

(19)



(11)

EP 4 400 435 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.07.2024 Bulletin 2024/29

(51) International Patent Classification (IPC):
B65B 11/46 (2006.01) B65B 11/54 (2006.01)
B65B 19/22 (2006.01) B65B 19/24 (2006.01)

(21) Application number: **23220394.3**

(52) Cooperative Patent Classification (CPC):
B65B 19/223; B65B 11/46; B65B 11/54;
B65B 19/228; B65B 19/24

(22) Date of filing: **27.12.2023**

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

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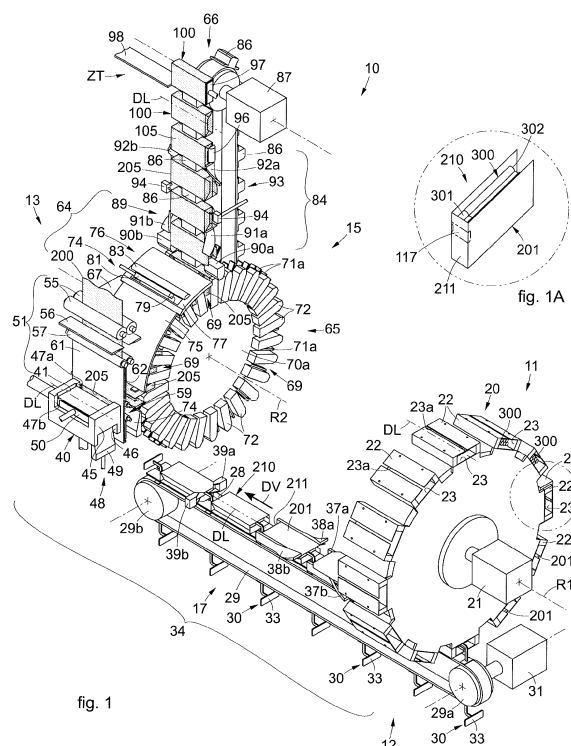
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(30) Priority: **29.12.2022 IT 202200027072**

(54) APPARATUS AND METHOD FOR FORMING SOFT PACKETS OF SMOKING ARTICLES

(57) Apparatus (10) for forming soft packets (100) of smoking articles (300) which have an elongated shape along a respective longitudinal axis (DL) with a respective lighting end (302) and a respective opposing mouth end (301). The apparatus comprises: a coupling unit (11) configured to form, along a first advance path (PA1), assemblies (210) comprising groups of smoking articles (300) partly wrapped by respective internal wrapping sheets

(201); a wrapping unit (13, 15) configured to wrap the assemblies (210) with respective covering sheets (205); a folding and transfer unit (34, 12) configured to fold internal wrapping sheets (201) around the respective groups of smoking articles (300), so as to fold the internal wrapping sheets (201) according to a cup-like shape and to move the assemblies (210) along a second advance path (PT) toward the wrapping unit (13, 15).

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns an apparatus and a method for forming soft packets of smoking articles, each comprising at least one internal containing casing for containing an organized group of smoking articles, and an external covering casing for covering the containing casing. In particular, the present invention finds application in the field of soft packets of smoking articles such as for example cigarettes, cigars, cigarillos, or similar products.

BACKGROUND OF THE INVENTION

[0002] Different known apparatuses for forming packets of smoking articles are known, for example designed and manufactured by the Applicant, which differ mainly in relation to the type of packet of smoking articles to be made, for example whether the packet is of the rigid type or of the soft type.

[0003] In particular, a rigid packet comprises a substantially rigid containing body, such as a sheet of paper or cardboard with a thickness of the order of one millimeter, having an openable hinged lid in which a containing casing containing the smoking articles is inserted. A soft packet, on the other hand, comprises a containing body made of flexible material, such as a very thin sheet of paper in the order of a tenth of a millimeter, which is open at the top, that is, without a lid, in which the containing casing is inserted.

[0004] In these apparatuses, whether they are designed to form rigid packets or soft packets, the smoking articles are fed in organized groups and disposed in such a way as to define, as a whole, substantially a parallelepiped around which the containing casing is then wrapped and therefore made.

[0005] Known apparatuses are provided with suitable folding means which, along a processing path, initially fold the wrapping sheet into a U-shape around the group of smoking articles, wrapping it on three sides; subsequently, the portions of the wrapping sheet protruding with respect to the group of smoking articles are folded around the latter in order to wrap it and therefore close it completely. In particular, the containing casing is made in such a way that its lower wall is without closing flaps and disposed in contact with the rear, or lighting, end of the smoking articles. The upper wall of the containing casing, on the other hand, is defined by the folded closing flaps that close the group of smoking articles at the upper part, and is disposed in contact with the mouth end provided with a filter thereof.

[0006] Usually, in a packet of smoking articles, the lower wall is disposed on the bottom of the containing body and the upper wall is facing upward, or exposed to the view, and accessible to the consumer to allow the extraction of the smoking articles.

[0007] In the specific case of soft packets, in order to keep the closing flaps of the upper wall folded over each other and prevent the latter from exiting from the upper aperture of the containing body, a printed element, such as a government stamp or a duty stamp for example, is glued transversely on the aforementioned upper wall and on two larger walls of the containing body.

[0008] A disadvantage of these soft packets, taking into account the presence of the printed element, is that, in order to extract the cigarettes from the containing casing, the consumer has to create an aperture by tearing off some portions of the closing flaps of the upper wall.

[0009] Furthermore, in known apparatuses, to complete the formation of the packet, whether it is rigid or soft, the latter is conveyed toward a covering unit in which the containing body is covered by means of an external covering casing made of transparent plastic material, for example polypropylene, which can be provided with a strip for its opening.

[0010] If, on the one hand, the use of plastic material for the covering casing allows the smoking articles present in the packet to be substantially hermetically isolated, keeping their physical and organoleptic characteristics substantially unchanged, on the other hand, it is a disadvantage from an ecological point of view.

[0011] There is therefore the need to perfect an apparatus and provide a method for forming a soft packet of smoking articles that can overcome at least one of the disadvantages of the state of the art.

[0012] To do this, it is necessary to solve at least the technical problem of perfecting an apparatus for forming a soft packet of smoking articles in which the disposition and formation of the containing casing simplifies access to the articles present inside it.

[0013] In particular, one purpose of the present invention is to provide an apparatus for forming a soft packet of smoking articles, also perfecting an apparatus normally used to form rigid packets.

[0014] Another purpose of the present invention is to provide an apparatus for forming a soft packet of smoking articles which is compact and highly efficient.

[0015] Another purpose of the present invention is to provide an apparatus and perfect a method for forming a soft packet of smoking articles which allow to reach high productivity.

[0016] Another purpose of the present invention is to provide an apparatus and perfect a method for forming a soft packet of smoking articles which is ecological and recyclable.

[0017] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0018] The present invention is set forth and characterized in the independent claims. The dependent claims

describe other characteristics of the present invention or variants to the main inventive idea.

[0019] In accordance with the above purposes and to resolve the technical problem disclosed above in a new and original way, also achieving considerable advantages compared to the state of the prior art, an apparatus according to the present invention for forming soft packets of smoking articles which have an elongated shape along a respective longitudinal axis with a respective lighting end and a respective opposing mouth end, comprises:

- a coupling unit configured to form, along a first advance path, assemblies comprising groups of smoking articles partly wrapped by respective internal wrapping sheets;
- a wrapping unit configured to wrap the assemblies with respective covering sheets;
- a folding and transfer unit disposed downstream of the coupling unit and configured to fold internal wrapping sheets around the respective groups of smoking articles, so as to fold the internal wrapping sheets according to a cup-like shape and to move the assemblies along a second advance path toward the wrapping unit.

[0020] In accordance with one aspect of the present invention, the apparatus also comprises a receiving and folding device interposed between the folding and transfer unit and the wrapping unit and configured to complete the folding of the internal wrapping sheets around the respective groups of smoking articles, so as to create at least one containing casing at a time, which is completely closed around the respective group of smoking articles.

[0021] In particular, the wrapping unit comprises:

- a plurality of forming pockets mobile along a third advance path;
- feed means configured to dispose on each occasion the covering sheets in front of a respective forming pocket;
- thrust means configured to thrust, on one flank, each assembly from the receiving and folding device against a respective covering sheet located in front of the forming pocket, in a direction of insertion, so as to fold the respective covering sheet into a U-shape while it is inserted, with the assembly, inside the forming pocket; and
- forming means configured to fold and close the covering sheets around the respective containing casings, creating corresponding covering casings, thus forming respective soft packets.

[0022] In accordance with another aspect, the folding and transfer unit comprises extraction members configured to be inserted into a corresponding housing seating of the coupling unit from a first open end and to thrust out of the housing seating through a second open end,

opposing the first open end, at least one assembly at a time, keeping the corresponding internal wrapping sheet folded into a U-shape on the smoking articles so that a central panel of the internal wrapping sheet is in contact with the lighting end, or the mouth end, of the smoking articles.

[0023] In accordance with another aspect, the first coupling unit comprises at least one rotating disc rotatable about a first axis of rotation provided with housing seatings which are disposed circumferentially, the extraction members being attached to advance means and configured to advance in a direction of advance parallel to the first axis of rotation.

[0024] In accordance with another aspect, the folding and transfer unit comprises first folding means comprising, in succession, at least one pair of first folding members configured to fold central flaps of a respective internal wrapping sheet in correspondence with a respective part folded into a U-shape, a pair of second folding members configured to fold rear lateral flaps of the respective internal wrapping sheet, a pair of third folding members configured to fold front lateral flaps of the respective internal wrapping sheet over the already folded rear lateral flaps, so as to fold the internal wrapping sheet according to a cup-like shape; and a pair of mobile fourth folding members configured to fold corner flaps of the respective internal wrapping sheet, against the lighting end or the mouth end of the group of smoking articles opposite that of the part folded into a U-shape.

[0025] In accordance with another aspect, the receiving and folding device comprises a housing drawer selectively mobile between a lowered position to accommodate at least one assembly at a time coming from the folding and transfer unit with the internal wrapping sheet closed in a cup-like shape around the smoking articles, and a raised position.

[0026] In accordance with another aspect, the receiving and folding device comprises second folding means comprising a fifth and a sixth folding member which are configured to respectively fold a smaller rear flap and a smaller front flap of a respective internal wrapping sheet on a side opposite to the side where the part folded into a U-shape is present.

[0027] The fifth folding member consists of a mobile element configured to fold the smaller rear flap of the respective internal wrapping sheet when the housing drawer is in the lowered position.

[0028] The sixth folding member consists of a folding wall of the receiving and folding device, the folding wall being disposed fixed and configured to fold the smaller front flap of the respective internal wrapping sheet against the smaller rear flap, cooperating with the housing drawer during the passage from the lowered position to the raised position.

[0029] In accordance with another aspect, the receiving and folding device has a first aperture facing toward the feed means, and a second aperture opposing the first aperture, sized so that the thrust means can pass through

it to allow the thrust of at least one assembly at a time through the first aperture, in the direction of insertion, which is perpendicular with respect to the disposition of the respective longitudinal axis of the smoking articles, in order to couple the assembly to a respective covering sheet.

[0030] The first and second aperture are aligned with the assembly when the housing drawer is in the raised position.

[0031] In accordance with another aspect, the feed means comprise, disposed in sequence, a pair of drawing rollers for feeding a feed belt, a cutting device for cutting the feed belt and making a plurality of the covering sheets, a pair of advance rollers for making the covering sheets just cut advance in a controlled manner from the feed belt in correspondence with the thrust means.

[0032] In accordance with another aspect, the apparatus also comprises two guide rollers disposed between the receiving and folding device and the plurality of forming pockets, the two guide rollers being located lying on a plane substantially perpendicular to the direction of insertion and configured so that the assemblies thrust by the thrust means pass through them.

[0033] The two guide rollers being also disposed at a distance such as to allow a correct coupling between a covering sheet and the corresponding containing casing, when the thrust means thrust the assembly into one of the forming pockets against the covering sheet.

[0034] In accordance with another aspect, the wrapping unit comprises both a wrapping wheel rotatable about a second axis of rotation and comprising the radially distributed forming pockets configured to accommodate respective assemblies wrapped by the corresponding containing casings with the longitudinal axes of the smoking articles disposed parallel to the second axis of rotation. With the wrapping wheel there are radially associated first closing means of the forming means to perform an initial part of closing the covering casings on the corresponding containing casings, and also a longitudinal wrapping channel disposed in proximity to and outside the wrapping wheel and with which there are operatively associated and laterally positioned second closing means of the forming means to perform a conclusive part of closing the covering casings.

[0035] The first closing means comprise both third folding means for folding corresponding flaps of the covering sheets around the corresponding containing casings, and also stable closing means disposed in succession to the third folding means and comprising one or more gluing members operatively associated with an abutment element and configured to deliver a layer of glue on at least one of the corresponding flaps and/or one or more heat-sealing members configured to heat-seal together the corresponding flaps possibly provided with a layer of heat-sealable material.

[0036] Moreover, the second closing means comprise both fourth folding means for folding remaining open flaps of the covering sheets around the corresponding con-

taining casings, and also additional stable closing means which comprise one or more additional gluing members operatively associated with the fourth folding means and configured to deliver a layer of glue on at least one of the open flaps and/or one or more additional heat-sealing members configured to heat-seal together the remaining open flaps possibly provided with a layer of heat-sealable material.

[0037] The present invention also concerns a method for forming soft packets of smoking articles having an elongated shape along a respective longitudinal axis with a respective lighting end and a respective opposing mouth end. The method comprises the following steps:

- coupling groups of smoking articles to a respective internal wrapping sheet by means of a coupling unit so as to form assemblies comprising groups of smoking articles covered by respective internal wrapping sheets folded into a U-shape, so that a respective central panel of each internal wrapping sheet is in contact with the mouth ends, or the lighting end, of the group of smoking articles;
- wrapping the assemblies with corresponding covering sheets by means of a wrapping unit;
- folding the internal wrapping sheets around the respective group of smoking articles, so that the internal wrapping sheets have a cup-like shape, and moving the groups of smoking articles covered with the respective internal wrapping sheets toward the wrapping unit.

[0038] In accordance with another aspect of the present invention, the method also comprises the steps of:

- completing the folding of the internal wrapping sheets by means of a receiving and folding device, so as to create a corresponding containing casing completely closed around the respective group of smoking articles;
- feeding, on each occasion, by means of feed means, the covering sheets in front of respective forming pockets;
- thrusting on one flank, by means of thrust means, each assembly from the receiving and folding device against the corresponding covering sheet located in front of the respective forming pocket, in a direction of insertion perpendicular to the respective longitudinal axis of the smoking articles which form the assembly, so as to fold the respective covering sheet into a U-shape while it is inserted, with the assembly, inside the respective forming pocket;
- folding and closing, by means of forming means, the covering sheets around the respective containing casings, creating corresponding covering casings, thus forming respective soft packets.

[0039] In accordance with another aspect, a housing

drawer of the receiving and folding device, when it is in a lowered position, receives at least one assembly at a time with the respective internal wrapping sheet closed in a cup-like shape, wherein a folding member operatively associated with the receiving and folding device folds a smaller rear flap of the respective internal wrapping sheet, and wherein the housing drawer, passing to a raised position, cooperates with a sixth folding member of the receiving and folding device, thus folding a smaller front flap of the respective internal wrapping sheet against the smaller rear flap, thus creating the corresponding containing casing.

[0040] In accordance with another aspect, the receiving and folding device has a first aperture facing toward the feed means, and a second aperture, opposing the first aperture, sized so that the thrust means pass through it, wherein the assembly is thrust by the thrust means through the first aperture in order to couple it to the respective covering sheet.

[0041] In accordance with another aspect, the assemblies coupled to the respective covering sheets are moved toward the respective forming pockets of a forming wheel, and cooperate head-wise with first closing means to perform an initial part of closing the covering casing.

[0042] In accordance with another aspect, a longitudinal wrapping channel, disposed downstream of the forming wheel, intercepts, by means of gripping and advance means, respective covering sheets closed almost completely on the corresponding containing casings, extracting them from the respective forming pockets, and conveys them toward a transfer zone, keeping the orientation unchanged and making them cooperate laterally with second closing means to complete the closure of the covering casings.

DESCRIPTION OF THE DRAWINGS

[0043] These and other aspects, characteristics and advantages of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematic three-dimensional view of an apparatus for forming soft packets of smoking articles according to the present invention;
- fig. 1A is a detailed three-dimensional view of an assembly fed into the apparatus of fig. 1, comprising an organized group of smoking articles on which an internal wrapping sheet is wrapped;
- fig. 2 is a schematic three-dimensional representation of a flow for working soft packets in the apparatus of fig. 1;
- fig. 2A is a schematic three-dimensional representation of a part of the flow for working the soft packets in the apparatus of fig. 1 according to another embodiment of the present invention;

- fig. 3 is a top schematic view of the apparatus of fig. 1;
- fig. 4 is a schematic lateral view of the apparatus of fig. 1;
- fig. 5 is a top view of an internal wrapping sheet used to create a containing casing for a soft packet of fig. 1, in which the internal wrapping sheet is shown in an unfolded condition;
- fig. 6 is a three-dimensional view of a containing casing obtained by means of a suitable folding of the internal wrapping sheet of fig. 5;
- fig. 7 is a top view of a second wrapping sheet with which a containing body of a soft packet of fig. 1 is made, in which the second wrapping sheet is shown in an unfolded condition;
- fig. 8 is a three-dimensional view of a containing body obtained by means of a suitable folding of the second wrapping sheet of fig. 7;
- fig. 9 is a top view of a third wrapping sheet with which a covering casing of a soft packet of fig. 1 is made, in which the third wrapping sheet is shown in an unfolded condition;
- fig. 10 is a three-dimensional view of a covering casing obtained by means of a suitable folding of the third wrapping sheet of fig. 9;
- fig. 11 is a lateral, schematic and section view of an intermediate step of intercepting an assembly comprising an organized group of smoking articles partly wrapped by the internal wrapping sheet of fig. 5, in correspondence with a folding and transfer unit of the apparatus of fig. 1;
- figs. 12A-12E are lateral, schematic and section views of an operating sequence of a folding step in which the containing casing of fig. 6 is made;
- figs. 13A-13E are schematic, lateral and section views of an operating sequence of the coupling between the containing casing of fig. 6 and a covering sheet, compatible with the second or third wrapping sheet of figs. 7 and 9, and of an initial step of forming a covering casing, compatible with the containing body or the covering casing of figs. 8 and 10;
- fig. 14 is a schematic, lateral and section view of a conclusive step of forming a covering casing for forming a soft packet of fig. 1.

