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(54) **APPARATUS FOR PRODUCING A PACK**

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(57) **ABSTRACT**

The invention relates to an apparatus for producing a pack (20) from a packaging-material web, comprising a forming tube (2), a filling tube (11), which runs, in part, through the forming tube, a forming shoulder (3), which is arranged on the forming tube (2) and is intended for forming a flexible enveloping tube, a folding means (7), which is arranged downstream of the forming shoulder (3), as seen in the conveying direction (A) of the flexible enveloping tube, and a sealing means (6) with a multiplicity of sealing units (6a, 6b), which are arranged downstream of the folding means (7), as seen in the conveying direction (A) of the flexible enveloping tube, wherein the forming tube (2) has a first diameter (D1) and in the filling tube (11) has a second diameter (D2) wherein the first diameter (D1) is greater than the second diameter (D2), wherein the folding means (7) is arranged at the end has first of the forming tube (2) and wherein the folding means (7) has a parabola-form folding element (8) in order to form folds in the flexible, enveloping tube, the parabola-form folding element (8) being arranged such that a vertex (9) of the parabola-form folding element (8) is directed counter to the conveying direction (A).

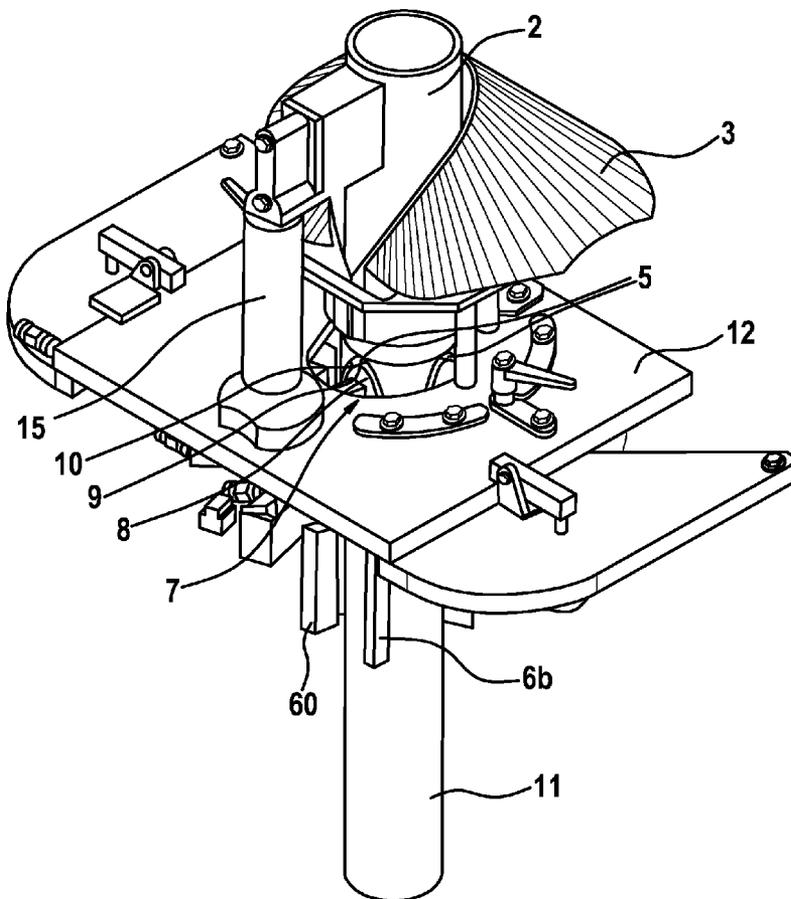


Fig. 1

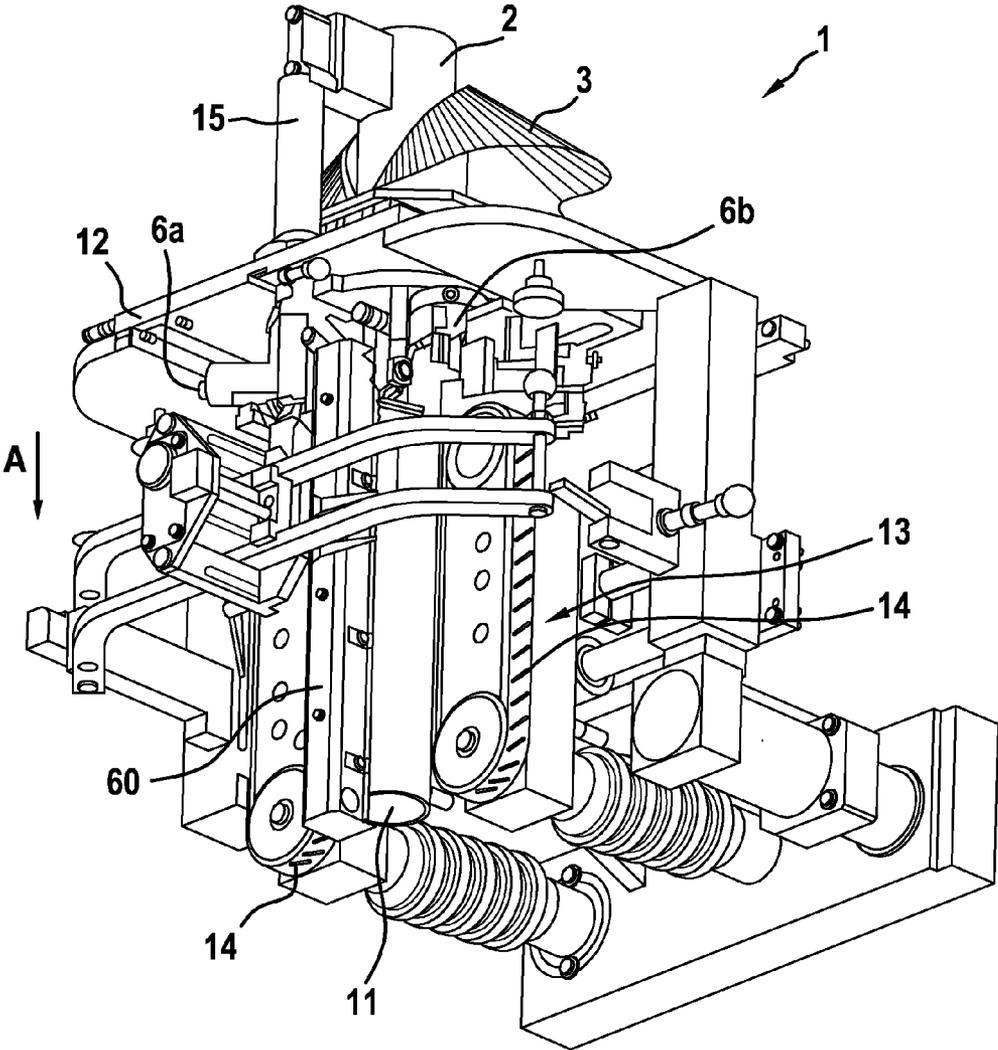
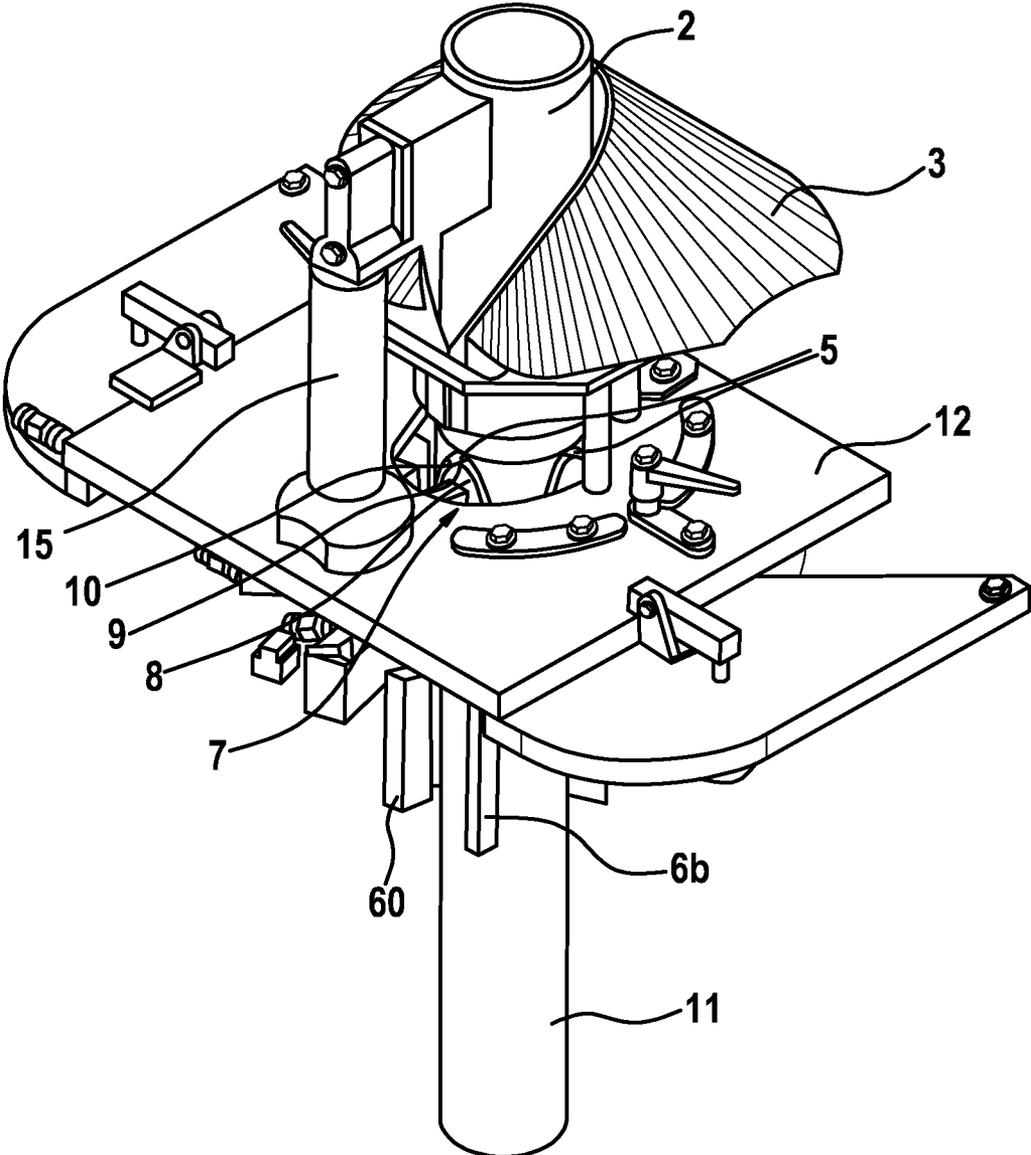


