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(54) Apparatus for folding a flap of a plastic film for forming bags with strip closure

(57) An apparatus for the folding of a flap of a plastic film for manufacturing bags (1) with strip closure, the plastic film being fed in the form of a half-tubular film (40) made up of two superimposed bands (41, 41') joined along a longitudinal side, wherein two shaped plate sheets (60, 60') are provided, inserted between the two bands (41, 41') of the plastic film (40) and arranged in sequence along the path of forward movement of the film, these plate sheets (60, 60') cooperating with means (51, 53; 51', 53') for forming a first fold of the flap of one band (41) and a second fold of the flap of the other band (41') of the film (40).

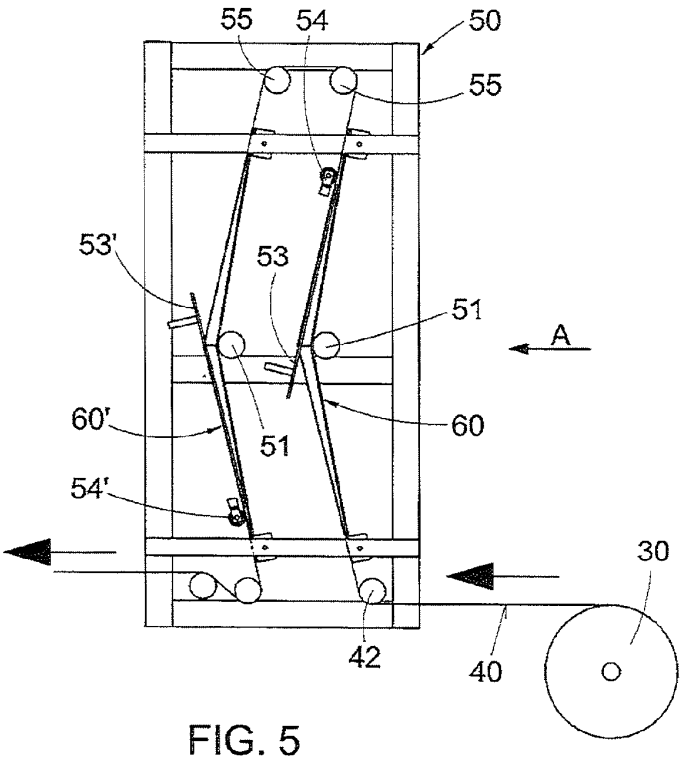

FIG. 5

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Description

[0001] The object of the present invention is an apparatus for folding the flap of the plastic film for forming bags with strip closure.

[0002] Bags with strip closure, also known by the commercial names Nastrosac or Prendifacile, commonly used for the collection of refuse, or also for the containing of products of various kinds, have a strip inserted in the fold of the upper lip of the bag, fold which is then sealed in such a way as to form a pocket or channel wherein the strip slides. Through a hole, preferably two opposite holes, formed at the upper flap of the walls of the bag, the user extracts the strip which slides in the aforesaid pocket or channel, causing the closure of the mouth of the bag through strangling.

[0003] The system of production of these bags with strip closure starts with a bubble extrusion of a tubular plastic film which is flattened and is divided on one side or in its centre in order to form respectively one or more half-tubular films constituted by two superimposed bands joined longitudinally on one side and compacted one in relation to the other in such a way that air does not remain between them.

[0004] According to a known system a hole is formed in the half-tubular film and therefore in the two bands which constitute it, subsequently the half-tubular film is slightly opened by means of rollers which are inserted inside, creating a kind of diamond shape, in order to allow the folding of the edge towards the interior (by 50 - 60 mm) and the simultaneous insertion of the closure strip. Subsequently the edge of the fold is sealed in order to create the pocket or channel of sliding of the strip.

[0005] The problem of this system is that, at the re-closure of the film after the formation of the fold of the lip, a great deal of air remains inside the half-tubular film and therefore the formed bag, which makes it unsightly.

[0006] A solution which has been proposed in order to seek to solve this problem consists in turning the film towards the exterior with a fold approximately double the usual (approximately 150 mm), after which the flap is turned towards the interior by about one third (approximately 40 - 50 mm) and finally the remaining flap part is closed inside the bag. This is performed first on one side and then on the other. This system is however fairly complicated and suffers from possible imperfections of the film.

[0007] Another solution proposed, very simple, provides for the fold of the flap outside of the bag rather than inside, therefore the pocket or channel remains outside of the bag. This solution wherein the external pocket is noted is unsightly, above all in the case of two-colour film on the two faces.