[0044] We must clarify that the phraseology and terminology used in the present description, as well as the figures in the attached drawings also in relation as to how described, have the sole function of better illustrating and explaining the present invention, their purpose being to provide a non-limiting example of the invention itself, since the scope of protection is defined by the claims.

[0045] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can be conveniently combined or incorporated into other embodiments without further clarifications.

DESCRIPTION OF SOME EMBODIMENTS

[0046] With reference to fig. 1, some embodiments described here concern an apparatus 10 which can be used to automatically form soft packets 100 of smoking articles 300, as defined above. In this apparatus 10 and in the corresponding method, the smoking articles 300 are processed along a processing path PL to be progressively packaged until the desired soft packet 100 is obtained.

[0047] In accordance with possible embodiments, the apparatus 10 can be part of a more complex machine, not shown entirely in the drawings, which can comprise other apparatuses or units for processing the soft packets 100.

[0048] Each smoking article 300 has an elongated shape and comprises a mouth end 301 (figs. 2, 2A and from 11 to 12E) for the smoker, provided with a filter 301a, a lighting end 302, opposing the mouth end 301, to be ignited to smoke the smoking article 300, and an external lateral surface with a generally tubular shape with which the tobacco is associated.

[0049] To better understand the present invention, below we will describe in detail a soft packet 100 already formed according to possible embodiments.

[0050] For example, a soft packet 100 (fig. 1) obtainable according to the embodiments described here can comprise a containing casing 101 (fig. 6) made of flexible material for containing smoking articles 300, and a covering element, hereafter referred to as a covering casing 105 (figs. 2 and 2A) for completely or partly covering the containing casing 101. In particular, the containing casing 101 is made starting from a respective first wrapping sheet, hereafter flat internal wrapping sheet 201, and the covering casing 105 is made starting from a respective flat covering sheet 205, the latter for example obtained from a feed belt 200.

[0051] The internal wrapping sheet 201 (fig. 5) is made of foil, or metallic paper, to preserve the organoleptic properties of the smoking articles 300.

[0052] According to possible embodiments, the internal wrapping sheet 201 is shaped and folded in such a way that the containing casing 101 (fig. 6) comprises: an upper wall 111 that can contact, during use, the mouth ends 301 of the smoking articles 300; a first and a second larger wall 112 and 113, parallel to each other and opposite each other, which contact, during use, the lateral surface of the smoking articles 300; a first and a second lateral wall 114 115, opposite each other and perpendicular to the first and second larger wall 112 and 113; and a bottom wall 116, opposite and parallel to the upper wall 111, which contacts, during use, the lighting end 302 of the smoking articles 300.

[0053] Alternatively, according to possible embodiments, the upper wall 111 can contact, during use, the lighting end 302 of the smoking articles 300; consequently, the lower wall 116 contacts the mouth end 301.

[0054] We must clarify that the by term "during use" we mean a condition in which the containing casing 101

is formed around the organized group of smoking articles 300.

[0055] According to possible embodiments, the internal wrapping sheet 201 (fig. 5), while being advantageously in a single body, is divided into: a central panel 211 which is configured to define, when the internal wrapping sheet 201 is folded into a U-shape on the smoking articles 300, the upper wall 111; a first and a second larger panel 212 and 213 adjacent to the central panel 211 and configured to define, when folded, the first larger wall 112 and, respectively, the second larger wall 113; a smaller rear flap 216a adjacent to the first larger panel 212 and a smaller front flap 216b adjacent to the second larger panel 213, which are configured to define, when folded and at least partly overlapping with each other, the lower wall 116. Furthermore, on the sides of the central panel 211 there are respective central flaps 217, on the sides of the first and second larger panel 212 and 213 there are respective rear lateral flaps 214a and 215a and respective front lateral flaps 214b and 215b, and on the sides of the rear and smaller front flap 216a and 216b there are respective corner flaps 218. The central flaps 217, the rear lateral flaps 214a and 215a, the front lateral flaps 214b and 215b and the corner flaps 218, are configured to define, when folded and at least partly overlapping with each other, the first and second lateral wall 114 and 115.

[0056] In the embodiment of fig. 5, on the internal wrapping sheet 201, in correspondence with the central panel 211, a closed profile C can be made, preferably obtained with non-continuous incisions or perforations, which, during use, defines a removable zone 117 of the upper wall 111. The removable zone 117 is configured to be removed so as to define an aperture through which it is possible to extract the smoking articles 300.

[0057] The removable zone 117 develops, for most of its extension, on the upper wall 111 and is disposed adjacent to, or in contact with, one of the two smaller upper edges of the same upper wall 111; specifically, the closed profile C is substantially rectangular and one of its larger sides laps one of the two aforementioned smaller upper edges.

[0058] The closed profile C is made in such a way that the removable zone 117 comprises a first portion 117a, which extends transversely for the entire upper wall 111, and at least one second portion 117b created on at least one of either the first or the second larger wall 112 or 113. In the example given here, the removable zone 117 comprises two second portions 117b the same as each other and made in a specular manner on the first larger wall 112 and on the second larger wall 113.

[0059] In addition, the removable zone 117 is provided with at least one opening flap 118 which is defined by an additional pre-incised profile, preferably with non-continuous incisions or perforations, and which is configured to be grasped and lifted by the consumer in order to remove the removable zone 117.

[0060] In accordance with possible embodiments de-

scribed using figs. 7 and 8, the covering casing 105 is defined by a containing body 102 and the covering sheet 205 is defined by another internal wrapping sheet, hereafter second wrapping sheet 202. In this case, the feed belt 200 is defined by a first feed belt 200a, as will be described in detail below.

[0061] The second wrapping sheet 202 is made of paper, or cardboard, and has a thickness in the order of about 1 mm.

[0062] According to possible embodiments, the second wrapping sheet 202 is shaped and folded in such a way that the containing body 102 (fig. 8) comprises: a first and a second larger containing wall 122 and 123 parallel to each other and opposite each other, which contact, during use, the first and second larger wall 112 and 113, respectively; a first and a second lateral containing wall 124 and 125 opposite each other and perpendicular to the first and second larger wall 122 and 123, which contact, during use, the first and second lateral wall 114 and 115, respectively; and a lower containing wall 126 which can contact, during use, the lower wall 116.

[0063] In particular, the second wrapping sheet 202 (fig. 7), although advantageously being in a single body, comprises a larger lateral panel 224 configured to define, when the second wrapping sheet 202 is folded into a U-shape around the containing casing 101, the first containing lateral wall 124; a first and a second larger central panel 222 and 223 which are connected to the central lateral panel 224 from opposite sides to each other and configured to define, when folded, the first and second larger containing walls 122 and 123, respectively; a first larger lateral flap 225a adjacent to the first larger central panel 222 and a second larger lateral flap 225b adjacent to the second larger central panel 223 which are configured to define, when folded and at least partly overlapping each other, the second containing lateral wall 125.

[0064] Moreover, the second wrapping sheet 202 comprises a lower central flap 226a, adjacent to the central lateral panel 224, two larger lower flaps 226b and 226c adjacent to the lower central flap 226a and disposed in a symmetrical manner on opposite sides with respect to it, and two lower lateral flaps 226d and 226e each adjacent to a respective one of the two larger lower flaps 226b and 226c and disposed in a symmetrical manner with respect to the lower central flap 226a. The lower central flap 226a, the two larger lower flaps 226b and 226c and the lower lateral flaps 226d and 226e and the corner flaps 227 are configured to define, when folded and at least partly overlapping each other, the lower containing wall 126.

[0065] In accordance with other possible embodiments described using figs. 9 and 10, the covering casing 105 is defined by a covering body 103 and the covering sheet 205 is defined by another internal wrapping sheet, hereafter second flat wrapping sheet 203. In this embodiment, the feed belt 200 is defined by a second feed belt 200b, as will be described in detail below.

[0066] In particular, the third wrapping sheet 203 (fig. 9) is made of a very thin paper-based material, in the order of one-tenth of a millimeter. We must clarify that by the term "paper-based material" we mean a material having a percentage of paper greater than 70-80% by weight. Moreover, the third wrapping sheet 203 is also provided with a reduced percentage of plastic material, at most in the order of about 20-30% by weight, for example in the form of one or more layers. This percentage is such as to be compliant with current regulations that still allow the material with which the third wrapping sheet 203 is made to be defined as a paper-based material and, therefore, to be recycled and considered sustainable from an environmental point of view.

[0067] According to possible embodiments, the third wrapping sheet 203 is shaped and folded in such a way that the covering casing 103 (fig. 10) comprises: an upper covering wall 131 that can contact, during use, the upper wall 111 of the containing casing 101; a first and a second larger covering wall 132 and 133, parallel to each other and opposite each other, which contact, during use, the corresponding first and second larger walls 112 and 113; a first and a second lateral covering wall 134 and 135, opposite each other, which contact, during use, the first and second lateral wall 114 and 115; and a bottom covering wall 136, opposite and parallel to the upper covering wall 131 and which can contact, during use, the bottom wall 116.

[0068] We must clarify that, in this case, by the expression "during use" we mean a condition in which the containing casing 101, with the smoking articles 100 inside it, is covered by the covering casing 103.

[0069] The third wrapping sheet 203 (fig. 9), although advantageously being in a single body, is divided into an upper part 203a, a central part 203b and a lower part 203c, which when folded to obtain the covering casing 103 divide the latter respectively into an upper covering part 103a, a central covering part 103b and a lower covering part 103c.

[0070] The upper part 203a (fig. 9) comprises an upper central flap 231a, two larger upper flaps 231b and 231c adjacent to the upper central flap 231a and disposed in a symmetrical manner on opposite sides thereof, and two upper lateral flaps 231d and 231e each adjacent to a respective one of the two larger upper flaps 231b and 231c and disposed in a symmetrical manner with respect to the upper central flap 231a. The upper central flap 231a, the two larger upper flaps 231b and 231c and the two upper lateral flaps 231d and 231e are configured to define, when they are folded and at least partly overlapping each other, the upper wall 131.

[0071] The central part 203b comprises a central lateral panel 234 configured to define, when it is folded around the containing casing 101, the first lateral covering wall 134, a first and a second larger central panel 232 and 233 that are adjacent to the central lateral panel 234 and that are configured to define, when they are folded, the first larger covering wall 132 and, respectively, the

second larger covering wall 133, a first central lateral flap 235a adjacent to the first larger central panel 232 and a second central lateral flap 235b adjacent the second larger central panel 233, which, when they are folded and at least partly overlapping each other, define the second lateral wall 135.

[0072] The lower part 203c comprises a lower central flap 236a, two larger lower flaps 236b and 236c adjacent to the lower central flap 236a and disposed in a symmetrical manner on opposite sides with respect to it, and two lower lateral flaps 236d and 236e each adjacent to a respective one of the two larger lower flaps 236b and 236c and disposed in a symmetrical manner with respect to the lower central flap 236a. The lower central flap 236a, the two larger lower flaps 236b and 236c and the lower lateral flaps 236d and 236e are configured to define, when folded and at least partly overlapping each other, the lower covering wall 136.

[0073] Moreover, in correspondence with the upper part 203a, the upper central flap 231a, the two larger upper flaps 231b and 231c and the two upper lateral flaps 231d and 231e are separated from each other by cutting lines LT. Also in correspondence with the lower part 203c, the lower central flap 236a, the two larger lower flaps 236b and 236c and the two lower lateral flaps 236d and 236e are separated from each other by additional cutting lines LT'.

[0074] Thanks to the cutting lines LT, LT', there is a better coverage of the containing casing 101 and a better closure and of the soft packet 100. In particular, by means of the cutting lines LT and LT', the upper covering wall 131 and the lower covering wall 136 are obtained by overlapping the flaps of the upper part 203a and of the lower part 203c.

[0075] Furthermore, the third wrapping sheet 203 is provided with an opening strip 137 disposed in an upper zone of the central part 203b, close to the upper part 203a. Specifically, the opening strip 137 is delimited by a pre-incised profile P and it is configured to be removed, when the soft packet 100 is opened for the first time, to separate the upper part 203a from the central part 203b.

[0076] The opening strip 137 comprises a gripping flap 138 configured to be gripped by the consumer so as to facilitate the removal of the same opening strip 137, in order to separate the upper covering part 103a from the covering casing 103.

[0077] According to possible embodiments, the third wrapping sheet 203 is provided internally, that is, on the internal surface that, during use, contacts the containing casing 101, with a layer of heat-sealable material M for gluing the third wrapping sheet 203 to the containing casing 101 and thus create the covering casing 103. For example, the layer of heat-sealable material M can be disposed on the entire internal surface, or only on some specific functional zones.

[0078] According to possible embodiments, the heat-sealable material M can be a thermo-adhesive, or thermo-fusible glue.

[0079] We must clarify that, unless otherwise specified, here and hereafter in the description and the attached claims, by the term "covering casing 105" we mean the containing body 102 or, alternatively, the covering body 103; by the term "covering sheet 205" we mean the second wrapping sheet 202 or, alternatively, the third wrapping sheet 203; and by the term "feed belt 200" we mean the first feed belt 200a or, alternatively, the second feed belt 200b.

[0080] The apparatus 10 (fig. 1) comprises, disposed in sequence from right to left in figs. 1, 3 and 4, along the aforementioned main processing path PL:

- a first feed unit, hereafter defined as coupling unit 11 for feeding and forming, along a first feed or advance path PA1, a plurality of assemblies 210 (fig. 1A) each comprising an organized group of smoking articles 300 aligned parallel to a desired direction of longitudinal development, hereafter defined as longitudinal axis DL, and partly wrapped by an internal wrapping sheet 201;
- a transfer unit 12 provided with folding means 34 and defining together with them a folding and transfer unit 34, 12 (fig. 1) for receiving and transferring, along a transfer path, hereafter second advance path PT, one assembly 210 at a time to form the containing casings 101 starting from the internal wrapping sheets 201, wherein the smoking articles are kept aligned parallel to the longitudinal axis DL;
- a second feed unit 13 for feeding, along a second feed path PA2, the feed belt 200 from which corresponding covering sheets 205 are obtained, to be coupled to respective containing casings 101;
- a forming unit 15 for forming, along a forming path PF, covering casings 105 starting from corresponding covering sheets 205 wrapped on respective containing casings 101, in order to form the soft packets 100.

[0081] In particular, the folding and transfer unit 34, 12 is configured to fold internal wrapping sheets 201 around the respective groups of smoking articles 300, so as to fold the internal wrapping sheets 201 according to a cup-like shape and to move the assemblies 210 along a second advance path PT toward the wrapping unit 13, 15, that is, the second feed unit 13 and consequently the forming unit 15.

[0082] The second feed unit 13 and the forming unit 15 together define a wrapping unit 13, 15 for wrapping the assemblies 210 with the respective covering sheets 205. Therefore, hereafter, any reference to the second feed unit 13 and to the forming unit 15 could also refer to the wrapping unit 13, 15 that they define, and vice versa.

[0083] Therefore, the processing path PL comprises a first advance path PA1, a second advance path PT, a third advance path PA2 and a forming path PF (figs. 2 and 2A).

[0084] We must clarify that the coupling unit 11, the first transfer unit 12, the second feed unit 13 and the second forming unit 15 and the corresponding mechanical means, or components, are attached to respective support bases, walls, parts and/or fixed structures, which for a simpler illustration are not shown in the drawings.

[0085] In accordance with possible embodiments, the first advance path PA1 of the coupling unit 11 is closed in a loop and has, for example, a circular shape. According to other embodiments, not shown in the drawings, the first advance path PA1 is rectilinear, or may have at least one rectilinear segment.

[0086] Along the first advance path PA1 there are a zone Z11 for introducing smoking articles 300, a zone ZP1 for positioning the internal wrapping sheets 201, and a zone ZU for the exit of assemblies 210.

[0087] In accordance with some embodiments, the coupling unit 11 (figs. 1, 3 and 4) is configured to supply, with a desired orientation, the assembly 210 to the transfer unit 12, such that the mouth ends 301 are aligned with respect to a direction of advance DV parallel to the longitudinal axis DL.

[0088] In particular, the coupling unit 11 comprises at least one rotating disc 20 rotatable about a first axis of rotation R1 parallel to the direction of advance DV, and a first drive member 21 for driving the rotating disc 20.

[0089] Preferably, the first drive member 21 is configured to make the rotating disc 20 rotate according to a predetermined angular pitch. For example, the first drive member 21 is an electric motor.

[0090] The rotating disc 20 defines, with its periphery, the first advance path PA1. Specifically, the rotating disc 20 comprises a plurality of housing members 22, each substantially having the shape of a parallelepiped and centrally provided with a through housing seating 23 in which an organized group of smoking articles 300 is able to be positioned, in a known manner, with the lighting ends 301 facing and aligned with the direction of advance DV. The housing seatings 23 are disposed circumferentially.

[0091] Each housing seating 23 is provided with a central slit 23a which substantially divides an external wall of the housing member 22 into two parts.

[0092] According to possible embodiments, the coupling unit 11 also comprises positioning means 24, substantially of a known type, disposed in the positioning zone ZP (fig. 2) and configured to position one internal wrapping sheet 201 at a time on a respective housing member 22, folding it into a U-shape so that the corresponding central panel 211 (fig. 11) is in contact with the mouth ends 301 of the smoking articles 300. In this way, advantageously, the removable zone 117 can be directly in contact with the mouth end 301.