Fig. 2



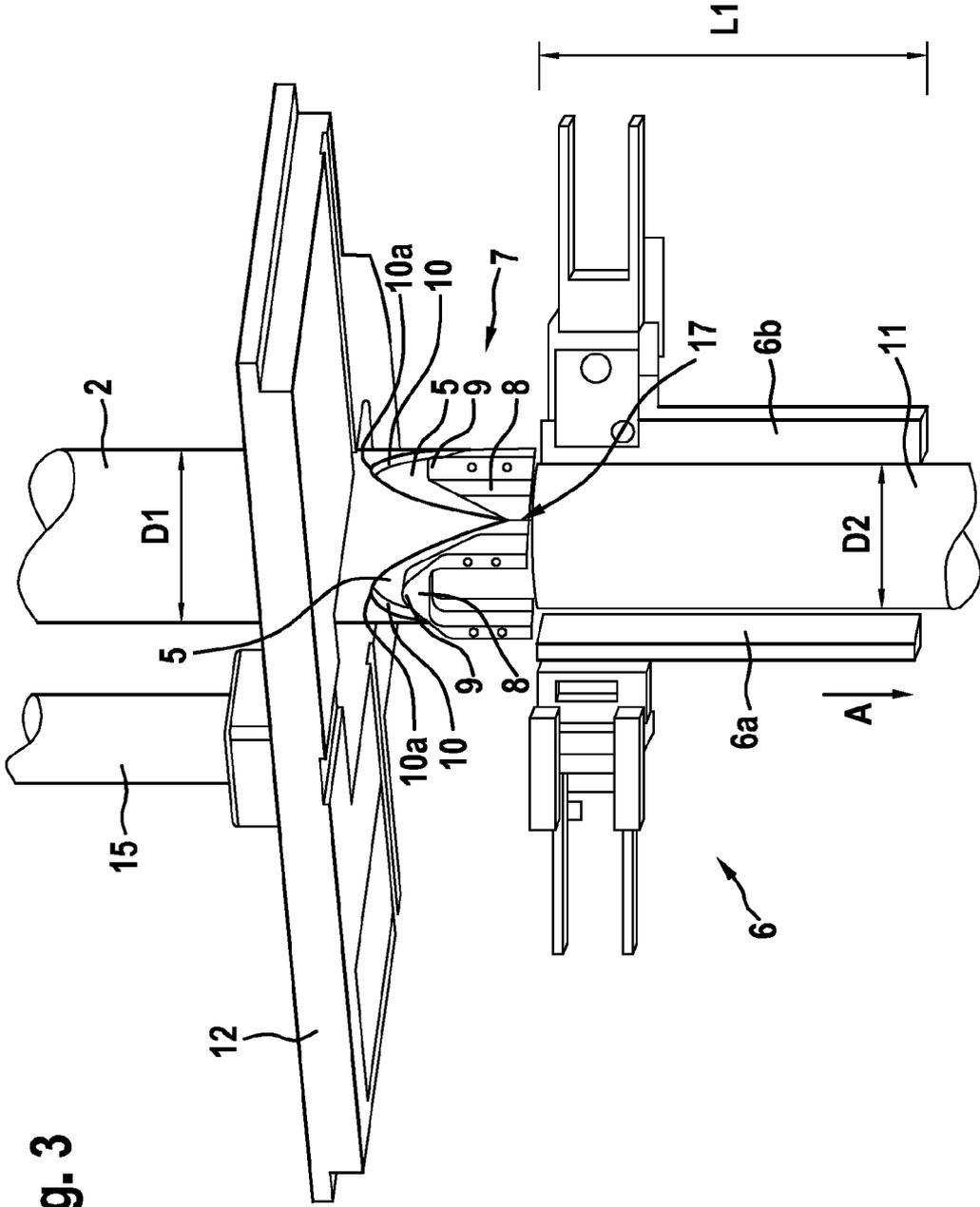


Fig. 3

Fig. 4a

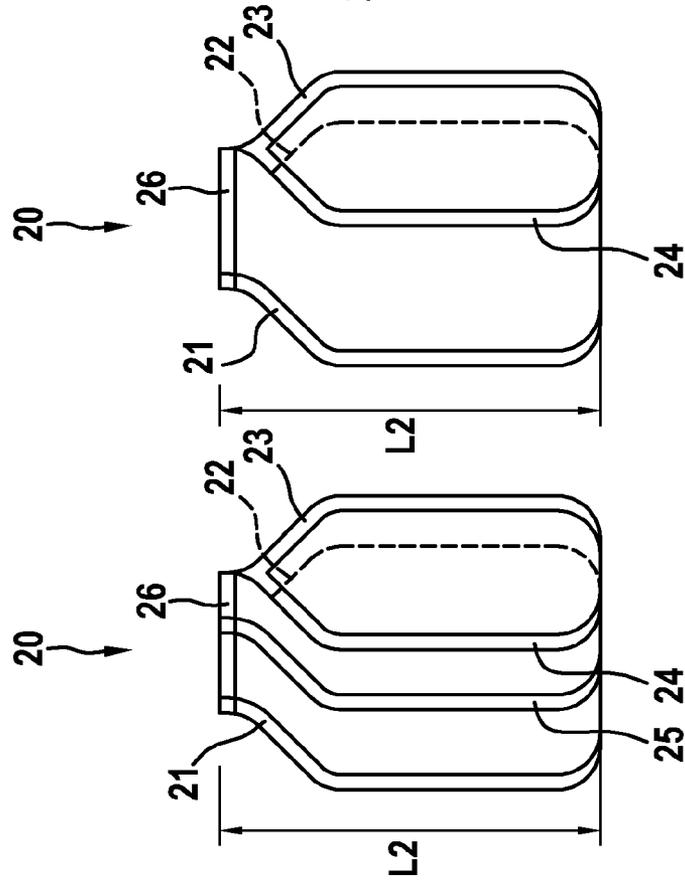


Fig. 4b

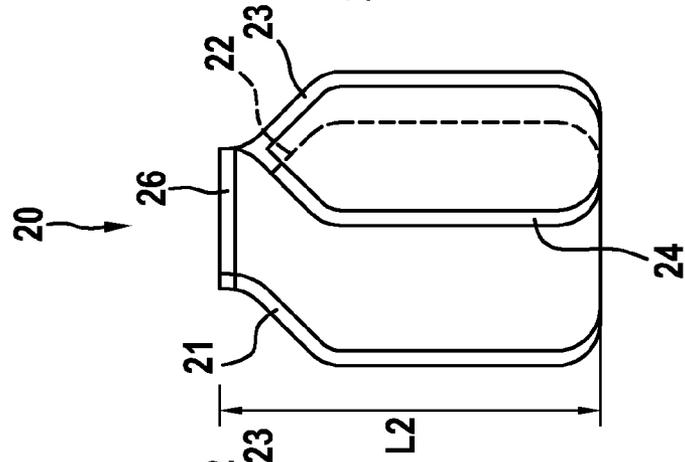


Fig. 4c

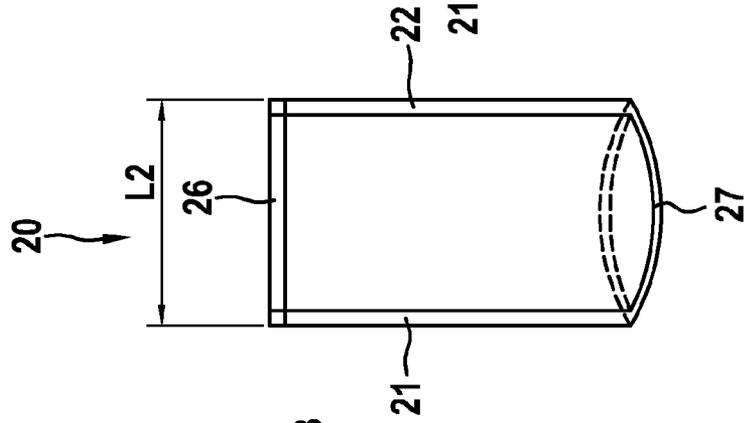
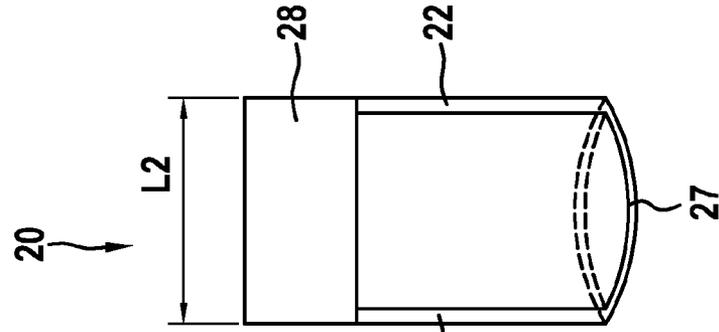


Fig. 4d



**APPARATUS FOR PRODUCING A PACK**

**BACKGROUND OF THE INVENTION**

[0001] The present invention relates to an apparatus for producing a pack from a packaging-material web, which particularly produces packs comprising a plurality of sealing edges in the longitudinal direction of the pack.

[0002] Apparatuses for producing packs from a packaging-material web are known from the prior art in different designs and are frequently referred to as “form-fill-seal bagging machines”. The production of food packs, in which food is stored, is, for example, an application of such an apparatus. The German patent publication DE 101 59 053 A1 proposes, for example, to provide seal seams in the packaging-material web prior to producing a flexible enveloping tube, said seal seams then forming the corners