[0008] The object of the invention is that of eliminating the disadvantages of the known solutions described above.

[0009] More particularly one object of the invention is that of providing an apparatus for the folding of the flap in the plastic film for the formation of bags with strip closure with internal pocket, wherein the entry of air inside the bag during the manufacturing process is reduced to a minimum.

[0010] Another object of the present invention is that of providing such an apparatus which is simple and economical to manufacture and which allows a high production capacity.

[0011] These objects are achieved by the apparatus according to the invention which has the features of the annexed independent claim 1.

[0012] Advantageous embodiments of the invention are described in the dependent claims.

[0013] Substantially, the apparatus according to the invention comprises, in sequence, for each side of the plastic film constituting the half-tubular film, an appropriately shaped plate sheet which allows the edge of the film to be turned inwards, with a minimum opening of the same (approximately 150 mm rather than the entire width of the film as occurs in the case of simultaneous diamond-shape opening of the two sides of the film).

[0014] A guide plate co-operates with the shaped plate sheet in order to aid the turning of the edge of the film.

[0015] Further features of the invention will be made clearer by the following detailed description, referred to one of its embodiments purely by way of a non-limiting example illustrated in the accompanying drawings, in which:

- Figure 1 is a front elevation view of a bag with strip closure which can be obtained with the apparatus according to the invention;
- Figure 2 is a schematic section taken along line II-II of Figure 1;
- Figure 3 is a schematic perspective view of a bag in closed position;
- Figure 4 is a plan view of a succession of rolled-up bags;
- Figure 5 is a side elevation view of a bag of the apparatus for folding the flap of the film according to the invention;
- Figures 6a, 6b are front elevation views, partially fictitious, showing the folding of the flaps of the two sides of the film, taken in the direction of the arrow A of Figure 5;
- Figure 7 is an enlarged plan view of the plate sheet for performing the first fold on the film shown in Figure 6a, the plate sheet of Figure 6b for performing the second fold having the same features;
- Figure 8 is a side elevation view of the plate sheet of Figure 7 taken in the direction of the arrow b;
- Figure 9 is a section taken along the line IX-IX of Figure 7.

Figure 1 shows a bag with strip closure which can be obtained using the apparatus according to the invention, denoted as a whole by reference numeral 1.

[0016] The bag 1 is obtained from a half-tubular film,

i.e. from two superimposed sheets 2, 3, constituting the two sides or opposite faces of the flattened bag, joined along a longitudinal side 4, which forms the base of the bag 1, and sealed along two transverse sides 5 which constitute the vertical sides of the bag. The upper flaps 6 of the opposite walls 2, 3 of the bag are turned towards the interior at the mouth 7 and sealed along sealing lines 8 in order to determine respective internal channels or pockets 9 wherein respective strips 10 are housed, accessible from the exterior through two opposite holes or cuts 11 with a substantially semicircular shape formed in the central zone of the mouth 7.

[0017] The ends of the strips 10 remain restrained to the bag 1 by means of the aforesaid sealing lines 5.

[0018] Pulling the strips 10 from the accessible part through the holes 11 causes the closure of the bag 1 through strangling, as shown schematically in Figure 3.

[0019] The bags 1, after manufacture, can be kept joined through pre-cut lines 12, which facilitate the separation from a roll 20 whereon they are wound, formed by a certain number of bags. Alternatively the formed bags can be completely separated one from the other and rolled, slightly superimposed and wrapped, or collected into bunches.

[0020] Referring now to Figures 5 to 9, a description is given of the apparatus for folding the flap of the film for forming the bags 1 with strip closure of the type previously described.

[0021] As mentioned, a reel 30 (Figure 5) of half-tubular plastic film is used to start, i.e. made up of two superimposed bands joined along a longitudinal side, the rear one with reference to Figure 5, i.e. the one on the right with reference to Figures 6a and 6b.

[0022] The half-tubular film, denoted generically by reference numeral 40 in Figure 5, arrives at a station of folding of the flap, denoted overall by reference numeral 50, where two plate sheets are arranged in sequence, appropriately shaped 60, 60', suitable for determining the folding of one and the other band of film 40 moving forwards.

[0023] In the embodiment illustrated in the drawings, the film 40 advances upwards along the plate sheet 60, which causes the folding of the flap of the lower band 41 of the film, which then reverses the direction of forward movement, descending downwards along the plate sheet 60', which performs the folding of the flap of the upper band 41' of the film.