[0093] According to other embodiments, the smoking articles 300 are oriented differently in the housing seatings 23 and the positioning means 24 are configured to position one internal wrapping sheet 201 at a time on a respective housing member 22, folding it into a U-shape

so that the corresponding central panel 211 is in contact with the lighting end 302 of the smoking articles 300.

[0094] The housing members 22 can be provided with retaining members, not shown in the drawings, preferably suction members, to retain the internal wrapping sheet 201 on the housing member 22, keeping it folded in a U-shape.

[0095] In accordance with some embodiments, the transfer unit 12 (figs. 1, 3 and 4) comprises conveyor means 17 for receiving the assemblies 210 from the coupling unit 11, and for moving them along the second advance path PT (fig. 2) in the direction of advance DV. In particular, the conveyor means 17 are configured to keep the assemblies 210 in the desired orientation to form the containing casings 101.

[0096] In the embodiments shown here, the second advance path PT is substantially rectilinear.

[0097] It is clear that, in accordance with other embodiments, the second advance path PT can comprise several consecutive rectilinear segments not aligned with each other, for example in an L-shape, or it can be curvilinear, or have at least one curvilinear segment.

[0098] The conveyor means 17 comprise a conveyor device provided with a pair of fixed support belts 28, parallel to each other and distanced from each other so that there is a central hollow space between them.

[0099] The folding and transfer unit 34, 12 comprises a plurality of advance elements, hereafter defined as extraction members 30, configured to be inserted into a corresponding housing seating 23 from a first open end, and to thrust out of the housing seating 23, through a second open end, opposing the first open end, at least one assembly 210 at a time, keeping the corresponding internal wrapping sheet 201 folded into a U-shape on the smoking articles 300. In this way, the central panel 211 of the internal wrapping sheet 201 is in contact with the lighting end 302, or the mouth end 301 of the smoking articles 300.

[0100] The extraction members 30 can be part of the conveyor means 17. The extraction members 30 are mobile along the central hollow space, that is along the second advance path PT, and are distanced, or offset, horizontally from each other by a certain distance, which is greater than the length of the smoking articles 300.

[0101] The extraction members 30 are associated with advance means and configured to advance in the direction of advance DV parallel to the first axis of rotation R1. Specifically, the support belts 28 give a base support for the assemblies 210, and the extraction members 30 are associated with the advance means which are defined by a connected conveyor belt 29 and end pulleys 29a, 29 which can be driven by a second drive member 31. By way of example, the second drive member 31 is an electric motor.

[0102] In particular, as shown in fig. 11, the extraction members 30 are able to be inserted, in correspondence with the exit zone ZU, into a corresponding housing seating 23 in order to thrust the smoking articles 300 out of

it in the direction of the longitudinal axis DL, and with them also the respective internal wrapping sheet 201, keeping the latter folded into a U-shape and the central panel 211 in contact with the mouth ends 301, and also to make a respective assembly 210 advance in the desired orientation, along the second advance path PT.

[0103] The central slit 23a has the function of allowing the passage of each extraction member 30 through the housing seating 23. In particular, the extraction members 30 are provided with a cantilevered thrust plate 33 conformed so as to be inserted into the housing seating 23 in order to contact the lighting end 302 of the smoking articles 300 and thrust the latter out, without interfering with the internal wrapping sheet 201.

[0104] We must clarify that the drive members 21, 31 (figs. 1, 3 and 4) are operatively connected to a central control unit 32 (fig. 4) programmed to drive the rotating disc 20 and the conveyor means 17 so that the respective movements are synchronized with each other, as will be described in detail below.

[0105] Furthermore, the transfer unit 12 (figs. 1, 3 and 4) is also provided with folding means 34 configured to perform a plurality of folds on each internal wrapper sheet 201, to close the smoking articles 300, which are aligned parallel to the longitudinal axis DL, and form respective containing casings 101.

[0106] The first folding means 34 are associated with a support structure which, for a clear description, is not shown in the drawings.

[0107] In some embodiments, the first folding means 34 comprise, in succession, a pair of first folding elements, or members 35a and 35b configured to perform the folding of the central flaps 217 in correspondence with a respective part folded into a U-shape of the internal wrapping sheet 201, a pair of second folding elements, or members 36a and 36b configured to perform the folding of the rear lateral flaps 214a and 215a, a pair of third folding elements, or members 37a and 37b configured to perform the folding of the front lateral flaps 214b and 215b, and a pair of folders, hereafter defined as fourth mobile folding members 39a and 39b, are configured to perform the folding of the corner flaps 218 by means of a movement perpendicular to the second advance path PT. The folding members 35a and 35b, 36a and 36b, 37a and 37b, 39a and 39b of each pair are disposed in a specular manner with respect to the second advance path PT and above the support belts 28 to cooperate with them in order to fold the internal wrapping sheet 201 (figs. 2 and 3).

[0108] The first folding members 35a and 35b, the second folding members 36a and 36b, and the third folding members 37a and 37b are of the static type. Preferably, the first folding members 35a and 35b, the second folding members 36a and 36b and the third folding members 37a and 37b comprise, or consist of, fixed abutments with a different conformation in relation to the specific folds to be performed. Moreover, the fourth folding members 39a and 39b are conformed so as to perform the

folding of the corner flaps 218 without counteracting the movement of the extraction member 30. By way of example, the drive of the fourth folding members 39a and 39b is carried out by respective actuation elements, for example provided with electric motors and/or other actuators, of a known type and not shown in the drawings.

[0109] A receiving and folding device 40 of the apparatus 10 is interposed between the folding and transfer unit 34, 12 and the wrapping unit 13, 15 and configured to complete the folding of the internal wrapping sheets 201 around the respective groups of smoking articles 300, so as to create at least one containing casing 101 at a time completely closed around the respective group of smoking articles 300 (figs. 1, 3 and 4).

[0110] The receiving and folding device 40 is disposed in succession to the fourth folding members 39a and 39b along said second advance path PT. The receiving and folding device 40 comprises second folding means 48 defined by a fifth 49 and a sixth 45 folding member and configured to fold respectively a smaller rear flap 216a and a smaller front flap 216b of a respective internal wrapping sheet 201, on a side opposite to the one where the part folded into a U-shape is present.

[0111] A first folding thruster, which defines the fifth folding member 49, is operatively associated with the receiving and folding device 40 and configured to fold a smaller rear flap 216a.

[0112] In particular, the receiving and folding device 40 (figs. 1 and 12A-12E) is selectively mobile between an advanced position PR1, in which it is positioned close to the support belts 28 to receive, from an advance member 30, the internal wrapping sheet 201 almost totally closed on the smoking articles 300, and a retracted position PR2, in which it is positioned to the side of the second feed unit 13 to allow the lateral coupling between the containing casing 101 and a corresponding covering casing 105, as will be described in detail below.

[0113] The movement of the positioning device 40 between the advanced position PR1 and the retracted position PR2 is carried out by respective actuation elements, for example provided with electric motors and/or other actuators, of a known type and not shown in the drawings.

[0114] The receiving and folding device 40 is substantially box-shaped and is open at the bottom and at the top. Inside it there is a housing drawer 41 for housing the internal wrapping sheet 201 almost totally closed on the smoking articles 300. In the example given here, the housing drawer 41 is provided with at least one base wall 42 for supporting the containing casing 101 and with an abutment wall 43, opposite the conveyor means 17, on which the upper wall 111, or alternatively the lower wall 116, of the containing casing 101 can abut.

[0115] In some embodiments, the housing drawer 41 is selectively mobile between a lowered position P1 for receiving, or accommodating, from an extraction member 30, or from the folding and transfer unit 34, 12, a respective internal wrapping sheet 201 closed almost to-

tally on the smoking articles 300, and a raised position P2 for completing the closure of the internal wrapping sheet 201. In this raised position P2, the housing drawer 41 is able to fold a smaller front flap 216b of the internal wrapping sheet, in cooperation with a front folding wall of the receiving and folding device 40 which defines the sixth folding member 45. We must clarify that the drive of the housing drawer 41 takes place by means of actuators of a known type and not shown in the drawings.

[0116] We must also clarify that the folding of the smaller rear flap 216a by means of the fifth folding member 49 occurs when the housing drawer 41 is in the lowered position P1.

[0117] As can be observed in figs. 1 and 12A-12E, the receiving and folding device 40, on the front folding wall, is provided with a lower aperture 46 to allow the insertion of the internal wrapping sheet 201 wrapped on the smoking articles 300 in the housing drawer 41, when the latter is in the lowered position P1. The lower aperture 46 also has the function of allowing the insertion of the fifth folding member 49, which is mobile vertically and selectively to fold a smaller rear flap 216a.

[0118] Moreover, the receiving and folding device 40 can also be provided with a first upper lateral aperture 47a, hereafter first aperture 47a, facing toward the second feed unit 13 and with a second upper lateral aperture 47b, hereafter second aperture 47b, parallel to the first aperture 47a. At least the first aperture 47a negatively traces the outline of the first or second lateral wall 114 or 115 to allow the lateral extraction of the containing casing 101, once this is formed.

[0119] We must clarify that in the embodiments shown here, the receiving and folding device 40 is conformed in such a way that the front folding wall defines a fixed abutment element, that is, the sixth folding member 45, so that when the housing drawer 41 moves to the raised position P2, the still open smaller front flap 216b, by contrast, folds inward, that is, toward the already folded smaller rear flap 216a, thus completing the folding of the internal wrapping sheet 201 and obtaining the containing casing 101.

[0120] In possible embodiments, in the event that the containing casing 101 is oriented differently, in particular in the opposite sense with respect to what has just been described, the closure of the smaller rear and front flap 216a, 216b can take place differently, for example with the same insertion of the containing casing 101 into the housing drawer 41.

[0121] The transfer unit 12 comprises thrust means 50 (figs. 1 and 3) operatively associated with the receiving and folding device 40 and disposed outside the second upper aperture 47b. The thrust means 50 can, for example, comprise one or more thrusters.

[0122] The thrust means 50 are configured to thrust the containing casing 101 through the first aperture 47a, along a coupling line, hereafter defined as direction of insertion LC, which is transverse, in particular perpendicular, to the longitudinal axis DL (fig. 1 and 13A-12E),

in order to couple it laterally to a corresponding covering sheet 205 keeping the aforementioned desired orientation, in correspondence with a coupling zone ZA.

[0123] In other words, the wrapping unit 13, 15 comprises thrust means 50 configured to thrust, on one flank, each assembly 210 from the receiving and folding device 40 against a respective covering sheet 205 located in front of a forming pocket 69, in the direction of insertion LC, so as to fold the respective covering sheet 205 into a U-shape while it is inserted, with the assembly 210, into a respective forming pocket 69, as will be described in detail below.

[0124] The wrapping unit 13, 15 comprises feed means 51 configured to dispose, on each occasion, the covering sheets 205 in front of the respective forming pocket 69.

[0125] In particular, the second feed unit 13 comprises feed means 51 (fig. 1, 3, 4) which have the function of disposing, on each occasion, the covering sheets 205, with respect to the containing casings 101, parallel to the longitudinal axis DL, in such a way that the coupling between the containing casings 101 and the covering sheets 205 occurs laterally.

[0126] We must clarify that the first aperture 47a faces toward the feed means 51, and the second aperture 47b, opposing the first aperture 47a, is sized so that the thrust means 50 can pass through it, in order to allow the thrust of at least one assembly 210 at a time through the first aperture 47a, in the direction of insertion LC, which is perpendicular with respect to the disposition of the respective longitudinal axis DL of the smoking articles 300, to couple the assembly 210 to a respective covering sheet 205.

[0127] Furthermore, we wish to clarify that the first and second aperture 47a, 47b are aligned with the assembly 210 when the housing drawer 41 is in the raised position P2.

[0128] The second feed unit 13 comprises contrast and guide means 59 configured to cooperate with the thrust means 50 to couple each containing casing 101 to a respective covering sheet 205, by folding the latter into a U-shape around the containing casing 101. The contrast and guide means 59 are disposed, along the second feed path PA2, in succession to the feed means 51.

[0129] We must clarify that with by expression "parallel to the longitudinal axis DL" we mean a condition in which each covering sheet 205, fed on each occasion by the feed means 51, lies on an ideal plane that is parallel to the longitudinal axis DL of the smoking articles 300.

[0130] Furthermore, by the term "laterally", when referring to the coupling between the covering sheet 205 and the containing casing 101, we mean that the covering sheet 205 is wrapped on the containing casing 101, by means of the U-shaped fold, so that the upper wall 111 and/or the lower wall 116 remain, at least temporarily, exposed.

[0131] In addition, by the expression "at least temporarily" we mean a condition in which the covering sheet 205 can be substantially flush with the upper wall 111,

so that when the folds of the covering sheet 205 are carried out, the latter remains in any case exposed to view, or can also protrude with respect to it so that when the folds are carried out, the latter can be coated and covered by the covering sheet 205.

[0132] Specifically, the case in which the covering sheet 205 is substantially flush with the upper wall 111 is relative to the second wrapping sheet 202 for making the containing body 102; instead, the case in which the covering sheet 205 protrudes beyond the upper wall 111 and the lower wall 116 is relative to the third wrapping sheet 203 for making the covering casing 103, as will be described in detail below.

[0133] In the embodiment shown here, the feed path PA2 (fig. 1) develops in a substantially vertical direction. It is clear that according to other possible embodiments, not shown in the drawings, the second feed path PA2 could develop in a horizontal direction, or inclined with respect to a horizontal plane, or have a curvilinear development, or have other suitable shapes.

[0134] The feed means 51 comprise, disposed in sequence, a pair of drawing rollers 55 for feeding the feed belt 200 in an asymmetrical, or symmetrical, manner with respect to the disposition of the containing casing 101, a cutting device 56 for cutting the feed belt 200 to size and making a plurality of the covering sheets 205, a pair of advance rollers 57 for making the feed belt 200 advance in a controlled manner toward the contrast and guide means 59.

[0135] Between the advance rollers 57 and the contrast and guide means 59 there are one or more front guide elements 61 and one or more rear guide elements 62 for guiding the feed belt 200 and the covering sheet 205, respectively, toward or in correspondence with the coupling zone ZA (fig. 2).

[0136] We wish to clarify that the drive of the drawing rollers 55 and of the cutting device 56 is carried out by respective actuation elements, for example provided with electric motors and/or other actuators, of a known type and not shown in the drawings. According to possible embodiments, the advance rollers 57 are also driven by respective actuation elements.

[0137] The contrast and guide means 59 (figs. 13A-13E) comprise a pair of contrast and guide rollers 59a, 59b disposed in a symmetrical manner with respect to the direction of insertion LC at a folding distance DP in such a way that there is sufficient space between them to allow the passage, with minimum play, of the containing casing 101 coupled to the respective covering sheet 205, determining the U-shaped fold of the latter on the containing casing 101, when the thrust means 50 thrust the corresponding assembly 210 into a forming pocket 69 against the covering sheet 205.

[0138] In other words, the two guide rollers 59a, 59b lie on a plane that is substantially perpendicular to the direction of insertion LC and are configured so that the assemblies 201 thrust by the thrust means 50 pass through them.

[0139] Specifically, the contrast and guide means 59 are configured both to counteract an irregular movement of the covering sheet 205 before it is coupled to the containing casing 101, cooperating with the front guide elements 61, and also to guide, in the direction of insertion LC, the covering sheet 205 folded into a U-shape around the containing casing 101 during their coupling.

[0140] In correspondence with a terminal zone of the second feed path PA2 (figs. 2 and 2A) there is also an end-of-travel element 63 which is attached to the front and/or rear guide elements 61, 62 and which has the function of stopping the descent of the covering sheet 205.

[0141] We must clarify that in the event the second wrapping sheet 202 is to be made, the feed means 51 are configured to feed the first feed roller 200a in an asymmetrical manner with respect to the disposition of the containing casing 101 and in relation to the orientation of the latter, in particular, depending on whether the upper wall 111 is facing forward, or not, with respect to the direction of advance DV.

[0142] Therefore, according to some embodiments, in correspondence with the coupling zone ZA, the second wrapping sheet 202 can be disposed in such a way that when it is wrapped in a U-shape on the containing casing 101, the lower central flap 226a, the larger lower flaps 226b and 226c, and the lower lateral flaps 226d and 226e protrude with respect to the first or second lateral wall 114 or 115 of the containing casing 101.

[0143] Instead, in the event that the third wrapping sheet 203 is to be made, the feed means 51 are configured to feed the second feed roller 200b in a symmetrical manner with respect to the disposition of the containing casing 101 present in the housing drawer 41. Therefore, in correspondence with the coupling zone ZA, the third wrapping sheet 203 is disposed in such a way that when it is wrapped in a U-shape on the containing casing 101, the flaps of the upper part 203a and the flaps of the lower part 203c protrude with respect to the first or the second lateral wall 114 or 115.

[0144] The forming unit 15 (figs. 1, 3 and 4) is configured to receive the containing casings 101 partly wrapped by the respective covering sheets 205.

[0145] The forming unit 15, defining together with the second feed unit 13 the wrapping unit 13, 15, is provided with first and second forming means 64, 84 for folding and closing the covering sheets 205 around the containing casings 101 to make corresponding covering casings 105, thus forming the respective soft packets 100.

[0146] The forming unit 15 comprises, along the forming path PF (fig. 2), a forming wheel 65 rotatable about a second axis of rotation R2, parallel to the first axis of rotation R1, with which first forming means 64 (figs. 1, 3 and 4) are radially associated in order to perform an initial part of forming the covering casing 105 keeping the containing casings 101 in the desired orientation. The forming unit 15 also comprises a forming belt, hereafter defined as a longitudinal wrapping channel 66, disposed

downstream, or outside, the forming wheel 65 in a position radial thereto, and with which there are operatively associated and laterally positioned the second forming means 84 in order to perform a conclusive part of forming the covering casing 105 keeping the containing casings 101 in the desired orientation and thus forming the soft packet 100.