of the pack after the flexible enveloping tube has been produced. This apparatus has basically proved to be successful. However, in order to produce the seal seams, a corresponding machine part has to be disposed upstream of the actual bag forms, which leads to very large design space requirements.

**SUMMARY OF THE INVENTION**

[0003] The apparatus according to the invention has, in contrast, the advantage of being designed in a compact and space-saving manner. In addition, different packs having different numbers of seal seams in the longitudinal direction can be produced in a simple way. This end is achieved according to the invention by virtue of the fact that the apparatus for producing a pack from a packaging-material web comprises a forming tube, a filling tube as well as a forming shoulder for forming a plastic tube. Furthermore, a folding means is provided which is disposed downstream of the forming shoulder, as seen in the conveying direction of the flexible enveloping tube. The forming tube thereby has a first diameter in the region of the forming shoulder, and the filling tube has a second diameter, which is smaller than the first diameter, in the region of the folding means. In so doing, a reduction in the diameter of the flexible enveloping tube is achieved; and therefore outwardly directed folds in said flexible enveloping tube can be folded by the folding means. Said folds can then be sealed and form edge regions in the finished state of the pack. In order to achieve a continuous folding via the folding means, said folding means comprises at least one parabola-form folding element, wherein the folding process begins at a vertex of the parabola. That means that the parabola-form folding element is arranged such that the vertex is oriented in the direction of the forming shoulder, i.e. counter to the conveying direction of said flexible enveloping tube. The excess material at the forming tube resulting from the reduction in diameter can therefore be guided along the parabola-form folding element and be folded into a fold, which can subsequently be sealed by the sealing means.