[0024] The illustrated arrangement is preferred for reasons of bulk, in that the shaped plate sheets 60, 60' are arranged vertically and adjacent a short distance one from the other. It is however clear that the plate sheets 60, 60' can be arranged in any way, for example in line, provided they are separated one from the other, in order to act first on one band and then on the other of the film 40.

[0025] Herein below one of the plate sheets will be described in detail with the relative accessories, for example the plate sheet 60 which performs the folding of the lower band 41 of the film 40. Similar considerations apply for the plate sheet 60' which operates in a perfectly similar manner in order to perform the folding of the upper band 41'.

[0026] Referring to Figures 5 and 6a, the half-tubular film 40, whose two lower 41 and upper 41' bands are perfectly coupled one to the other without infiltrations of air, is driven by a roller 42 on the first shaped plate sheet 60 which is inserted between the two bands on the open side of the half-tubular film 40.

[0027] The shaped plate sheet 60 has a very open V shape, with an angle at the apex α which varies for example from 145 to 165°, preferably 156.21°. The plate sheet 60 has a decrease in width from the side of inlet to the side of outlet of the film, in particular the width decreases gradually up to the apex of the V, situated approximately in the midline of the plate sheet, to then remain constant up to the outlet side. By way of example, a plate sheet approximately 1,000 mm long has a width at the film inlet base from 200 to 220 mm, preferably 210 mm, which decreases gradually up to 145 - 155 mm, preferably 150 mm at the apex of the V up to the opposite film outlet base.

[0028] The difference in width between the bases of the plate sheet (approximately 60 mm) corresponds to the fold of the film.

[0029] The two branches 62, 63 of the V-shaped plate sheet 60 are not perfectly plane in plan view but slanting, in such a way that in the side view of Figure 8, between the projections of the front and rear edges of the V-shaped plate sheet, at the apex V, a cusp or arrow F of approximately 30 mm is formed. The angle B between the projections of the aforesaid front and rear edges, from the end towards the apex V, is approximately 3°.

[0030] Moreover, on the rectilinear internal edge of the plate sheet 60, at the apex V, a curved cut 64 is provided, serving the purposes to be mentioned herein below.

[0031] The plate sheet 60 shaped in this way, inserted between the two bands 41, 41' of the half-tubular film 40, forms a limited opening of the two bands of the film, slightly greater than the aforesaid cusp or arrow of approximately 30 mm which is determined at the apex V of the plate sheet, opening which goes to zero at the film inlet and outlet ends. The depth of this opening is also limited and corresponds substantially to the maximum width of the plate sheet 60, which as mentioned is approximately 210 mm.

[0032] The two bands 41, 41' of the half-tubular film 40 are kept adherent one to the other during the folding of the flap by a roller 51 positioned at the apex of the V-shaped plate sheet, and having a conical section 52 in the zone involved by the plate sheet, in order not to interfere with it and allow the opening of the film. Likewise the plate sheet 60 has the aforesaid curved cut 64 in order not to create a step in the zone adjacent to the roller.

[0033] Figure 6a shows schematically the formation of the fold of the flap of the lower band 41, aided by a guide plate 53 which is inserted between the two bands of the film 40 and co-operates with the narrower upper branch

63 of the plate sheet 60.

[0034] Externally to the band 41 of the film a roller 54 is positioned with axis slightly tilted inwards and upwards, acting against the upper branch 63 of the plate sheet 60, in order to stretch the folded film and avoid the formation of wrinkles.

[0035] As mentioned, Figure 6a is a partially fictitious view, in order to show better elements which otherwise would not be visible. In particular the view is taken from the interior of the half-tubular film 40, i.e. removing the upper band 41', in order to show the folding of the flap of the lower band 41. The roller 54 is obviously positioned behind the plate sheet 60 and the band 41 of the film.

[0036] Having performed the first fold on the band 41, the film passes through drive rollers 55 and goes to the second plate sheet 60' with relative accessories, for the forming of the second fold on the upper band 41', in a perfectly identical manner to what has previously been described.

[0037] In Figure 6b elements corresponding to those of Figure 6a have been denoted with the same reference numerals followed by a prime.

[0038] The half-tubular film at the outlet from the station 50, i.e. downstream of the second shaped half-plate 60', has both flaps folded inwards, as shown by the enlargement of the part enclosed in a circle in Figure 6b.

[0039] After the formation of the folds, the holes 11 are formed and in the pockets or channels formed following folding of the flaps respective strips 10 are inserted. Subsequently transverse seals 5 are performed in order to form the bags 1 which remain joined one to the other, and centrally to the transverse seals 5 pre-incision lines 12 are formed in order to facilitate the tear removal of the bags.

