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(54) APPARATUS AND METHOD TO MAKE BLANKS

VORRICHTUNG UND VERFAHREN ZUM STANZEN VON ZUSCHNITTEN

MACHINE ET PROCEDE POUR LA FABRICATION DE POSES

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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] EP 1.103.369 A2 discloses an apparatus of the known type to make blanks starting from a sheet of material upon which the preamble of claim 1 is based. The etching means also comprise a first roller to which a second roller, parallel to said first roller is associated.

[0015] One purpose of the present invention is to provide an apparatus which is more flexible than known apparatuses.

[0016] 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.

[0017] 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.

[0018] 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.

[0019] According to the invention, an apparatus is provided as defined in claim 1. According to the invention, a method is provided as defined in claim 11.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] 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 ap-

paratus in fig. 1.

DETAILED DESCRIPTION OF SOME PREFERENTIAL FORMS OF EMBODIMENT

[0021] 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).

[0022] 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.

[0023] 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.

[0024] 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.

[0025] 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.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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 supported 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.

[0030] 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.

[0031] The rolls 1, 2, 3 and 4 are mounted on a plate 7, interposed between them and the drive means 14, 17.

[0032] 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.

[0033] 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.

[0034] 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.

[0035] 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.

[0036] 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.

[0037] 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.

[0038] With reference to figs. 3 and 4 two different forms of embodiment of the first roll 3 are shown.

[0039] 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 L1 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.

[0040] 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.

[0041] 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.

[0042] Moreover, it should be noted that the circumferential lengths or extensions L1 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).

[0043] 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.

[0044] 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.

[0045] 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.

[0046] 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).

[0047] 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.

[0048] The blank 30 is provided with four lines prepared 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.

[0049] The latter are made with etching means visible in figs. 3 and 5 comprising the first roll. Each internal line of intended folding 31b 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 31a are defined by a continuous pre-creasing, longitudinal and substantially parallel to that of the internal lines of intended folding 31b. The pre-creasing of the external lines of intended folding 31a 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.

[0050] 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.

[0051] 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.

[0052] 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.

[0053] 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.

[0054] 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.

[0055] The latter define the profile and the length of the cut, features which it is possible to modify by replacing the blade means 8a.

[0056] 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.

[0057] 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.

[0058] 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.

[0059] 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.

[0060] 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.

[0061] 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.

[0062] 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.

[0063] 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.

[0064] 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.

[0065] 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.

[0066] 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'.

[0067] 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.

[0068] 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.

[0069] 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.

[0070] 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.

[0071] 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.

[0072] 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.

[0073] 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.

[0074] 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.

[0075] 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.

[0076] Variants and/or additions to what is described above and/or what is shown in the drawings are also possible.

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 roller (3) to which at least a second roller (4), parallel to said first roller (3), is associated, **and in that** said first roller (3) comprises a first portion (3a), substantially in the form of a hollow body, and a second portion (3b), substantially conformed as an internal bar, coaxial to said hollow body, said first portion (3a) being provided with cutter means (9) on an external surface (19) and being removably associated with said second portion (3b).
2. Apparatus as in claim 1, **characterized in that** said cutter means (9) comprise one or more cutters (21, 22, 23) made in correspondence with an angular portion (18) of said first portion (3a) having a circumferential length (L1, L2) correlated to the length (L) of said blank (30, 130), at least said cutter means (9) being replaceable.
3. Apparatus as in claim 1 or 2, **characterized in that** the external diameter (D1) of said first portion (3a) is pre-determined and constant while the circumferential length (L1, L2) and/or the height (H) of said cutter means is variable depending on the etching and/or cutting operations to be carried out on said sheet (5).
4. 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).
5. Apparatus as in any claim hereinbefore, **characterized in that** said feed means (1, 2) comprise pre-creasing etching means (31a) defining external lines of preparation for bending in said blank (30).
6. Apparatus as in any claim hereinbefore, **character-**

ized 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).

7. 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).

8. Apparatus as in claim 7, **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.

9. 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.

10. 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.

11. 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** it also comprises an assembly step, preliminary to said steps, during which said etching and cutting means (3, 4) are assembled with respect to each other, connecting in a removable manner a first portion (3a), substantially in the form of a hollow body, to a second portion (3b), substantially conformed as an internal bar, coaxial to said hollow body, wherein said first portion (3a) is provided with cutter means (9).

12. Method as in claim 11, **characterized in that** said etching and/or cutting is performed by said first roll (3) by means of said cutter means (9) protruding by a determinate height (H) above an external surface (19) of said first roll (3) for an angular portion (18) having a circumferential length (L1, L2) correlated

to the length (L) of said blank (30; 130).

13. Method as in claim 12, **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).

14. Method as in claim 13, **characterized 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).

15. Method as in claim 14, **characterized 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).

16. Method as in claim 14 or 15, **characterized in that** during the rotation of said first roll (3), 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).

17. Method as in claim 16, **characterized 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).

18. Method as in any claim from 11 to 17, **characterized in that** the external diameter (D1) of said first portion (3a) is predetermined and constant, whilst the circumferential length (L1, L2) and/or the height (H) of said cutter means (9) is variable as a function of the etching and/or cutting operations performed on said sheet (5), so that it is possible to replace said first portion (3a) so as to change said cutter means (9), maintaining said external diameter (D1) constant.

Patentansprüche

1. Vorrichtung (20) zur Erzeugung von Zuschnitten (30; 130) aus einem Blatt (5) aus Material, das von Zuführmitteln (1, 2) in einer Zuführrichtung (A) zuge-