[0147] Therefore, the forming path PF comprises a first curvilinear segment, or third advance path T1, defined by the periphery of the forming wheel 65, in which the initial part of forming the covering casing 105 is performed, and a second rectilinear segment T2, defined by the longitudinal wrapping channel 66, in which the conclusive part of forming the covering casing 105 is performed (fig. 2).

[0148] In this way, the forming unit 15 is very compact, in particular thanks to the radial disposition of the longitudinal wrapping channel 66 with respect to the forming wheel 65, which lie substantially on a same ideal vertical plane.

[0149] Specifically, along the first segment, or third advance path, T1 there are a zone ZI2 for inserting the covering elements 205 folded into a U-shape around the containing casing 101, which is aligned with the direction of insertion LC, a zone ZC for closing one or more flaps of the covering elements 205, and a pick-up zone ZP2.

[0150] Furthermore, the forming unit 15 comprises a third and a fourth drive member 67, 87 (figs. 1, 3 and 4) having respectively the function of driving the forming wheel 65 and the longitudinal wrapping channel 66, and operatively connected to the central control unit 32, which is programmed to drive the forming wheel 65 and the longitudinal wrapping channel 66 so that the respective movements are synchronized with each other, as will be described in detail below.

[0151] The wrapping unit 13, 15 comprises a plurality of forming pockets 69 mobile along the third advance path T1.

[0152] Specifically, the forming wheel 65 comprises the plurality of forming pockets 69 which are configured to accommodate corresponding covering sheets 205 folded into a U-shape around the respective containing casing 101, so as to make them cooperate with the first forming means 64 in order to perform the first initial forming part, maintaining the desired orientation.

[0153] In particular, the forming wheel 65 is internally hollow and comprises a first and a second disc 70a and 70b distanced from each other, positioned in a symmetrical manner with respect to the direction of insertion LC and each provided with a plurality of radial fins 71a, 71b, coupled two by two to each other and configured to cooperate with a respective covering sheet 205. Each pair of fins 71a of the first disc 70a is operatively associated with a corresponding pair of fins 71b of the second disc 70b symmetrical thereto, so as to define upper and lower wall elements of a respective forming pocket 69.

[0154] On the sides of each pair of fins 71a, 71b there are respective lateral abutment elements 72 attached ex-

ternally to the first and second disc 70a and 70b and having the function both of defining corresponding lateral wall elements of the respective forming pocket 69, and also of supplying a fixed abutment for folding corresponding protruding flaps of the covering sheet 205.

[0155] Considering the second wrapping sheet 202, the lateral abutment elements 72 allow to perform the inward folding of the lower central flap 226a.

[0156] Considering, instead, the third wrapping sheet 203, the lateral abutment elements 72 allow to perform the inward folding of the upper and lower central flap 231a and 236a. We must clarify that the lateral abutment elements 72 have a shape such as to allow only the folding of the lower central flap 226a, or of the upper and lower central flap 231a and 236a, without interfering with other protruding flaps of the second or third wrapping sheet 202 or 203 (figs. 2 and 2A).

[0157] Therefore, each forming pocket 69 (figs. 1, 3 and 4) is defined by a first and a second pair of fins 71a, 71b and by two corresponding lateral abutment elements 72.

[0158] Furthermore, the first forming means 64 comprise, in succession, third folding means 73 for folding corresponding flaps of the covering sheets 205 around the corresponding containing casings 101 and stable closing means 76. Specifically, the third folding means 73 comprise, in succession, at least a second folding thruster 74 and a folding wall 75 for folding corresponding flaps of the covering sheet 205 around the containing casing 101.

[0159] The second folding thruster 74 is disposed in correspondence with the insertion zone ZI2 and is selectively mobile in a direction perpendicular to the direction of insertion LC in order to perform the folding of a corresponding flap of the covering sheet 205. Considering the second or third wrapping sheet 202 or 203, the second folding thruster 74 has the function of performing the inward folding of the respective first central lateral flap 225a or 235a (figs. 2 and 2A).

[0160] The folding wall 75 (fig. 1) is arched and disposed outside the forming wheel 65 to supply an abutment and fold another corresponding protruding flap of the covering casing 105 inward. Specifically, considering the second or third wrapping sheet 202, 203, the folding wall 75 has the function of folding inward the second central lateral flap 225b or 235b on the first central lateral flap 225a or 235a already folded (figs. 2 and 2A).

[0161] The stable closing means 76 (figs. 1 and 14) are disposed in correspondence with the closing zone ZC and comprise, alternatively or in combination, one or more gluing members 81 operatively associated with an abutment element 77 and configured to deliver a layer of glue on at least one of the corresponding flaps folded by the third folding means 73, in order to close them stably by means of the abutment element 77, and/or one or more heat-sealing members 83 configured to heat-seal together the flaps folded by means of the third folding means 73, possibly provided with a layer of heat-sealable

material M.

[0162] In the example given here, the abutment element 77 comprises an arcuate plate provided with a transverse aperture 79 having the function of allowing a partial and temporary reopening of the flap folded by means of the folding wall 75 for the possible preparation of glue. Considering the second or third wrapping sheet 202, 203, the transverse aperture 79 has the function of allowing the partial and temporary reopening of the second central lateral flap 225b or 235b.

[0163] We must clarify that in the initial forming part, that is, along the forming wheel 65, most of the operations of forming the covering casing 105 are advantageously performed; this advantageously occurs in a very compact space and reducing processing times.

[0164] The longitudinal wrapping channel 66 (figs. 1 and 14) is disposed vertically, in correspondence with the pick-up zone ZP2, in the space that exists between the first and second disc 70a, 70b and is positioned in such a way as to perpendicularly intercept the covering casing 105 almost formed and conveyed by the forming wheel 65.

[0165] In particular, the longitudinal wrapping channel 66 is provided with gripping and advance means 86, preferably defined by gripping dowels, which are configured both to intercept and extract from the forming pockets 69 respective covering sheets 205 wrapped almost totally on the corresponding containing casings 101, and also to convey them toward a transfer zone ZT (fig. 2) making them cooperate laterally with the second forming means 84 to perform the conclusive part of forming the covering casing 105, thus forming respective soft packets 100. Specifically, each of the gripping and advance means 86 is conformed in such a way as to be able to pass between the fins 71a, 71b of the first and second disc 70a, 70b.

[0166] The gripping and advance means 86 (figs. 1 and 14) are distanced from each other by a distance equal to approximately the length of the covering casings 105 so as to contact, at the upper and lower part, respective almost formed covering casings 105, conveying them along the second segment T2 up to the transfer zone ZT. We must clarify that each of the gripping and advance means 86 defines, with the previous or next one, a conveyor pocket for a corresponding covering casing 105.

[0167] The second forming means 84 comprise, along the second segment T2, both fourth folding means 89 for folding the remaining open flaps of the covering sheet 205, and also additional stable closing means 93 disposed in correspondence with a second closing zone ZC2 for completing the conclusive part of forming the covering casing 105. For example, the second forming means 84 are associated with the support structure of the longitudinal wrapping channel 66 which, for a clearer illustration, is not shown in the drawings.

[0168] The fourth folding means 89 (fig. 1 and 14) comprise, in succession, a pair of fourth folding elements 90a, 90b, a pair of fifth folding elements 91a, 91b and a pair of sixth folding elements 92a, 92b. The folding elements

90a and 90b, 91a and 91b, 92a and 92b of each pair are disposed in a specular manner with respect to the longitudinal wrapping channel 66 to cooperate with it and complete the folding of the covering sheet 205.

[0169] Preferably, the fourth folding elements 90a and 90b, the fifth folding elements 91a and 91b, and the sixth folding elements 92a and 92b are of a static type. For example, the fourth folding elements 90a and 90b, the fifth folding elements 91a and 91b, and the sixth folding elements 92a and 92b comprise, or consist of, fixed abutments conformed differently in relation to the specific folds to be performed.

[0170] In particular, considering the second wrapping sheet 202 and the case in which the latter protrudes at the lower part with respect to the containing casing 101, the fourth folding elements 90a and 90b are configured to fold the lower lateral flaps 226d and 226e, the fifth folding elements 91a and 91b are configured to fold one of the two larger lower flaps 226b or 226c, and the sixth folding elements 92a and 92b are configured to fold the other of the two larger lower flaps 226c or 226b, concluding the folding operations and creating the containing body 102 (fig. 2).

[0171] Considering the third wrapping sheet 203, the fourth folding elements 90a and 90b are configured to fold the lower lateral flaps 236d and 236e, the fifth folding elements 91a and 91b are configured to simultaneously fold one of the two larger upper flaps 231b or 231c and one of the two larger lower flaps 236b or 236c, and the sixth folding elements 92a and 92b are configured to simultaneously fold the other of the two larger upper flaps 231c or 231b and one of the two larger lower flaps 236b or 236c, concluding the folding operations and creating the covering body 103 (fig. 2A).

[0172] The additional stable closing means 93 (figs. 1 and 14) are disposed in a specular manner with respect to the longitudinal wrapping channel 66, in particular between the fifth folding elements 91a and 91b and the sixth folding elements 92a and 92b.

[0173] The additional stable closing means 93 comprise, alternatively or in combination, one or more gluing members 94 operatively associated with the fourth folding means 89, in particular with the fifth and sixth folding elements 91a and 91b and configured to deliver a layer of glue on at least one of the remaining open flaps in order to stably close them by means of the fourth folding means 89, and/or one or more heat-sealing members 96 configured to heat-seal the remaining open flaps, possibly provided with a layer of heat-sealable material M.

[0174] According to other possible embodiments, not shown in the drawings, along the longitudinal wrapping channel 66, downstream of the sixth folding elements 92a and 92b, there can be disposed additional heat-sealing members.

[0175] In the terminal part of the forming unit 15 there is at least one transfer and extraction member 97, such as a thruster, aligned with the transfer zone ZT and configured to thrust one corresponding soft packet 100 at a

time from the longitudinal wrapping channel 66 to means 98 for conveying the soft packet 100 toward other processing zones or units, not shown in the drawings.

[0176] Some embodiments of a method for forming soft packets 100 are described below, in relation to the operation of the apparatus 10 (fig. 1) described heretofore. The method comprises:

- an initial preparation step, in which the aforementioned central control unit 32 is programmed to control and coordinate the drive of the coupling unit 11, of the folding and transfer unit 12, 34, of the second feed unit 13, of the second forming unit 15, that is, of the wrapping unit 13, 15 and their operating components;
- a first feeding step, or coupling step, in which, in the coupling unit 11, the assemblies 210 are fed and formed, in which the internal wrapping sheet 201 is partly wrapped in a U-shape on the smoking articles 300, and in which the latter are disposed aligned parallel to a desired direction of the longitudinal axis DL;
- a folding and transferring step, in which, in the folding and transfer unit 34, 12, along the second advance path PT, first folding means 34 perform a plurality of folds on each of the internal wrapping sheets 201 so that they have a cup-like shape to enclose corresponding smoking articles 300 aligned parallel to the longitudinal axis DL, and thus form respective containing casings 101;
- a second feeding step, in which, in the second feed unit 13, along a second feed path PA2, the feed means 51 feed and dispose, on each occasion, the covering sheets 205, with respect to the containing casings 101, parallel to the longitudinal axis DL of the smoking articles 300, so that the contrast and guide means 59, cooperating with the thrust means 50, laterally couple each containing casing 101 to a respective covering sheet 205 by folding the latter into a U-shape around the containing casing 101, with respect to the longitudinal axis DL; and
- a main forming step, in which containing casings 101 are received in the second forming unit 15, around which the respective covering sheets 205 are partly wrapped, and in which the first and second forming means 64, 84 fold and close the covering sheets 205 around the respective containing casings 101 in the desired orientation, thus creating corresponding covering casings 105 and, as a result, forming respective soft packets 100.

[0177] In other words, during the main forming step the assemblies 210 are wrapped with the corresponding covering sheets 205 by means of a wrapping unit 13, 15. Furthermore, in the second feeding step the feed means 51 feed and dispose, on each occasion, the covering sheets 205 in front of respective forming pockets 69. We must clarify that what has been described for a single

internal wrapping sheet 201 with which the containing casing 101 is obtained and for a single covering sheet 205 with which the covering casing 105 is obtained is valid cyclically for each of the containing casings 101 and the covering casings 105 with which respective soft packets 100 are formed, or made.

[0178] In the initial preparation step, the central control unit 32 is programmed to drive the drive members 21, 31 and, consequently, the rotating disc 20 and the conveyor means 17 so that when a housing member 22 provided with the assembly 210 reaches the exit zone ZU, an extraction member 30 intercepts the smoking articles 300, thrusting them, together with the internal wrapping sheet 201, out of the housing seating 23. Moreover, the central control unit 32 is programmed to drive the drive members 67 and 87 and, consequently, the forming wheel 65 and the longitudinal wrapping channel 66 so that when a forming pocket 69 provided with the almost formed covering casing 105 reaches the pick-up zone ZP2, it is intercepted by corresponding gripping and advance means 86 which, advancing, pick up the same covering casing 105.

[0179] In some embodiments, the first feeding step, or coupling step, comprises, in sequence, the following operating sub-steps:

- a feeding and insertion sub-step, in which in correspondence with the introduction zone ZI1, the smoking articles 300 are inserted into a respective housing seating 23, in the direction of the longitudinal axis DL;
- a first movement sub-step, in which, by means of the first drive member 21, the rotating disc 20 rotates counterclockwise and takes the smoking articles 300 into the positioning zone ZP, where it stops for a few milliseconds;
- a positioning sub-step, in which the positioning means 24 position the internal wrapping sheet 201 on the housing member 22 folding it into a U-shape; and
- a second movement sub-step, in which, by means of the first drive member 21, the rotating disc 20 rotates counterclockwise and takes the assembly 210 into the exit zone ZU.

[0180] In particular, the assemblies 210 are supplied to the transfer unit 12 with a desired orientation, such that the mouth ends 301 are aligned with respect to the direction of advance DV.

[0181] According to preferred embodiments, the smoking articles 300 can be fed into the housing seatings 23 with the mouth ends 301 facing forward with respect to the direction of advance DV. Then, in the positioning sub-step, the positioning means 24 positions the internal wrapping sheet 201 on the housing member 22 by folding it into a U-shape so that the central panel 211 is in contact with the mouth end 301.

[0182] According to other possible embodiments, the smoking articles 300 can be fed with the lighting ends 302 facing forward with respect to the direction of ad-

vance DV. Then, in the positioning sub-step, the positioning means 24 positions the internal wrapping sheet 201, folding it into a U-shape, so that the central panel 211 is in contact with the lighting end 302.

[0183] Then, in an intermediate interception step (fig. 11), one extraction member 30 at a time, moving along the second advance path PT, intercepts the smoking articles 300 present in a corresponding housing seating 23 and, inserting itself in the latter, thrusts out the smoking articles 300 aligned parallel to the longitudinal axis DL, and with them also the corresponding internal wrapping sheet 201, keeping the latter in position folded in a U-shape, so that its center panel 211 is in contact with mouth ends 301, or lighting ends 302, of the smoking articles 300, to then make the assembly 210 advance with the desired orientation along the second advance path PT.

[0184] In this way, the transfer step begins, which comprises an initial folding step and a conclusive folding step. In particular, in this transfer step, the conveyor means 17 keep the assembly 210 in the desired orientation in the transfer along the second advance path PT.

[0185] In some embodiments, the initial folding step (fig. 2) comprises, in sequence, at least the following operating sub-steps:

- a first initial folding sub-step, in which the extraction member 30, advancing along the second advance path PT in the direction of advance DV, takes the internal wrapping sheet 201 against the first folding element 35a, 35b, thus folding the central flaps 217;
- a second initial folding sub-step, in which the extraction member 30 takes the internal wrapping sheet 201 against the second folding element 36a, 36b, thus folding the rear lateral flaps 214a and 215a;
- a third initial folding sub-step, in which the extraction member 30 takes the internal wrapping sheet 201 in contact with the third folding element 37a, 37b, thus folding the front lateral flaps 214b and 215b; and
- a fourth initial folding sub-step, in which the extraction member 30 takes the internal wrapping sheet 201 in correspondence with the fourth folding members 39a and 39b which, with a movement perpendicular to the second advance path PT, close the corner flaps 218 without interrupting the advance of the extraction member 30 itself.

[0186] At this point, the containing casing 101 is almost formed, and a conclusive folding step begins in which, initially, the receiving and folding device 40 moves into the receiving position PR1 (figs. 12A, 12B) with the housing drawer 41 in the lowered position P1 to receive, from the extraction member 30, the internal wrapping sheet 201 closed in a cup-like shape and almost totally wrapped on the smoking articles 300.

[0187] Thereafter, the receiving and folding device 40 returns to the resting position PR2 (fig. 12C).

[0188] Then, the folding of the internal wrapping sheets 201 is completed by means of the receiving and folding

device 40, so as to create a corresponding containing casing 101 completely closed around the respective group of smoking articles 300.

[0189] In some embodiments, in a first conclusive folding sub-step (fig. 12D), in which the fifth folding member 49 folds, with a movement from bottom to top, the smaller rear flap 216a, which protrudes from the bottom aperture 46, against the lighting end 302 of the smoking articles 300.

[0190] Subsequently, in a second conclusive folding sub-step (fig. 12E), while the fifth folding member 49 keeps the smaller rear flap 216a folded against the lighting end 302, the housing drawer 41 passes into the raised position P2 and, by taking the smaller front flap 216b against the front wall of the receiving and folding device 40, that is, against the sixth folding member 45, causes the folding of the latter on the already folded smaller rear flap 216a. In this way, a corresponding containing casing 101 is formed, in which the smoking articles 300 are kept aligned parallel to the longitudinal axis DL.

[0191] During the conclusive folding step, the second feeding step is also performed, so that when the containing casing 101 is formed, a covering sheet 205 is present in correspondence with the coupling zone ZA.