[0040] All the bags obtained in this way are wound to form the roll 20.

[0041] The roll 20 is presented in a very compact form, the entry of air between the two bands of the film during the folding of the flaps being prevented, thanks to the apparatus according to the invention which allows this folding to be performed by means of a minimal opening of the band of the film, unlike the most used systems of the state of the art which required a diamond-shaped opening of both the bands of the film simultaneously and substantially for their entire width.

[0042] As mentioned previously, instead of the pre-incision lines 12 actual cuts can be formed in order to separate the bags 1 formed, which are subsequently rolled up, slightly superimposed and wrapped, or collected into bunches.

[0043] Naturally the invention is not limited to the particular embodiment previously described and illustrated in the accompanying drawings, but instead numerous detail changes can be made thereto, within the reach of the person skilled in the art, without thereby departing from the scope of the same invention as defined in the annexed claims.

Claims

1. Apparatus for the folding of the flap of the plastic film for manufacturing bags (1) with strip closure, the plastic film being fed in the form of a half-tubular film (40) made up of two superimposed bands (41, 41') joined along a longitudinal side, **characterised in that** it provides two shaped plate sheets (60, 60') inserted between the two bands (41, 41') of the plastic film (40) and arranged in sequence along the path of forward movement of the film, these plate sheets (60, 60') co-operating with means (51, 53; 51', 53') for forming a first fold of the flap of a band (41) and a second fold of the flap of the other band (41') of the film (40).

2. Apparatus according to claim 1, **characterised in that** said plate sheets (60, 60') have a very open V shape and a decreasing width on a first branch (62, 62') of the V, starting from the film inlet base to the apex (V) of the V-shaped plate sheet and a constant width on the second branch of the V, from the apex to the film outlet base.

3. Apparatus according to claim 2, **characterised in that** said two branches (62, 63; 62', 63') of the V-shaped plate sheet (60, 60') are slightly slanting, such that the projections, in a side view, of the front and rear edges of the V-shaped plate sheet form a cusp or an arrow (F).

4. Apparatus according to claims 2 and 3, wherein the angle at the apex α of said V-shaped plate sheet (60, 60') is about 145 - 165°, preferably 156.21°, the length of said arrow (F) is about 30 mm, and the difference in width between the bases of said plate sheet (60, 60') for the inlet and outlet of the film is about 60 mm.

5. Apparatus according to any one of claims 2 to 4, **characterised in that** a roller (51, 51') for accompanying the film (40) co-operates with said plate sheet (60, 60'), said roller being positioned externally with respect to said film at the apex of the V-shaped plate sheet, where it has a conical section (52, 52').

6. Apparatus according to any one of the preceding claims, **characterised in that** a guide plate (53, 53') co-operates with said plate sheet (60, 60'), said guide plate being inserted between the bands (41, 41') of the film (40) in order to aid the folding of the respective flap.

7. Apparatus according to any one of the preceding claims, **characterised in that** it provides a pressure roller with tilted axis (54, 54') acting externally to the band of film (41, 41') against the outlet end section of the plate sheet (60, 60'), in order to spread the

film and avoid the formation of wrinkles in the folding area.

8. Apparatus according to claim 5, wherein said plate sheet (60, 60') has on the straight side, at the apex (V), a curved cut suitable for avoiding the formation of a step in the zone adjacent to the roller (51, 51').

9. Method for the folding of the flap of the plastic film during the formation of bags with strip closure, wherein the film is fed in the form of a half-tubular film made up of two superimposed bands (41, 41') joined along a longitudinal side, **characterised in that** it provides in sequence a first folding of the flap of a band (41) by means of a shaped plate sheet (60) inserted between the two bands, and a second folding of the other band (41') by means of a second shaped plate sheet (60').

10. Shaped plate sheet (60, 60') for the folding of the flap of the plastic film for manufacturing bags with strip closure with the apparatus according to claim 1 or with the method according to claim 9, **characterised in that** it has a very open V shape with an angle α between 145 and 165°, preferably 156.21°, and a width decreasing from the film inlet base up to approximately the midline where the apex (V) of the plate sheet is positioned, which continues with a constant width up to the film outlet base, the two branches (62, 63; 62', 63') of the plate sheet (60, 60') being slightly slanting, such that the projections, in a side view, of the front and rear edges of the plate sheet form an arrow (F) of about 30 mm at the apex of the plate sheet.