- führt wird, umfassend Ätz- und Schneidemittel (3, 4), die dazu geeignet sind, Ätzungen (31; 131) und/oder Längsschnitte (32; 132; 135) an dem genannten Blatt (5), parallel zur genannten Zuführrichtung (A), durchzuführen, und Schermittel (8), die dazu geeignet sind, das genannte Blatt (5) abzuschneiden, um den genannten Zuschnitt (30; 130) davon zu trennen, **dadurch gekennzeichnet, dass** die genannten Ätz- und Schneidemittel (3, 4) zumindest eine erste Rolle (3) umfassen, welcher zumindest eine zweite Rolle (4), die zur genannten ersten Rolle (3) parallel ist, zugeordnet ist, **und dass** die genannte erste Rolle (3) einen ersten Abschnitt (3a), im Wesentlichen in Form von einem Hohlkörper, und einen zweiten Abschnitt (3b), im Wesentlichen als ein Innenstab ausgestaltet, koaxial zum genannten Hohlkörper, umfasst, wobei der genannte erste Abschnitt (3a) mit Schneideeinrichtungen (9) an einer äußeren Fläche (19) versehen ist und mit dem genannten zweiten Abschnitt (3b) abnehmbar verbunden ist.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die genannten Schneideeinrichtungen (9) einen oder mehrere Messer (21, 22, 23) umfassen, die an einem Winkelabschnitt (18) des genannten ersten Abschnitts (3a) mit einer Umfangslänge (L1, L2) geformt sind, die mit der Länge (L) des genannten Zuschnitts (30, 130) in Beziehung steht, wobei zumindest die genannten Schneideeinrichtungen (9) austauschbar sind.
3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Außendurchmesser (D1) des genannten ersten Abschnitts (3a) vorbestimmt und gleichbleibend ist, während die Umfangslänge (L1, L2) und/oder die Höhe (H) der genannten Schneideeinrichtungen (9) je nach den Ätz- und/oder Schneidvorgängen veränderlich ist, die am genannten Blatt (5) durchzuführen sind.
4. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannten Zuführmittel (1, 2) zumindest zwei entgegengesetzte Walzen (1, 2) umfassen, zwischen denen das genannte Blatt (5) imstande ist, in der genannten Zuführrichtung (A) vorwärts zu laufen.
5. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannten Zuführmittel (1, 2) Vorfalt-Ätzmittel (31a) umfassen, welche äußere Vorbereitungslinien zur Einbiegung des genannten Zuschnitts (30) definieren.
6. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannten Schermittel (8) in einem Abstand von einem Schneidbereich positioniert sind, der durch einen Berührungsbereich definiert ist, in welchem die genannte erste Walze (3) im Wesentlichen die genannte zweite Walze (4) tangiert, und zwar zumindest entlang einer Ausdehnung, die der Länge (L) des genannten Zuschnitts (30; 130) oder ganzzahligen Vielfachen der genannten Länge (L) gleich ist.
7. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannten Schermittel (8) eine Unterstützung (6) umfassen, die mit zumindest ersten feststehenden Klingenvorrichtungen (6a) ausgestattet ist.
8. Vorrichtung nach Anspruch 7, **dadurch gekennzeichnet, dass** andere Klingenvorrichtungen (8a) vorhanden sind, die mit den genannten ersten Klingenvorrichtungen (6a) zusammenarbeiten, um das genannte Blatt (5) zu scheren, um den genannten Zuschnitt (30; 130) zu erhalten und ihn von dem genannten Blatt (5) zu trennen, **und dass** die genannten anderen Klingenvorrichtungen (8a) eine angehobene Arbeitsstellung, und eine abgesenkte Nichtarbeitsstellung aufweisen.
9. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest die genannten Zuführmittel (1, 2) von ihrem eigenen Antriebsmittel (14) angetrieben sind, das von einer Steuer- und Kontrolleinheit (36) geregelt ist, die es stufenweise steuert.
10. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zumindest die genannten Zuführmittel (1, 2) automatische Achsenabstand-Einstellmittel einschließen, je nach dem Blatt (5), das zuzuführen ist.
11. Verfahren zur Erzeugung von Zuschnitten (30; 130) aus einem Blatt (5) aus Material, umfassend zumindest einen Zuführschritt, während welches das genannte Blatt (5), nach einer intermittierenden schrittweisen Bewegung, mittels Zuführmittel (1, 2), die in einer Zuführrichtung (A) zugeführt sind, vorgeschoben wird; einen Ätz- und/oder Schneideschritt, während welches Ätzungen (31; 131) und/oder Längsschnitte (32; 132; 135), parallel zur genannten Zuführrichtung (A), an dem genannten Blatt (5) von Ätz- und Schneidemitteln (3, 4) gemacht werden, und einen Trennschritt, während welches der genannte Zuschnitt (30; 130) von dem genannten Blatt (5) mittels Schermittel (8) getrennt wird, **dadurch gekennzeichnet, dass** es ferner einen Montageschritt, der die genannten Schritte vorausgeht, umfasst, während welches die genannten Ätz- und Schneidemittel (3, 4) zueinander montiert werden, indem ein erster Abschnitt (3a), im Wesentlichen in Form von einem Hohlkörper, mit einem zweiten Abschnitt (3b), im Wesentlichen als ein Innenstab ausgestaltet, koaxial

zum genannten Hohlkörper, abnehmbar verbunden wird, worin der genannte erste Abschnitt (3a) mit Schneideeinrichtungen (9) versehen ist.

12. Verfahren nach Anspruch 11, **dadurch gekennzeichnet, dass** das genannte Ätzen und/oder Schneiden von der genannten ersten Walze (3) mittels der genannten Schneideeinrichtungen (9) durchgeführt wird, die um eine festgelegte Höhe (H) über eine Außenfläche (19) der genannten ersten Walze (3) entlang einen Winkelabschnitt (18) mit einer Umfangslänge (L1, L2) herausragen, die mit der Länge (L) des genannten Zuschnitts (30, 130) in Beziehung steht.

13. Verfahren nach Anspruch 12, **dadurch gekennzeichnet, dass** der genannte Ätz- und/oder Schneideschritt während des genannten Zuführschrittes stattfindet und einen ersten Teilschritt umfasst, in welchem die genannte erste Walze (3) und die genannte zweite Walze (4) sich von einer anfänglichen Winkelstellung (B) bis zu einer abschließenden Winkelstellung (D) drehen und die genannten Schneideeinrichtungen (9) das genannte Blatt (5) der Länge nach an einem Schneidbereich, während eines spezifischen Berührungsteilschrittes der genannten ersten Walze (3) mit der genannten zweiten Walze (4), ätzen und/oder schneiden.

14. Verfahren nach Anspruch 13, **dadurch gekennzeichnet, dass** der genannte Ätz- und/oder Schneideschritt einen anderen Teilschritt umfasst, in welchem die genannte erste Walze (3) und die genannte zweite Walze (4) sich von der genannten abschließenden Winkelstellung (D) bis zu einer Auskoppungs-Winkelstellung (E) drehen, in welcher die genannten Schneideeinrichtungen (9) von dem genannten Blatt (5) ausgekoppelt werden und das genannte Blatt (5) nicht ätzen und/oder schneiden.

15. Verfahren nach Anspruch 14, **dadurch gekennzeichnet, dass** während des genannten ersten Teilschrittes und des genannten anderen Teilschrittes die genannte erste Walze (3), die genannte zweite Walze (4) und die genannten Zuführmittel (1, 2) nach dem gleichen Bewegungsgesetz, durch Steuer- und Kontrollmittel (36) gesteuert, gedreht werden.

16. Verfahren nach Anspruch 14 oder 15, **dadurch gekennzeichnet, dass** während der Umdrehung der genannten ersten Walze (3) die genannten Zuführmittel (1, 2) in eine Richtung (Z) gedreht werden, die der vorherigen entgegengesetzt ist, und zwar derart, dass das genannte Blatt (5) um eine Menge (L') zurückgezogen wird, die im Wesentlichen derjenigen gleich ist, die während der Umdrehung der genannten ersten Walze (3) von der genannten abschließenden Winkelstellung (D) zur genannten Auskopp-

lungsstellung (E) zurückgelegt wird.

17. Verfahren nach Anspruch 16, **dadurch gekennzeichnet, dass** die genannten Zuführmittel (1, 2) und daher das genannte Blatt (5) angehalten und in einer Pausenstellung (S) stationär gehalten werden, bis die genannte erste Walze (3) die genannte anfängliche Winkelstellung (B) erreicht.

18. Verfahren nach einem der Ansprüche 11 bis 17, **dadurch gekennzeichnet, dass** der Außendurchmesser (D1) des genannten ersten Abschnitts (3a) vorbestimmt und gleichbleibend ist, während die Umfangslänge (L1, L2) und/oder die Höhe (H) der genannten Schneideeinrichtungen (9) in Abhängigkeit von den Ätz- und/oder Schneidvorgängen veränderlich ist, die am genannten Blatt (5) durchgeführt werden, so dass es möglich ist, den genannten ersten Abschnitt (3a) zu ersetzen, um die genannten Schneideeinrichtungen (9) auszutauschen, wobei der genannte Außendurchmesser (D1) konstant gehalten wird.

