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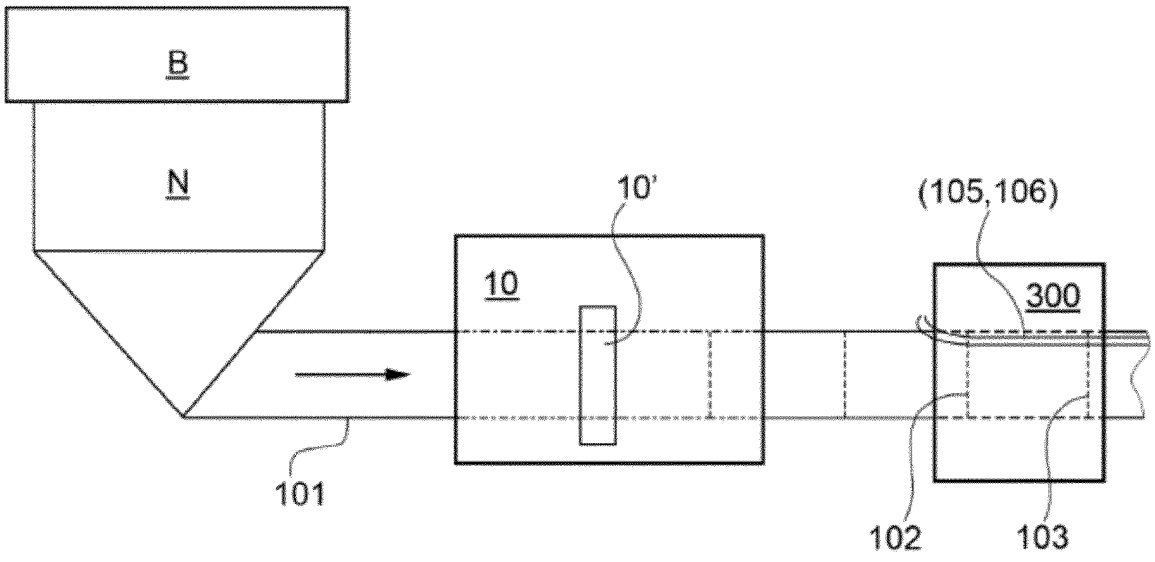
(54) **A PRODUCTION METHOD FOR PRODUCING SHIPPING ENVELOPES OF TAMPER-PROOF PLASTIC MATERIAL**

(57) The present invention relates to a method for the production of a tamper-proof envelope (100) of heat-weldable material and comprising the phases of:
- Feeding at least one tape (N) of heat-weldable material along a processing path and positioning a lower sheet (106) of said heat-weldable material on top of an upper sheet (105) of said heat-weldable material;
- Welding (102, 103) for forming the envelope and application of an adhesive strip (105, 106) for creating the tamper-proof closing of the envelope;
- wherein, along said processing path, the welding phase is carried out first and, subsequently to said welding phase, the application phase of the adhesive strip is carried out.

FIG.4



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Description

Scope of the invention

[0001] The present invention relates to the technical field of production process for producing shipping envelopes of thermal-welding material, such as plastic material, of the tamper-proof type.

[0002] Particularly, the invention relates to an innovative production method which enables an application of the adhesive strip in such a way as to be free from production defects and/or risks of breakages.

Brief outline of the known art

[0003] Tamper-proof or burglarproof envelopes have been existing for a long time.

[0004] They are generally of plastic material or anyway heat-weldable material, of various sizes and they are also used to ship valuable goods.

[0005] They are used to ship any type of object such as music CDs or valuable objects in general and they are even used to ship money.

[0006] Both figure 1 and figure 2 of known art describe a solution of envelope well known within the state of the art.

[0007] With reference to figure 1, a tamper-proof envelope 100 of heat-weldable material, such as plastic material, is described.

[0008] The envelope is formed by sheet material of the heat-weldable type, such as plastic material, and in particular by an upper sheet overlapping a lower sheet.

[0009] Figure 2 shows indeed the upper sheet 150 overlapping the lower sheet 160.

[0010] The two overlapped sheets have a closed bottom 101, that is a longitudinal lower edge, as well highlighted both in figure 1 and in figure 2.

[0011] In addition, there is comprised an upper opening 104 parallel to the lower longitudinal edge, that is generally obtained by opening the upper edge and acts for introducing objects/goods into the envelope.

[0012] The two transversal edges (102, 103) are then comprised.

[0013] Generally, the product is obtained starting from one single-fold tape, that is a tape unwound from a parent reel and folded along its longitudinal center-line by overlapping one half to the other one.

[0014] In a non-limiting way, in the case of single-fold material, there is thus a welding in correspondence of the two transversal edges (102, 103) since the sheet per se is already closed at the bottom 101 because it is obtained by folding the single tape over itself.

[0015] Therefore, for this purpose, figure 1 schematizes with hatching (St) the transversal welding strips going along the whole length of the edges 102 and 103 thereby producing closing lines.

[0016] The transversal lines may have a variable width depending on the type of welding bar used.

[0017] Figure 2 shows instead the closure 101 obtained as a consequence of the sheet folded over itself.

[0018] In this way, by folding the tape over itself along the longitudinal center-line, the lower sheet overlapping the upper sheet is achieved. The transversal welds 102 and 103 delimit the envelope laterally.

[0019] Obviously, obtaining the envelope in question for example by positioning two single tapes one on top of the other one is not excluded.

[0020] In this case, three welds will be necessary, that is the two mentioned transversal ones (102, 103) to which the bottom one 101 is added.

