls 3, 4 return to the first step B without contacting the sheet 5, the cropping means 8, in particular the blade means 8a, carry out their outward travel X from their lowered position to the raised position during which they penetrate through the sheet 5 in correspondence with the cutting line 34, 134. Afterward, once they have reached their end-of-travel, the blade means 8a, after a short stop with a duration T, carry out their return travel Y from their raised position to their lowered position during which they again pass through the sheet 5. At this point, the work cycle of the apparatus 20 has been completed, and has obtained a blank 30, 130.

[0078] The apparatus 20 also comprises a control and management unit 36, 37, which allows to adjust the functioning of the apparatus 20, that is, in particular, to drive, advantageously step-wise, the drive means 14, 17, 26 so as to coordinate the movement of the unwinding rolls 1, 2 with that of the first and second rolls 3, 4 and that of the cropping means 8 according to the functioning of the apparatus 20 described above.

[0079] The steps of the work cycle described above, with particular reference to the unwinding rolls 1, 2, the first and second rolls 3, 4, and the cropping means 8, are also illustrated by the movement-time Cartesian diagram in fig. 12.

[0080] Thanks to the invention, it is possible to obtain an apparatus 20 to achieve blanks 30, 130, in particular to form an internal casing (or "collar") for a packet for smoking articles, which is very flexible.

[0081] Indeed, the apparatus 20 can obtain blanks 30, 130 having any desired length L, simply by replacing the first portion 3a, the so-called "format part", of the first rolls 3 with another first portion suitable for the blank to be

made. In particular, the first portion 3a will be replaced in such a way that the cutter means 9 which it is provided with extend circumferentially for an arc having a length substantially equal to length L of the blank to be produced, keeping the external diameter D1 constant.

[0082] This replacement operation can be carried out by an operator quite quickly, since the second portion 3b of the first rolls 3 does not need to be replaced. For this reason, the apparatus 20 has a higher productivity than known apparatuses.

[0083] Furthermore, the apparatus 20 does not oblige the operator to entirely replace the etching and/or cutting means 3, 4 for every different length of the blank, because it is enough to replace the first portion 3a, without this causing a variation in the diameter of the first rolls 3. Therefore, it is no longer necessary to replace the second rolls 4 as well. This entails a considerable reduction in costs, because it is not necessary to have available a large number of first and second rolls 3, 4, in particular equal to the number of different types of blanks to be made with the apparatus.

[0084] In a variant of the invention, not shown, the first and second rolls 3, 4 are replaced by a punch and counter-punch, the punch being provided with the cutter elements that etch and/or cut the sheet. The punch is mobile between an operating position in which the cutter elements with which it is provided interact with the sheet, and an inactive position in which they do not interact with the sheet. The punch acts in the same way as the first rolls 3 of the apparatus 20 shown, and comprises a first portion, called "format part", removably attached to a second portion by attachment means of a known type. The cutter elements are made on the first portion, which faces the sheet and the counter-punch. As for the apparatus described above, the cutter elements have a shape and sizes that are a function of the blank to be obtained. In particular, the cutter elements will extend longitudinally for a length substantially equal to the length L of the blank. This variant of the apparatus operates with intermittent functioning. Therefore, when the unwinding rolls rotate, they feed the sheet forward by a quantity equal to the length L at every step, and afterward, while they are in the pause step, the punch moves from the inactive position to the operating position, in which the cutter elements with which it is provided etch and/or cut the sheet. Furthermore, again while the unwinding rolls are stationary, after etching and/or cutting the sheet the punch returns to the inactive position, and the cropping means crop the sheet in correspondence with cutting lines that separate two adjacent blanks, so as to achieve a blank separate from the sheet from which it was obtained.

[0085] Variants and/or additions to what is described above and/or what is shown in the drawings are also possible.

[0086] While the foregoing is directed to embodiments of the invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

Claims

1. Apparatus (20) to make blanks (30; 130) starting from a sheet (5) of material fed by feed means (1, 2) in a direction of feed (A), comprising etching and cutting means (3, 4) suitable to perform etchings (31; 131) and/or longitudinal cuts (32; 132, 135) on said sheet (5), parallel to said direction of feed (A), and cropping means (8) suitable to shear said sheet (5) so as to separate said blank (30; 130) from it, **characterized in that** said etching and cutting means (3, 4) comprise at least a first roll (3) to which at least a second roll (4), parallel to said first roll (3), is associated, said at least a first roll (3) having an external surface (19), said at least a first roll (3) being provided with cutter means (9) on said external surface (19), said cutter means (9) comprising one or more cutters (21, 22, 23) made in correspondence with an angular portion (18) of said first roll (3), said one or more cutters (21, 22, 23) having a circumferential length (L1, L2) correlated to a length (L) of said blank (30, 130).

2. Apparatus as in claim 1, **characterized in that** the circumferential lengths (L1, L2) of the angular portion (18) provided with said one or more cutters (21, 22, 23) is less than or at most equal to the length (L) of said blank (30, 130).

3. Apparatus as in claim 1 or 2, **characterized in that** the angular portion (18) on which the cutter means (9) are made is from 45° to 110°.

4. Apparatus as in claim 1, 2 or 3, **characterized in that** the angular portion (18) on which the cutter means (9) is made is 110°.

5. Apparatus as in claim 4, **characterized in that** the cutter means (9) comprise, in correspondence to a central part, a first C-shaped cutter (21), second cutters (22) extending, mutually parallel, on the external surface (19), for a determinate circumferential length (L1) and interrupted in correspondence to the central part of the angular portion (18) where the first C-shaped cutter (21) is made.

6. Apparatus as in claim 1, 2 or 3, **characterized in that** the angular portion (18) on which the cutter means (9) is made is 45°.

7. Apparatus as in claim 6, **characterized in that** the cutter means (9) comprise a first C-shaped cutter (21), and a plurality of third cutters (23), aligned and parallel with respect to each other, which extend on the external surface (19) for a determinate circum-

ferential length (L2), less than the circumferential length (L1) of the first and second cutters (21, 22).