25 Revendications

1. Appareil (20) de réalisation de flans (30; 130) à partir d'une feuille (5) de matière entraînée par des moyens (1, 2) d'avance dans une direction d'avance (A), comprenant des moyens (3, 4) de gravure et de découpe, pouvant effectuer des entailles (31 ; 131) et/ou des découpes longitudinales (32 ; 132, 135) sur ladite feuille (5), parallèlement à ladite direction d'avance (A), et des moyens (8) de rognage aptes à cisailer ladite feuille (5) de façon à séparer ledit flan (30 ; 130) de celle-ci, **caractérisé en ce que** lesdits moyens (3, 4) de gravure et de découpe comportent au moins un premier galet (3) auquel est associé au moins un deuxième galet (4) parallèle audit premier galet (3), et **en ce que** ledit premier galet (3) comprend une première partie (3a), se présentant sensiblement sous la forme d'un corps creux, et une deuxième partie (3b), sensiblement configurée comme une barre intérieure, coaxiale audit corps creux, ladite première partie (3a) étant munie de moyens de coupe (9) sur une surface extérieure (19) et étant associée de façon amovible à ladite deuxième partie (3b).

2. Appareil selon la revendication 1, **caractérisé en ce que** lesdits moyens (9) de coupe comprennent un ou plusieurs couteaux (21, 22, 23) formés au niveau d'une partie angulaire (18) de ladite première partie (3a) dont la longueur circonférentielle (L1, L2) est corrélée à la longueur (L) dudit flan (30, 130), au moins lesdits moyens (9) de coupe étant remplaçables.

3. Appareil selon la revendication 1 ou 2, **caractérisé en ce que** le diamètre extérieur (D1) de ladite première partie (3a) est pré-déterminé et constant, tandis que la longueur circonférentielle (L1, L2) et/ou la hauteur (H) desdits moyens de coupe est variable en fonction des opérations de gravure et/ou de découpe à effectuer sur ladite feuille (5). 5
4. Appareil selon n'importe laquelle des revendications précédentes, **caractérisé en ce que** lesdits moyens (1, 2) d'avance comportent au moins deux rouleaux opposés (1, 2) entre lesquels ladite feuille (5) peut avancer dans ladite direction d'avance (A). 10
5. Appareil selon n'importe laquelle des revendications précédentes, **caractérisé en ce que** lesdits moyens (1, 2) d'avance comprennent des moyens (31a) de gravure de pré-pliage définissant des lignes extérieures de préparation au pliage dans ledit flan (30). 15
6. Appareil selon n'importe laquelle des revendications précédentes, **caractérisé en ce que** lesdits moyens (8) de rognage sont situés à une distance d'une zone de découpe, qui est définie par une zone de tangence dans laquelle ledit premier galet (3) est sensiblement tangent audit deuxième galet (4), au moins le long d'une étendue égale à la longueur (L) dudit flan (30 ; 130), ou à des multiples entiers de ladite longueur (L). 20
7. Appareil selon n'importe laquelle des revendications précédentes, **caractérisé en ce que** lesdits moyens (8) de rognage comprennent un support (6) muni d'au moins des premiers moyens (6a) de lame fixe. 25
8. Appareil selon la revendication 7, **caractérisé en ce que** d'autres moyens (8a) de lame sont prévus, qui coopèrent avec lesdits premiers moyens (6a) de lame pour cisailer ladite feuille (5) et obtenir ledit flan (30 ; 130) et pour le séparer de ladite feuille (5), et **en ce que** lesdits autres moyens (8a) de lame ont une position haute de fonctionnement et une position basse de non-fonctionnement. 30
9. Appareil selon n'importe laquelle des revendications précédentes, **caractérisé en ce que** au moins lesdits moyens (1, 2) d'avance sont entraînés par leur propre organe d'entraînement (14) contrôlé par une unité de contrôle et commande (36), pas à pas. 35
10. Appareil selon n'importe laquelle des revendications précédentes, **caractérisé en ce que** au moins lesdits moyens (1, 2) d'avance comportent des moyens de réglage automatique d'entraxe, en fonction de la feuille (5) à faire avancer. 40
11. Procédé de réalisation de flans (30 ; 130) à partir d'une feuille (5) de matière, comprenant au moins une étape d'avance pendant laquelle ladite feuille (5) est avancée, par un mouvement intermittent pas à pas, par des moyens (1, 2) d'avance dans une direction d'avance (A) ; une étape de gravure et/ou de découpe, pendant la quelle sont effectuées des entailles (31 ; 131) et/ou des découpes longitudinales (32 ; 132, 135), parallèlement à ladite direction d'avance (A), sur ladite feuille (5), par des moyens (3, 4) de gravure et de découpe, et une étape de séparation, pendant laquelle ledit flan (30 ; 130) est séparé de ladite feuille (5) par des moyens (8) de rognage, **caractérisé en ce qu'il** comprend par ailleurs une étape d'assemblage, préliminaire auxdites étapes, pendant laquelle lesdits moyens (3, 4) de gravure et de découpe sont assemblés les uns aux autres, et relie ainsi de façon amovible une première partie (3a), se présentant sensiblement sous la forme d'un corps creux, à une deuxième partie (3b), sensiblement configurée comme une barre intérieure, coaxiale audit corps creux, dans lequel ladite première partie (3a) est munie de moyens (9) de coupe. 45
12. Procédé selon la revendication 11, **caractérisé en ce que** lesdites gravure et/ou découpe sont effectuées par ledit premier galet (3) au moyen desdits moyens (9) de coupe qui font saillie sur une hauteur (H) déterminée au dessus d'une surface extérieure (19) dudit premier galet (3) le long d'une partie angulaire (18) dont la longueur circonférentielle (L1, L2) est corrélée à la longueur (L) dudit flan (30 ; 130). 50
13. Procédé selon la revendication 12, **caractérisé en ce que** ladite étape de gravure et/ou de découpe est effectuée pendant ladite étape d'avance et comprend une première sous-étape dans laquelle ledit premier galet (3) et ledit deuxième galet (4) tournent depuis une position angulaire initiale (B) jusqu'à une position angulaire finale (D), et lesdits moyens (9) de coupe gravent et/ou découpent ladite feuille (5) dans la direction longitudinale, au niveau d'une zone de découpe, pendant une sous-étape spécifique de tangence dudit premier galet (3) avec ledit deuxième galet (4). 55
14. Procédé selon la revendication 13, **caractérisé en ce que** ladite étape de gravure et/ou de découpe comprend une autre sous-étape dans laquelle ledit premier galet (3) et ledit deuxième galet (4) tournent depuis ladite position angulaire finale (D) jusqu'à une position angulaire de dégagement (E), dans laquelle lesdits moyens (9) de coupe sont dégagés de ladite feuille (5) et ne gravent et/ou découpent ladite feuille (5). 55
15. Procédé selon la revendication 14, **caractérisé en ce que** pendant ladite première sous-étape et pendant ladite autre sous-étape, ledit premier galet (3),

ledit deuxième galet (4) et lesdits moyens (1, 2) d'avance sont tournés avec la même loi de mouvement, sous la commande de moyens (36) de contrôle et de commande.