[0021] In any case, the envelope is open on the side of the upper edge 104 for enabling to insert into the envelope the objects or goods in general that it will have to contain during the use.

[0022] Moving to figure 2, in correspondence of the edge delimiting the upper opening 104, an adhesive strip (105, 105', 106) indicated as "detail A" is applied with the purpose of the tamper-proof closing.

[0023] The adhesive strip is an assembly of overlapped layers composed in this way:

- A generally red or light blue upper adhesive tape 105;
- A lower tape 106, generally indicated in technical jargon as "liner".
- A gluing material (105') interposed between the liner and the adhesive tape 105.

[0024] The adhesive tape 105 may contain thermal-coloring additives that are activated by heat. Generally, this adhesive tape 105 is red.

[0025] The liner has the purpose of protecting the adhesive material 105' and only after having removed the "liner" strip, the gluing material distributed onto the tape can stick.

[0026] More in particular, adhesive material is spread over the adhesive tape 105 in correspondence of its side (105') facing the lower sheet 160 of the envelope (see figure 2A) to be able indeed to stick onto it and close the opening.

[0027] The liner, or sheet 106, protects the gluing material and only once it has been removed, the tape 105 can be pressed onto the edge of the lower sheet 160 to close the envelope.

[0028] Therefore, substantially, by simply removing the protection 106 from the tape 105, thereby freeing the side 105' of the strip provided with adhesive, this part 105' can overlap the underlying portion of sheet 160, thereby closing the envelope along its whole opening, with an actually sealed closing.

[0029] Having described that, the production process that is currently used to produce such envelopes provides the following steps, with reference to figure 3 and 3A of the known art:

[0030] The envelope product can be obtained starting from the unwinding of two tapes that are overlapped or from one single-fold tape (N) that is then unwound from

a parent reel (B) and folded along its longitudinal centerline in such a way as to obtain two overlapped sheets (150, 160).

[0031] Figure 3 refers in a non-limiting way to the single-fold tape but the present description is also valid for other cases, such as the two overlapped tapes.

[0032] In a first phase, once the two sheets are overlapped for forming the envelope (for example by folding the single-fold tape over itself or by overlapping two continuous tapes) one proceeds with the application phase of the above-introduced adhesive strip (105, 106), generally with a process in a continuous way.

[0033] In a continuous way, the tape is folded and enters an application station 300 of the adhesive strip, schematically depicted in figure 3 and well known per se within the state of the technique.

[0034] During the forward motion of the strip, the strip is applied in a continuous way.

[0035] Therefore, a continuous single-fold tape having this continuous adhesive strip in correspondence of its open side 104, is obtained.

[0036] The tape proceeds towards a welding and cutting station shown in figure 3A forming the transversal welded edges 102 and 103 of figure 1 and the cut of the tape in such a way as to form the succession of envelopes with a width (p) as per figure 3A.

[0037] The welding station is also well known per se and provides a welding bar 400 moving towards a matching part 401 in such a way as to carry out the welding.

[0038] Generally, the welding is in the form of two lines (L1, L2) positioned at a certain distance from each other and each one forming a line (St) of figure 1.

[0039] The line (L1) belongs to the envelope upstream of the blade and the line (L2) belongs to the downstream envelope (envelopes that actually are not detached from each other yet).

[0040] A blade 500 is positioned in the middle thereby generating a cut interposed between the two welding lines (L1, L2) contextually to the welding.

[0041] In this way, the welding of the transversal edge of the completed downstream envelope is generated and the welding of the first transversal edge of the tape which moving forward at pitch (p) will then be able to be completed with the second transversal edge as described above.

[0042] In this way, besides welding, the formed envelope is detached from the rest of the tape.

[0043] Having applied the adhesive strip before the welding, inevitably the welding bars act also onto an edge of the adhesive strip.

[0044] In fact, moving back to figure 1, it is indicated how according to the known art the hatched welding area of edges (103, 104) (i.e. St) overlaps to the end portion of the adhesive strip.

[0045] This causes the adhesive strip to be subjected to a sudden heating in correspondence of its end edges.

[0046] This causes a series of severe technical issues.

[0047] First of all, the welding heat activates the thermal-coloring agents present in the tape 105, thereby causing an activation although no tampering has occurred.

[0048] Many fraudulent actions try the opening through heat to try melting glue and the thermal-coloring agent highlights this tampering.

[0049] The welding acting also onto the two end portions of the already applied adhesive strip may cause an unwanted activation of these thermal-coloring agents.

[0050] In addition, heat causes unwanted deformations onto the whole adhesive strip, particularly in correspondence of the edges onto which the heating bar pushes.

[0051] As a consequence, tears or breakages of the said strip may be caused and they may compromise the correct functioning thereof.

[0052] This problem has not been solved by now, given that the only way to act would be reducing the temperature of the welding bar. However, as well highlighted by the detail A of figure 2A, the presence area of the strip is an area with greater thickness, because the layers forming the strip are present. Therefore, if the temperature of the welding bar is reduced, the risk is that the welding (St) would be less resistant or even absent in the welding area (St) along the application section of the strip along the edges 103 and 104 (section indicated in figure 1 with "Z").

[0053] On the contrary, an excessive temperature of the welding bar with the purpose of compensating for the over-thickness due to the adhesive strip 105 may cause an excessive fusion of the material along the whole edge 103 and 104, thus altering the welding in the line outside the section "Z".

Summary of the invention

[0054] Therefore, the aim of the present invention is providing a production method and corresponding production line which resolves said technical disadvantages at least partially.