8. Apparatus as in any claims hereinbefore, **characterized in that** said one or more cutters (21, 22, 23) project radially by a determinate height (H) beyond an external diameter (D1) of the external surface (19) of said first roll (3), so as to be able to interact with the sheet (5) to be worked without the remaining parts of the external surface (19) interfering thus with the etching and cutting operations.

9. Apparatus as in claim 8, **characterized in that** said external diameter (D1) is pre-determined and constant.

10. Apparatus as in any claims hereinbefore, **characterized in that** the circumferential length (L1, L2) of said cutter means (9) is variable depending on the etching and/or cutting operations to be carried out on said sheet (5).

11. Apparatus as in any claim hereinbefore, **characterized in that** said feed means (1, 2) include at least two opposite rolls (1, 2) between which said sheet (5) is suitable to advance in said direction of feed (A).

12. Apparatus as in any claim hereinbefore, **characterized in that** said feed means (1, 2) comprise precreasing etching means (31a) defining external lines of preparation for bending in said blank (30).

13. Apparatus as in any claim hereinbefore, **characterized in that** said cropping means (8) are positioned at a distance from a cutting zone, defined by a tangency zone in which said first roll (3) is substantially tangent to said second roll (4), at least for an extension equal to the length (L) of said blank (30; 130), or to integer multiples of said length (L).

14. Apparatus as in any claim hereinbefore, **characterized in that** said cropping means (8) comprise a support (6) equipped with at least first fixed blade means (6a).

15. Apparatus as in claim 14, **characterized in that** other blade means (8a) are present, cooperating with said first blade means (6a) to shear said sheet (5) so as to achieve said blank (30; 130) and to separate it from said sheet (5), **and in that** said other blade means (8a) present a raised operating position, and a lowered non-operating position.

16. Apparatus as in any claim hereinbefore, **characterized in that** at least said feed means (1, 2) are driven by their own drive member (14) governed by a control and command unit (36) which controls it step-wise.

17. Apparatus as in any claim hereinbefore, **characterized in that** at least said feed means (1, 2) include automatic interaxis adjustment means, according to the sheet (5) to be fed.

18. Apparatus as in any claim hereinbefore, **characterized in that** said cutter means (9) are replaceable.

19. Apparatus as in any claim hereinbefore, **characterized in that** said cutter means (9) are configured for performing longitudinal etchings and/or longitudinal cuts.

20. Method for making blanks (30; 130) starting from a sheet (5) of material, comprising at least a feed step during which said sheet (5) is made to advance, according to an intermittent step-wise motion, by means of feed means (1, 2) fed step-wise in a direction of feed (A); an etching and/or cutting step, during which etchings (31; 131) and/or longitudinal cuts (32; 132, 135) are made, parallel to said direction of feed (A), on said sheet (5) by means of etching and cutting means (3, 4), and a separation step, during which said blank (30; 130) is separated from said sheet (5) by means of cropping means (8), **characterized in that** said etching and/or cutting is performed by at least a first roll (3) associated to a second roll (4) parallel to said first roll (3), using cutter means (9) provided on an external surface (19) of said first roll (3), said cutter means (9) comprising one or more cutters (21, 22, 23) made in correspondence with an angular portion (18) of said first roll (3), said one or more cutters (21, 22, 23) having a circumferential length (L1, L2) correlated to a length (L) of said blank (30; 130).

21. Method as in claim 20, **characterized in that** said etching and/or cutting step occurs during said feed step and comprises a first sub-step in which said first roll (3) and said second roll (4) rotate from an initial angular position (B) to a final angular position (D) and said cutter means (9) etch and/or cut said sheet (5) longitudinally in correspondence with a cutting zone, during a specific tangency sub-step of said first roll (3) with said second roll (4), **in that** said etching and/or cutting step comprises another sub-step in which said first roll (3) and said second roll (4) rotate from said final angular position (D) to an angular position of disengagement (E), in which said cutter means (9) are disengaged from said sheet (5) and do not etch and/or cut said sheet (5) **and in that** during said first sub-step and during said other sub-step, said first roll (3), said second roll (4) and said feed means (1, 2) are rotated according to the same law of motion, controlled by control and command means (36).

22. Method as in claim 21, **characterized in that** after

reaching the disengagement position (E), the first roll (3) and second roll (4) rotate to return to the initial angular position (B), and **in that** during the rotation of said first roll (3) to return to the initial angular position (B), said feed means (1, 2) are rotated in a direction (Z) inverse to the previous one, in such a manner as to retract said sheet (5) by a quantity (L') substantially equal to that performed during the rotation of said first roll (3) from said final angular position (D) to said disengagement position (E) **and in that** said feed means (1, 2) and therefore said sheet (5), are stopped and kept stationary in a pause position (S) until said first roll (3) reaches said initial angular position (B).

23. Method as claim 20, 21 or 22, **characterized in that** said cutter means (9) performs longitudinal etchings and/or longitudinal cuts.

