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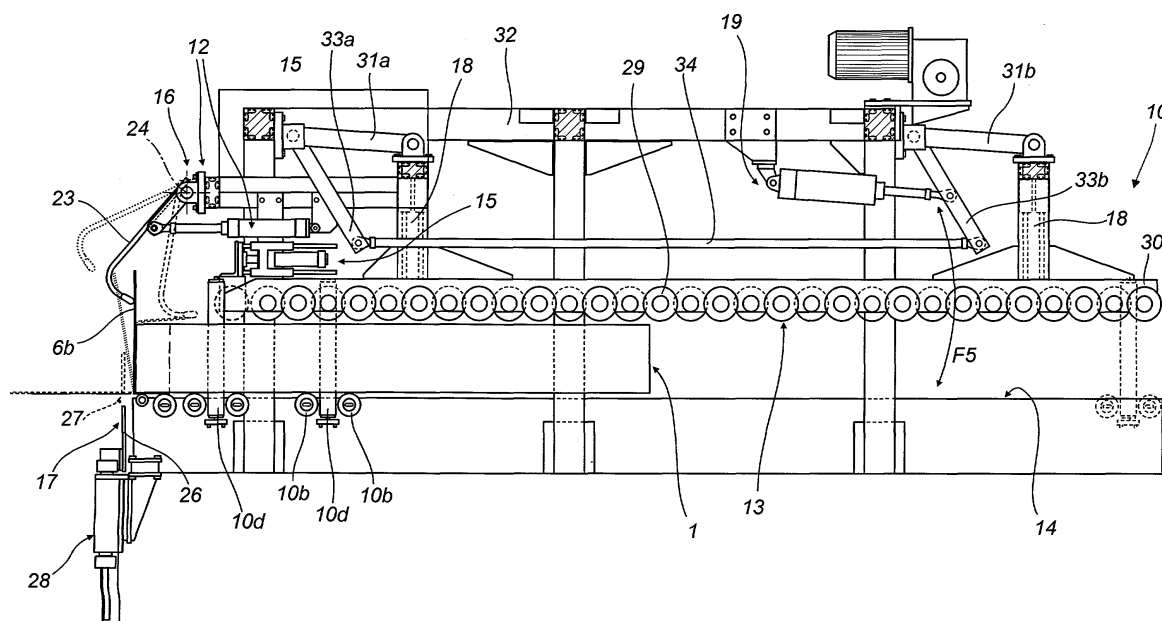
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(54) **Apparatus for packaging panels**

(57) An apparatus for packaging panels (1) comprising: a station (3) for positioning and checking the incoming panels (1), equipped with a unit (4) for identification of at least the dimensions of the panel (1); a station (5) for forming lengths (6a, 6b, 6c, 6d) of packaging material, located at the side of the positioning station (3) and designed to form covers for the longitudinal, front and rear edges (1a, 1b, 1c, 1d) of the incoming panel (1); a station (7) for placing the panel (1) on part of the lengths (6a, 6b, 6c, 6d), the latter positioned on a table (8); a

station (10) for covering the longitudinal edges (1a, 1b) of the panel (1) with the projecting portions of the lengths (6a, 6b) by folding the portions (6a, 6b) over the edges (1a, 1b); a station (11) for wrapping the panel (1) - lengths (6a, 6b, 6c, 6d) assembly with film, located downstream of the covering station (10) relative to a panel (1) direction feed (A); the station (10) for covering the edges (1a, 1b, 1c, 1d) comprising means (12) for automatically folding the projecting portion of the lengths (6c, 6d) of packaging material over the front and rear edges (1c, 1d) of the panel (1).

FIG. 3



Description

[0001] The present invention relates to an apparatus for packaging panels, in particular panels made of wood or the like which will be used to make furniture.

[0002] At present, the above-mentioned apparatuses for packaging wooden furniture components, that is to say predominantly flat panels, may use solutions of various types, depending on the type of final package required.