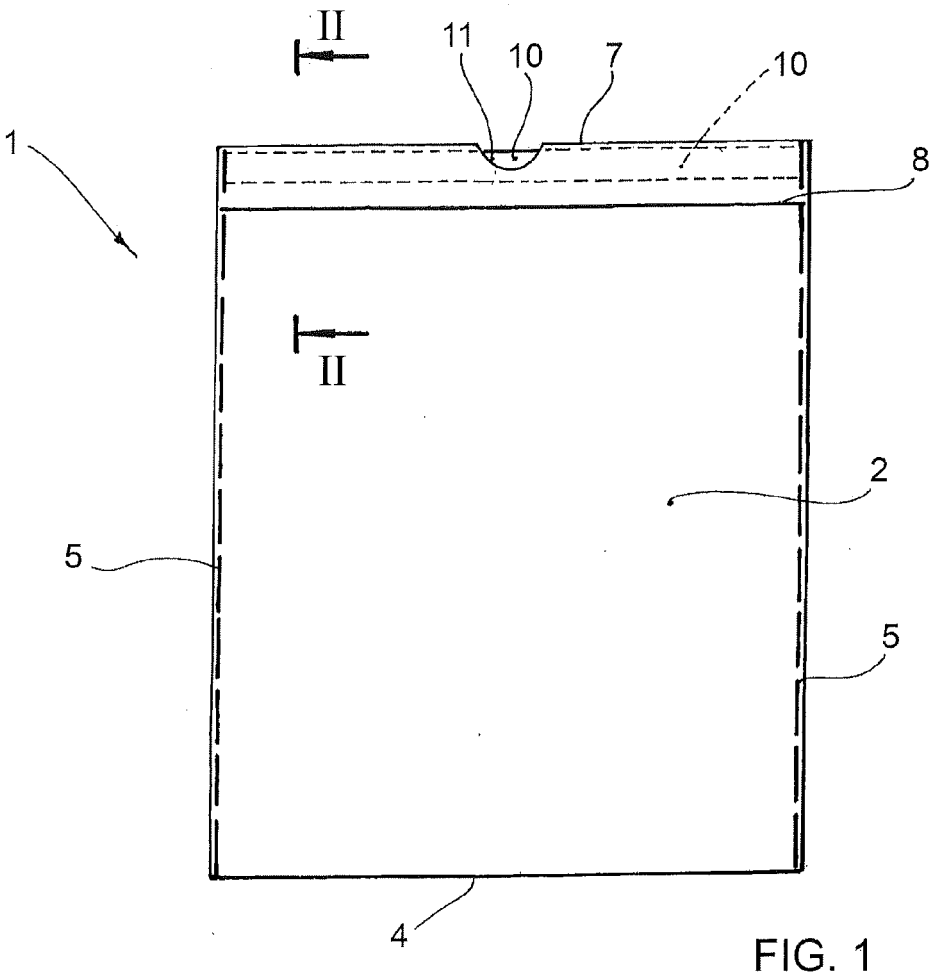


FIG. 1

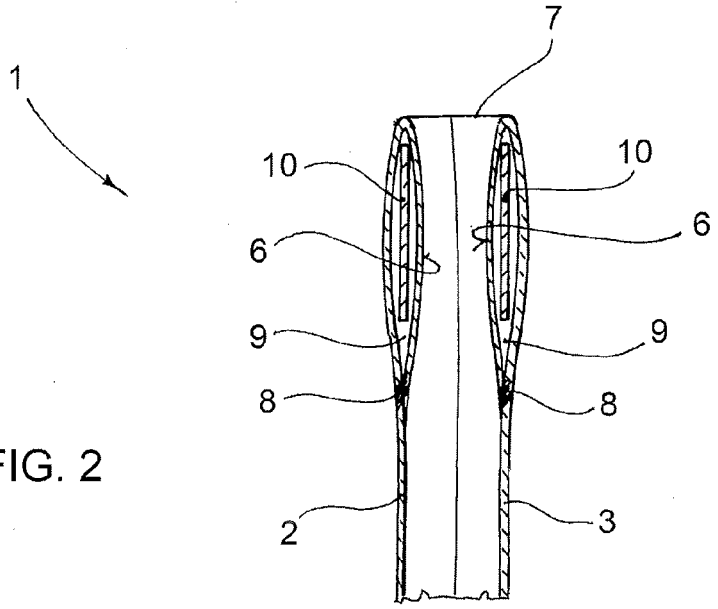