[0192] In some embodiments, the second feeding step, comprises, in sequence, the following operating sub-steps:

- a feeding and advance sub-step, in which the feed belt 200 is fed from above, in a known manner, and is made to advance by means of the drawing rollers 55 along the second feed path PA2;
- a cutting sub-step, in which, during the advance of the feed belt 200, the cutting device 56 cuts the latter to size, in order to obtain a covering sheet 205, while the same feed belt 200 is made to advance in a controlled manner toward the contrast and guide means 59 by the advance rollers 57;
- a preparation step (fig. 13A), in which the covering sheet 205 is disposed in correspondence with the coupling zone ZA in such a way that it is correctly aligned with the direction of insertion LC, and it is kept unfolded and in position thanks to the action of the contrast and guide means 59 that cooperate with the front guide elements 61.

[0193] In particular, the contrast and guide means 59 (figs. 13B-13C) counteract the irregular movement of the covering sheet 205 before the latter is coupled to the containing casing 101 and, when the thrust means 50 thrust the containing casing 101 against the covering sheet 205, in order to couple them in the direction of insertion LC, which is perpendicular to the longitudinal axis DL, the same contrast and guide means 59 guide the containing casing 101 and the covering sheet 205 in the direction of insertion LC causing the latter to be folded into a U-shape around the containing casing 101. In other words, the thrust means 50 thrust, on one flank, each

assembly 210 from the receiving and folding device 40 against the corresponding covering sheet 205 located in front of the respective forming pocket 69, in a direction of insertion LC perpendicular to the respective longitudinal axis DL of the smoking articles 300, so as to fold the respective covering sheet 205 into a U-shape while it is inserted, with the assembly 210, into the respective forming pocket 69.

[0194] The main forming step (figs. 13D, 13E and 14) then begins, which comprises an initial forming step and a conclusive forming step.

[0195] In the initial forming step, the assemblies 210 coupled to the respective covering sheets 205 are moved toward the respective forming pockets 69, and cooperate head-wise with first closing means 64 to perform an initial part of closing the covering casing 105.

[0196] In some embodiments, the initial forming step comprises, in succession, the following operating sub-steps:

- a first initial forming sub-step, in which the same insertion of the covering sheet 205 folded into a U-shape on the containing casing 101 involves the folding of corresponding flaps thereof which, protruding from the folding pocket 69, are contrasted by the lateral abutment elements 72;
- a second initial folding sub-step, in which the folding pocket 69 is still aligned with the direction of insertion LC and the second folding thruster 74, with a movement from bottom to top, folds a corresponding flap of the covering sheet 205, which protrudes from the forming pocket 69, onto the first or second lateral wall 114 or 115 of the containing casing 101 (fig. 13D);
- a third initial forming sub-step, in which, by means of the third drive member 67, the forming wheel 65 rotates clockwise taking a flap of the covering sheet 205, which protrudes from the forming pocket 69, against the folding wall 75, folding it inward temporarily (fig. 13E); and
- a fourth initial forming sub-step (fig. 14), in which, by means of the third drive member 67, the forming wheel 65 rotates clockwise until it takes the covering sheet 205 below the transverse aperture 79, so that the flap just folded is partly reopened, and in which the stable closing means 76 stably close this partly reopened flap on the other one already folded by means of the second folding thruster 74.

[0197] In particular, the closure of these flaps can take place either by means of the combined action of the gluing members 81, which apply a layer of glue on at least one of these flaps, and the forming wheel 65, which by rotating takes the partly reopened flap against the abutment element 77 so as to close it stably, or by means of one or more heat-sealing members 83 which heat-seal these flaps together, on which a heat-sealable material

M is present.

[0198] Then, the forming wheel 65, by means of the third drive member 67, rotates clockwise to take the covering sheet 205 in correspondence with the pick-up zone ZP2.

[0199] Subsequently, in an intermediate pick-up step, the fourth drive member 87 drives the longitudinal wrapping channel 66 which, by means of the gripping and advance means 86, intercepts the almost formed covering casing 105 and picks it up from the respective forming pocket 69, maintaining its orientation unchanged, in order to perform the conclusive forming step by making it cooperate with the second closing means 84.

[0200] In some embodiments, the conclusive forming step (fig. 14) comprises, in succession, the following operating sub-steps:

- a first conclusive forming sub-step, in which the longitudinal wrapping channel 66, by means of the gripping and advance means 86, makes the covering sheet 205 advance and takes it against the fourth folding elements 90a, 90b folding corresponding protruding flaps;
- a second conclusive forming sub-step, in which the longitudinal wrapping channel 66 makes the covering sheet 205 advance and takes it against the fifth folding elements 91a, 91b folding other protruding flaps;
- an application sub-step, in which the longitudinal wrapping channel 66 makes the covering sheet 205 advance and takes it in correspondence with the gluing members 81 so that the latter apply a layer of glue on one or more flaps to be stably closed; and
- a third conclusive forming sub-step, in which the longitudinal wrapping channel 66 makes the covering sheet 205 advance further and takes it against the sixth folding elements 92a, 92b folding and closing the last still open flaps of the covering sheet 205, thus creating the covering casing 105 and, consequently, forming the soft packet 100.

[0201] In the event that the flaps are provided with a heat-sealable material M, the application sub-step is not necessary and an alternative third conclusive forming step is provided, in which the longitudinal wrapping channel 66, by means of the gripping and advance means 86, makes the covering sheet 205 advance and takes it in correspondence with one or more heat-sealing members 96 to heat-seal together the flaps folded by the fifth and sixth folding elements 91a, 91b and 92a, 92b.

[0202] In this way, a soft packet 100 is formed in which, thanks to the removable zone 117 present on the upper wall 111, access to the smoking articles 300 is simpler, faster and more practical.

[0203] In accordance with possible embodiments, in the event that the covering sheet 205 is defined by the second wrapping sheet 202 (fig. 2) and that the covering

casing 105 is defined by the containing body 102. In particular, the first feed belt 200A is fed in an asymmetrical manner with respect to the disposition of the containing casing 101 and the orientation thereof, so that the second wrapping sheets 202 are disposed on one side substantially flush with the containing casing 101 on the other side protruding with respect thereto. Preferably, the second wrapping sheets are disposed flush with the upper wall 111 and protrude with respect to the lower wall 116, in relation to the specific orientation of the containing casing 101, that is, depending on whether the upper wall 111 faces forward or not with respect to the direction of advance DV.

[0204] For example, in the event that the upper wall 111 faces forward with respect to the direction of advance DV, the initial forming step comprises, in succession, the following operating sub-steps:

- a first initial folding sub-step, in which the same insertion of the second wrapping sheet 102 folded into a U-shape on the containing casing 101 involves the folding of the lower central flap 226a;
- a second initial folding sub-step, in which the second folding thruster 74 folds the first central lateral flap 225a which protrudes from the forming pocket 69, onto the first or second lateral wall 114 or 115 of the containing casing 101;
- a third initial folding sub-step, in which, by means of the third drive member 67, the forming wheel 65 takes the second central lateral flap 225b against the folding wall 75, folding it temporarily toward the already folded first central lateral flap 225a;
- a fourth initial forming sub-step, in which, by means of the third drive member 67, the forming wheel 65 takes the second wrapping sheet 202 below the transverse aperture 79 of the abutment element 77, so as to cause the newly closed second central lateral flap 225b to partly reopen, and in which the stable closing means 76 stably close the partly reopened second central lateral flap 225b on the first central lateral flap 225a.

[0205] In particular, the closure of these flaps can take place either by means of the combined action of the gluing members 81, which apply a layer of glue on at least one of either the first or the second central lateral flap 225a, 225b, and the forming wheel 65, which takes the partly reopened second central lateral flap 225b against the abutment element 77 so as to close it stably, or by means of one or more heat-sealing members 83 which heat-seal the first and second central lateral flap 225a, 225b, on which a heat-sealable material M is possibly present.

[0206] Then, the forming wheel 65 rotates clockwise to take the second wrapping sheet 202 in correspondence with the pick-up zone ZP2.

[0207] Subsequently, in an intermediate pick-up step, the fourth drive member 87 drives the longitudinal wrap-

ping channel 66 which, by means of the gripping and advance means 86, intercepts the partly closed second wrapping sheet 202 and picks it up from the respective forming pocket 69, in order to perform the conclusive forming step.

[0208] In some embodiments, the conclusive forming step comprises, in succession, the following operating sub-steps:

- a first conclusive forming sub-step, in which the longitudinal wrapping channel 66, by means of the gripping and advance means 86, makes the second wrapping sheet 202 advance and takes it against the fourth folding elements 90a, 90b folding the lower lateral flaps 226d and 226e;
- a second conclusive forming sub-step, in which the longitudinal wrapping channel 66 makes the second wrapping sheet 202 advance and takes it against the fifth folding elements 91a, 91b folding one of the two larger lower flaps 226b or 226c;
- an application sub-step, in which the longitudinal wrapping channel 66 makes the second wrapping sheet 202 advance and takes it in correspondence with one or more gluing members 81 so that the latter apply a layer of glue on at least one of the larger lower flaps 226b and 226c; and
- a third conclusive forming sub-step, in which the longitudinal wrapping channel 66 makes the second wrapping sheet 202 advance and takes it against the sixth folding elements 92a, 92b folding and stably closing the other of the two larger lower flaps 226c or 226b, thus creating the containing body 102 and, consequently, forming the soft packet 100.

[0209] In the event that the flaps are provided with a heat-sealable material M, the application sub-step is not necessary and an alternative third conclusive forming step is provided, in which the longitudinal wrapping channel 66 makes the wrapping sheet 202 advance and takes it in correspondence with one or more heat-sealing members 96 which heat-seal the two larger lower flaps 226c or 226b.

[0210] In accordance with possible embodiments, in case the covering sheet 205 is defined by the third wrapping sheet 203 (fig 2A) and the covering casing 105 is defined by the covering body 103, the second feed belt 200b is fed in a symmetrical manner with respect to the disposition of the containing casing 101, so that the third wrapping sheets 203 protrude with respect to the containing casing 101 both with respect to the upper wall 111 and also with respect to the lower wall 116.

[0211] In some embodiments, the initial forming step comprises, in succession, the following operating sub-steps:

- a first initial folding sub-step, in which the insertion of the second wrapping sheet 203 folded into a U-shape on the containing casing 101 causes the fold-

ing of the upper and lower central flap 231a and 236a;

- a second initial folding sub-step, in which the second folding thruster 74 folds the first central lateral flap 235a onto the first or second lateral wall 114 or 115 of the containing casing 101;
- a third initial folding sub-step, in which, by means of the third drive member 67, the forming wheel 65 takes the second central lateral flap 235b against the folding wall 75, folding it temporarily toward the already folded first central lateral flap 225a;
- a fourth initial forming sub-step, in which, by means of the third drive member 67, the forming wheel 65 takes the third wrapping sheet 203 below the transverse aperture 79 of the abutment element 77, so as to cause the newly closed second central lateral flap 235b to partly reopen, and in which the stable closing means 76 stably close this partly reopened second central lateral flap 235b on the first central lateral flap 235a.

[0212] In particular, the closure of these flaps can take place either by means of the combined action of the gluing members 81, which apply a layer of glue on at least one of either the first or the second central lateral flap 235a, 235b, and the forming wheel 65, which takes the partly reopened second central lateral flap 235b against the abutment element 77 so as to close it stably, or by means of one or more heat-sealing members 83 which heat-seal the first and second central lateral flap 235a, 235b, on which a heat-sealable material M is possibly present.

[0213] Then, the forming wheel 65 rotates clockwise to take the third wrapping sheet 203 in correspondence with the pick-up zone ZP2.

[0214] Subsequently, in an intermediate pick-up step, the fourth drive member 87 drives the longitudinal wrapping channel 66 which, by means of the gripping and advance means 86, intercepts the partly closed third wrapping sheet 203 and picks it up from the respective forming pocket 69, in order to perform the conclusive forming step.

[0215] In some embodiments, the conclusive forming step comprises, in succession, the following operating sub-steps:

- a first conclusive forming sub-step, in which the longitudinal wrapping channel 66, by means of the gripping and advance means 86, makes the second wrapping sheet 202 advance and takes it against the fourth folding elements 90a, 90b folding the upper and lower lateral flaps 231d, 231e and 236d, 236e;
- a second conclusive forming sub-step, in which the longitudinal wrapping channel 66 makes the third wrapping sheet 203 advance and takes it against the fifth folding elements 91a, 91b folding one of the two larger upper and lower flaps 231b or 231c and 236b or 236c;

- an application sub-step, in which the longitudinal wrapping channel 66 makes the third wrapping sheet 203 advance in correspondence with one or more gluing members 81 which apply a layer of glue on at least one of the larger upper and lower flaps 231b or 231c and 236b or 236c; and
- a third conclusive forming sub-step, in which the longitudinal wrapping channel 66 makes the third wrapping sheet 203 advance and takes it against the sixth folding elements 92a, 92b folding the other of the two larger upper and lower flaps 231c or 231b and 236c or 236b;

[0216] In the event that the flaps are provided with a heat-sealable material M, the application sub-step is not necessary and an alternative third conclusive forming step is provided, in which the longitudinal wrapping channel 66 makes the third wrapping sheet 203 advance and takes it in correspondence with one or more heat-sealing members 96 to heat-seal the two larger upper and lower flaps 231b, 231c and 236b or 236c, thus creating the covering body 103.

[0217] In this way, an environmentally friendly and fully recyclable soft packet 100 is advantageously formed, which does not need to be covered with another external covering made of polypropylene and in which, through the removal of the upper part 103a of the covering body 103, the smoking articles 300 are easily accessible to the consumer.

[0218] Subsequently, in a final transfer step, the transfer member 97 transfers the soft packet 100 from the longitudinal wrapping channel 66 to the conveyor means 98 present in the transfer zone ZT that convey it toward other processing zones, or units.

[0219] It is clear that modifications and/or additions of parts may be made to the apparatus 10 and method as described heretofore, without departing from the field and scope of the present invention, as defined by the claims.

[0220] For example, according to possible embodiments, not shown in the drawings, in correspondence with the coupling zone ZA, preferably close to the forming wheel 65, gluing means can be provided configured to prepare a layer of gluing material on the covering sheet 205 or on the containing casing 101 to couple them together in a stable manner.

[0221] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art will be able to achieve other equivalent forms of apparatus and method for forming soft packets of smoking articles, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

[0222] In the following claims, the sole purpose of the references in brackets is to facilitate their reading and they must not be considered as restrictive factors with regard to the field of protection defined by the claims.

Claims

1. Apparatus (10) for forming soft packets (100) of smoking articles (300) which have an elongated shape along a respective longitudinal axis (DL) with a respective lighting end (302) and a respective opposing mouth end (301), said apparatus (10) comprising:

- a coupling unit (11) configured to form, along a first advance path (PA1), assemblies (210) comprising groups of smoking articles (300) partly wrapped by respective internal wrapping sheets (201);
- a wrapping unit (13, 15) configured to wrap said assemblies (210) with respective covering sheets (205);
- a folding and transfer unit (34, 12) disposed downstream of said coupling unit (11) and configured to fold internal wrapping sheets (201) around the respective groups of smoking articles (300), so as to fold said internal wrapping sheets (201) according to a cup-like shape and to move said assemblies (210) along a second advance path (PT) toward said wrapping unit (13, 15),

characterized in that it also comprises a receiving and folding device (40) interposed between said folding and transfer unit (34, 12) and said wrapping unit (13, 15) and configured to complete the folding of said internal wrapping sheets (201) around the respective groups of smoking articles (300), so as to create at least one containing casing (101) at a time, which is completely closed around the respective group of smoking articles (300), **and in that** said wrapping unit (13, 15) comprises:

- a plurality of forming pockets (69) mobile along a third advance path (T 1);
- feed means (51) configured to dispose, on each occasion, said covering sheets (205) in front of a respective forming pocket (69);
- thrust means (50) configured to thrust, on one flank, each assembly (210) from said receiving and folding device (40) against a respective covering sheet (205) located in front of the forming pocket (69), in a direction of insertion (LC), so as to fold the respective covering sheet (205) into a U-shape while it is inserted, with said assembly (210), inside the forming pocket (69); and
- forming means (64, 84) configured to fold and close said covering sheets (205) around the respective containing casings (101), creating corresponding covering casings (105), thus forming respective soft packets (100).