[0003] In the past, packages were used in which the panel was completely covered with elements made of synthetic material, for example special polystyrene shapes contained in special boxes made of cardboard or other materials.

[0004] However, such packages are expensive, not very environmentally-friendly because some materials cannot be recycled, and also cannot be standardised on medium - high production systems in furniture manufacturing companies.

[0005] Therefore, alternative types of packaging were examined, such as those obtained by completely covering the panel from a continuous source of packaging material (corrugated cardboard) and each time adapting the dimensions of the packaging to those of the product to be wrapped: this solution is undoubtedly effective but inevitably expensive.

[0006] Alternatively, solutions were found involving partial panel wrapping (that is to say, of the most delicate zones of the panel), using lengths of cardboard wrapped with heat-shrink or stretch film which forms the final package, securing the cardboard to the panel (of particular interest in this text).

[0007] Such apparatuses normally comprise:

- a station for positioning and checking the incoming panels arriving from the production lines (on shuttles) and equipped with a bar code reader which identifies the panel type and dimensions;
- a station for forming lengths of cardboard which will cover the longitudinal, front and rear edges of the panel; said station consisting of a magazine for continuous cardboard fed on a horizontal table and towards a cutting unit controlled by a control unit connected to the bar code reader, so that the cardboard can be cut to size to form four lengths;
- a station, located parallel with the positioning station, for placing the panel on a first part of the lengths of cardboard (already attached to one another, for example, with a spot of glue) using special pick and place means (such as suction cup units); there being an operator present in this station who, once the panel has been set down, joins the free part of the front and rear lengths of cardboard to the panel by folding them and securing them, for example with adhesive tape or the like;
- a station for moving the panel - cardboard assembly and simultaneously folding the part of the lengths

of cardboard projecting from the panel on the longitudinal sides of the panel by means of shaped contact elements towards

- a station for wrapping the panel - cardboard assembly with stretch or heat-shrink film.

[0008] However, such an apparatus has revealed several disadvantages due to the need for manual folding of the front and rear lengths of cardboard, by an operator, with application of adhesive material.

[0009] It was found that this operation, due to the presence of an operator, results in a low production speed in the packaging cycle, and application of an adhesive tape may cause surface imperfections on the panels packaged which are not always accepted by the customer, in particular on panels made of top quality wood.

[0010] The aim of the present invention is, therefore, to overcome these disadvantages by providing an apparatus for packaging panels which has a high level of productivity, fully automated packaging cycle, in particular the folding, and preventing any contact between adhesive substances and the surface of the panels.

[0011] According to the invention, this aim is achieved by an apparatus for packaging panels comprising: a station for positioning and checking the incoming panels, equipped with a unit for identification of at least the panel dimensions; a station for forming lengths of packaging material, located at the side of the positioning station and designed to form covers for the longitudinal, front and rear edges of the incoming panel; a station for placing the panel on part of the lengths, the latter positioned on a table; a station for covering the longitudinal edges of the panel with the projecting portions of the lengths by folding the portions over the edges; a station for wrapping the panel - lengths assembly with film, located downstream of the covering station relative to a panel direction of feed; the station for covering the edges comprising means for automatically folding the projecting portion of the lengths of packaging material over the front and rear edges of the panel.

[0012] The technical characteristics of the invention, with reference to the above aims, are clearly described in the claims below and its advantages are apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without restricting the scope of the inventive concept, and in which:

- Figure 1 is a perspective view of a package for a panel made with the apparatus according to the present invention;
- Figure 2 is a schematic top plan view with some parts cut away to better illustrate others of an apparatus for packaging panels according to the present invention;
- Figure 3 is a schematic side view with some parts

cut away to better illustrate others of a station which is part of the apparatus illustrated in Figure 2;

- Figure 4 is a schematic side view with some parts cut away to better illustrate others of a first detail with reference to Figure 3;
- Figure 5 is a schematic side view with some parts cut away to better illustrate others of a second detail with reference to Figure 3.

[0013] With reference to the accompanying drawings, in particular Figures 1 and 2, the apparatus according to the invention is used to package predominantly flat panels 1 made of wood or the like.