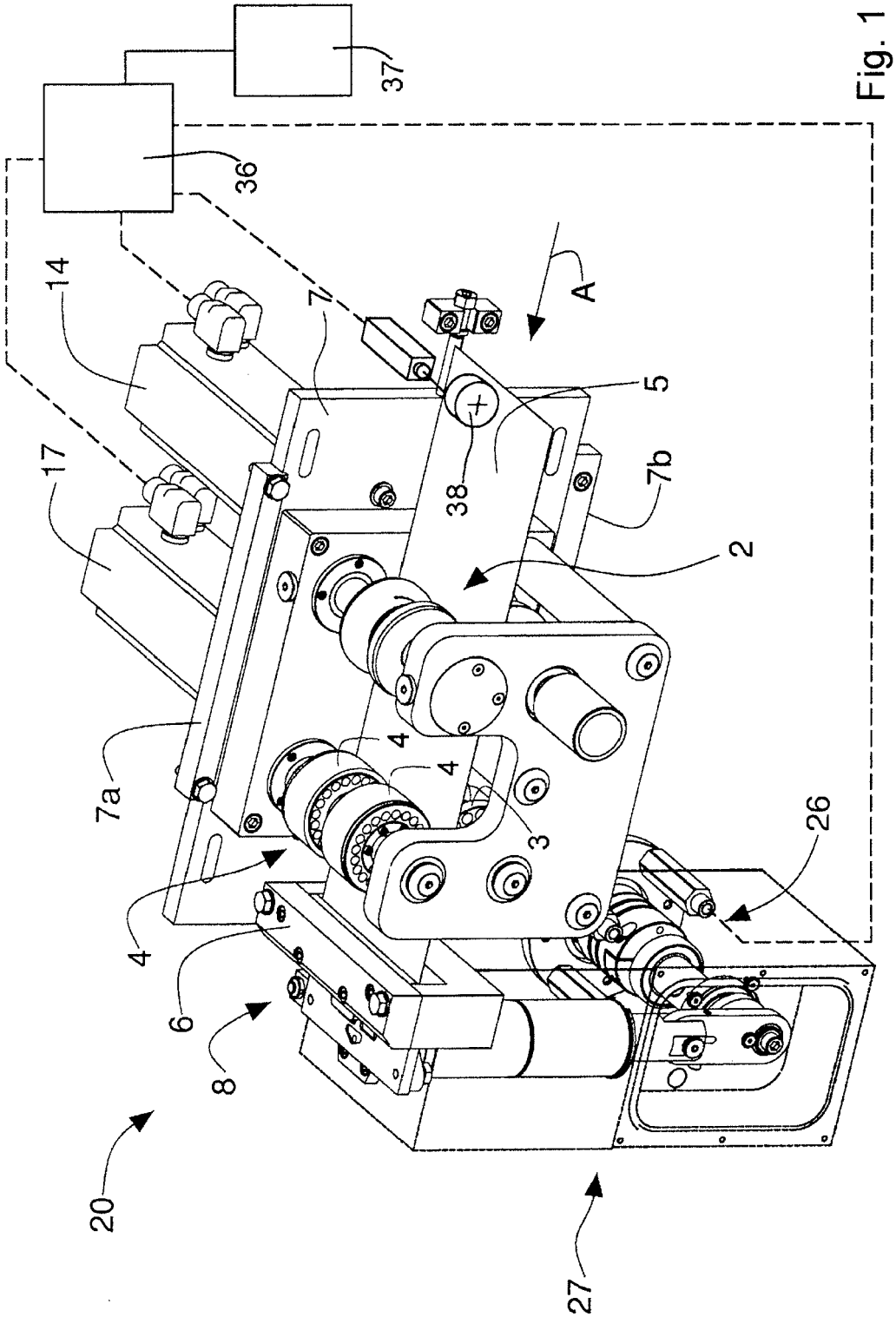

Fig. 1

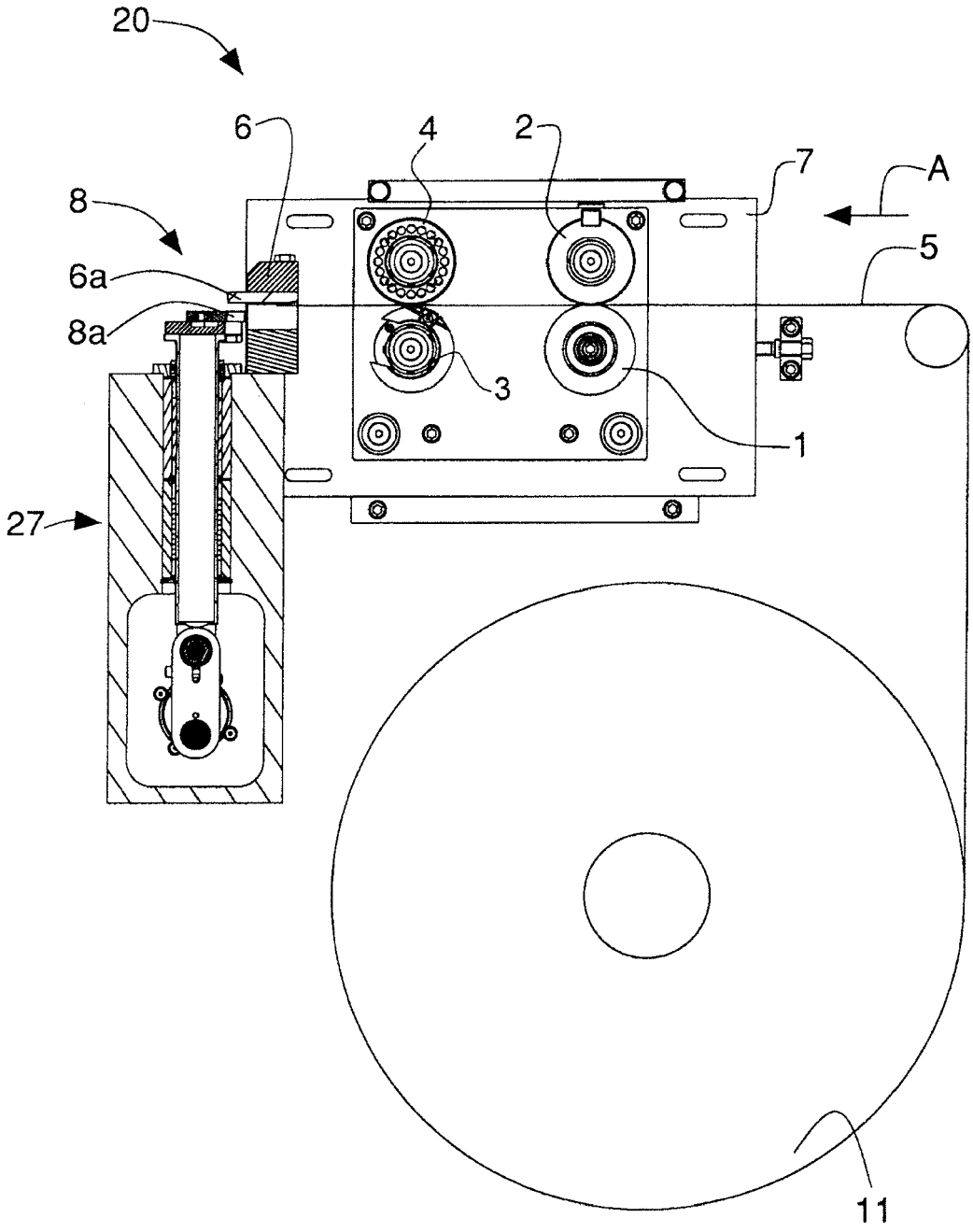

Fig. 2