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16. Procédé selon la revendication 14 ou 15, **caractérisé en ce que** pendant la rotation dudit premier galet (3), lesdits moyens (1, 2) d'avance sont tournés dans une direction (Z) inverse de la précédente, de façon à retirer ladite feuille (5) d'une quantité (L') sensiblement égale au parcours de rotation dudit premier galet (3) depuis ladite position angulaire finale (D) à ladite position de dégagement (E). 10
17. Procédé selon la revendication 16, **caractérisé en ce que** lesdits moyens (1, 2) d'avance et par conséquent ladite feuille (5) sont arrêtés et maintenus fixes dans une position de pause (S) jusqu'à ce que le premier galet (3) n'atteint ladite position angulaire initiale (B). 15 20
18. Procédé selon n'importe laquelle des revendications 11 à 17, **caractérisé en ce que** le diamètre extérieur (D1) de ladite première partie (3a) est pré-déterminé et constant, tandis que la longueur circonférentielle (L1, L2) et/ou la hauteur (H) desdits moyens (9) de coupe est variable en fonction des opérations de gravure et/ou de découpe effectuées sur ladite feuille (5), de façon à permettre le remplacement de ladite première partie (3a) pour changer lesdits moyens de coupe (9) tout en maintenant ledit diamètre extérieur (D1) constant. 25 30

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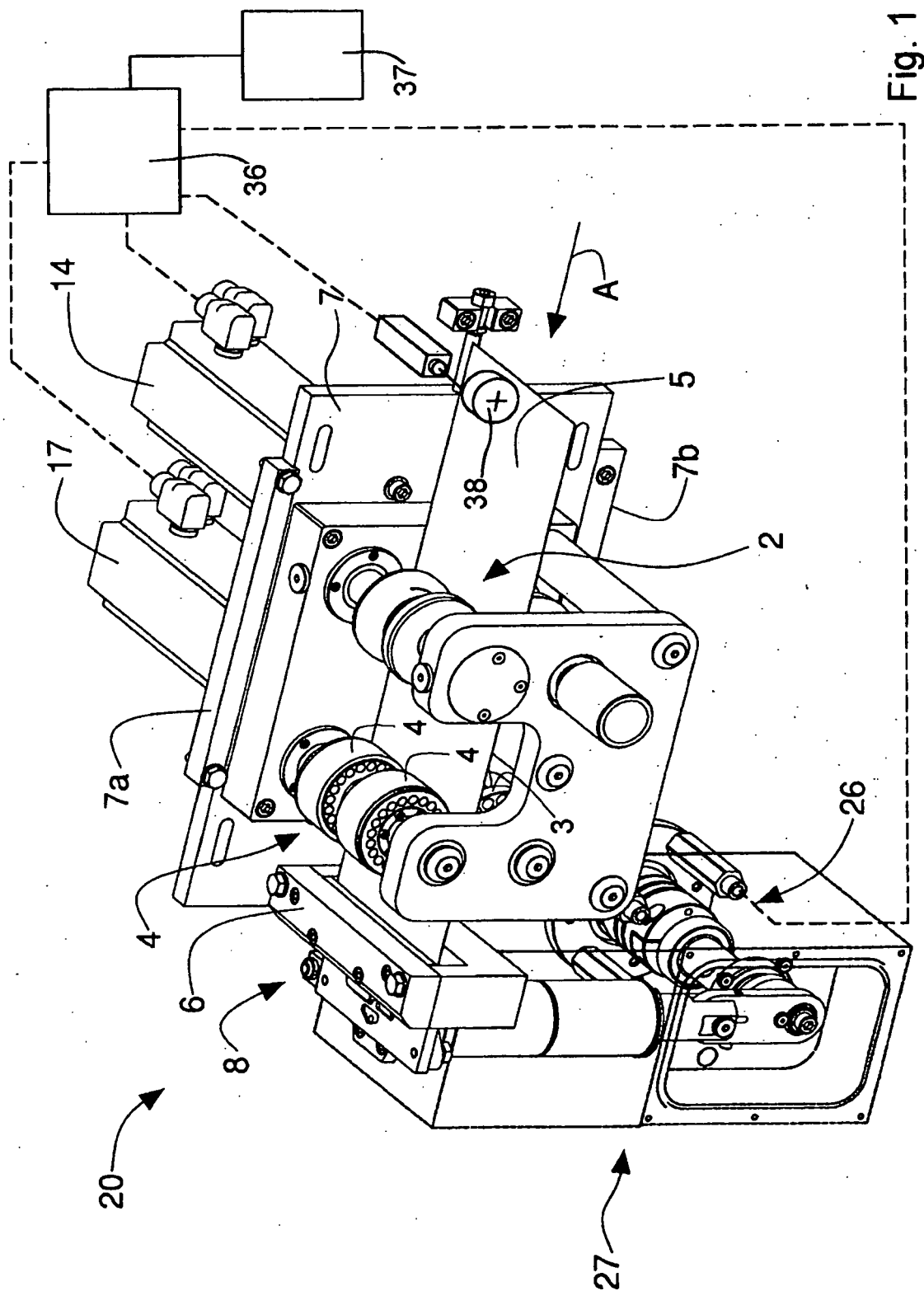