FIG. 2

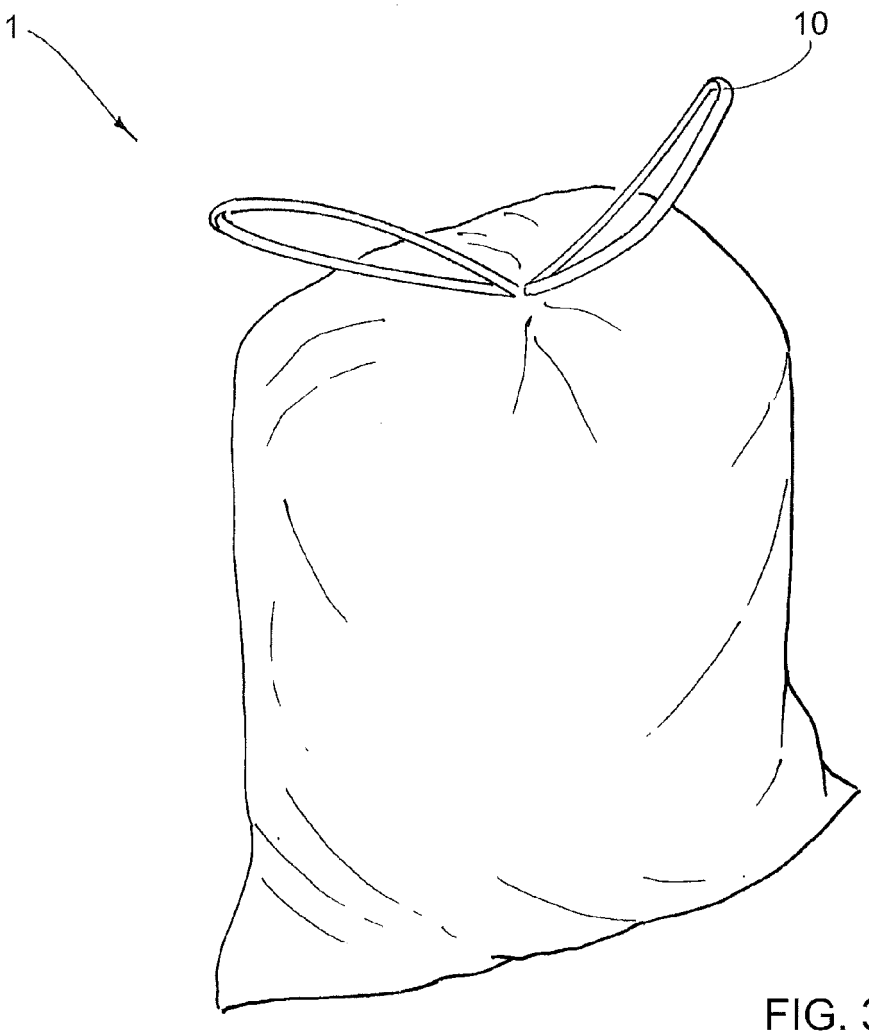
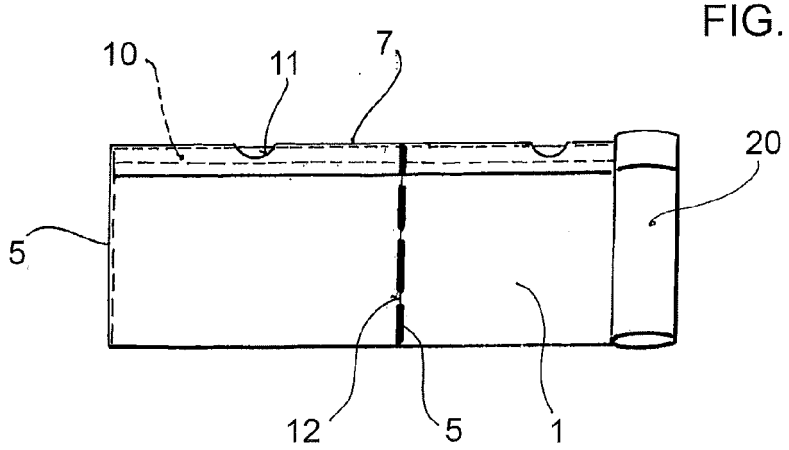