[0014] The panel 1 is packaged using four lengths 6a, 6b, 6c and 6d of packaging material (for example cardboard) designed to cover the relative edges 1a, 1b, 1c and 1d of the panel 1. Obviously, the panel 1 may be completely covered without this limiting the scope of the inventive concept for the present invention.

[0015] The apparatus, labelled 2 as a whole, basically comprises:

- a station 3 for positioning and checking the incoming panels 1 from panel 1 production stations, the positioning and checking station being equipped with a unit 4 for the identification of at least the panel 1 dimensions;
- a station 5 for forming lengths 6a, 6b, 6c, 6d of packaging material, located close to (that is to say, at the side of in this configuration) the positioning station 3 and designed to form covers for the longitudinal, front and rear edges 1a, 1b, 1c and 1d of the incoming panel 1;
- a station 7 for placing the panel 1 on part of the lengths 6a, 6b, 6c, 6d, the latter positioned on a first table 8, and using handling means 9;
- a station 10 for covering the longitudinal edges 1a and 1b of the panel 1 with the projecting portions of the lengths 6a and 6b by folding the portions 6a and 6b over the edges 1a, 1b;
- a station 11 for wrapping the panel 1 - lengths 6a, 6b, 6c, 6d assembly with film, located downstream of the covering station 10 relative to a panel 1 direction of feed A.

[0016] In further detail, the positioning station 3 is equipped with a unit 4 for reading the bar codes which are already applied to the panels 1, so as to identify the panel 1 type and dimensions.

[0017] The station 5 for forming the lengths 6a, 6b, 6c, 6d consists of a magazine 5a for continuous packaging material which can be fed to a cutting unit 5b connected to the bar code reader unit 4, so that the material can be cut to size.

[0018] The station 7 for placing the panel on part of the lengths is fed with the lengths 6a, 6b, 6c, 6d already positioned as they arrive from the cutting unit (see arrow A) and on which the panel 1 is placed by the handling

means 9, for example robot or suction cup units which can also join the various lengths 6a, 6b, 6c, 6d together with a spot of glue before placing the panel.

[0019] The station 10 for covering the edges 1a, 1b, 1c, 1d also comprises means 12 for automatically folding the projecting portion of the lengths 6c and 6d of packaging material over the front and rear edges 1c and 1d of the panel 1.

[0020] This covering station 10 also comprises means 13 for retaining the lengths 6c and 6d folded over the front and rear of the panel 1 and acting on the lengths 6c, 6d themselves until close to the wrapping station 11.

[0021] At a structural level, this station 10 for covering the edges 1a, 1b, 1c, 1d comprises a second horizontal table 14 for moving the panel 1 in the direction of feed A, the second table consisting of a first plurality of rollers 10a, and between and coplanar with the first table 8 of the station 7 for placing the panel on part of the lengths and the wrapping station 11.

[0022] As illustrated in Figures 2 and 3, the station 10 is equipped with folders 10b and 10c for the lengths 6a and 6b for the longitudinal edges 1a and 1b of the panel 1. These folders 10b and 10c are of the known type and may comprise a double row of opposite and adjustable wheels with an ellipsoidal cross-section for vertical lifting of the two lengths 6a and 6b along the entire second table 14, and an upper pair 10c of shaped contact elements, positioned opposite the second table 14, so as to fold the projecting portion of the lengths 6a and 6b over the panel 1 just before it enters the wrapping station 11.

[0023] The lifting rollers 10b are attached to and alternated with cylinders 10d for centring the package, designed to allow linear and correct feed towards the wrapping station 11.

[0024] The wrapping station 11, schematically illustrated since it is of the known type, forms definitive packaging if a stretch film is used, or intermediate packaging if a heat-shrink film is used, since the pack is then transferred to special ovens which cause the film to retract and form the final package (the ovens not illustrated here).

[0025] As illustrated in Figure 3, the automatic folding means 12 are positioned at the end of the second horizontal table 14 close to the station 7 for placing the panel on part of the lengths, that is to say, upstream of the table relative to the direction of feed A.