[0004] In order to achieve an especially good folding result, parabola-form recesses are likewise preferably formed on the forming tube. A parabola-form gap is thus provided between the parabola-form folding element and the parabola-form recesses in the forming tube, through which gap the flexible enveloping tube can be guided. The parabolic shapes are thereby preferably different; wherein in a particularly preferred manner, the parabolic shape of the parabola-form recess is more elongated than that of the parabola-form folding element. According to a further preferred embodiment of

the invention, the parabolic shape of the parabola-form folding element and/or of the parabola-form recesses is asymmetrical.

[0005] In a particularly preferred manner, the folding means comprises exactly four parabola-form folding elements as well as preferably likewise exactly four parabola-form recesses. In this way, packs can be produced having a maximum of four sealing edges.

[0006] According to another preferred embodiment of the present invention, the sealing units are drag sealing units, which facilitate a sealing process of the folds during a movement of the flexible enveloping tube. It should be noted that even in the case of a temporary stoppage in order to seal a transverse seam, the drag sealing units can also still seal in order to obtain a better sealing result.

[0007] The apparatus further preferably comprises a feed device for moving the flexible enveloping tube in the conveying direction. The feed device is preferably a rotating belt which engages on the outside of said flexible enveloping tube. In a particularly preferred manner, said feed device is disposed in the circumferential direction between sealing units of the sealing means in order to enable an overall axial length of said means which is as short as possible.

[0008] The apparatus further preferably comprises a retaining element in order to hold the forming tube to a table top or something similar. A recess, through which the forming tube is guided, is then to be formed in the table top or similar object.

[0009] The sealing units further preferably have a length in the conveying direction of the flexible enveloping tube which is less than a length of the edges on the pack which have been produced. This is possible because the sealing units are designed as drag sealing units so that a sealing process can not only be performed during a stoppage of the intermittently operating machine, if, e.g., a transverse seal seam is being produced, but also during the feed of the flexible enveloping tube.

[0010] The vertexes of the parabola-form folding element and the parabola-form recess further preferably lie in a straight line which is parallel to the conveying direction of the flexible enveloping tube.

[0011] The packs produced with the apparatus according to the invention are preferably used for food items. The packs can thereby, for example, have five seal seams in the longitudinal direction, namely four edge seal seams on the edges of the pack as well as a median longitudinal seam. In one embodiment of the inventive machine, only four seams can be required if the median longitudinal seam coincides in fact with an edge sealing seam. Furthermore, packs having only two lateral edge seal seams can also be produced.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0012] An exemplary embodiment of the invention is described below in detail with reference to the accompanying drawings. In the drawings:

[0013] FIG. 1 shows a schematic, perspective view of an apparatus for producing a pack pursuant to one preferred exemplary embodiment of the invention, as seen obliquely from below,

[0014] FIG. 2 shows a simplified, perspective view of the apparatus of FIG. 1, as seen obliquely from above,

[0015] FIG. 3 shows a perspective view of the apparatus of FIGS. 1 and 2, which depicts a folding means according to the invention, and

[0016] FIGS. 4a to 4d show different packs which can be produced using the apparatus from FIGS. 1 to 3.

#### DETAILED DESCRIPTION

[0017] An apparatus 1 for producing a pack from a packaging-material web is described below in detail with reference to FIGS. 1 to 3. Apparatuses 1 of this kind are also referred to as form-fill-seal bagging machines, in which a plastic tube, from which a pack can then be produced, is first formed from a packaging-material web. In this example a vertical form-fill-seal bagging machine is depicted.

[0018] As can be seen in FIG. 1, the apparatus 1 comprises a forming tube 2, on which a forming shoulder 3 is arranged. A filling tube 11, which can be seen in FIGS. 2 and 3, furthermore runs in the forming tube 2, said filling tube extending a greater length than that of said forming tube 2.

[0019] The apparatus 1 further comprises a sealing means 6 having a multiplicity of sealing units 6a, 6b as well as a folding means 7 for producing outwardly directed folds in a flexible enveloping tube produced by means of the forming shoulder 3. The folds produced in the folding means 7 are then sealed in the sealing means 6, wherein the sealed folds serve as stiffened edges for the pack to be produced.