FIG. 3

FIG. 4



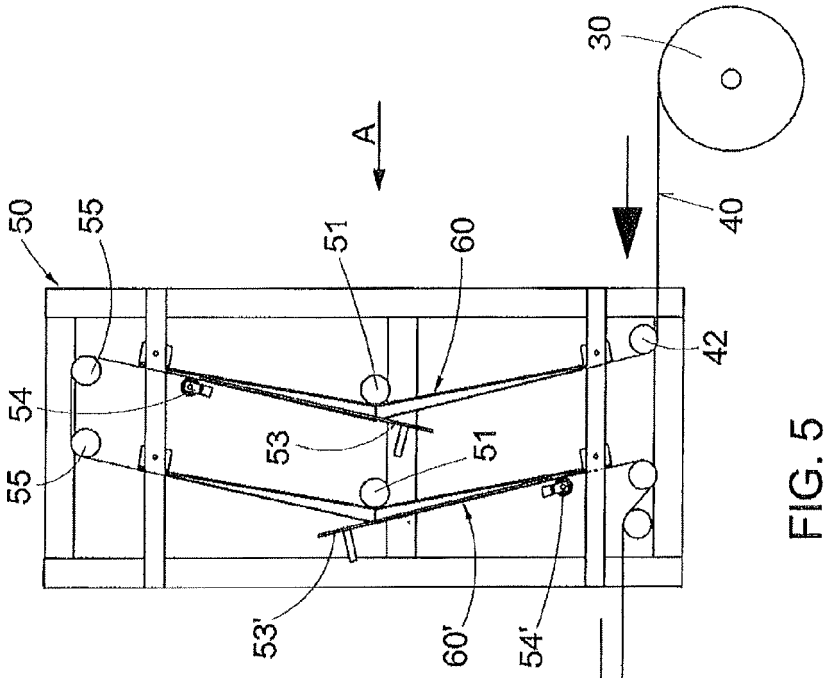


FIG. 5

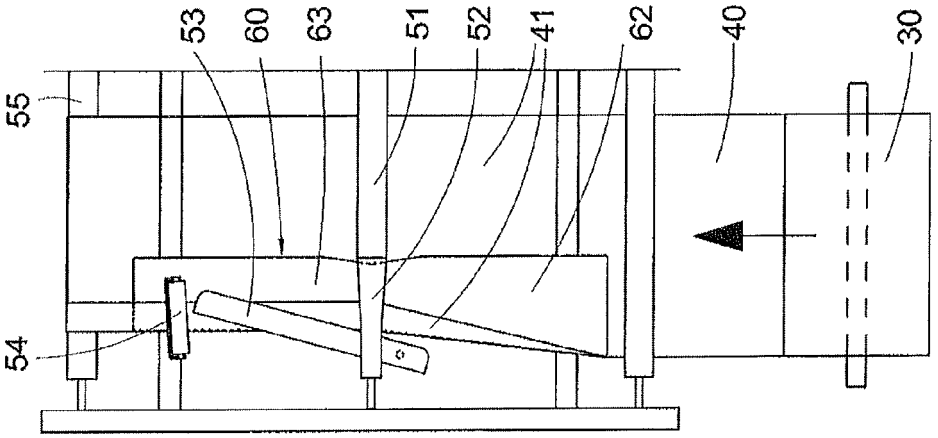


FIG. 6a

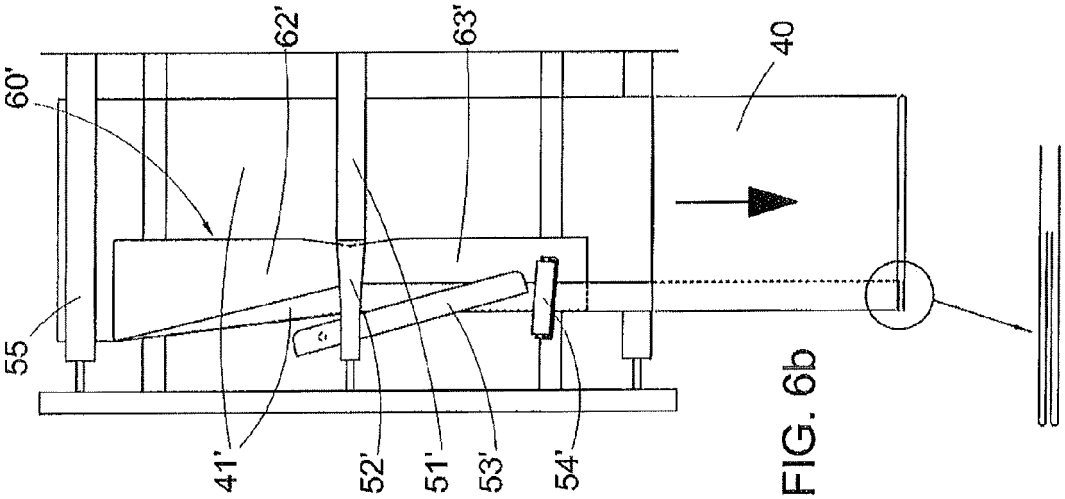