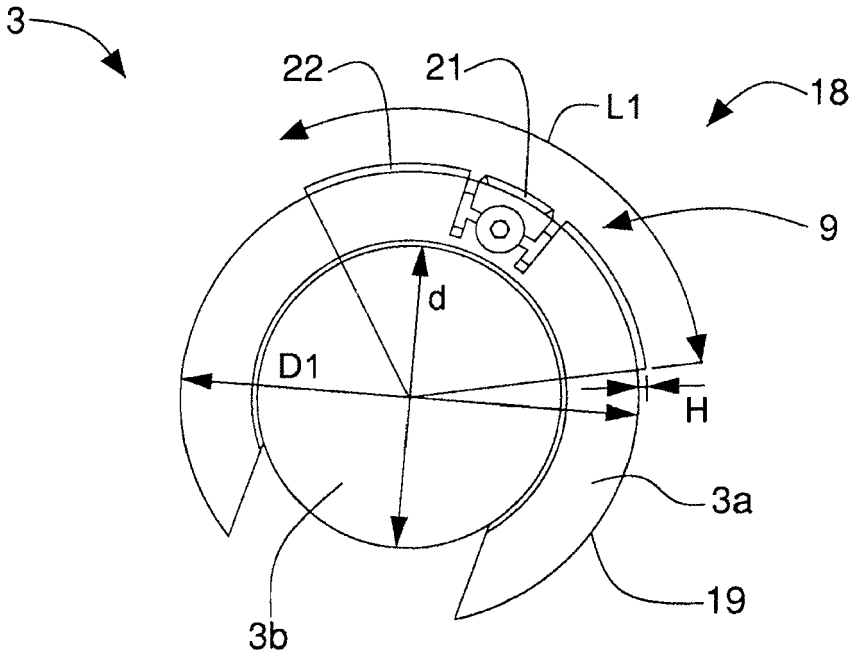

Fig. 3

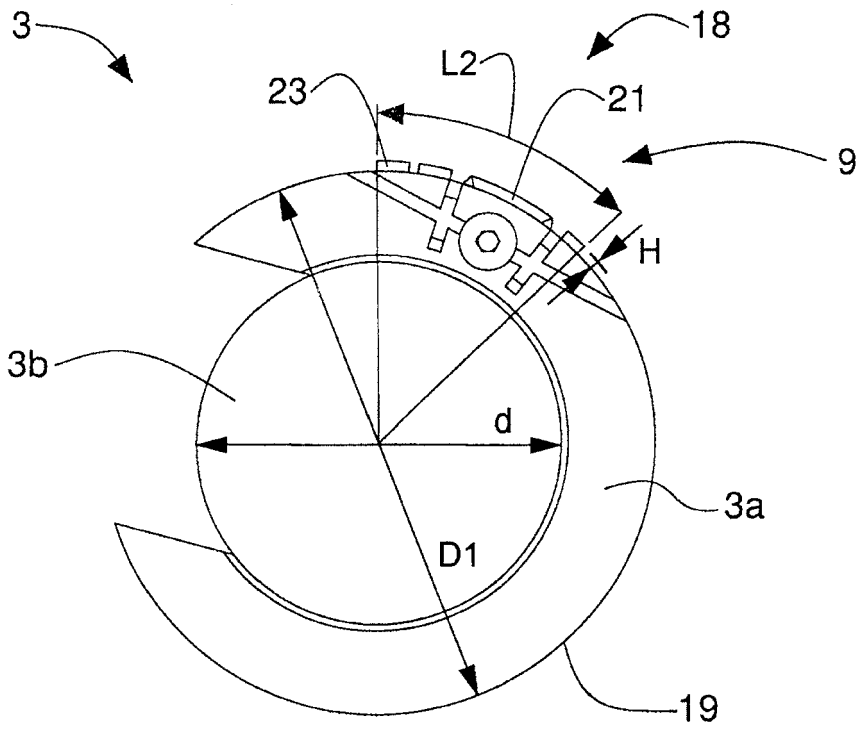

Fig. 4