[0026] These automatic folding means 12 comprise:

- a first unit 15 for folding the length 6c projecting from the front of the panel 1;
- a second unit 16 for folding the length 6d projecting from the rear of the panel 1;
- a part 17 for vertically lifting the two projecting lengths 6c, 6d, respectively, of the front 1c and rear 1d of the panel 1 and positioned between the station 7 for placing the panel on part of the lengths and the covering station 10.

[0027] These two folding units 15 and 16 and the above-mentioned means 13 for retaining the folded lengths 6c, 6d are supported by a bridge-shaped frame 18 over the second conveyor table 14.

[0028] This frame 18 has means 19 for adjusting the distance between the two folding units 15 and 16 and the second conveyor table 14 according to the panel 1 thickness S.

[0029] As illustrated in Figure 4, the first folding unit 15 comprises a rigid contact element 20 extending vertically, positioned at the end of the covering station 10.

[0030] This contact element 20 is attached to a supporting body 21 connected to horizontal drive means 22 (motor-driven cylindrical guides) providing movement parallel with the second conveyor table 14 so as to allow: a first, operating forward position, in which the contact element 20 is outside the dimensions of the frame 18, allowing the length 6c to be folded over the front edge 1c of the panel 1 (see arrows F3 and F4 in Figure 4); and a non-operating back position (see Figure 5), in which the contact element 20 is within the dimensions of the frame 18, to prevent contact with the second folding unit 16 (see arrow F in Figure 4).

[0031] The supporting body 21 is attached to the frame 18 in such a way that it allows adjustment of the height of the contact element 20.

[0032] Figure 5 provides a detailed illustration of the second folding unit 16, which comprises an "L"-shaped lever 23 pivoting, at 24, at the end of the supporting frame 18.

[0033] This lever 23 is connected to the end of a drive cylinder 25 which is in turn connected to the frame 18 and is designed to allow the lever 23 to move, in both directions, (see arrow F1 in Figure 5), from a non-operating raised position, in which the operating end 23a of the lever 23 is outside the dimensions of the panel 1 in transit, and an operating lowered position, in which the operating end 23a of the lever 23 intercepts and folds the projecting portion of the length 6d over the rear edge 1d of the panel 1 (see arrow F4 in Figure 5).

[0034] The lifting part 17 comprises (see Figures 4 and 5) a vertical contact wall 26 positioned inside a separating slot 27 between the station 7 for placing the panel on part of the lengths and the covering station 10.

[0035] This wall 26 has drive means 28 designed to allow, respectively, lifting of the wall 26 outside of the slot 27, when the relative projecting portions of the front and rear lengths 6c and 6d on the panel 1 pass, so that they can be folded upwards (see arrow F3 in Figure 5), and a relative lowering of the wall 26 below the slot 27 (see arrow F2 in Figure 3).

[0036] The above-mentioned retaining means 13 comprise a plurality of idle contact rollers 29, evenly arranged along a central zone parallel with the second conveyor table 14.

[0037] These rollers 29 are connected to a horizontal beam 30 which is part of the upper supporting frame 18, height-adjustable to allow the rollers 29 to be positioned

correctly for the thickness S of the panel 1 fed along the second table 14 and so as to keep the projecting portions of the front and rear lengths 6c, 6d in their folded configuration as they approach the wrapping station 11.

[0038] As illustrated in Figure 3, the means 19 for adjusting the distance between the frame 18 and the second table 14 comprise a supporting unit consisting of a pair of arms 31a and 31b connected, at a respective end, to a load-bearing structure 32 of the covering station 10, and, at the other end, to the frame 18.

[0039] These supporting arms 31a, 31b are controlled by a kinematic drive unit in the form of a four-bar linkage, which consists of a pair of levers 33a and 33b, connected at one end to the respective ends of the pair of arms 31a and 31b at the load-bearing structure 32.