2. Apparatus (10) as in claim 1, **characterized in that** said folding and transfer unit (34, 12) comprises extraction members (30) configured to be inserted into a corresponding housing seating (23) of said coupling unit (11) from a first open end and to thrust out of said housing seating (23), through a second open end opposing said first open end, at least one assembly (210) at a time, keeping the corresponding internal wrapping sheet (201) folded in a U-shape on said smoking articles (300) so that a central panel (211) of said internal wrapping sheet (201) is in contact with the lighting end (302), or the mouth end (301), of said smoking articles (300).
3. Apparatus (10) as in claim 2, **characterized in that** said first coupling unit (11) comprises at least one rotating disc (20) rotatable about a first axis of rotation (R1) provided with housing seatings (23) which are disposed circumferentially, said extraction members (30) being attached to advance means and configured to advance in a direction of advance (DV) parallel to said first axis of rotation (R1).
4. Apparatus (10) as in any claim hereinbefore, **characterized in that** said folding and transfer unit (34, 12) comprises first folding means (34) comprising, in succession, at least one pair of first folding members (35a, 35b) configured to fold central flaps (217) of a respective internal wrapping sheet (201) in correspondence with a respective part of the latter folded into a U-shape, a pair of second folding members (36a, 36b) configured to fold rear lateral flaps (214a, 215a) of said respective internal wrapping sheet (201), a pair of third folding members (37a, 37b) configured to fold front lateral flaps (214b, 215b) of said respective internal wrapping sheet (201) over said already folded rear lateral flaps (214a, 215a), so as to fold the internal wrapping sheet (201) according to a cup-like shape; and a pair of mobile fourth folding members (39a, 39b) configured to fold corner flaps (218) of said respective internal wrapping sheet (201) against the lighting end (302) or the mouth end (301) of the group of smoking articles (300) opposite that of the part folded into a U-shape.
5. Apparatus (10) as in any claim hereinbefore, **characterized in that** said receiving and folding device (40) comprises a housing drawer (41) selectively mobile between a lowered position (P1) to accommodate at least one assembly (210) at a time coming from said folding and transfer unit (34, 12) with the internal wrapping sheet (201) closed in a cup-like shape around said smoking articles (300), and a raised position (P2).
6. Apparatus (10) as in any claim hereinbefore, **characterized in that** said receiving and folding device (40) comprises second folding means (48) compris-

- ing a fifth (49) and a sixth (45) folding member which are configured to respectively fold a smaller rear flap (216a) and a smaller front flap (216b) of a respective internal wrapping sheet (201) on a side opposite to the side where the part folded into a U-shape is present.
7. Apparatus (10) as in claim 6 when it depends on claim 5, **characterized in that** said fifth folding member (49) consists of a mobile element configured to fold said smaller rear flap (216a) of said respective internal wrapping sheet (201) when said housing drawer (41) is in said lowered position (P1).
 8. Apparatus (10) as in claim 6 when dependent on claim 5 or as in claim 7, **characterized in that** said sixth folding member (45) consists of a front folding wall of said receiving and folding device (40), said folding wall being disposed fixed and configured to fold said smaller front flap (216b) of said respective internal wrapping sheet (201) against said smaller rear flap (216a), cooperating with the housing drawer (41) during the passage from said lowered position (P1) to said raised position (P2).
 9. Apparatus (10) as in any claim hereinbefore, **characterized in that** said receiving and folding device (40) has a first aperture (47a) facing toward said feed means (51), and a second aperture (47b) opposing said first aperture (47a), sized so that said thrust means (50) can pass through it to allow the thrust of at least one assembly (210) at a time through said first aperture (47a), in said direction of insertion (LC), which is perpendicular with respect to the disposition of the respective longitudinal axis (DL) of said smoking articles (300), in order to couple said assembly (210) to a respective covering sheet (205).
 10. Apparatus (10) as in claim 9, when it depends on one of the claims from 5 to 8, **characterized in that** said first and second aperture (47a, 47b) are aligned with said assembly (210) when said housing drawer (41) is in the raised position (P2).
 11. Apparatus (10) as in any claim hereinbefore, **characterized in that** said feed means (51) comprise, disposed in sequence, a pair of drawing rollers (55) for feeding a feed belt (200), a cutting device (56) for cutting said feed belt (200) and making a plurality of said covering sheets (205), a pair of advance rollers (57) for making the covering sheets (205) just cut advance in a controlled manner from said feed belt (200) in correspondence with said thrust means (50).
 12. Apparatus (10) as in any claim hereinbefore, **characterized in that** it also comprises two guide rollers (59a, 59b) disposed between said receiving and folding device (40) and said plurality of forming pockets (69), said two guide rollers (59a, 59b) being located lying on a plane substantially perpendicular to said direction of insertion (LC) and configured so that said assemblies (201) thrust by said thrust means (50) pass through them, said two guide rollers (59a, 59b) being also disposed at a distance such as to allow a correct coupling between a covering sheet (205) and the corresponding containing casing (101), when the thrust means (50) thrust said assembly (210) into one of the forming pockets (69) against said covering sheet (205).
 13. Apparatus (10) as in any claim hereinbefore, **characterized in that** said wrapping unit (13, 15) comprises both a wrapping wheel (65) rotatable about a second axis of rotation (R2) and comprising said radially distributed forming pockets (69) configured to accommodate respective assemblies (210) wrapped by the corresponding containing casings (101) with the longitudinal axes (DL) of the smoking articles (300) disposed parallel to said second axis of rotation (R2), wherein with said wrapping wheel (65) there are radially associated first closing means (64) of said forming means (64, 84) to perform an initial part of closing said covering casings (105) on the corresponding containing casings (101), and also a longitudinal wrapping channel (66) disposed in proximity to and outside said wrapping wheel (65) and with which there are operatively associated and laterally positioned second closing means (84) of said forming means (64, 84) to perform a conclusive part of closing said covering casings (105).
 14. Apparatus (10) as in claim 13, **characterized in that** said longitudinal wrapping channel (66) is provided with gripping and advance means (86) configured both to extract said assemblies (210) wrapped by said covering sheets (205) from said forming pockets (69), and also to convey them toward a transfer zone (ZT) by making them cooperate laterally with said second closing means (84).
 15. Apparatus (10) as in claim 14, **characterized in that** said first closing means (64) comprise both third folding means (73) for folding corresponding flaps of said covering sheets (205) around the corresponding containing casings (101), and also stable closing means (76) disposed in succession to said third folding means (73) and comprising one or more gluing members (81) operatively associated with an abutment element (77) and configured to deliver a layer of glue on at least one of said corresponding flaps and/or one or more heat-sealing members (83) configured to heat-seal together said corresponding flaps possibly provided with a layer of heat-sealable material (M), **and in that** said second closing means (84) comprise both fourth folding means (89) for fold-

ing remaining open flaps of said covering sheets (205) around the corresponding containing casings (101), and also additional stable closing means (93) which comprise one or more additional gluing members (94) operatively associated with said fourth folding means (89) and configured to deliver a layer of glue on at least one of said open flaps and/or one or more additional heat-sealing members (96) configured to heat-seal together said remaining open flaps possibly provided with a layer of heat-sealable material (M).

16. Method for forming soft packets (100) of smoking articles (300) having an elongated shape along a respective longitudinal axis (DL) with a respective lighting end (302) and a respective opposing mouth end (301), said method comprising the following steps:

- coupling groups of smoking articles (300) to a respective internal wrapping sheet (201) by means of a coupling unit (11) so as to form assemblies (210) comprising groups of smoking articles (300) covered by respective internal wrapping sheets (201) folded into a U-shape, so that a respective central panel (211) of each internal wrapping sheet (201) is in contact with the mouth ends (301) or the lighting end (302) of the group of smoking articles (300);
- wrapping said assemblies (210) with corresponding covering sheets (205) by means of a wrapping unit (13, 15);
- folding said internal wrapping sheets (201) around the respective group of smoking articles (300), so that said internal wrapping sheets (201) have a cup-like shape, and moving said groups of smoking articles (300) covered with the respective internal wrapping sheets (201) toward said wrapping unit (13, 15); said method being **characterized in that** it also comprises the steps of:
 - completing the folding of said internal wrapping sheets (201) by means of a receiving and folding device (40), so as to create a corresponding containing casing (101) completely closed around the respective group of smoking articles (300);
 - feeding, on each occasion, by means of feed means (51), said covering sheets (205) in front of respective forming pockets (69);
 - thrusting on one flank, by means of thrust means (50), each assembly (210) from said receiving and folding device (40) against the corresponding covering sheet (205) located in front of the respective forming pocket (69), in a direction of insertion (LC) perpendicular to the respective longitudinal axis (DL) of the smoking articles (300) which form said assembly (210), so as to fold the respective covering sheet (205)

into a U-shape while it is inserted, with said assembly (210), inside the respective forming pocket (69);

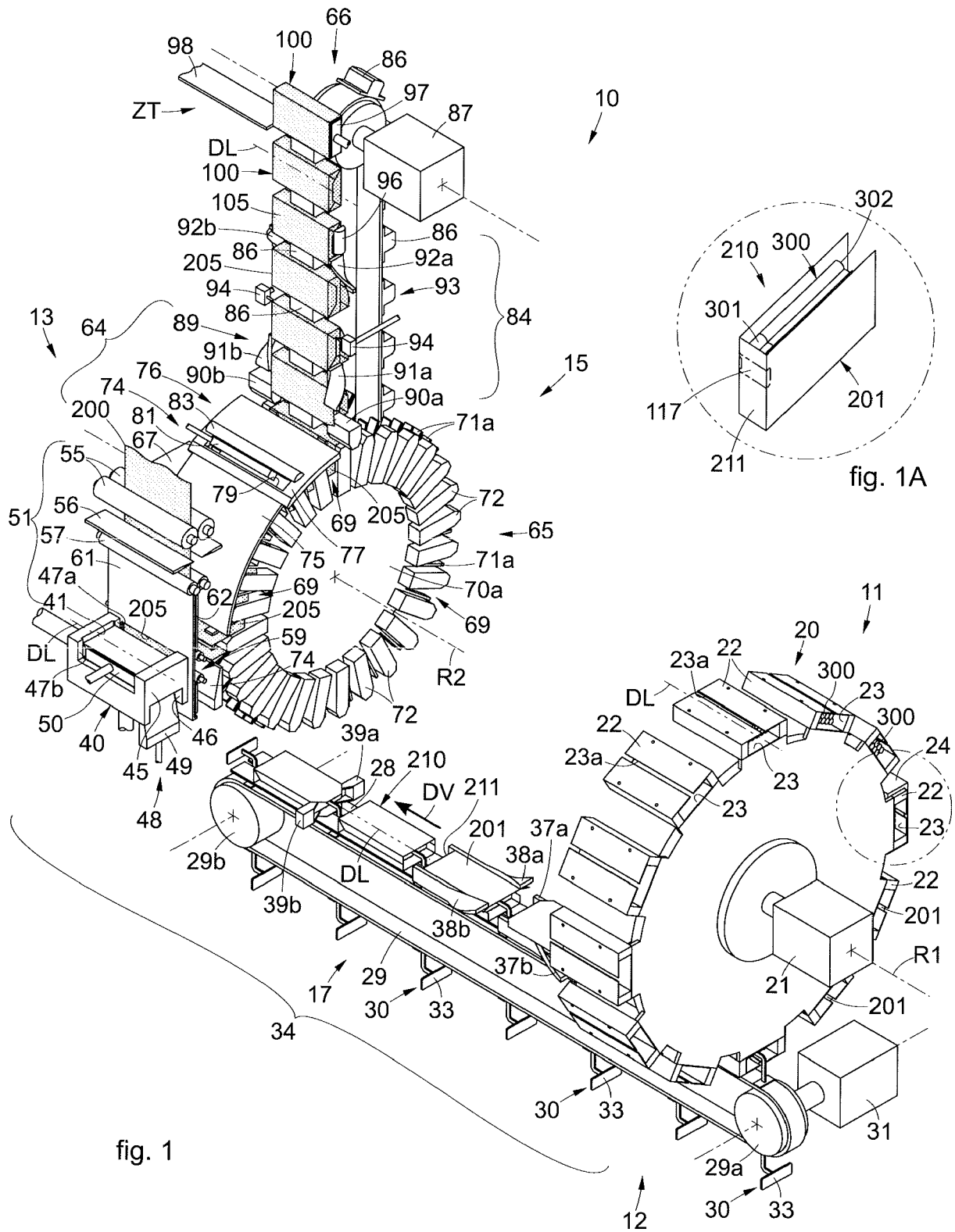
- folding and closing, by means of forming means (64, 84), said covering sheets (205) around the respective containing casings (101), creating corresponding covering casings (105), thus forming respective soft packets (100).

17. Method as in claim 16, **characterized in that** a housing drawer (41) of the receiving and folding device (40), when it is in a lowered position (P1), receives at least one assembly (210) at a time with the respective internal wrapping sheet (201) closed in a cup-like shape, wherein a fifth folding member (49) operatively associated with said receiving and folding device (40) folds a smaller rear flap (216a) of said respective internal wrapping sheet (201), and wherein said housing drawer (41), passing to a raised position (P2), cooperates with a sixth folding member (45) of said receiving and folding device (40), thus folding a smaller front flap (216b) of said respective internal wrapping sheet (201) against the smaller rear flap (216a), thus creating the corresponding containing casing (101).

18. Method as in claim 16 or 17, **characterized in that** said receiving and folding device (40) has a first aperture (47a) facing toward said feed means (51), and a second aperture (47b), opposing said first aperture (47a), sized so that said thrust means (50) pass through it, wherein said assembly (210) is thrust by the thrust means (50) through said first aperture (47a) in order to couple it to the respective covering sheet (205).

19. Method as in any claim from 16 to 18, **characterized in that** the assemblies (210) coupled to the respective covering sheets (205) are moved toward the respective forming pockets (69) of a forming wheel (65), and cooperate head-wise with first closing means (64) to perform an initial part of closing said covering casing (105).

20. Method as in claim 19, **characterized in that** a longitudinal wrapping channel (66), disposed downstream of said forming wheel (65), intercepts, by means of gripping and advance means (86), respective covering sheets (205) closed almost completely on the corresponding containing casings (101), extracting them from said respective forming pockets (69), and conveys them toward a transfer zone (ZT), keeping the orientation unchanged and making them cooperate laterally with second closing means (84) to complete the closure of said covering casings (105).