[0055] In particular, the aim of the present invention is providing a production method of the tamper-proof envelopes, and corresponding production line, wherein the application of the adhesive closing strip is such that it does not cause any damages or defects to it.

[0056] These and other aims are achieved with the present method for producing a tamper-proof envelope (100) of heat-weldable material, according to claim 1.

[0057] This method comprises the phases of:

- Feeding at least one tape (N) of heat-weldable material along a processing path and positioning a lower sheet (106) of said heat-weldable material on top of an upper sheet (105) of said heat-weldable material;
- Welding (102, 103) for forming the envelope at least partially and applying an adhesive strip (105, 106) for creating the tamper-proof closing of the envelope.
- According to the invention, at least a part of the weld-

ing phase is previously carried out and, subsequently to said welding phase, the application phase of the adhesive strip is carried out.

[0058] More particularly, advantageously, at least the welds that intercept the application area/s of the adhesive strip are carried out before the application phase of the said adhesive strip (105, 105', 106).

[0059] In this way, all said technical disadvantages are readily resolved.

[0060] In particular, by carrying out now the welding upstream of the application of the adhesive strip, the welding is carried out only onto the tape constituting the envelope, particularly onto the two overlapped sheets.

[0061] In this way, all the issues deriving from the interposition of an adhesive strip are solved because this is not physically present at the moment of the welding and therefore because its application is postponed.

[0062] Therefore, it is possible to adjust the temperature of the welding bar at the most suitable value depending on the production material of the envelope and this ensures an intact welding.

[0063] The subsequent application of the adhesive strip renders the strip intact and free from defects.

[0064] The welds that must be carried out before are therefore at least those ones concerning the application area of the adhesive strip.

[0065] Any other possible welding, if present (their presence is not necessary) can be carried out at any moment.

[0066] Given that the welds to be carried out before are those ones concerning the application area of the said strip, therefore one operates first the welding to form the two transversal closed sides (102, 103) of the envelope and then the adhesive strip is applied.

[0067] If the starting material is a single-fold material, the envelope bottom will be already closed by the tape folding and therefore the only welds to be carried out are indeed the ones corresponding to the two transversal closings of the envelope, obviously keeping the upper opening.

[0068] If the starting tape is not made by a single-fold material but by two overlapped sheets, then a third transversal welding of the bottom will be necessary and, as mentioned, it could be carried out at any moment, because it would not intercept the adhesive strip anyway.

[0069] Therefore, in that case, this third further welding could be preferably carried out contextually to the production of the transversal welds but it could also be carried out at the end of the application of the adhesive strip, for example contextually to the envelope cut or before the cut and in exit from the application phase of the adhesive strip.

[0070] Advantageously, said welding phase can occur in a continuous way onto the tape under processing.

[0071] Advantageously, said application phase of the adhesive strip can also occur in a continuous way onto the tape under processing after the welding.

[0072] In particular, an adhesive strip roll is rolled down and applied onto the already welded tape.

[0073] The application phase of the adhesive strip occurs like in the known art, that is by using the gluing material 105' which is distributed onto an edge portion of the strip 105, with this edge portion that is attached through said glue to the envelope sheet and the remaining part of the strip 105 covered by the liner 106 (see the detail of figure 2A).

[0074] Advantageously, there is comprised, at the end of the application phase of the adhesive strip, a cutting phase of the tape for forming the envelope.

[0075] Advantageously, the welding operation creates on the tape under processing, with a certain pitch (p), a succession of transversal welding lines (102, 103) which form the two transversal sides of the envelope.

[0076] As mentioned, preferably but not necessarily, the starting tape is a single-fold tape.

[0077] In this case, advantageously, there is provided the folding of the tape according to a longitudinal axis thereof in such a way as to generate the upper sheet which overlaps the lower sheet with the fold line (101) which forms the closed bottom of the envelope.

[0078] It is also described here a production line for the production of tamper-proof envelopes of heat-weldable material and comprising the following stations:

- An application station (300) of the adhesive strip;
- A welding station (10) for the formation of at least two welded edges (102, 103) generating two closed sides of the envelope;
- According to the invention, the said welding station (10) is provided upstream of the application station (300) of the adhesive strip (105, 106).
- The edges that are welded form two closed sides of the envelope and these closed sides intercept the strip, meaning that the strip that is applied reaches and overlaps such closed edges.
- Accordingly, welds concerning application areas of the adhesive strip are carried out upstream before the application of the adhesive strip.

[0079] Advantageously, said welding station is in a continuous way.

[0080] Advantageously, said application station of the adhesive strip is in a continuous way.

[0081] Advantageously, downstream of said application station (300) of the adhesive strip, a cutting station (60, 60') is comprised.

[0082] It is also described here the use of a welding station, preferably in a continuous way, positioned upstream of the application station of the adhesive strip in a production line of tamper-proof envelopes.

Brief description of the drawings

[0083] Additional features and advantages of the present method and corresponding plant, according to

the invention will become apparent from the following description of one embodiment thereof, given only by way of non-limiting example, with reference to the attached drawings, wherein:

- Figure 1 shows a tamper-proof envelope according to the known art wherein the closing welding of the transversal edges 102 and 103 overlaps the edges of the adhesive strip because this is applied upstream of the welding;
- Figure 2 shows in section the envelope of figure 1 according to a section line A-A;
- Figure 2A shows in an enlarged view the detail A relative to the adhesive strip formed by the upper tape 105, by the lower protective tape 106 and by the interposed adhesive material 105';
- Figure 3 and figure 3A show schematically the production line and therefore the method providing first the application of the adhesive strip and then, downstream of the application section of the adhesive strip, the welding operation with a suitable welding section;
- Figure 4 shows schematically a production line according to the present invention;
- Figure 5 shows the production line according to the invention wherein the cut is carried out downstream of the application section 300 of the adhesive strip;
- Figure 6 schematizes the working principle, known per se, of a welding machine in a continuous way.