[0040] These levers 33a and 33b are joined together, at the other end, by a horizontal rod 34 to form the four-bar linkage.

[0041] Between the load-bearing structure 32 and one of the levers, 33b, there is a drive cylinder 35 designed to adjust the distance between the second table 14 and the first and second folding units 15 and 16 and the idle retaining rollers 29 according to the panel 1 thickness S and by rotation of the levers 33a, 33b in both directions (see arrow F5 in Figure 3).

[0042] The use of a sort of four-bar linkage is preferable, since it leads to differentiated positioning, that is to say, parallel with the second table 14 but moved away from and towards the starting end of the station 10, of the folding units 15 and 16 relative to the infeed, so that the lengths are always folded without the risk of interference between the material being folded and the fixed structures of the station 10.

[0043] The apparatus described operates in a simple way, automating all operations involved in the formation and completion of the panel 1 package.

[0044] After formation of the lengths 6a, 6b, 6c and 6d and panel 1 positioning on them, all of the folding steps are carried out automatically in the covering station 10, whose units are suitably adjusted according to the panel 1 thickness S: the first operation is lifting and relative folding of the front length 6c thanks to interaction between the lower wall 26 and the contact element 20; then the longitudinal lengths 6a and 6b are lifted by the side rollers 10b and, when the panel 1 completely enters the station 10, folding of the rear length 6d again with synchronised movements of the wall 26 and the lever 23. Close to the wrapping station 11 infeed, the folders 10c definitively fold the longitudinal lengths 6a and 6b.

[0045] Therefore, the apparatus structured in this way fulfils the preset aims thanks to a construction architecture which does not alter the conventional geometries of the stations.

[0046] The presence of the two front and rear folders allows operator presence at the station for placing the panel on parts of the lengths to be eliminated, thus increasing productivity over the same period.

[0047] In addition, automatic front and rear folding

avoids the presence of adhesive means in contact between the front and rear lengths and the surface of the panel.

[0048] The invention described has evident industrial applications and may be subject to modifications and variations without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. An apparatus for packaging panels (1), the apparatus (2) comprising at least:

- a station (3) for positioning and checking the incoming panels (1) and equipped with a unit (4) for the identification of at least the panel (1) dimensions;
- a station (5) for forming lengths (6a, 6b, 6c, 6d) of packaging material, located close to the positioning station (3) and designed to form covers at least for the longitudinal, front and rear edges (1a, 1b, 1c, 1d) of the incoming panel (1);
- a station (7) for placing the panel (1) on part of the lengths (6a, 6b, 6c, 6d), the latter being positioned on a first table (8), and using handling means (9);
- a station (10) for covering the longitudinal edges (1a, 1b) of the panel (1) with the projecting portions of the relative lengths (6a, 6b) by folding the portions (6a, 6b) over the edges (1a, 1b);
- a station (11) for wrapping the panel (1) - lengths (6a, 6b, 6c, 6d) assembly with film, located downstream of the covering station (10) relative to a panel (1) direction of feed (A), the apparatus being **characterised in that** the station (10) for covering the edges (1a, 1b, 1c, 1d) comprises means (12) for automatically folding the projecting portion of the lengths (6c, 6d) of packaging material over the front and rear edges (1c, 1d) of the panel (1).

2. The apparatus according to claim 1, **characterised in that** the station (10) for covering the edges (1a, 1b, 1c, 1d) comprises means (13) for retaining the folded front and rear lengths (6c, 6d) on the panel (1), operating on the lengths (6c, 6d) until close to the wrapping station (11).

3. The apparatus according to claim 1, in which the station (10) for covering the edges (1a, 1b, 1c, 1d) comprises a second horizontal table (14) for moving the panel (1) in the direction of feed (A) and between and coplanar with the station (7) for placing the panel on part of the lengths and the wrapping station

(11), the apparatus being **characterised in that** the automatic folding means (12) are positioned at the end of the second horizontal table (14) close to the station (7) for placing the panel on part of the lengths.