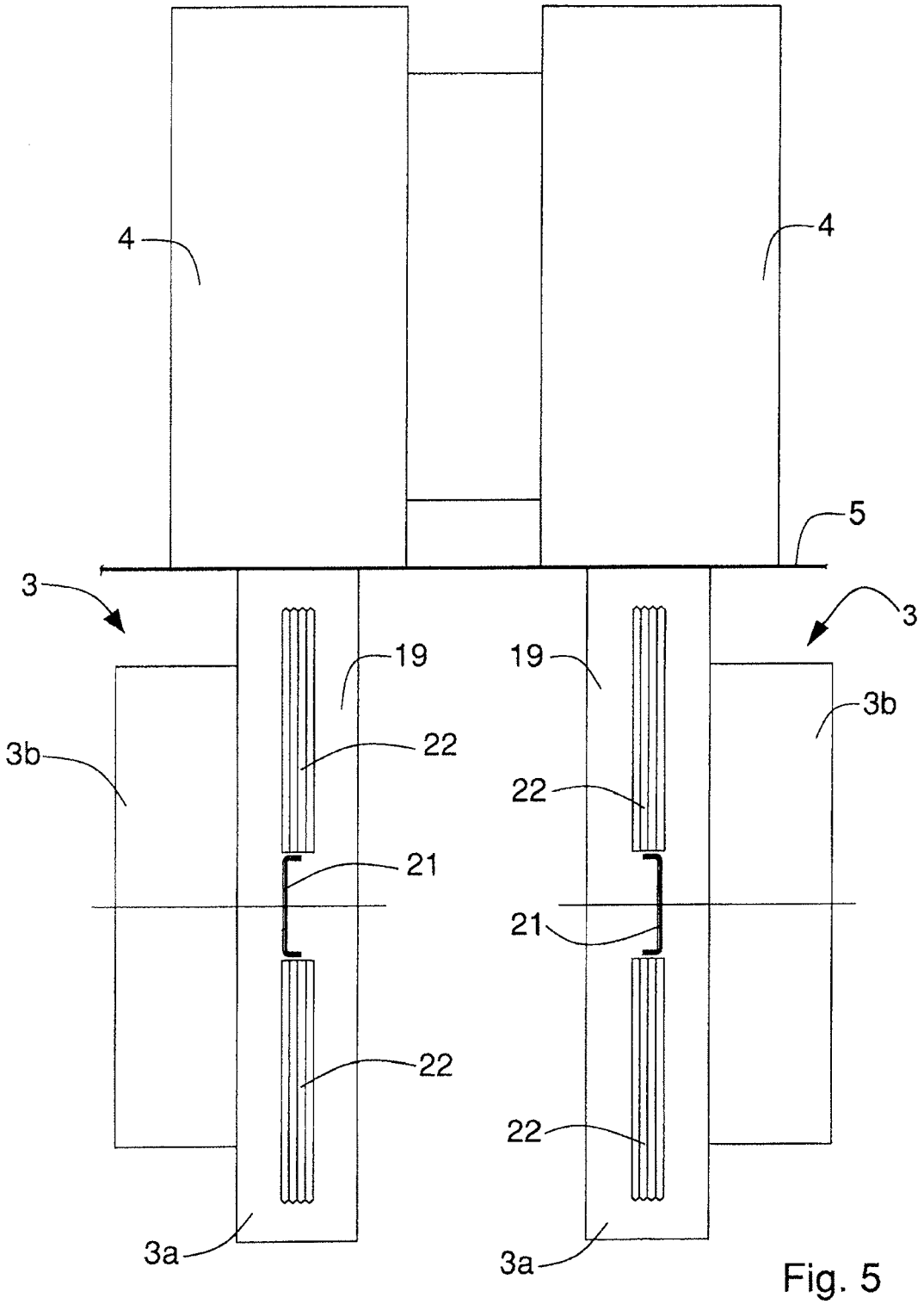

Fig. 5

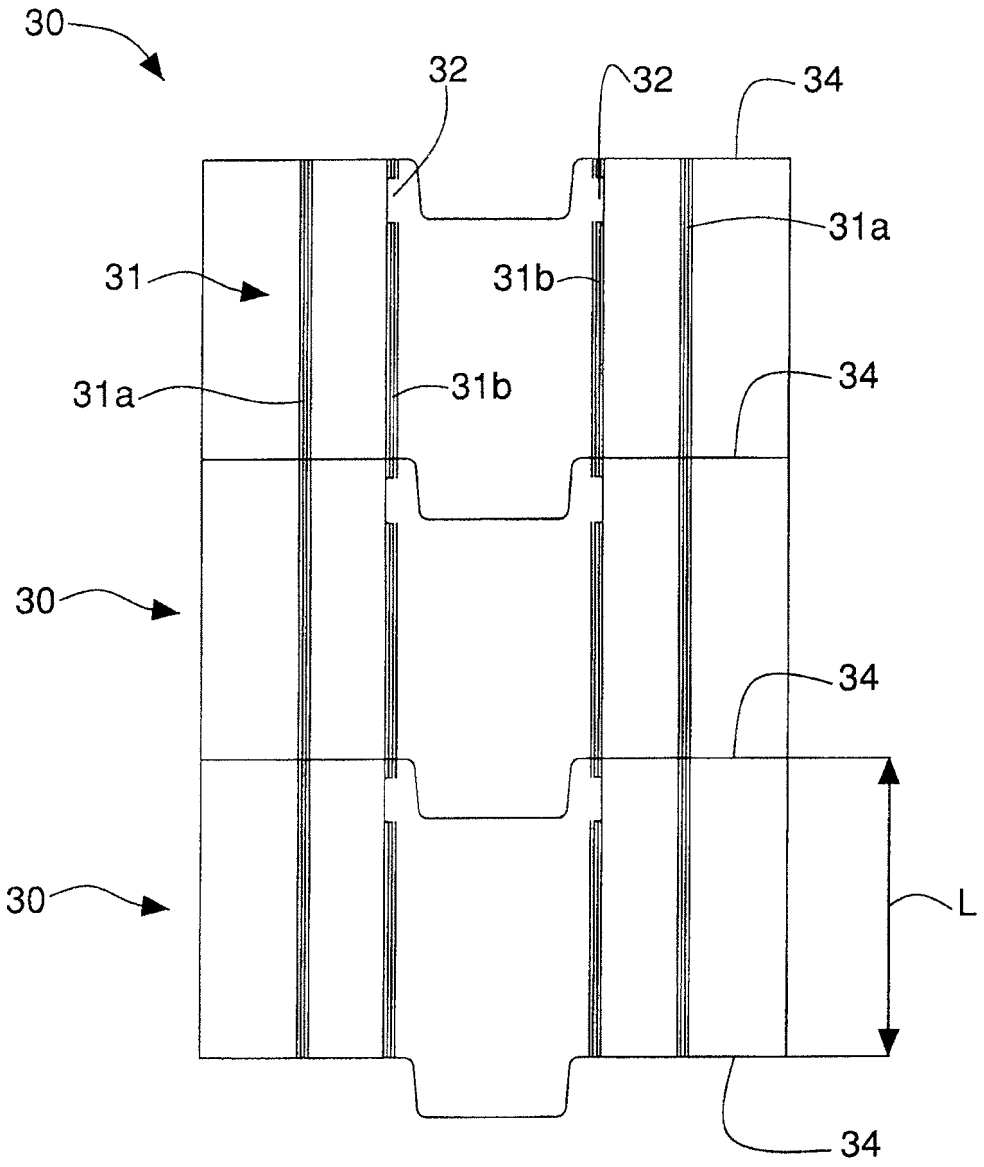

Fig. 6