Description of some preferred embodiments

[0084] Figure 4 shows schematically a production line for a tamper-proof shipping envelope according to the invention.

[0085] The exemplifying case of figure 4 describes a production line, and corresponding method, according to a single tape of heat-weldable single-fold material, for example of plastic material.

[0086] As already introduced in the known art, the tape (N) can be unwound from a starting parent reel (B) and folded, as known, along a longitudinal axis thereof, preferably the center-line one, positioning one part of the tape on top of the other one.

[0087] In this way, as per the known art, the two overlapped sheet (150, 160) are obtained as indicated in figure 2 with the closed bottom (101).

[0088] According to the invention, differently from the known art, it is introduced now a welding section 10 upstream of the application section 300 of the adhesive strip.

[0089] Actually, therefore, the welding section that for the single-fold material in the known art was positioned downstream of the application section of the strip is now shifted upstream of the strip.

[0090] This station positioned upstream of the strip application works for welding, before the strip application, all those welding areas (necessary for the envelope formation) that may concern the application area of the adhesive strip.

[0091] For example, in the case of the single-fold material, as described, the welding station in question is just the one generating the transversal welds for forming the two closed sides of the envelope, given that the envelope bottom is already closed per se by the sheet fold and other welds are not necessary.

[0092] Therefore, with reference to figure 4, it is indicated the forward direction of the tape along its processing path with a suitable arrow applied onto the tape.

[0093] Therefore, the tape finds the welding section and then, in exit from it, it finds the application section of the adhesive strip (therefore the application section 300 of the adhesive strip positioned downstream of the welding section 10).

[0094] In this way, by carrying out a welding upstream of the application of the adhesive strip, all said technical disadvantages are resolved given that a welding that also concerns the adhesive strip is actually not performed anymore.

[0095] Substantially, as well highlighted by figure 4, firstly one carries out a welding onto the tape for generating the two transversal lines (102, 103) that delimit each envelope and then one carries out the application of the adhesive strip with the suitable section 300.

[0096] In this way, the adhesive strip remains intact and it is not damaged by the heat action of the welding bar.

[0097] As shown in figure 5, the application station (or section) 300 of the adhesive strip that applies the strip onto the already welded envelope is present thereby applying the strip onto already welded areas.

[0098] Downstream of the application section (or station) 300 of the adhesive strip one carries out the envelope cut.

[0099] Therefore, the cut occurs after having firstly welded and then applied the adhesive strip, thereby actually carrying out the cut onto a tape which is ready and worked at this point.

[0100] The cut occurs in a suitable cutting section (or station) (60, 60') provided with a blade 70 which is lowered onto the tape and the tape is stopped during the blade lowering (start and stop).

[0101] The blade raises and lowers according to a certain cadence synchronized with the forward motion speed of the tape in such a way as to cause the tape to move forward with a certain pitch (p), to stop the tape and to cut and to start the tape again cyclically.

[0102] The blade cuts astride the welds (102, 103) thus determining the separation of the single envelopes (see in figure 5 the cut pitch (p) that is astride the produced welds).

[0103] With reference to figure 4, the welding section 10 (or station) can be preferably of the continuous type and it has been well known per se within the state of the art and used for a long time for example in the production field of plastic bags.

[0104] The section is said continuous when the forward motion of the tape is never interrupted.

[0105] The welding bar (10') is present on this type of welding section and, as it is well known within the state of the art, it lowers until it intercepts the tape under processing moving forward according to the arrow direction indicated in figure 4 along the processing path.

[0106] The welding bar can be identical to the one already described in the known art and therefore it can generate two strips (L1, L2) spaced from each other or one single strip.

[0107] The welding bar trapping the two layers (or sheets) of material heats locally the material that melts, thereby mixing. During the cooling, the material acquires its solid state again thereby becoming a local union of the two layers (or sheets).

[0108] Obviously, a support plane along which the tape moves is provided and the bar (10') lowers according to a vertical motion until intercepting the tape to generate a transversal welding line (102, 103). The bar raises and lowers according to a certain cadence synchronized with the forward motion of the tape in such a way as to generate transversal welding lines according to a certain pitch (5) as per figure 5.

[0109] According to the well-known process of continuous welding, as per figure 6, the section 10 provides a roll passage system of the tape that can be shifted and shifts according to a motion inverse to the forward motion of the tape and with the same speed. In this way, the absolute speed of the tape with respect to the welding bar, in the section comprised between the shiftable rolls, is equal to zero when rolls shift in the direction opposite to the forward direction of the tape. In this way, the tape keeps still enabling the lowering of the welding bar and the welding, although actually the feeding is never interrupted.

[0110] This type of solution, schematized in figure 6 is well known within the state of the art and for this reason it will not described in detail anymore.

[0111] Although the welding in a continuous way is the preferred solution, the use of a welding section 10 of the start and stop type that indeed operates like the downstream cutting station is not excluded.

[0112] This causes the tape feeding to be interrupted every time the welding bar lowers to carry out the welding.

[0113] Although the preferred embodiment of the described invention is a working proceeding and corresponding production line starting from one single-fold tape, anyway, the use of two single overlapped tapes is not excluded.