[0020] The folding means 7 is depicted in detail in FIG. 3 while leaving out obscuring components. Said folding means 7 comprises a plurality of parabola-form folding elements 8, which have a vertex 9 that is oriented in the direction of the forming tube 2. The shape of the parabola-form folding elements 8 is selected corresponding to the desired edge form of the pack. Parabola-form recesses are further provided in each case at corresponding positions with respect to the parabola-form folding elements 8 on the free end of the forming tube 2, which end is directed to the folding means 7. The end of the forming tube 2 therefore comprises a plurality of parabola-form recesses 10, which are arranged along the circumference. The parabolic curves of the parabola-form recesses 10 thereby intersect in a region 17, in which the folds are formed from the flexible enveloping tube.

[0021] As can be seen in FIG. 3, the forming tube 2 has a diameter D1 which is larger than a diameter D2 of the filling tube 11. After being shaped by the forming shoulder, the flexible enveloping tube, which is not depicted in FIG. 3, fits closely around the forming tube 2 and is transported downwards. In so doing, said flexible enveloping tube is drawn into a parabola-form gap 5 between the parabola-form recess 10 and the parabola-form folding element 8. In this exemplary embodiment, the sealing means comprises in total four sealing units; and therefore four parabola-form recesses 10 are also correspondingly provided on the end of the forming tube 2. As can likewise be seen in FIG. 3, the regions of the flexible enveloping tube which overlap due to the reduction in diameter of D1 to D2 are guided through the parabola-form folding elements 8 to the region 17 where the folds are formed so that the desired folds can be produced using the excess material resulting from the reduction in diameter of D1 to D2. In this exemplary embodiment, exactly four folds are produced, wherein a fold which closes the flexible enveloping tube and, e.g., could also be provided as a median longitudinal seam on the pack coincides with an edge fold.

[0022] As can further be seen in FIG. 3, a sealing unit 6a, 6b is arranged below each region 17 for forming folds at corresponding positions as seen in the conveying direction of the flexible enveloping tube. For the sake of clarity, a sealing unit lying below the region 17 for forming folds is not depicted.

[0023] The flexible enveloping tube is conveyed by means of a feed device 13 shown in FIG. 1, wherein the feed device 13 comprises two rotating belts 14, which are motor-driven. The two belts 14 are thereby arranged on the filling tube 11 at positions which are opposed to each other by 180°.

[0024] It should be further noted that the sealing units 6a, 6b of the sealing means 6 are provided as drag sealing means, with which a sealing operation is possible during a stoppage of the flexible enveloping tube as well as when said flexible enveloping tube is being conveyed. Because the depicted form-fill-seal bagging machine has an intermittent mode of operation in order to respectively produce corresponding transverse seal seams, a sealing takes place even during a stoppage of the machine. In this connection, provision can be made for the sealing process to be interrupted after a certain amount of stoppage time in order to avoid too large of a heat generation at the fold to be sealed.

[0025] As can be especially seen in FIGS. 1 and 2, the form-fill-seal bagging machine 1 further comprises a table 12, whereat a protruding retaining element 15 for holding the forming tube 2 is disposed. A through hole for the feedthrough of the forming tube 2 and the filling tube 11 is provided in the table 12 itself. The sealing means 6 as well as the folding means 7 is thereby disposed below the table 12, and the forming shoulder 3 is disposed above said table 12. The fed packaging-material web is therefore formed into a flexible enveloping tube at the forming shoulder and guided along the exterior circumference of the forming tube 2 through the table 12 to the folding means 7 and then to the folding means 6.