Fig. 1

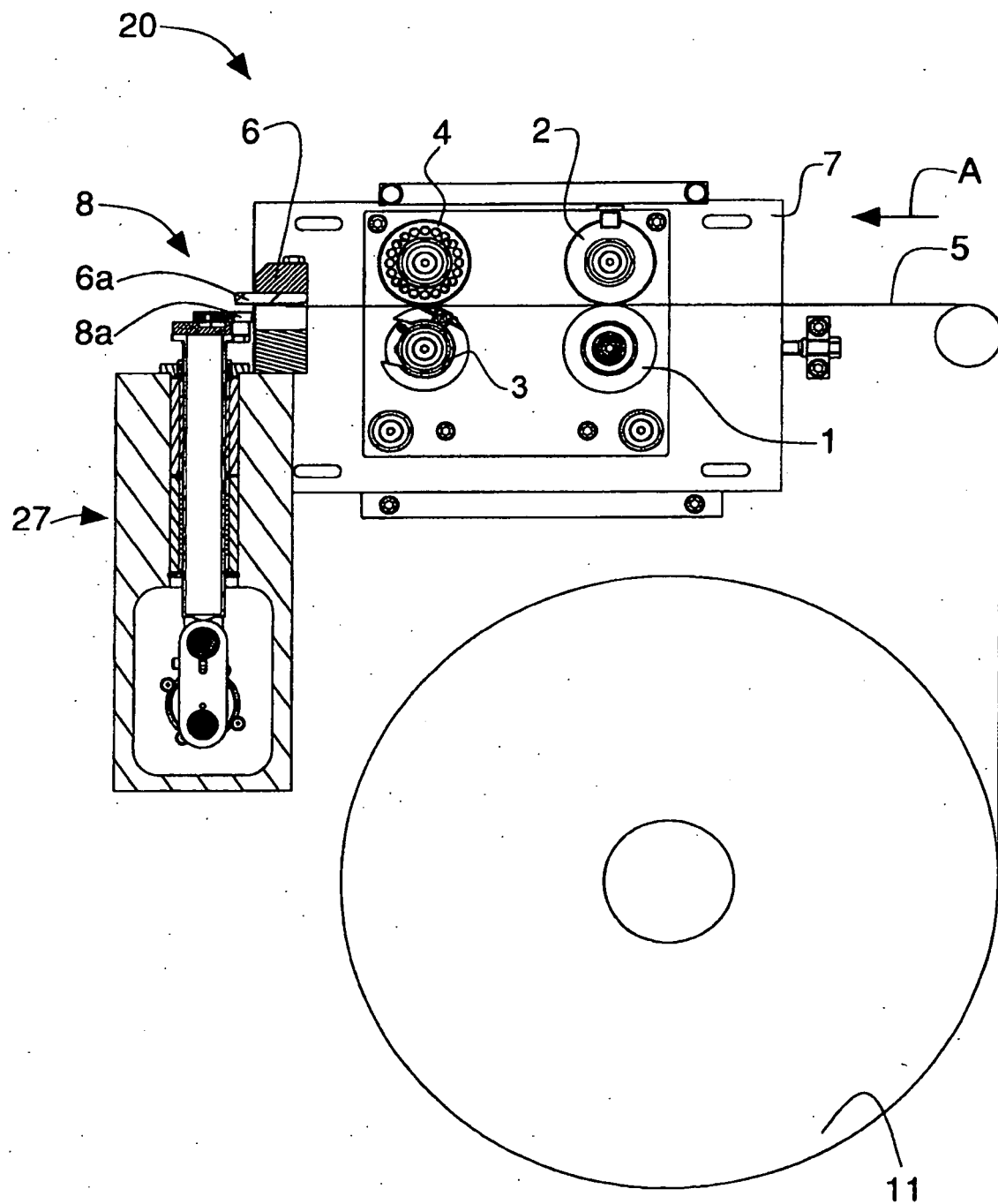


Fig. 2

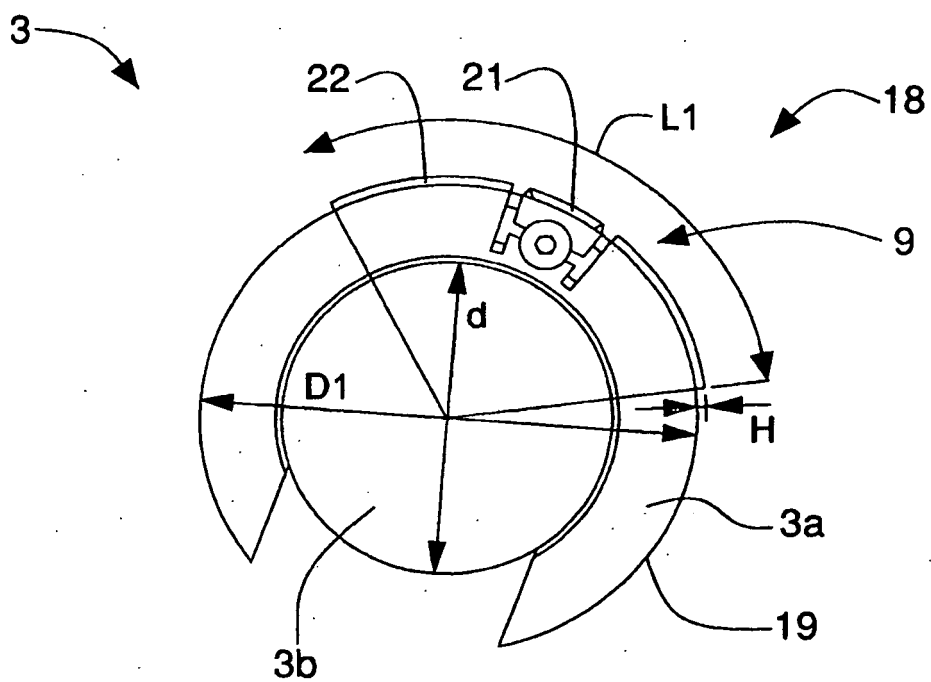