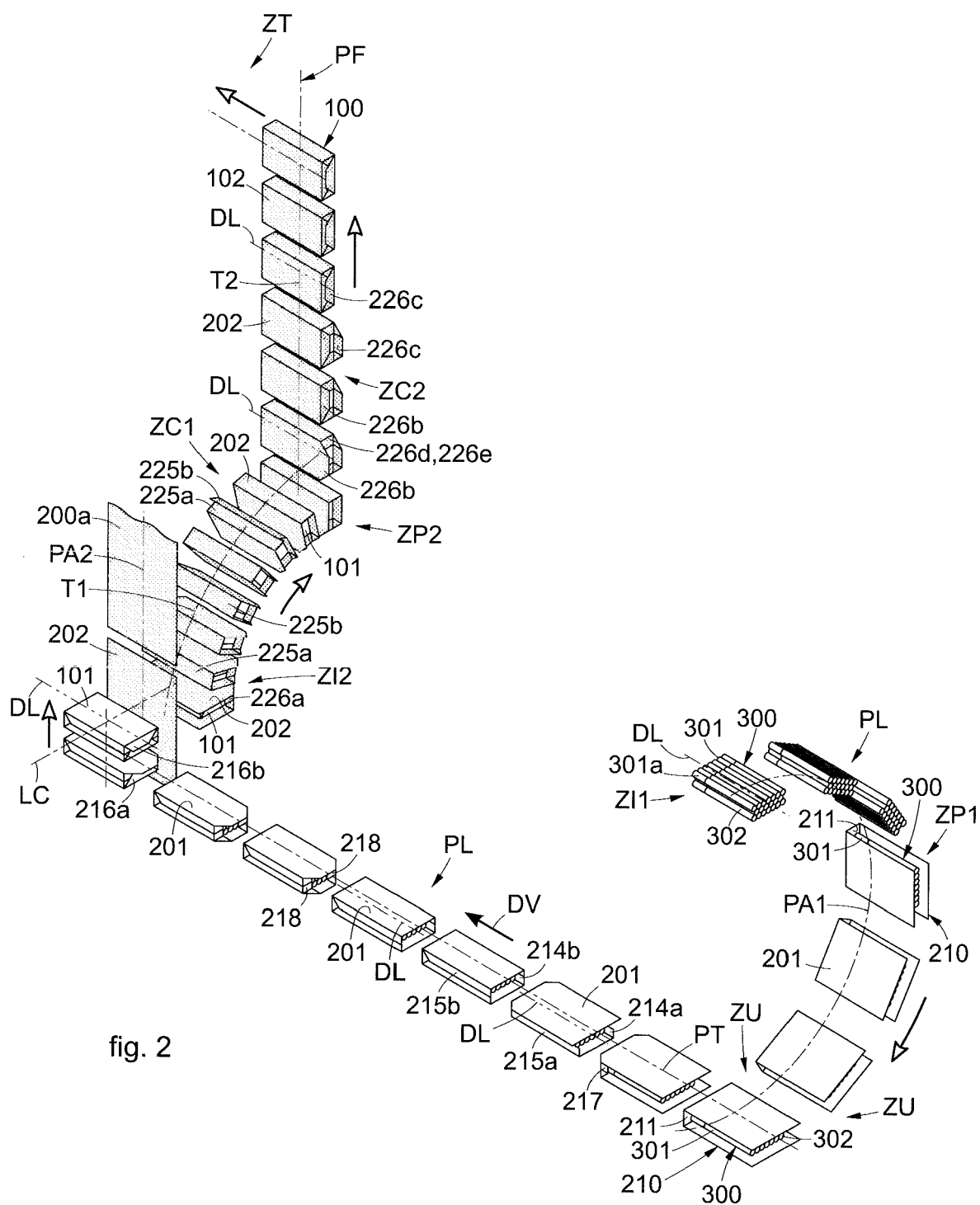


fig. 2

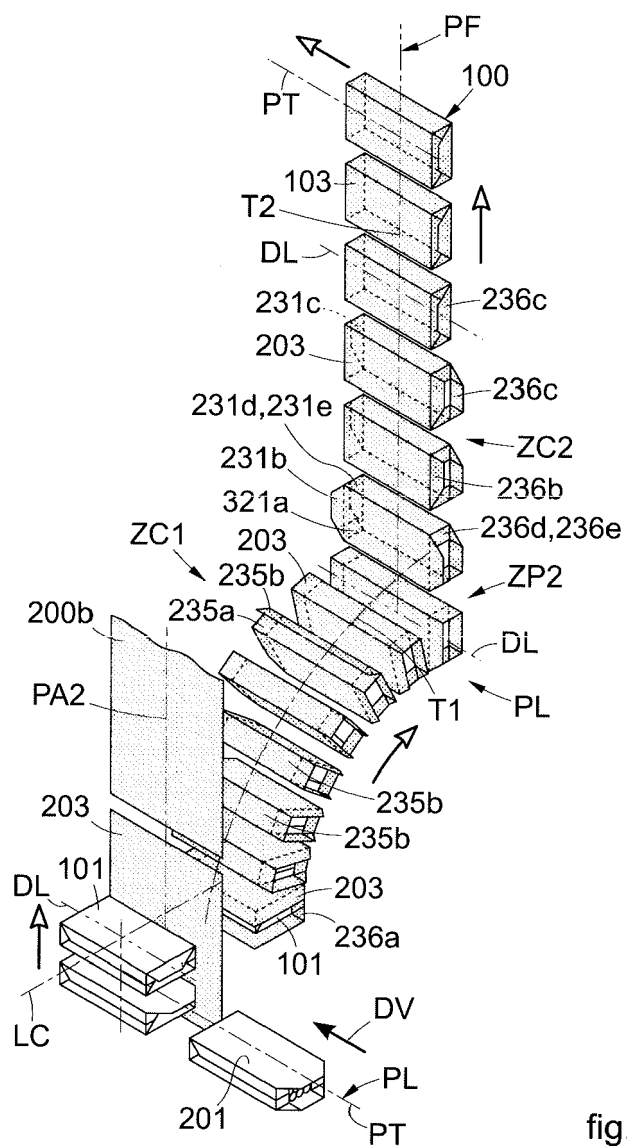


fig. 2A

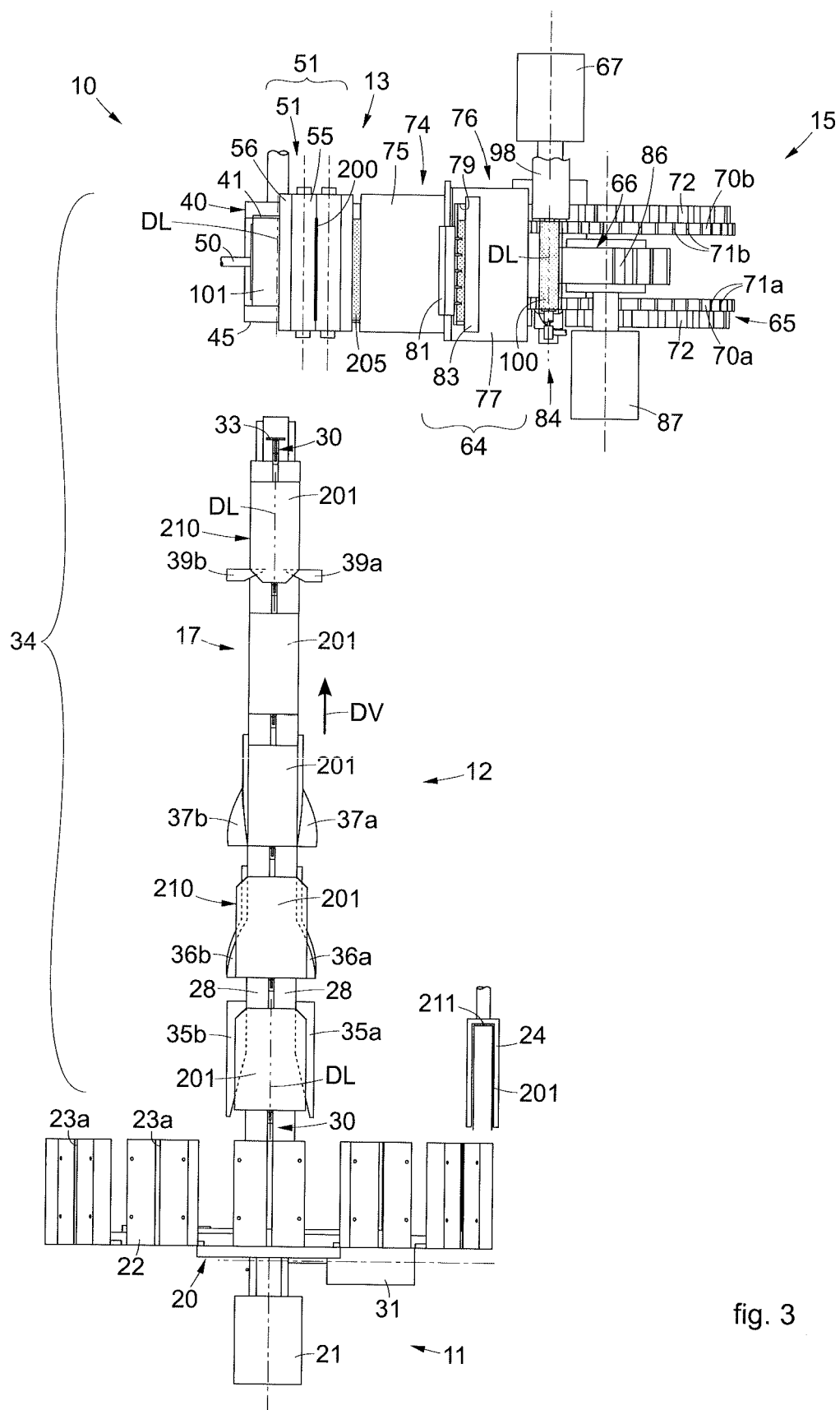


fig. 3

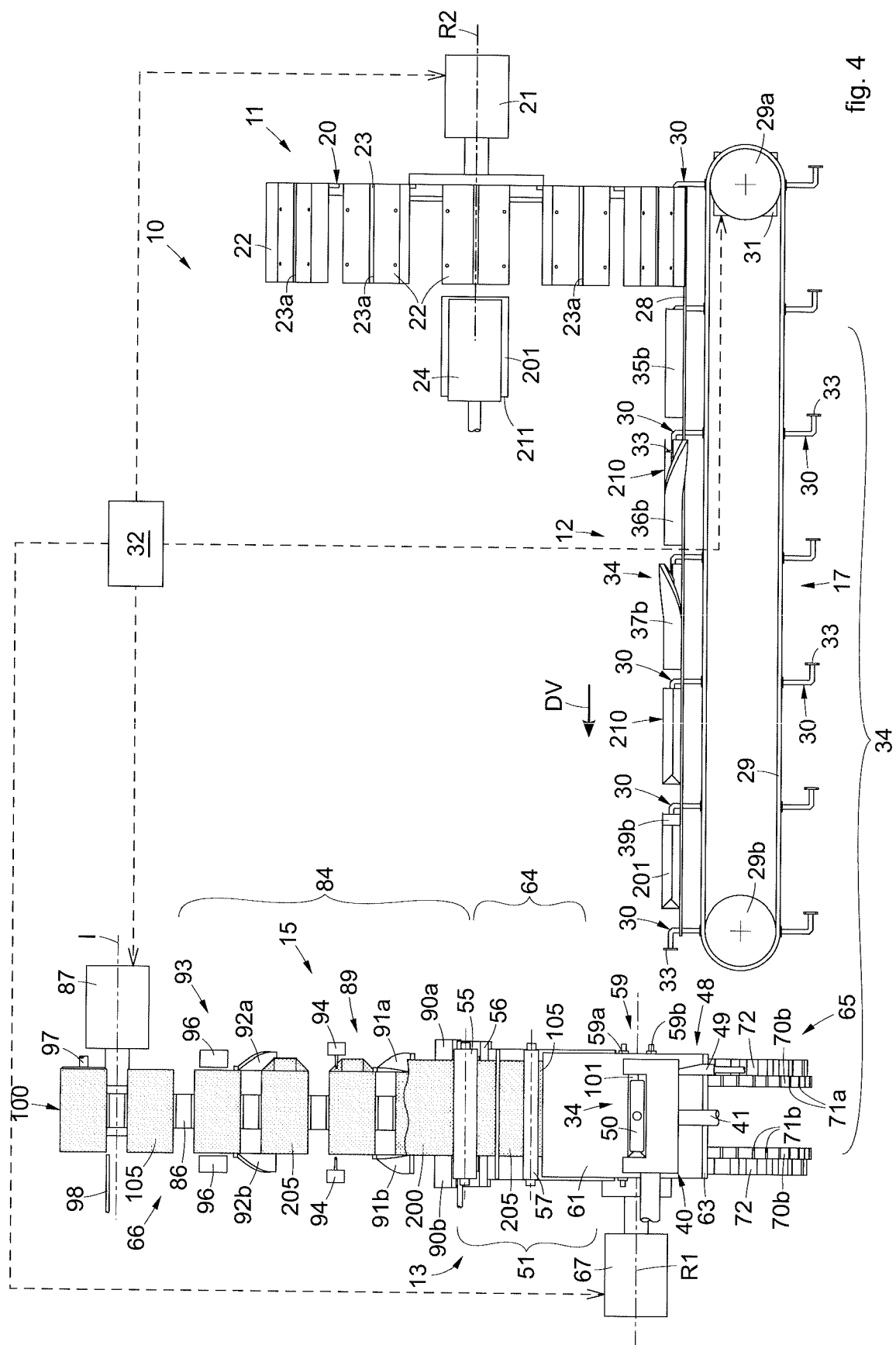


fig. 4

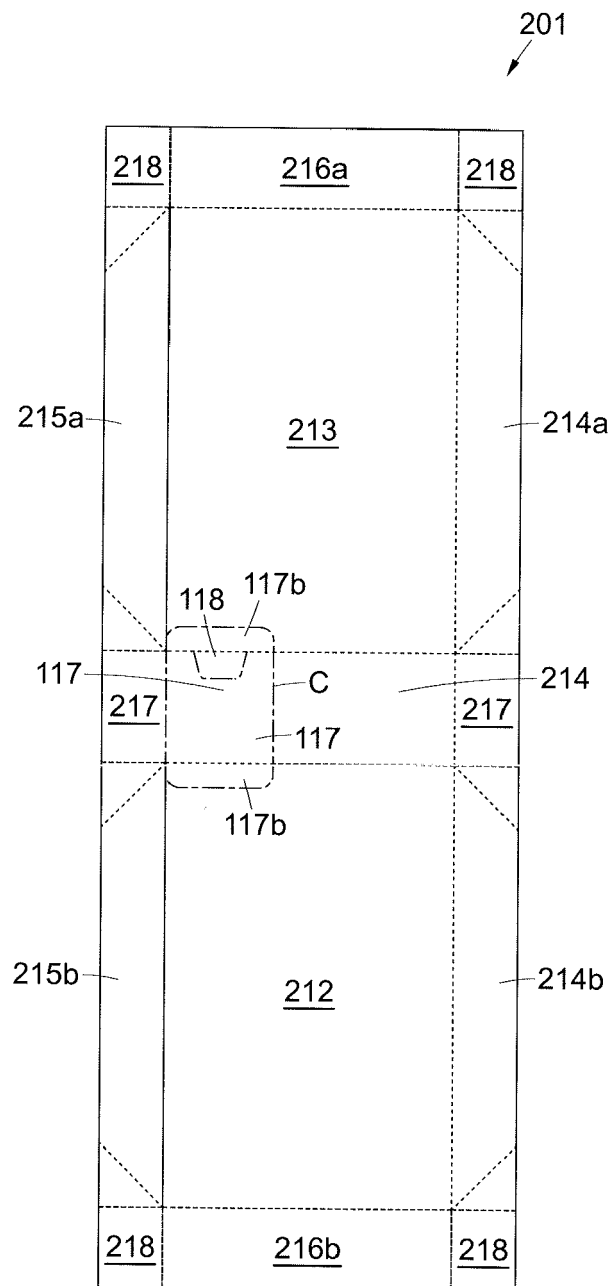


fig. 5

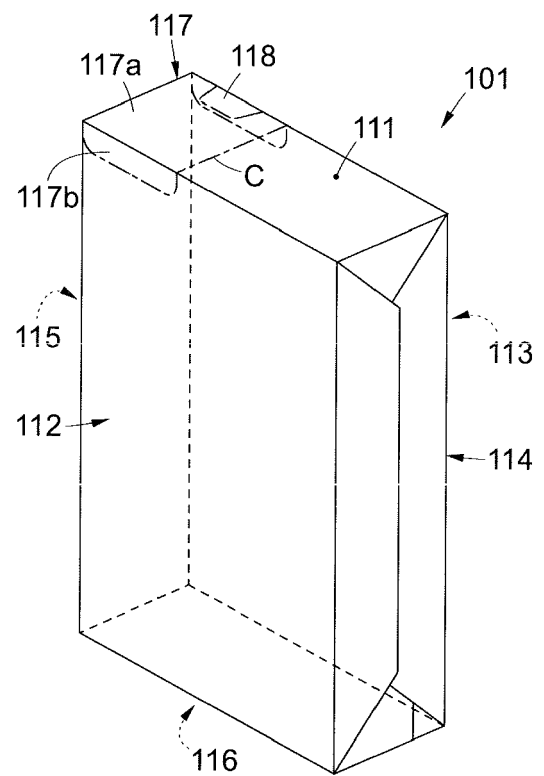


fig. 6

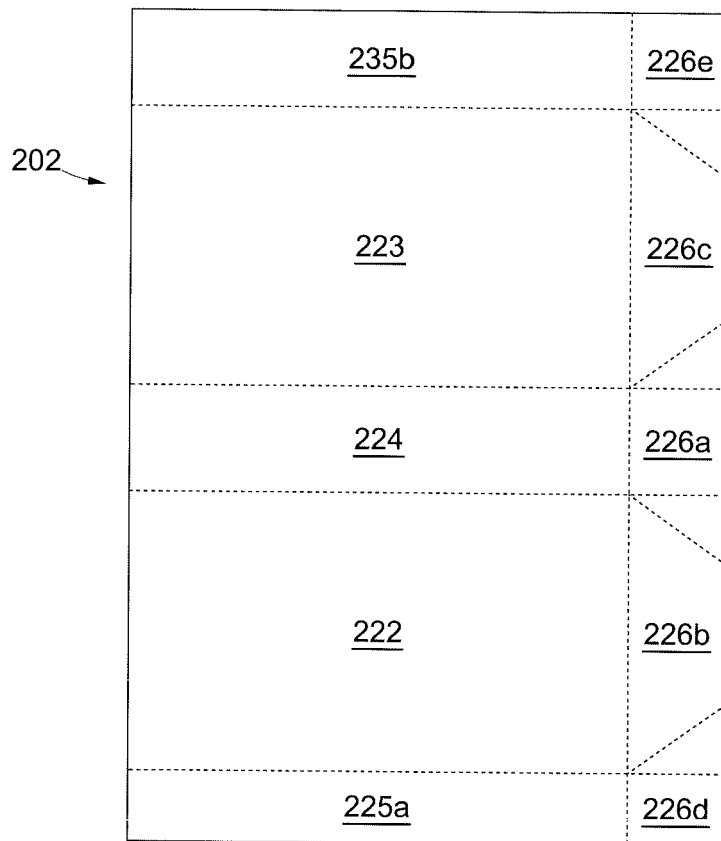


fig. 7

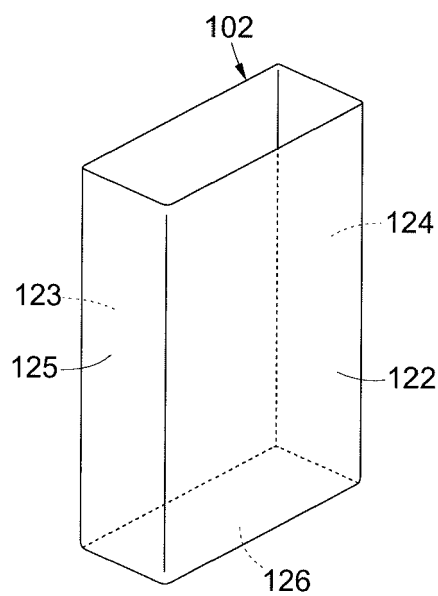


fig. 8

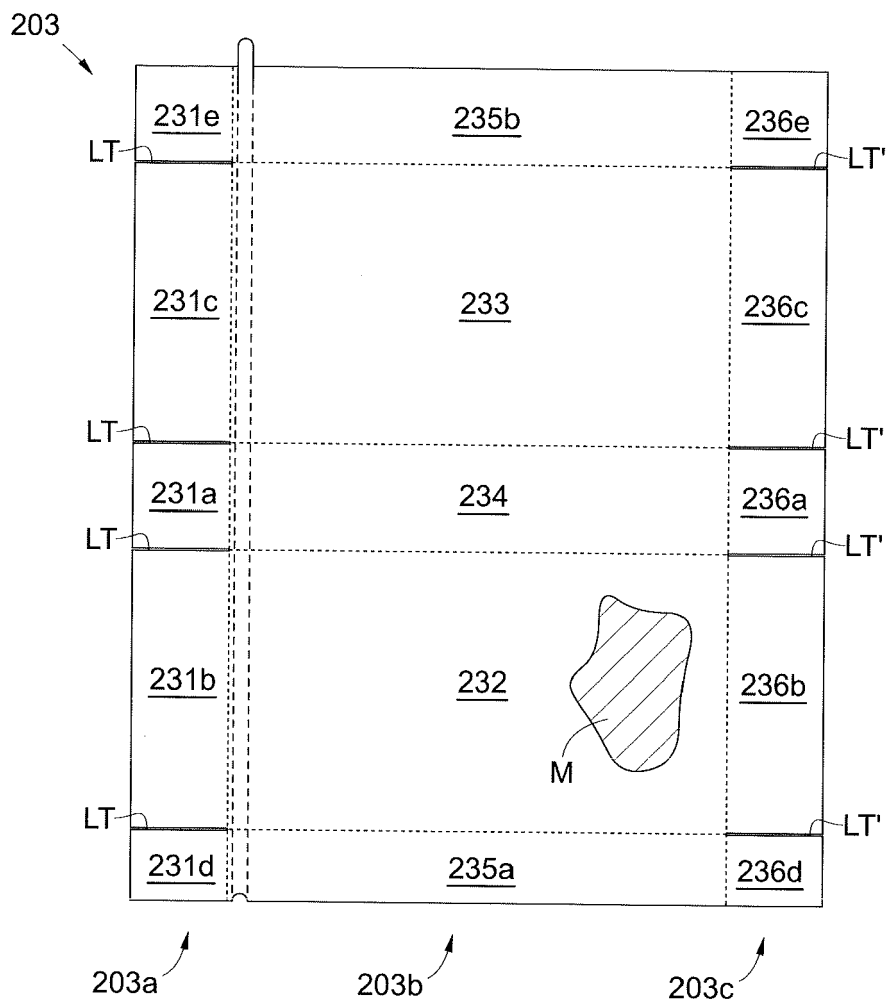


fig. 9

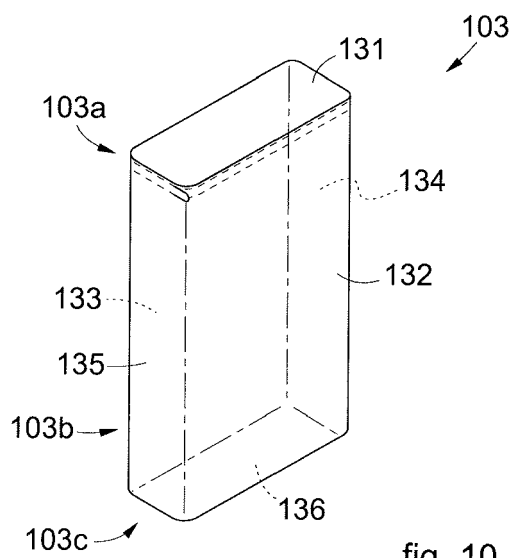


fig. 10

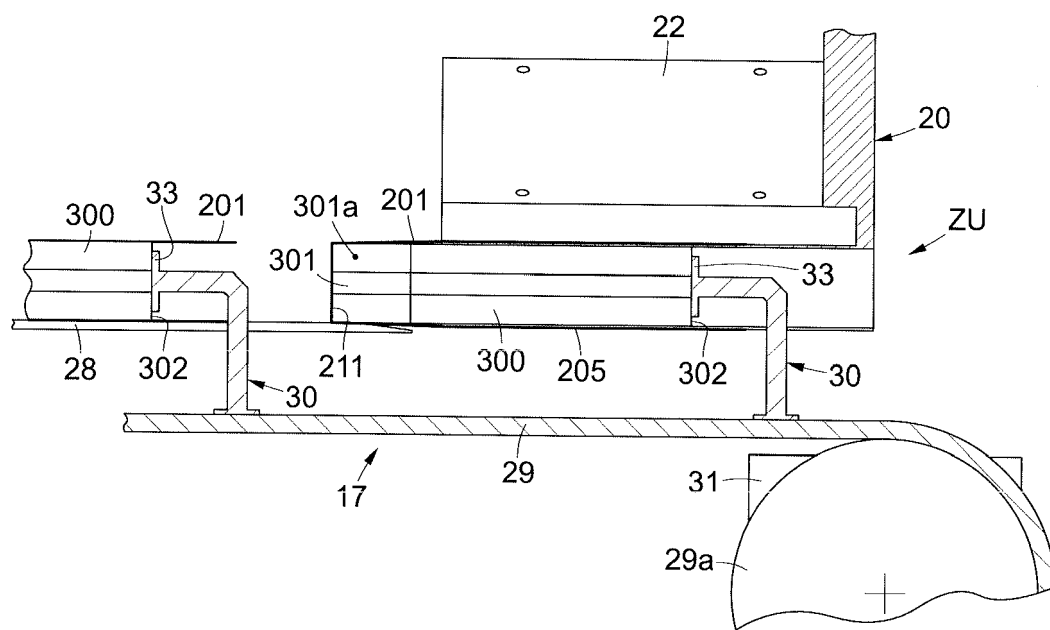
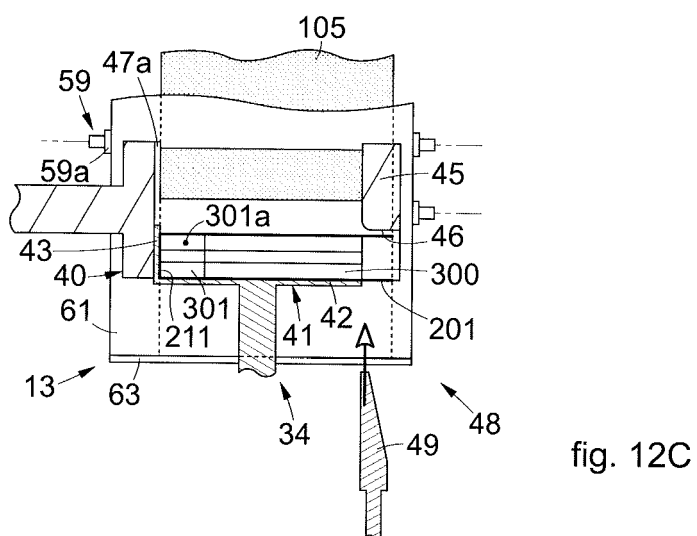