[0026] It should be further noted that a length L1 of the sealing units 6a, 6b is shorter than a length L2 of the produced pack. As an alternative, a length L1 of the sealing units can also be longer than a length L2 of the produced pack. Examples of the pack which can be produced by means of the inventive form-fill-seal bagging machine are shown in FIGS. 4a to 4d. FIG. 4a thereby shows a pack comprising in total five longitudinal seal seams, namely a first longitudinal sealing seam 21, a second longitudinal sealing seam 22, a third longitudinal sealing seam 23 and a fourth longitudinal sealing seam 24. A median longitudinal seam is denoted with the reference numeral 25. In order to produce such a pack, a median longitudinal seam sealing unit 60 is additionally provided on the form-fill-seal bagging machine depicted in FIG. 1. In addition, a top seam 26 as well as a base seam, which is not shown, is available on the pack 20. The pack shown in FIG. 4b has basically the same design as the pack shown in FIG. 4a; however, the median longitudinal seam coincides with one of the edge longitudinal seams. In so doing, an additional sealing unit for the median longitudinal seam can be eliminated. FIGS. 4c and 4d show packs, which are self-standing, because said packs have at the base thereof a stiff circumferential base seam 27 provided at the edge. Such packs are also designated as "doypacks". These packs are rotated about an angle of 90° so that the lateral seams are actually the top and base seams when the pack stands upright. For that reason, the pack length L2 is horizontally delineated in FIGS. 4c and 4d. Such packs can be produced having exactly three sealing means. The pack shown in FIG. 4d is provided with an overlap 28 for reclosing the pack. In this case, a top seam can be eliminated. The overlap can, for example, be provided by means of adhesive bonding on the body of the pack.

[0027] According to the invention, an intermittent form-fill-seal bagging machine 1 having a very compact design, in particular as seen in the conveying direction A of the flexible enveloping tube, is provided. By making provision for the parabola-form folding elements 8, a fast and reliable shaping of folds to be sealed can be achieved, said folds being subsequently sealed by the sealing means 6. The form-fill-seal bagging machine according to the invention can thereby be quickly retrofitted for use with other packs, for example by exchanging the complete forming system (forming shoulder including filling pipe) and/or removing parabola-form folding elements or removing sealing units of the sealing means.

[0028] The parabolic shapes of the parabola-form folding element 8 and the parabola-form recess 10 are furthermore preferably different. In particular, the formed parts on the front and back are the same and likewise the formed parts on the left and right side. The formed parts on the front and rear are however not the same as the formed parts on the left and right side.

- 1. An apparatus for producing a pack (20) from a packaging-material web, comprising:
  - a forming tube (2),
  - a filling tube (11), which runs, in part, through the forming tube,
  - a forming shoulder (3), which is arranged on the forming tube (2) for forming a flexible enveloping tube,
  - a folding means (7), which is arranged downstream of the forming shoulder (3), as seen in a conveying direction (A) of the flexible enveloping tube, and
  - a sealing means (6) with a multiplicity of sealing units (6a, 6b), which are arranged downstream of the folding means (7), as seen in the conveying direction (A) of the flexible enveloping tube,
- wherein the forming tube (2) has a first diameter (D1) and the filling tube (11) has a second diameter (D2), wherein the first diameter (D1) is greater than the second diameter (D2), wherein the folding means (7) is arranged at an end of the forming tube (2) and
- wherein the folding means (7) has a parabola-form folding element (8) in order to form folds in the flexible envel-

oping tube, the parabola-form folding element (8) being arranged such that a vertex (9) of the parabola-form folding element (8) is directed counter to the conveying direction (A).

- 2. The apparatus according to claim 1, characterized in that a parabola-form recess (10) is formed at the end of the forming tube (2), wherein the parabola-form folding element (8) protrudes into the parabola-form recess (10) such that a parabola-form gap (5) develops, wherein the packaging-material web is displaced in order to form the folds which are to be sealed.

- 3. The apparatus according to claim 1, comprising exactly four folding means (7), which are arranged along a circumference of the end of the forming tube (2).

- 4. The apparatus according to claim 2, characterized in that a parabolic shape of the parabola-form folding element (8) is different with respect to a parabolic shape of the parabola-form recess (10).

- 5. The apparatus according to claim 1, characterized in that the sealing units of the sealing means are drag sealing units.

- 6. The apparatus according to claim 1, further comprising a feed device (13) for moving the flexible enveloping tube in the conveying direction (A).

- 7. The apparatus according to claim 6, characterized in that the feed device (13) is disposed between two sealing units of the sealing means (6), as seen in a circumferential direction of the filling tube (11).

- 8. The apparatus according to claim 1, further comprising a retaining element (15) for holding the forming tube (2) to a table top (12).

- 9. The apparatus according to claim 1, characterized in that the sealing units (6a, 6b) of the sealing means have a length (L1) in the conveying direction (A) of the flexible enveloping tube, which is less than a length of edges (21, 22, 23, 24) on the pack (20) which have been produced.

- 10. The apparatus according to claim 2, characterized in that a vertex of the parabola-form folding element (8) and a vertex (10a) of the parabola-form recess (10) lie in a straight line parallel to the conveying direction (A).

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