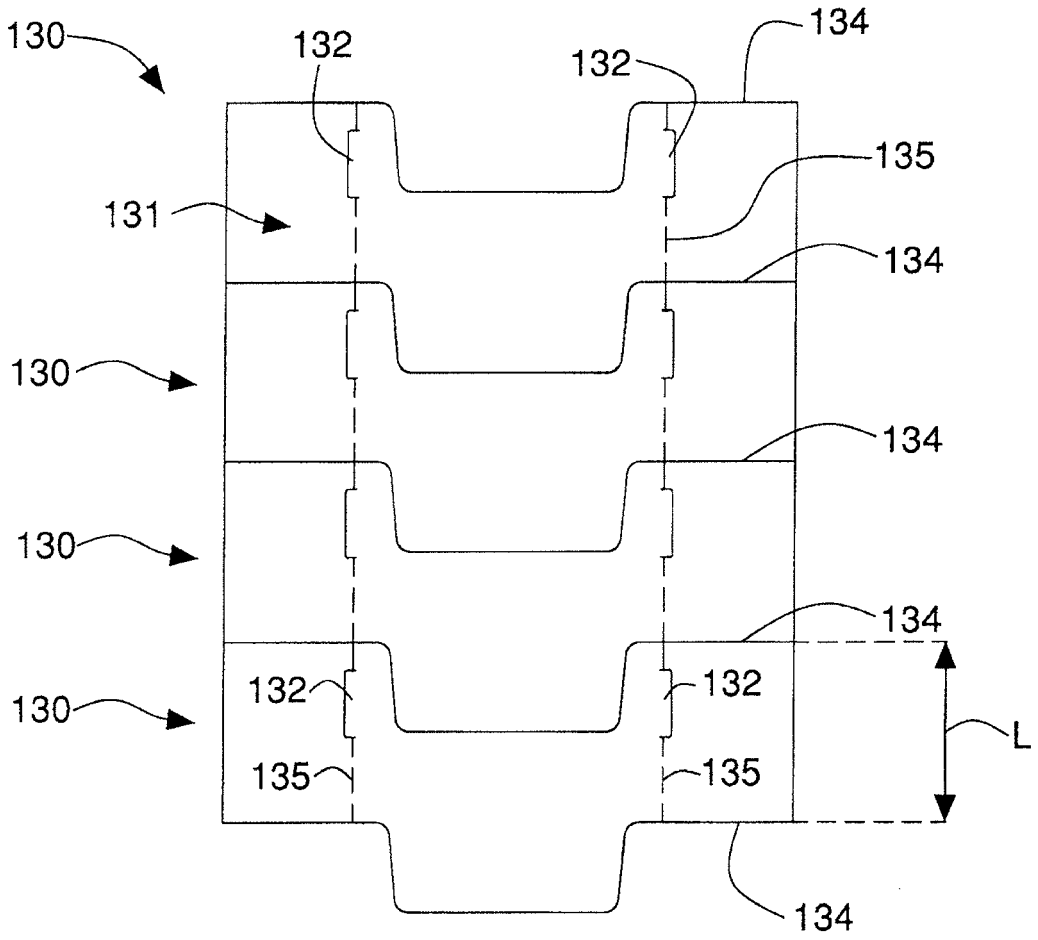
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Fig. 7