Fig. 3

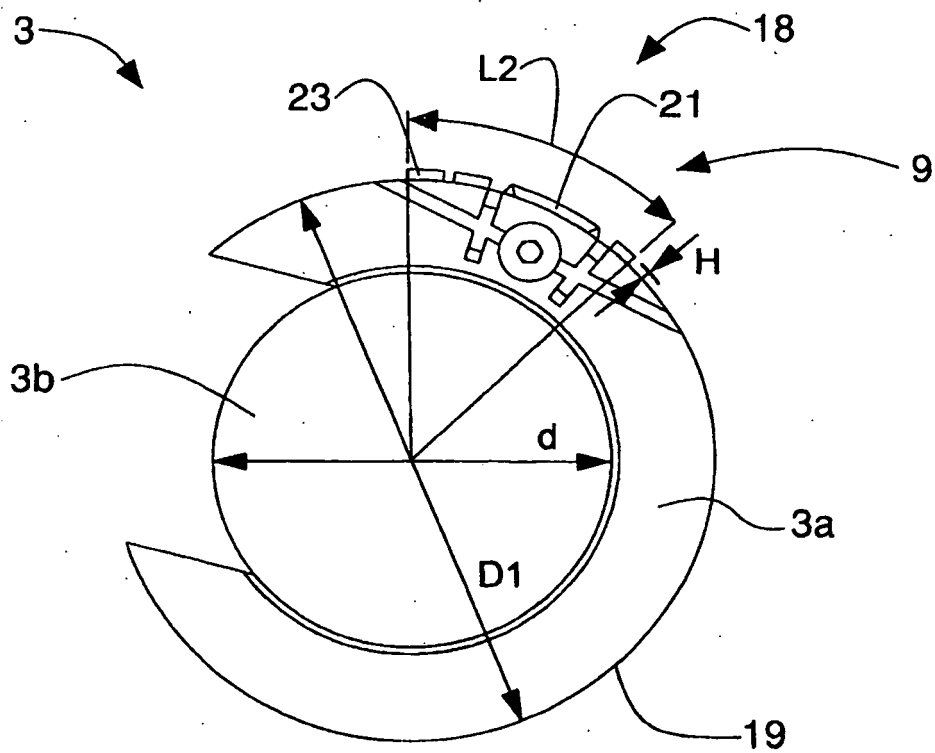
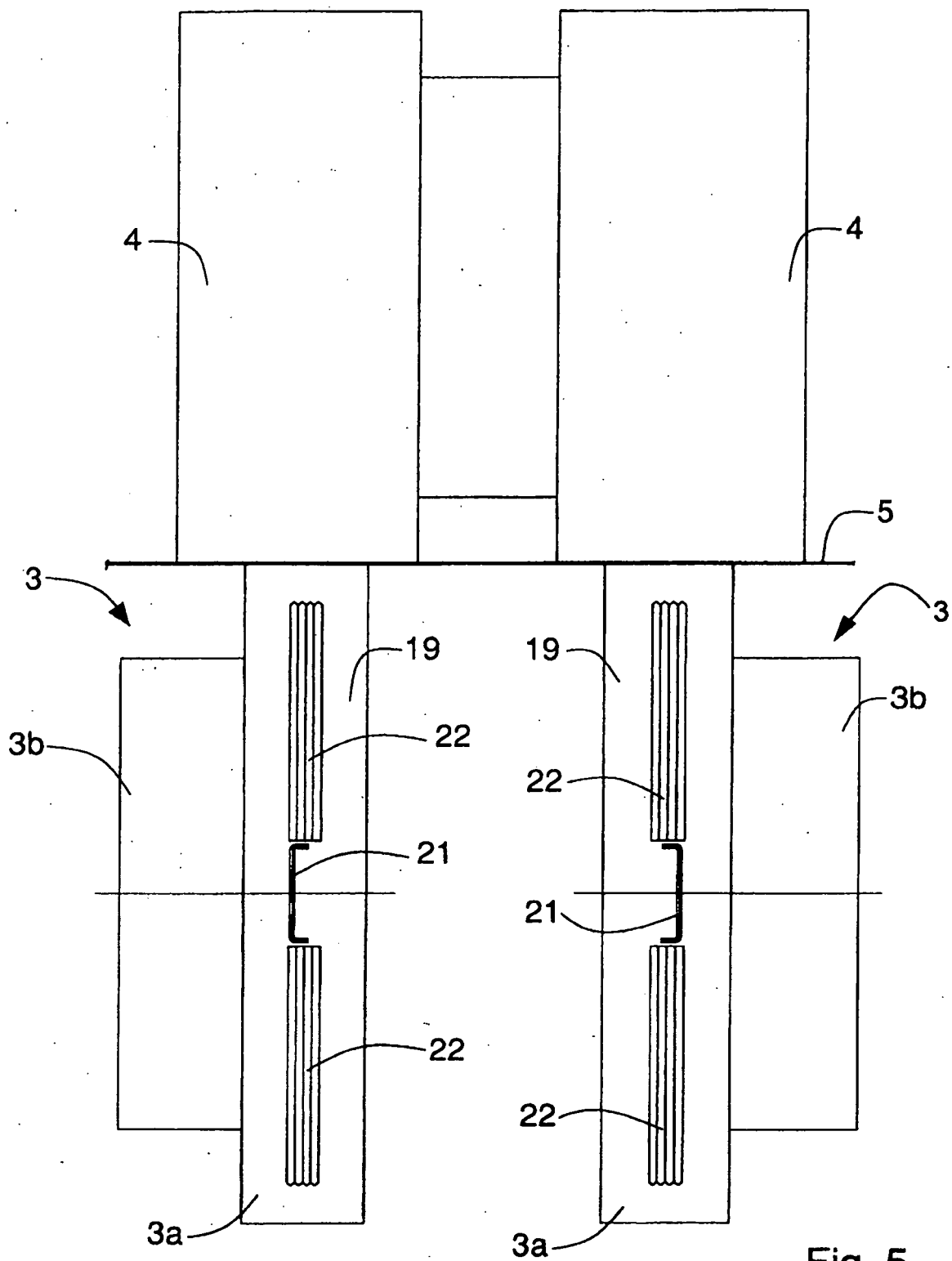