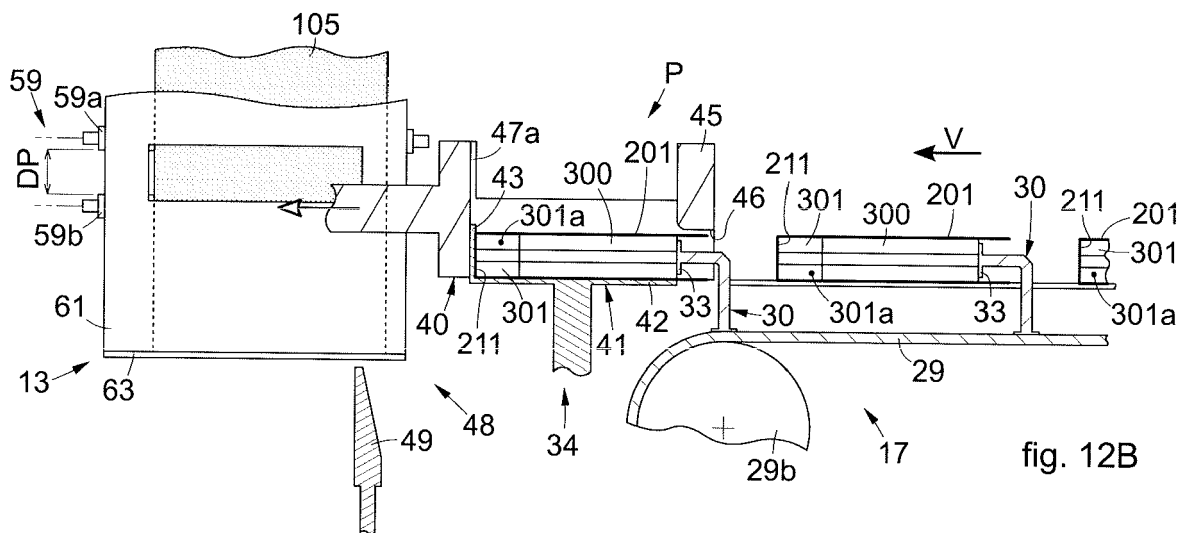
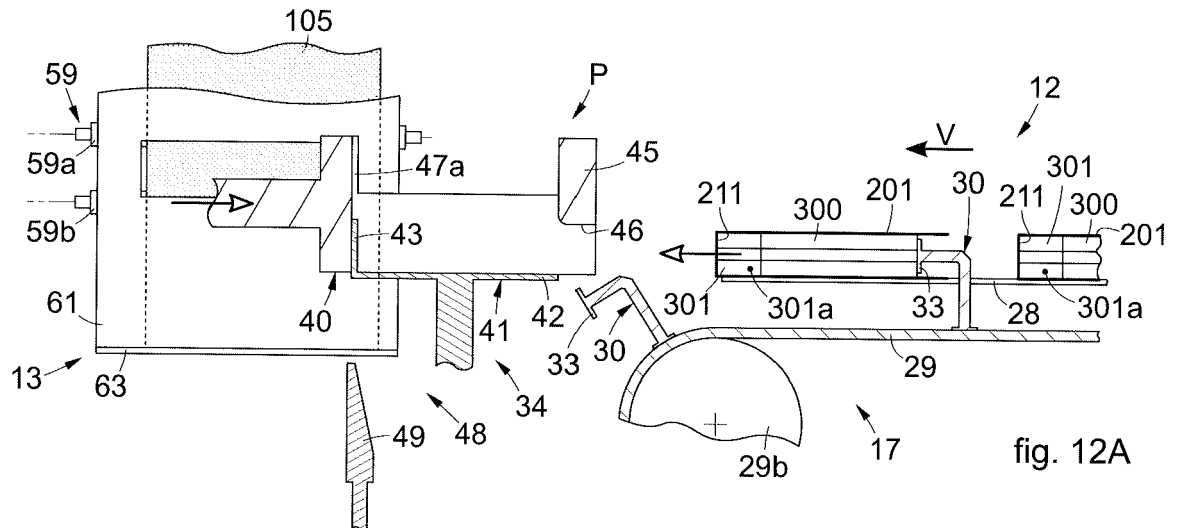
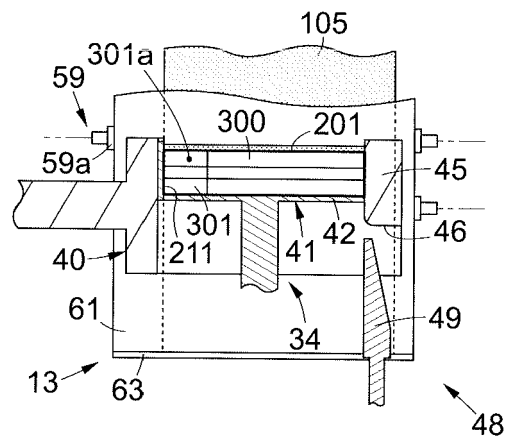
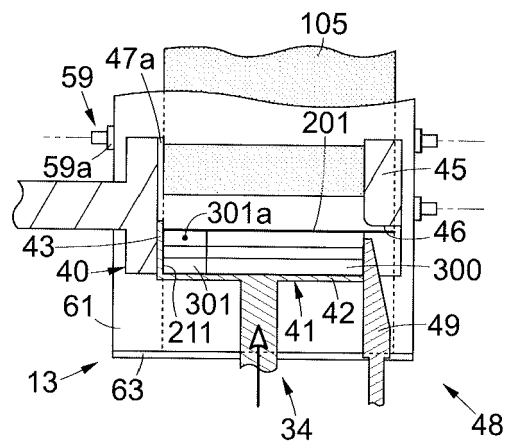
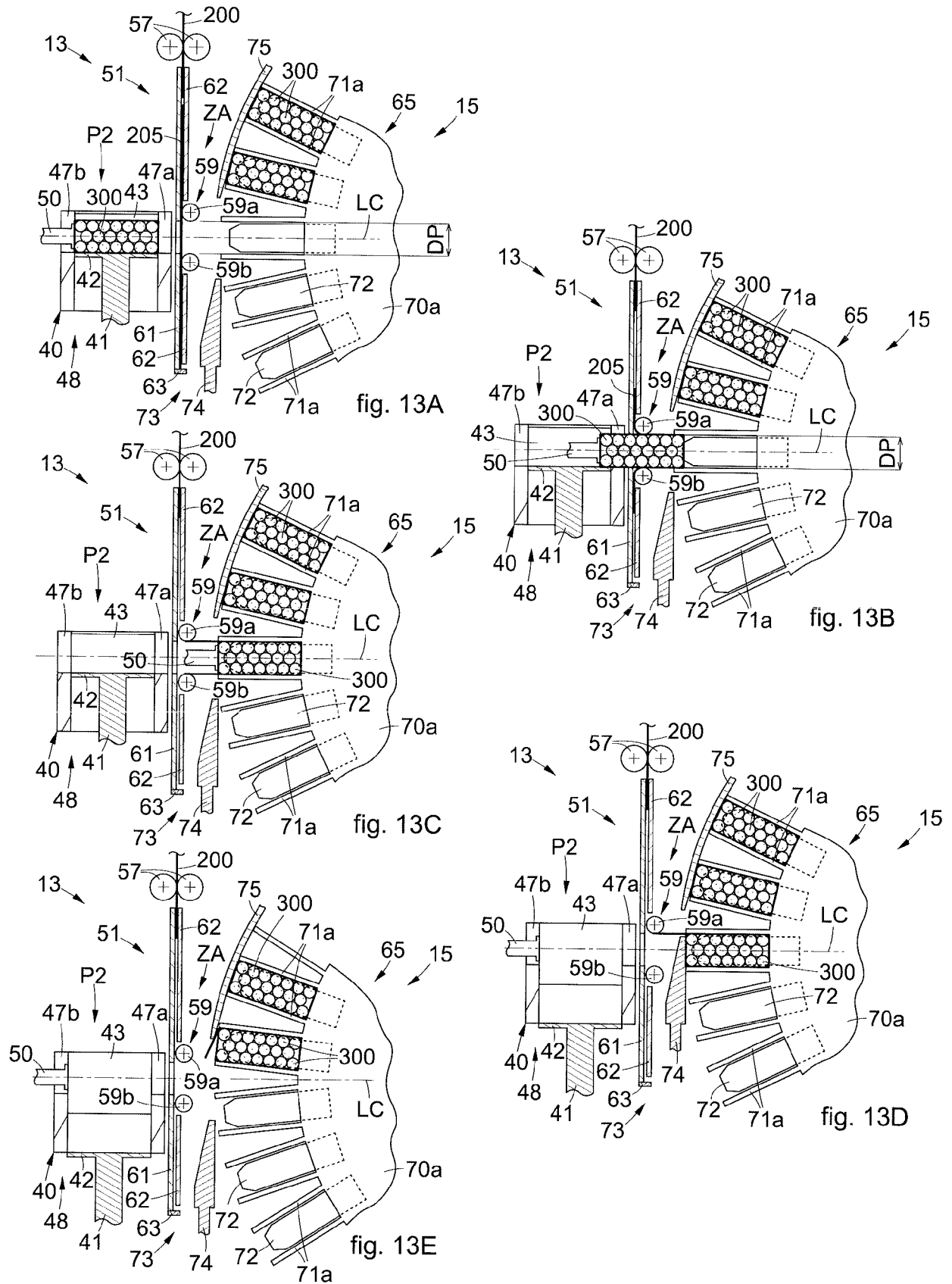
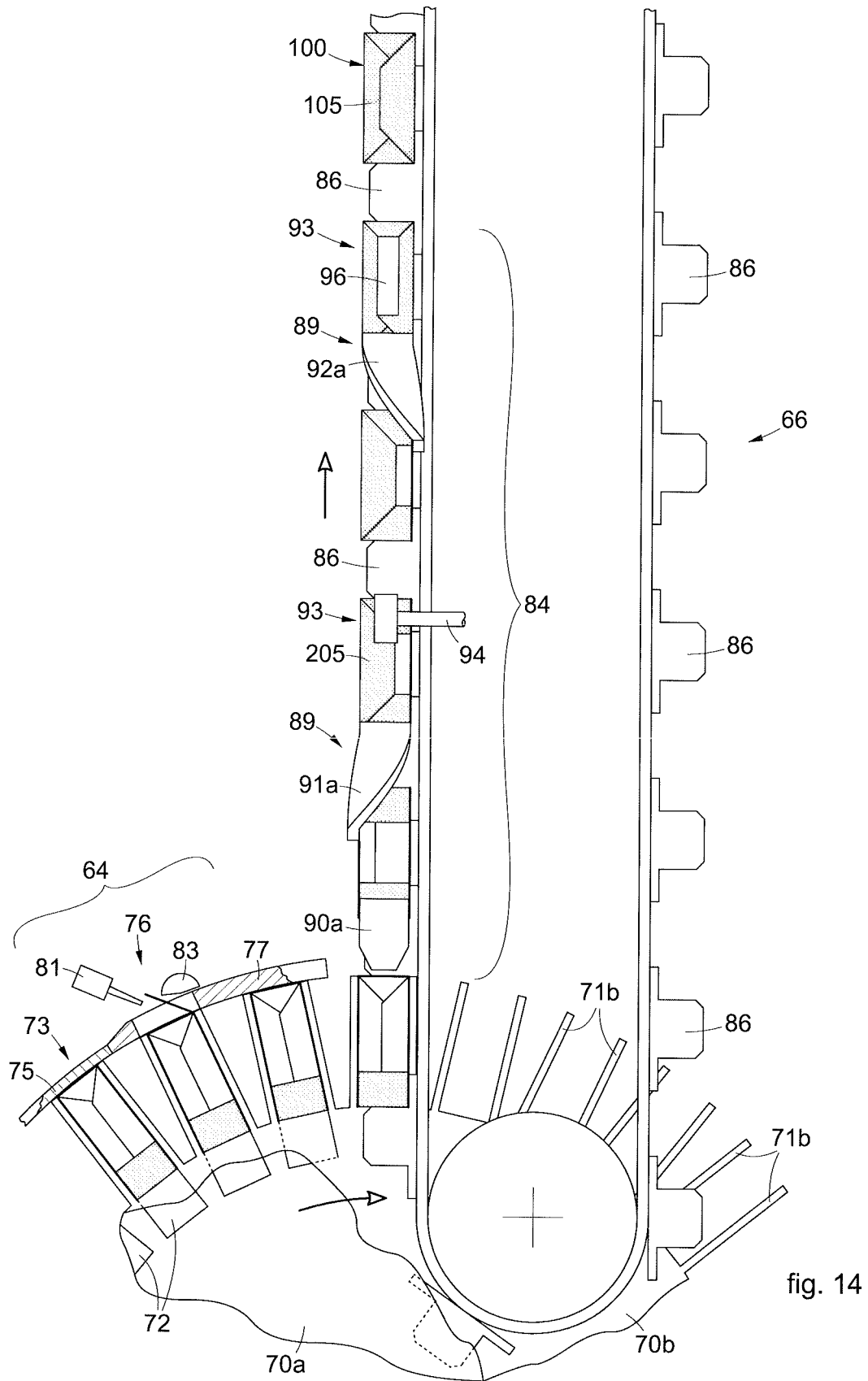


fig. 11











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Application Number

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			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 May 2024	Examiner Lawder, M
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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