[0114] In this case, there would be three welds to be carried out, that is the bottom one and the two lateral ones (i.e. the two transversal ones forming the two sides of the envelope).

[0115] Given that the application area of the adhesive strip only intercepts the two transversal welds, then the bottom welding can theoretically be made, in this case, at any moment and not necessarily upstream of the adhesive strip application.

[0116] Therefore, the description above remains substantially unvaried and applicable also in the case of two overlapped tapes.

[0117] The tape width can be any, producing envelopes of any size and even two or more tracks can be worked starting from a single track of suitable width.

Claims

1. A method for the production of one or more tamper-proof envelopes (100) of heat-weldable material and comprising the phases of:

   - Feeding at least one tape (N) of heat-weldable material along a processing path;
   - Forming the envelope through welding operations onto the said at least one tape and applying an adhesive strip (105, 105', 106) to create the tamper-proof closing of the envelope/s;
   - **Characterized by the fact that** along the said processing path, at least the welds which intercept the area/s of application of the adhesive strip are carried out before the application phase of the said adhesive strip (105, 105', 106).

2. The method, according to claim 1, wherein the said welding phase occurs in a continuous way onto the tape under processing.

3. The method, according to claim 1 or 2, wherein the said application phase of the adhesive strip occurs in a continuous way onto the tape under processing after the said welding.

4. The method, according to one or more of the preceding claims, wherein there is comprised, at the end of the application phase of the adhesive strip, a cutting phase of the tape for forming the envelope.

5. The method, according to one or more of the preceding claims, wherein the said welding operation creates onto the tape under processing, with a certain pitch (p), a succession of transversal welding lines (102, 103) which form the two transversal sides of the envelope.

6. The method, according to one or more of the preceding claims, wherein the starting tape is a single-fold tape and wherein there is provided the folding of the tape according to a longitudinal axis thereof in such a way as to generate an upper sheet (105) which overlaps the lower sheet (106) with the fold line (101) which forms the closed bottom of the envelope or, alternatively, there are provided two starting tapes which are overlapped along the processing path in such a way that one generates the upper

sheet and the other one generates the lower sheet overlapping one another and wherein, in this case, a further welding is provided to generate the closed bottom of the envelope.

7. A production line for the production of one or more tamper-proof envelopes of heat-weldable material and comprising the following stations:

- At least one welding station (10) for forming at least two welded edges (102, 103) which generate the two closed sides (102, 103) of the envelope;
- At least one station (300) of application of an adhesive strip;
- **Characterized by the fact that** at least the said at least one welding station (10) is arranged upstream of the station (300) of application of the adhesive strip (105, 105', 106).

8. The production line, according to claim 7, wherein the said welding station and the said station of application of the adhesive strip are both in a continuous way.

9. The production line, according to claim 7 or 8, wherein there is comprised a feeding station of at least one tape of heat-weldable material arranged upstream of the said at least one welding station (10) .

10. The production line, according to one or more of the preceding claims from 7 to 9, wherein a cutting station (60, 60') is comprised downstream of the said station (300) of application of the adhesive strip.

11. The use of a welding station, preferably in a continuous way, positioned upstream of a station of application of the adhesive strip in a production line of tamper-proof envelopes.

FIG.1

(KNOWN ART)