Fig. 4



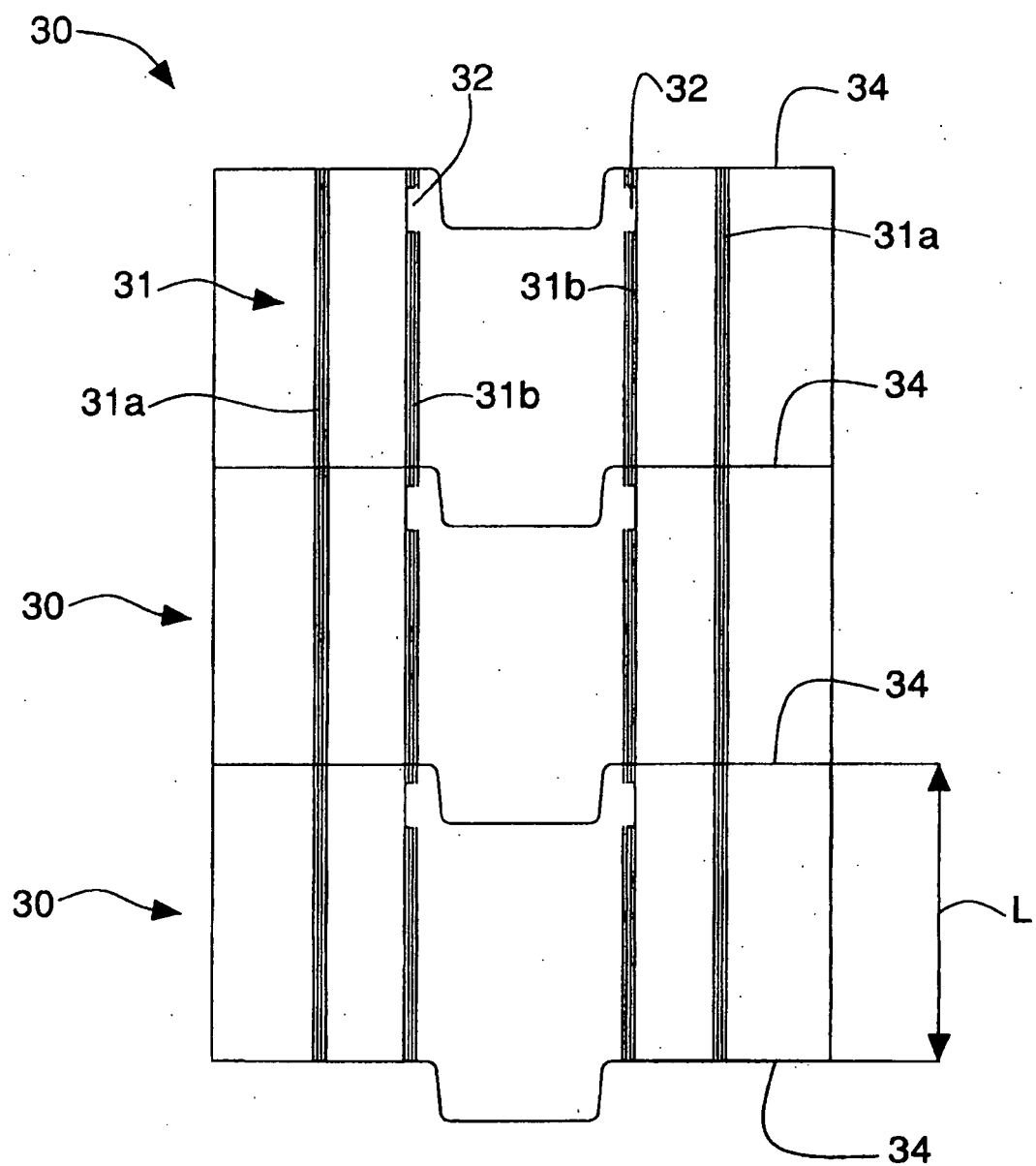


Fig. 6

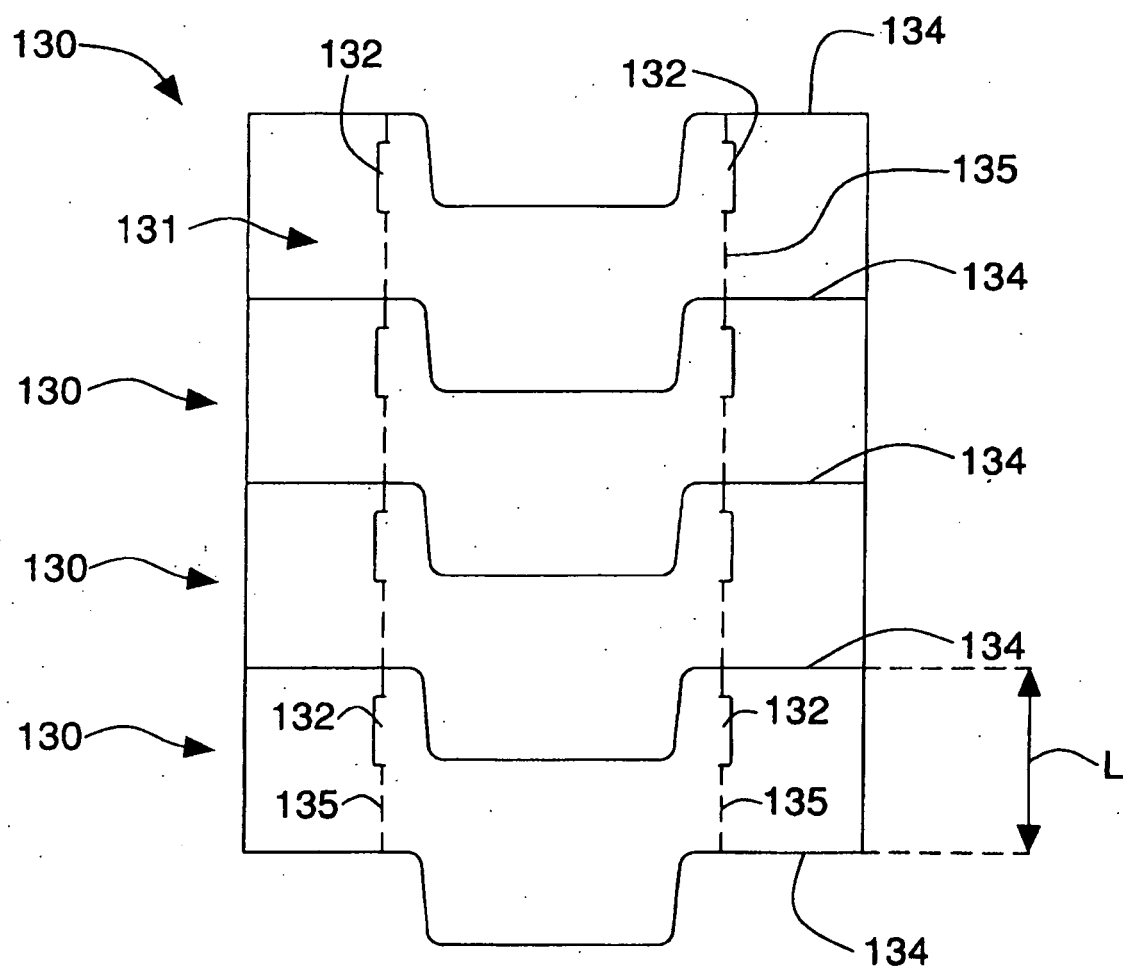
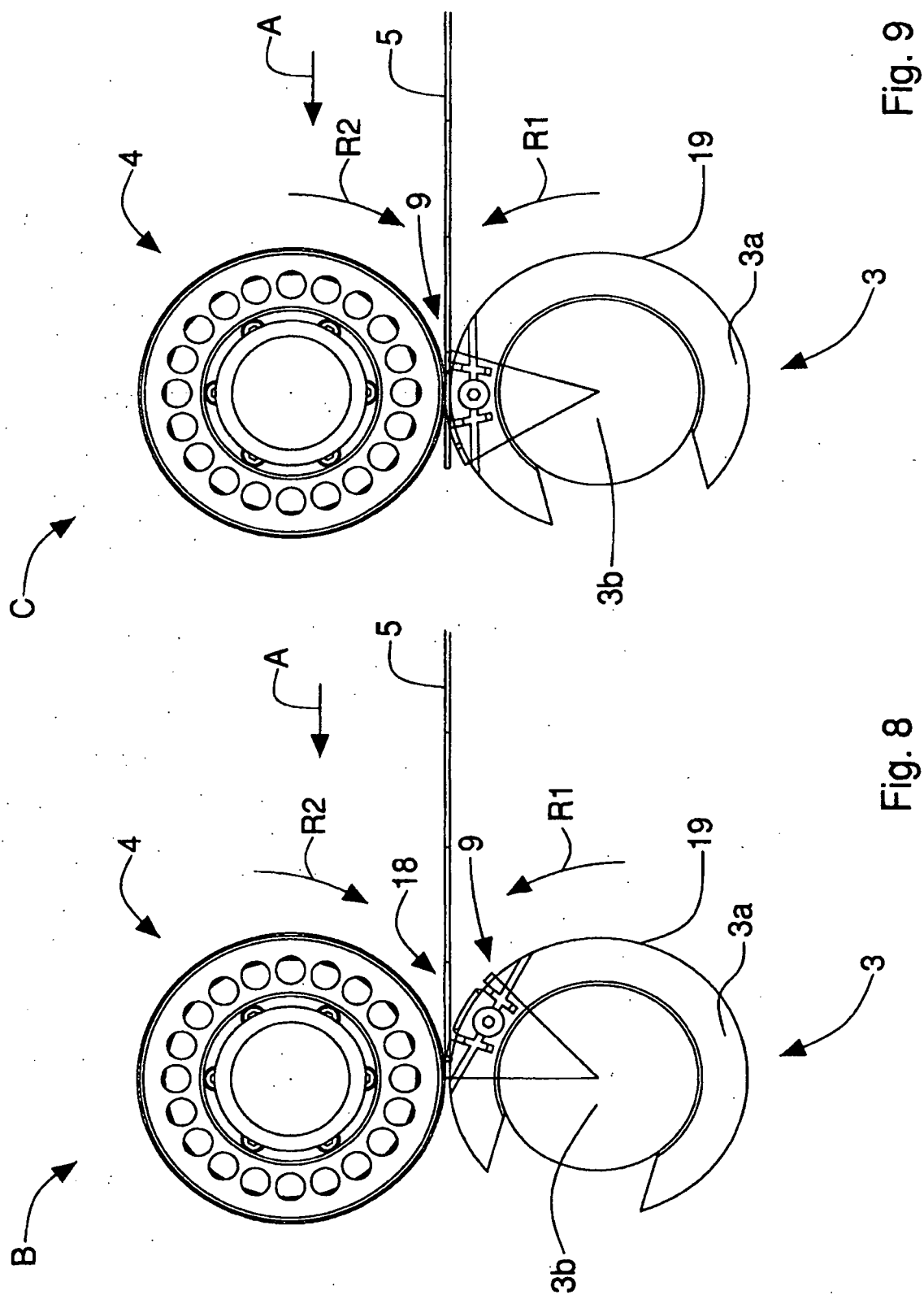