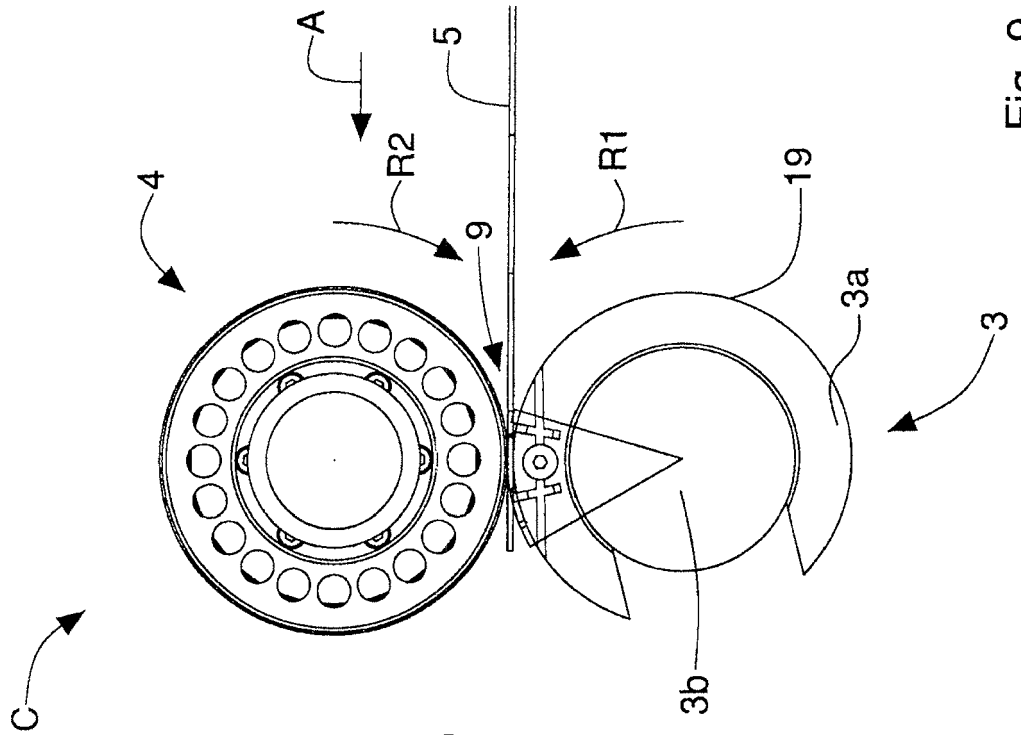


Fig. 9

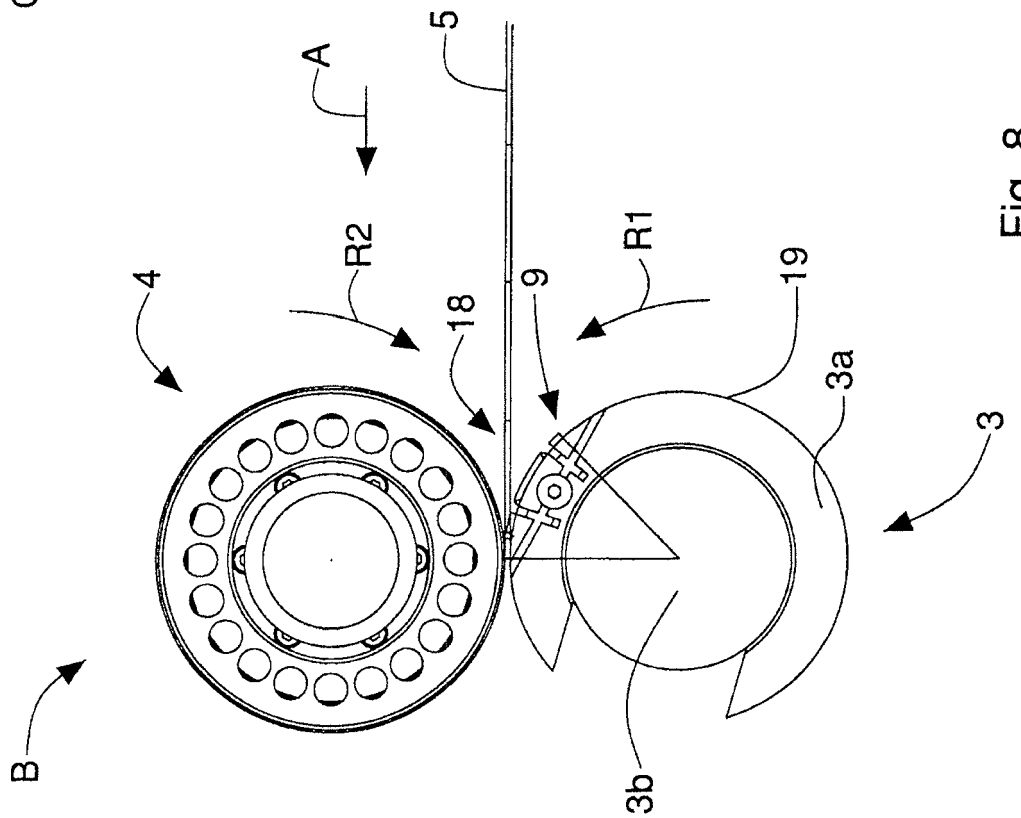


Fig. 8

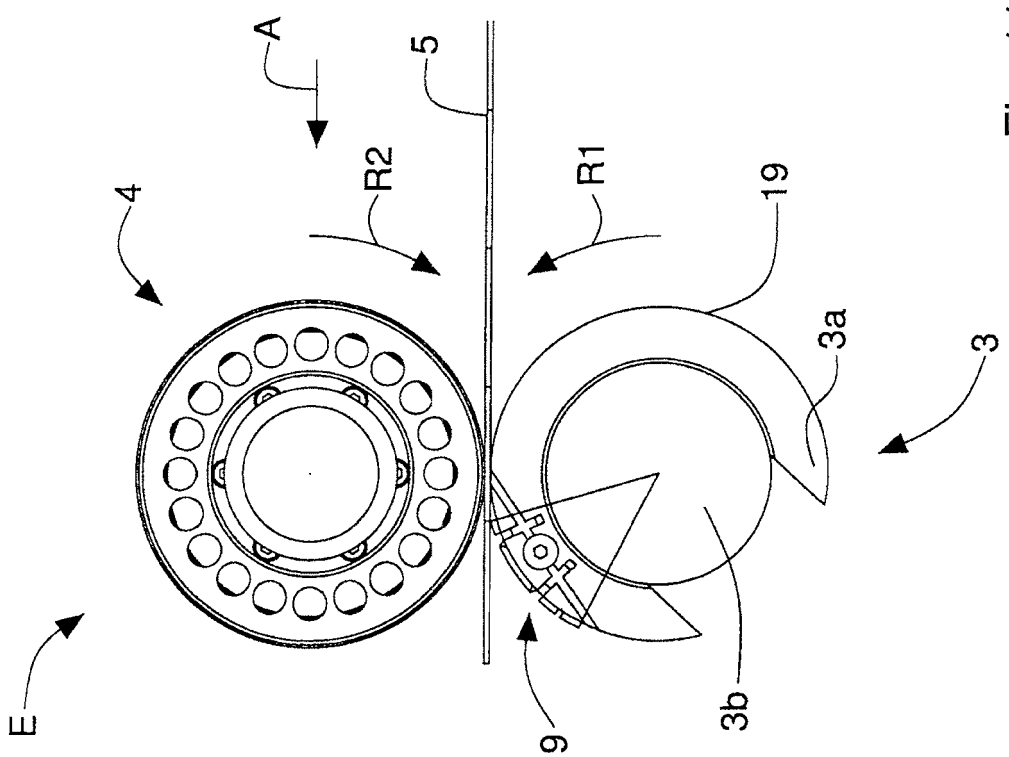


Fig. 11

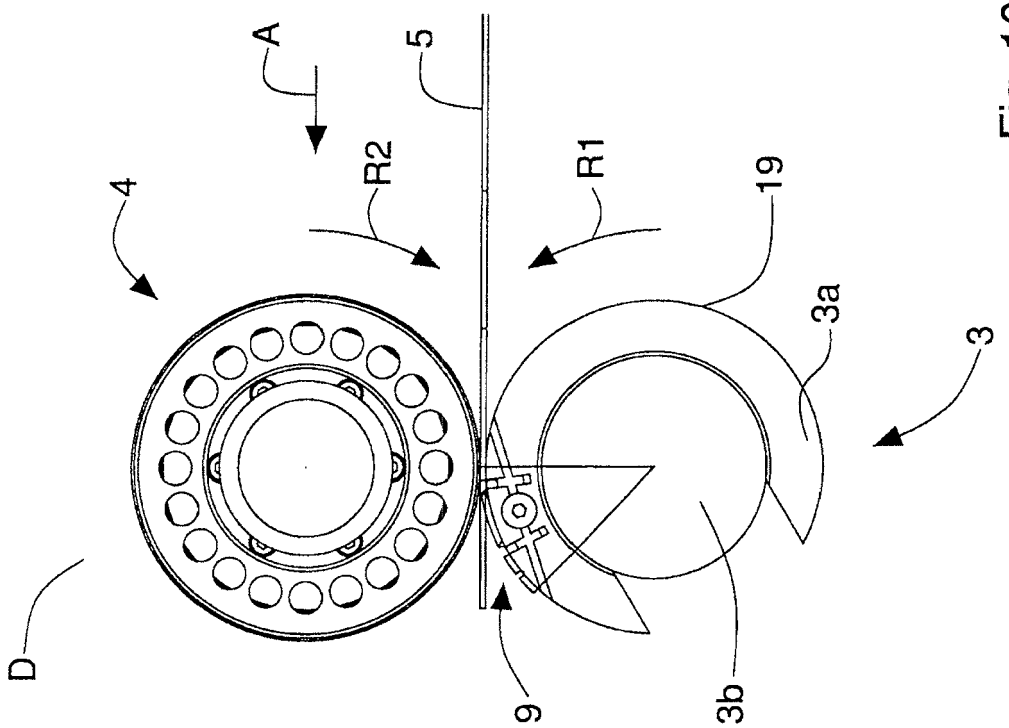
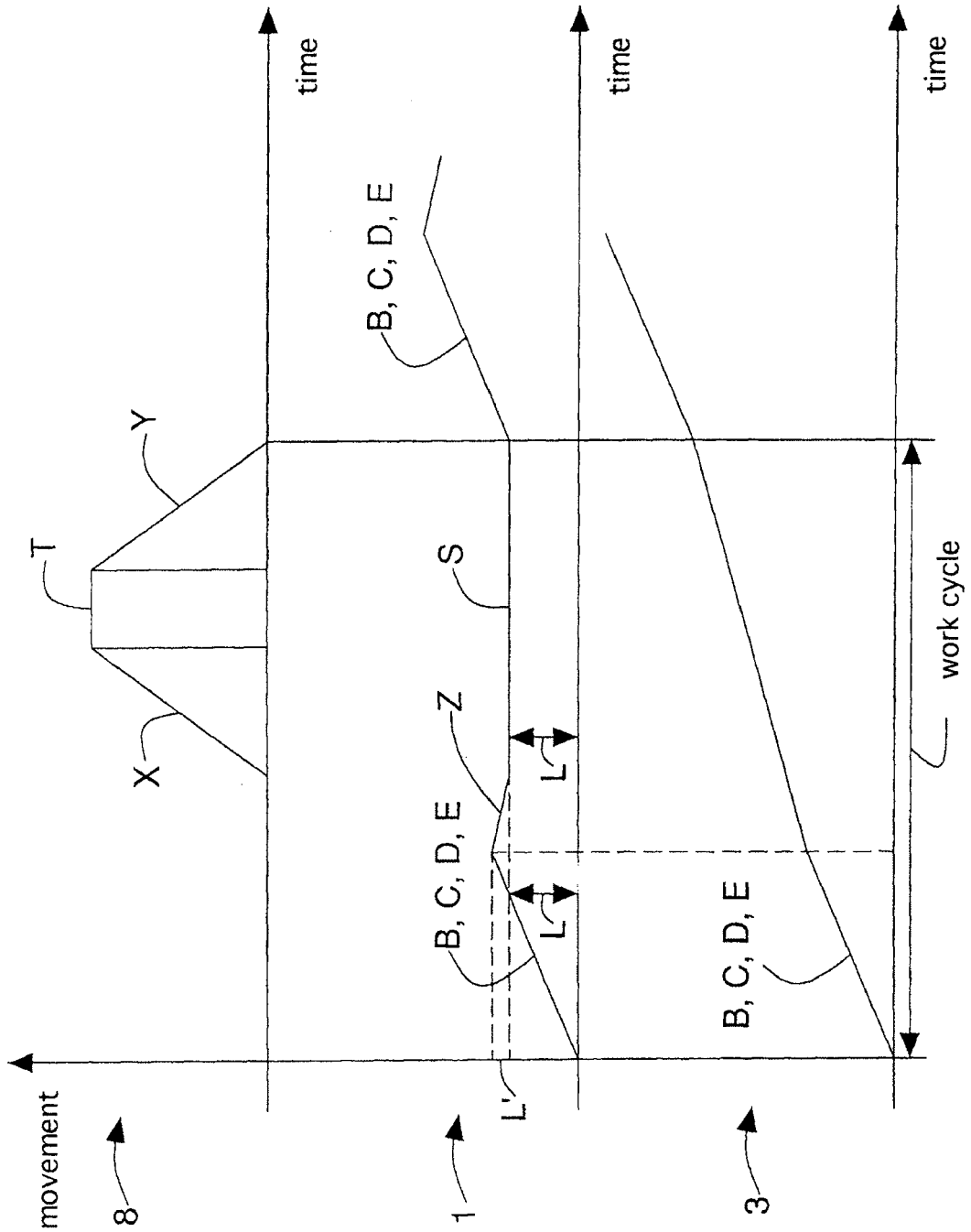


Fig. 10


movement
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time
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Y
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B, C, D, E
B, C, D, E
B, C, D, E
L'
L'
L'
work cycle
8
1
3

Fig. 12

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Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 July 2016	Canelas, Rui

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