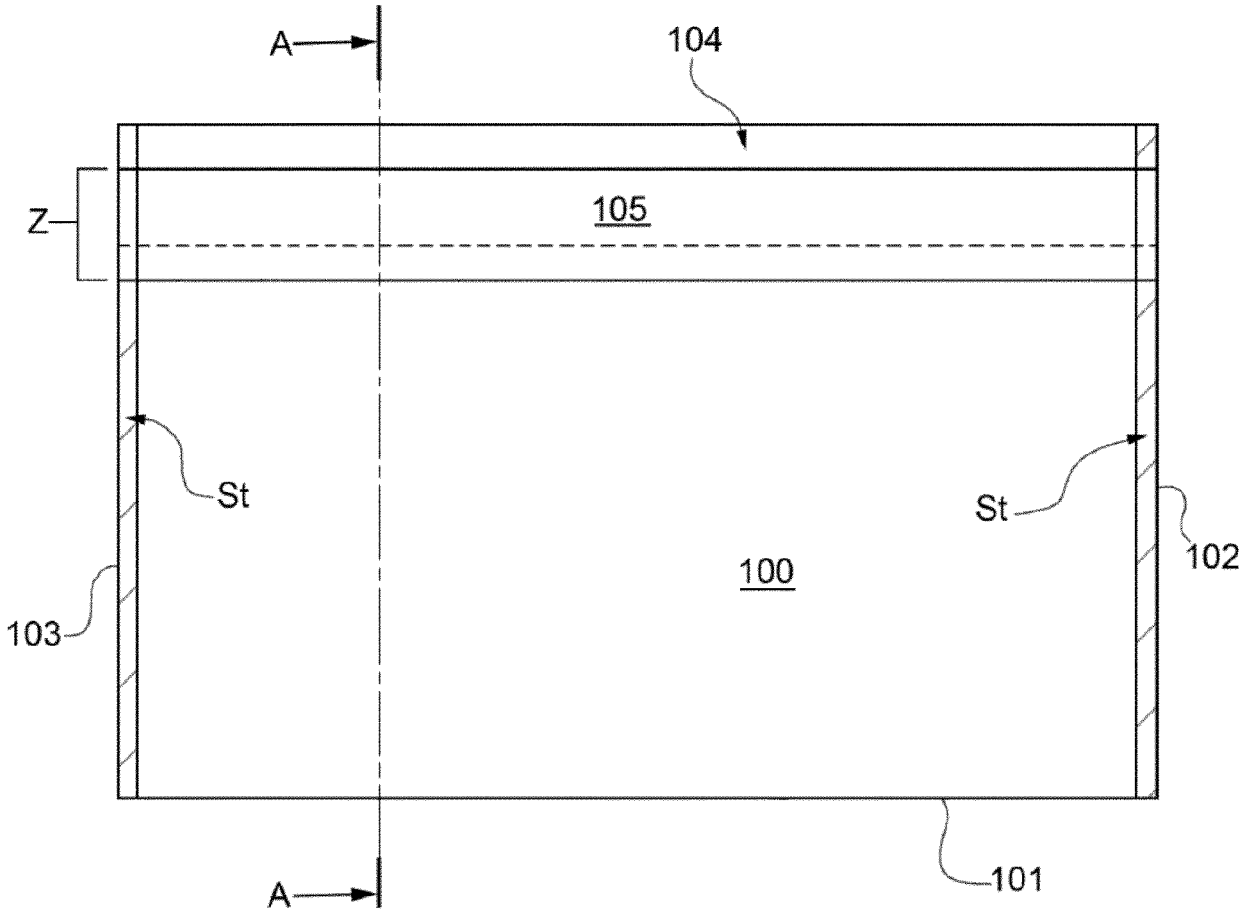


FIG.2

(KNOWN ART)

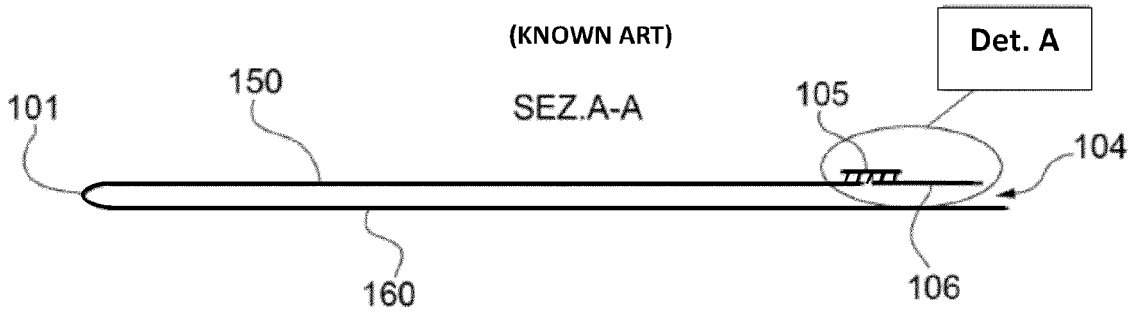


FIG.2A

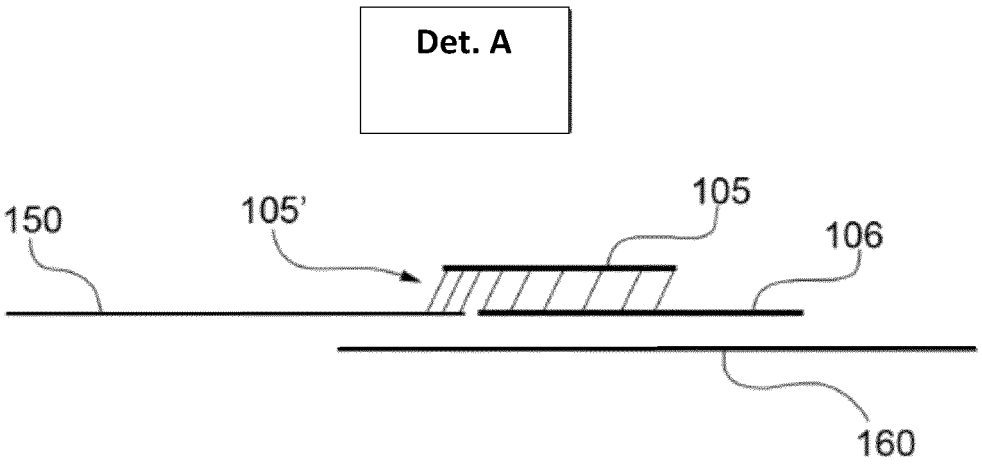


FIG.3

(KNOWN ART)

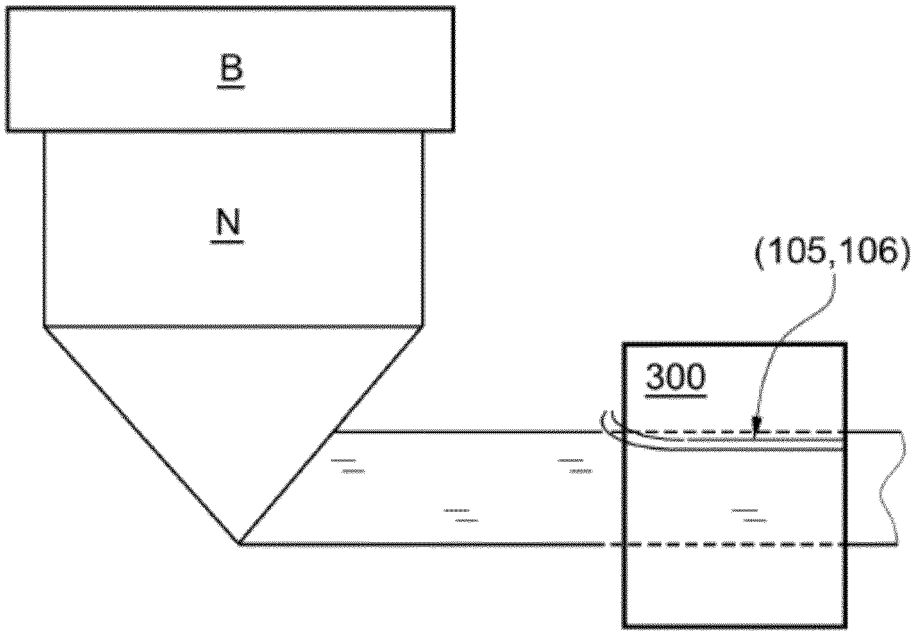


FIG.3A

(KNOWN ART)