Fig. 7



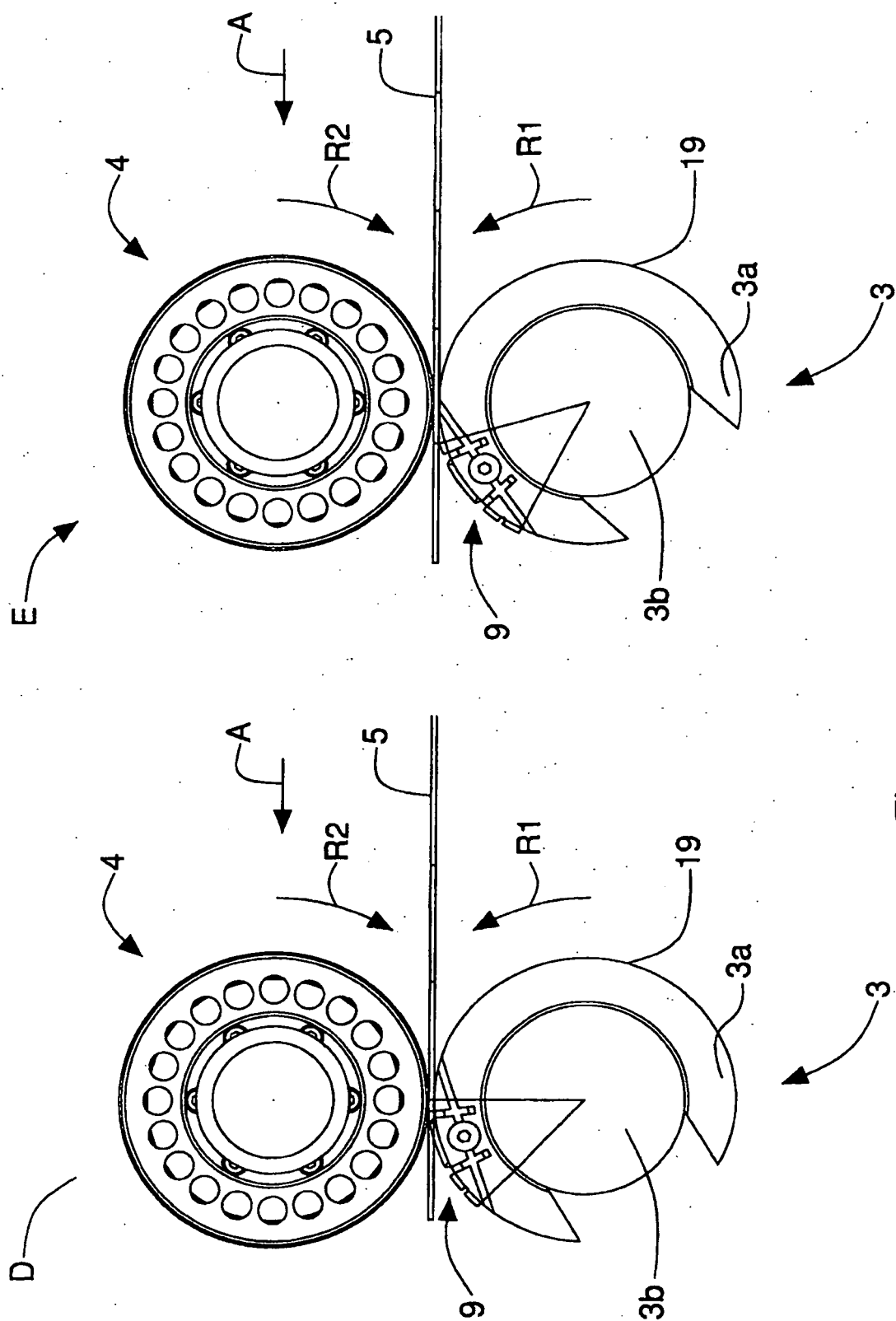


Fig. 11

Fig. 10

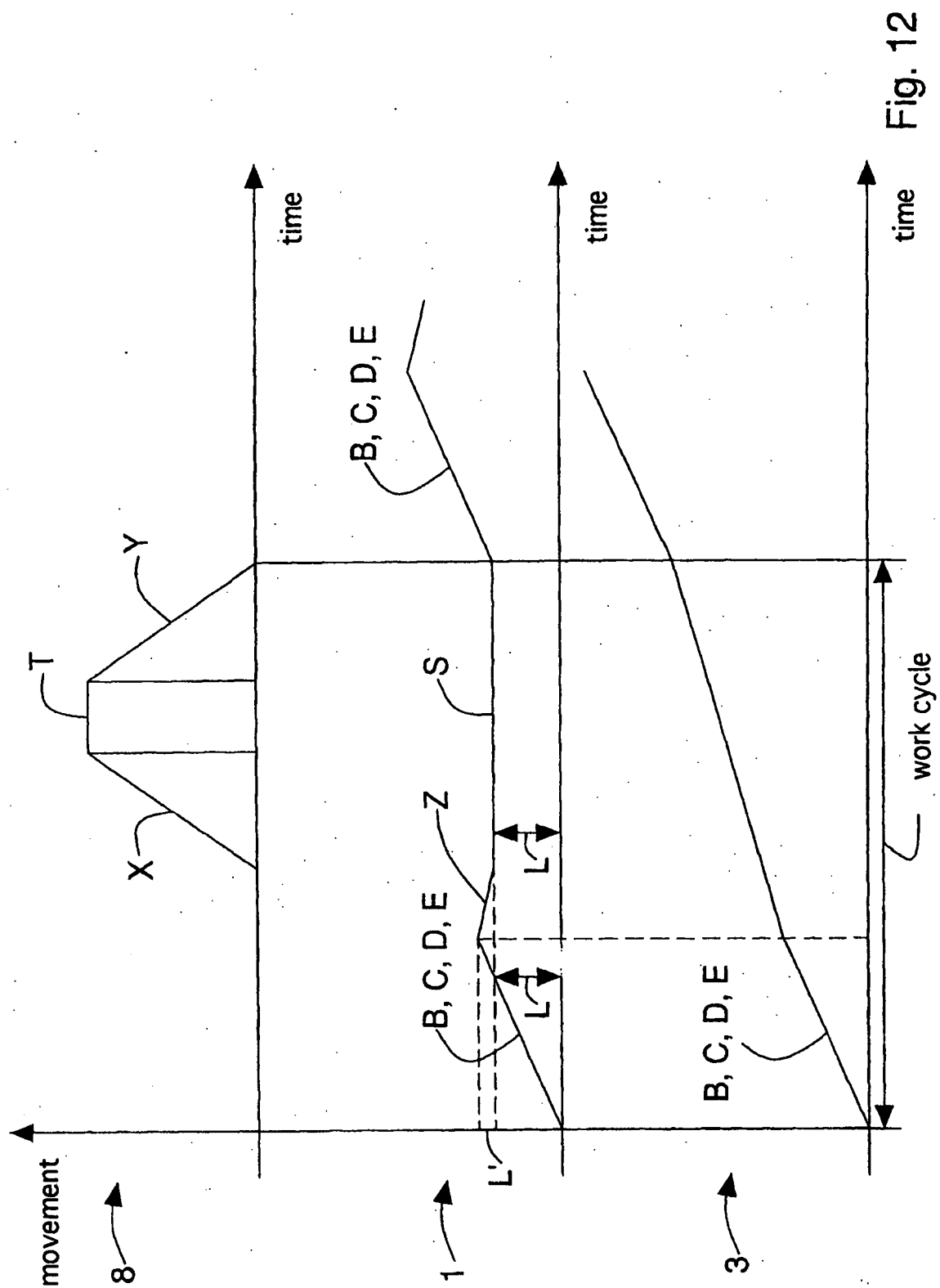


Fig. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1103369 A2 [0014]