FIG. 6b

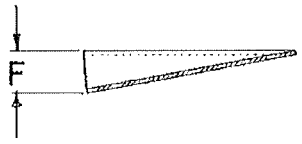


FIG. 9

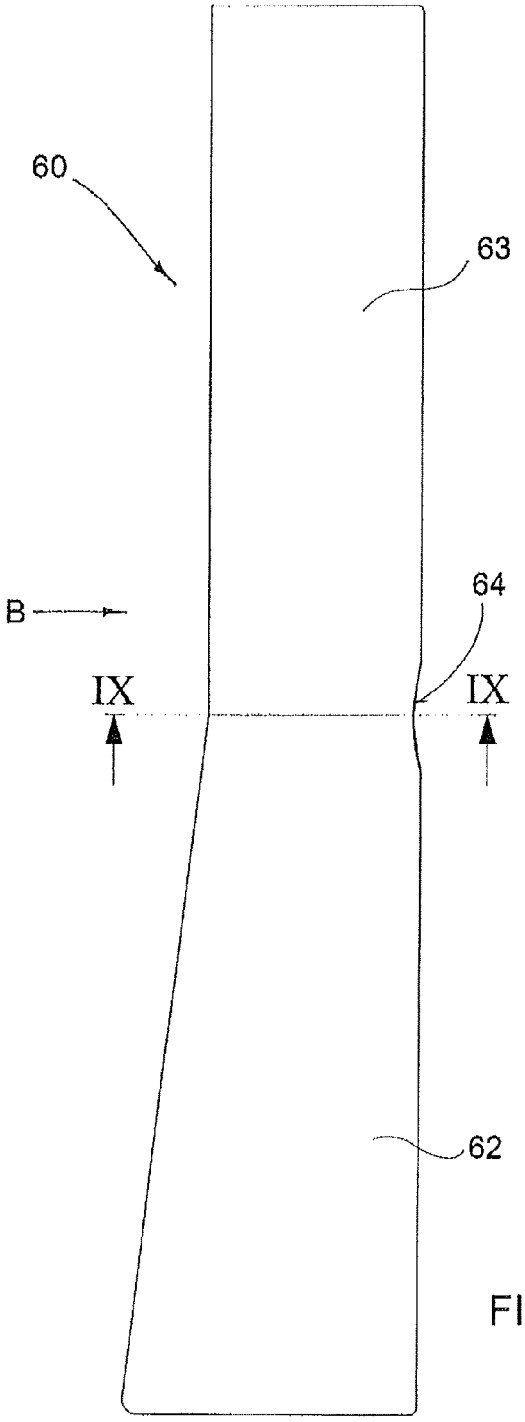


FIG.7

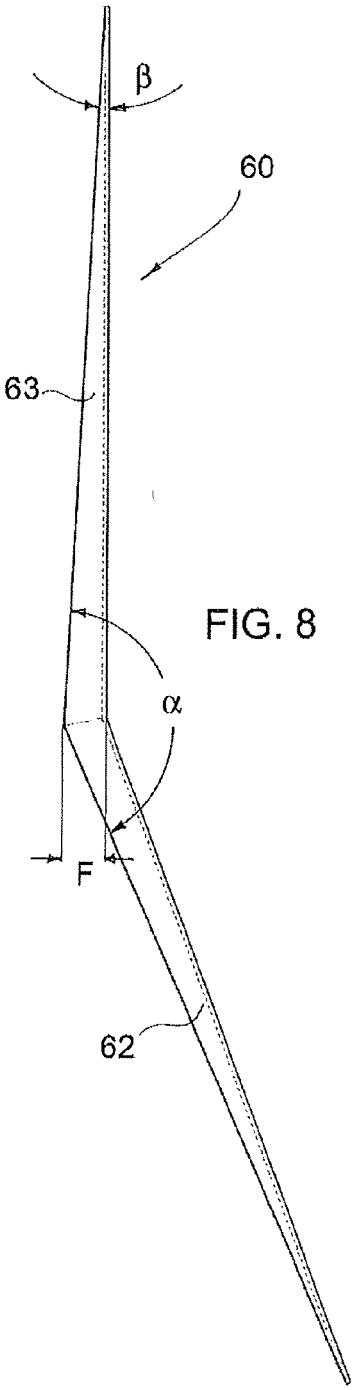


FIG. 8