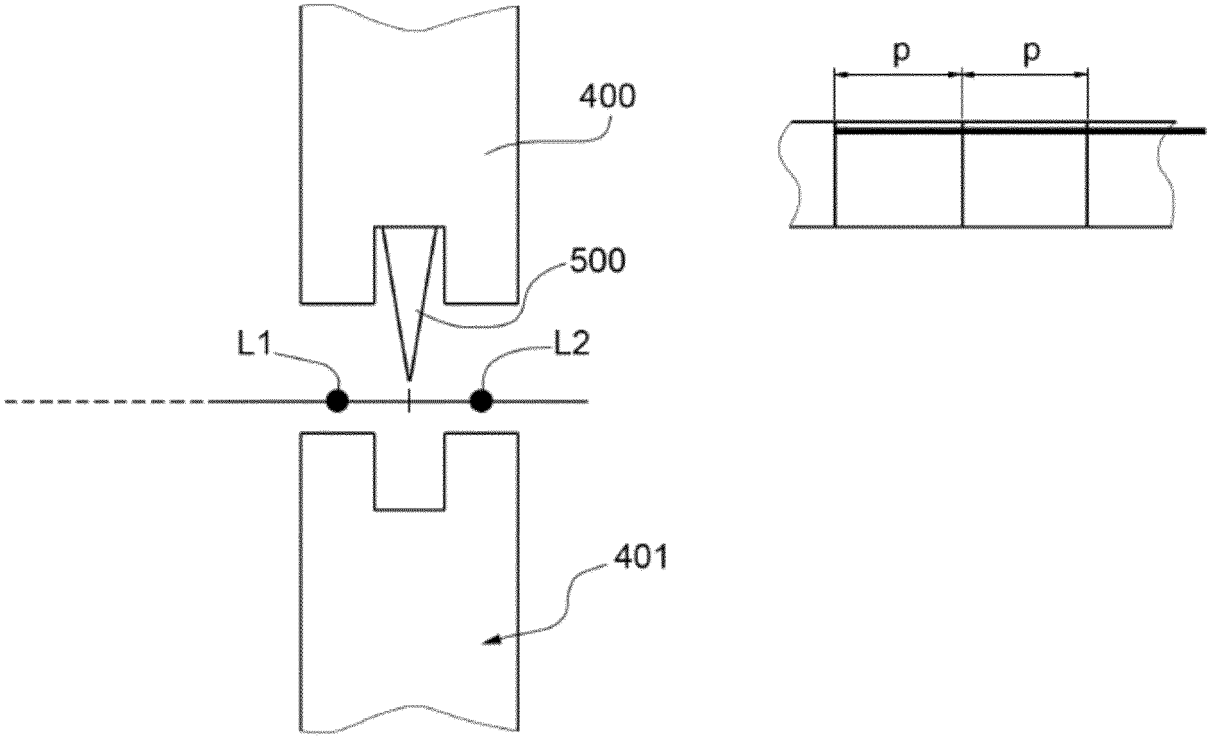


FIG.4

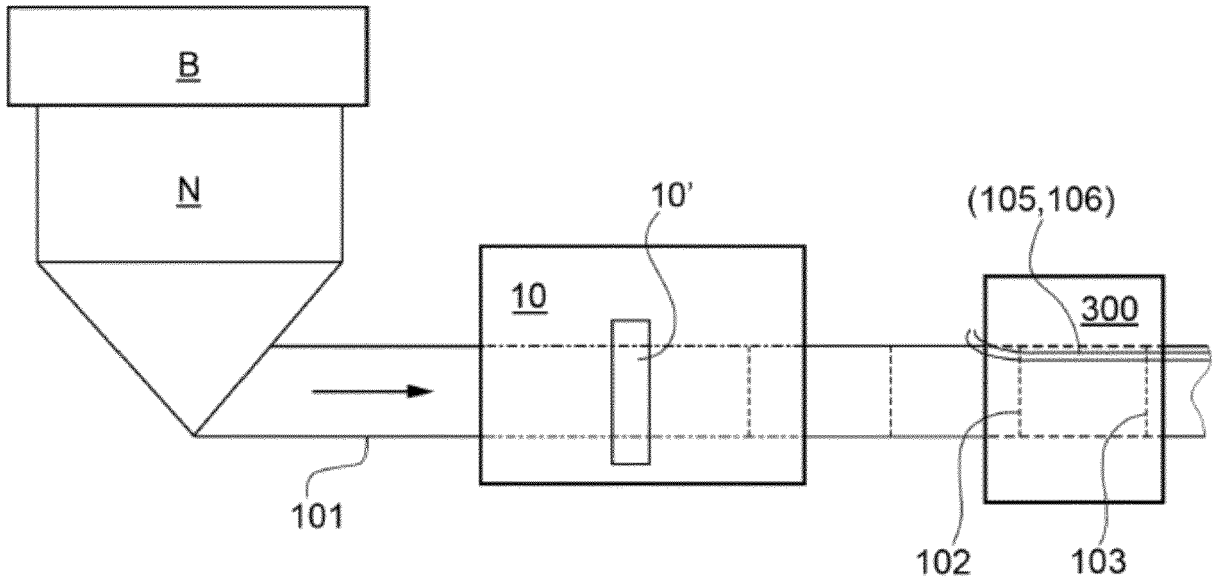


FIG.5

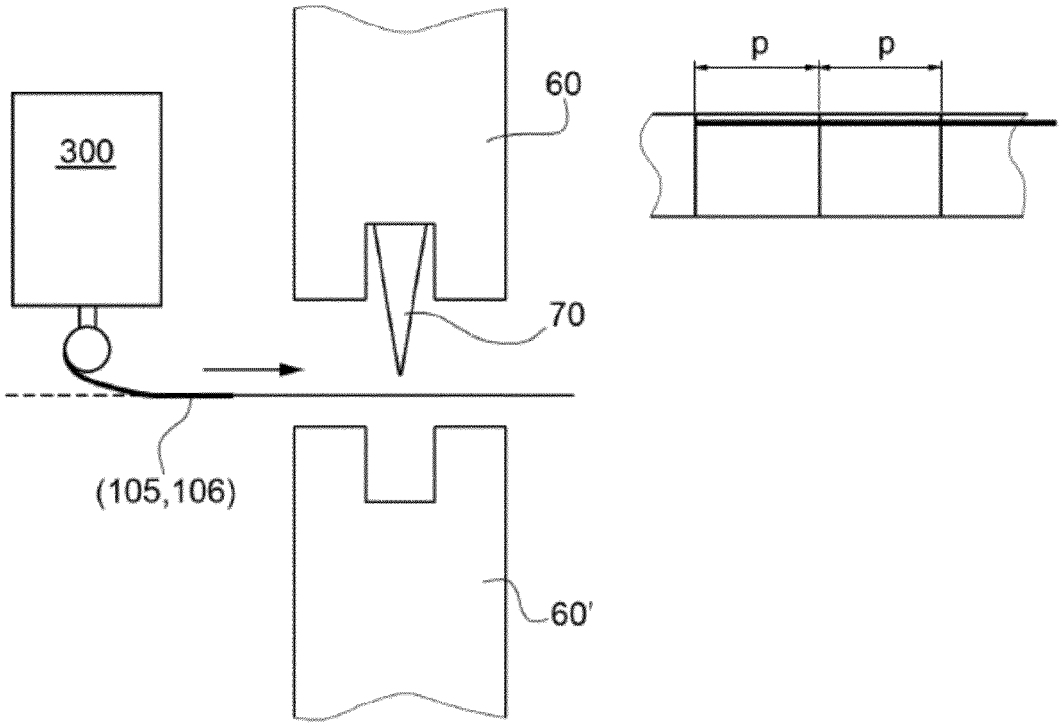
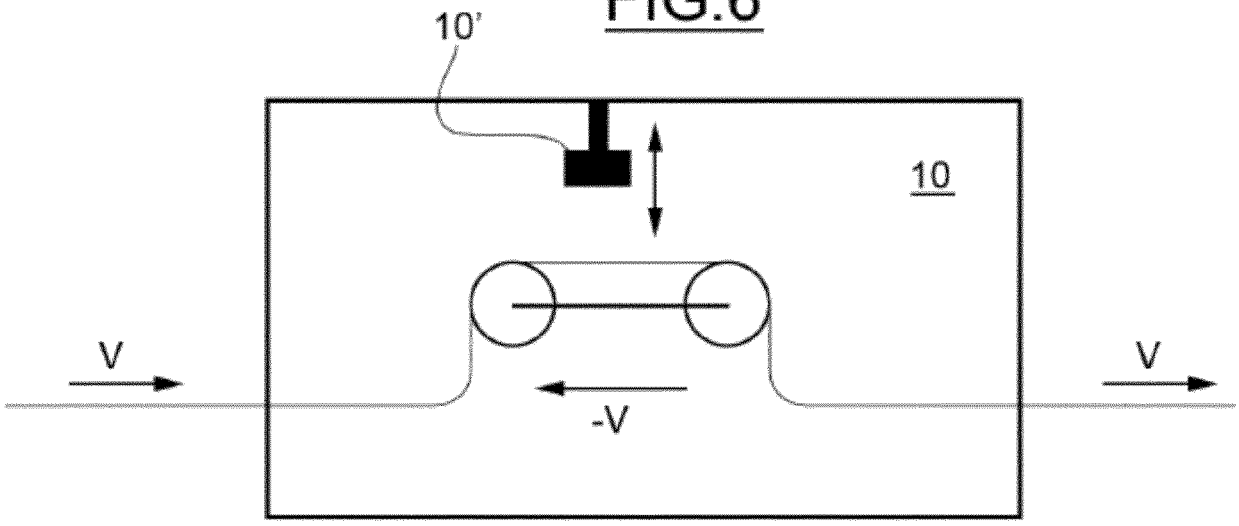


FIG.6



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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 5123

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 278 594 A (VENUS FLEXIBLE PACKAGING LIMIT [GB]) 7 December 1994 (1994-12-07) * page 3, line 9 - page 5, line 18 * * page 6, line 8 - page 7, line 21 * * figures 1-3, 7 *	1-11	INV. B31B70/00 B31B70/60 B31B70/64 B31B70/81
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TECHNICAL FIELDS SEARCHED (IPC)

B31B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 June 2022	Sundqvist, Stefan

CATEGORY OF CITED DOCUMENTS

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