4. The apparatus according to claims 1 and 3, **characterised in that** the automatic folding means (12) comprise:

- a first unit (15) for folding the length (6c) projecting from the front of the panel (1);
- a second unit (16) for folding the length (6d) projecting from the rear of the panel (1);
- a part (17) for vertically lifting the lengths (6c, 6d) projecting from the front (1c) and rear (1d) of the panel (1) and positioned between the station (7) for placing the panel on part of the lengths and the covering station (10).

5. The apparatus according to claim 4, **characterised in that** the first and second folding units (15, 16) and the means (13) for retaining the folded lengths (6a, 6b, 6c, 6d) are supported by a bridge-shaped frame (18) over a second conveyor table (14) forming the covering station (10); the frame (18) having means (19) for adjusting the distance between the first folding unit (15) and second folding unit (16) and the second conveyor table (14) according to the panel (1) thickness (S).

6. The apparatus according to claims 4 and 5, **characterised in that** the first folding unit (15) comprises a rigid contact element (20) extending vertically and positioned at the end of the covering station (10); the contact element (20) being attached to a supporting body (21) connected to horizontal drive means (22) providing movement parallel with the second conveyor table (14) and allowing a first, operating forward position, in which the contact element (20) is outside the dimensions of the frame (18), so that the length (6c) can be folded over the front edge (1c) of the panel (1), and a non-operating back position, in which the contact element (20) is within the dimensions of the frame (18), preventing contact with the second folding unit (16); the supporting body (21) being attached to the frame (18) in such a way as to allow adjustment of the height of the contact element (20).

7. The apparatus according to claims 4 and 5, **characterised in that** the second folding unit (16) comprises an "L"-shaped lever (23) pivoting, at (24), at the end of the supporting frame (18); the lever (23) being connected to the end of a drive cylinder (25) in turn connected to the frame (18) and designed to allow the lever (23) to move, in both directions, from a non-operating raised position, in which an oper-

ating end (23a) of the lever (23) is outside the dimensions of the panel (1) in transit, and an operating lowered position, in which the operating end (23a) of the lever (23) folds the projecting portion of the length (6d) over the rear edge (1d) of the panel (1). 5

8. The apparatus according to claims 4 and 5, **characterised in that** the lifting part (17) comprises a vertical contact wall (26) positioned in a separating slot (27) between the station (7) for placing the panel on part of the lengths and the covering station (10), the wall (26) having drive means (28) designed to allow, respectively, wall (26) lifting out of the slot (27), when the projecting portions of the front and rear lengths (6c, 6d) on the panel (1) pass, allowing them to be folded upwards, and wall (26) lowering below the slot (27). 10 15

9. The apparatus according to claim 2, **characterised in that** the retaining means (13) comprise a plurality of idle contact rollers (29), evenly arranged along a central zone and parallel with a second conveyor table (14), forming part of the covering station (10); the rollers (29) being connected to a horizontal beam (30) which is part of the upper supporting frame (18) with adjustable height, to allow the rollers (29) to be positioned correctly for the thickness (S) of the panel (1) being fed on the second table (14), thus keeping the portions of the front and rear lengths (6c, 6d) in their folded configuration. 20 25 30

10. The apparatus according to claim 5, **characterised in that** the means (19) for adjusting the distance between the frame (18) and the second table (14) comprise a supporting unit consisting of a pair of arms (31a, 31b) connected, at a respective end, to a load-bearing structure (32) of the covering station (10), and, at the other end, to the frame (18); the supporting unit (31a, 31b) being controlled by a kinematic drive unit in the form of a four-bar linkage consisting of a pair of levers (33a, 33b), connected to the respective ends of the pair of arms (31a, 31b) at the load-bearing structure (32), and joined to one another, at the other end, by a horizontal rod (34); there being between the load-bearing structure (32) and one of the levers (33b) a drive cylinder (35) designed to adjust the distance between the second table (14) and the first and second folding units (15, 16) and the retaining means (13), according to the panel (1) thickness (S), by rotation of the levers (33a, 33b) in both directions. 35 40 45 50

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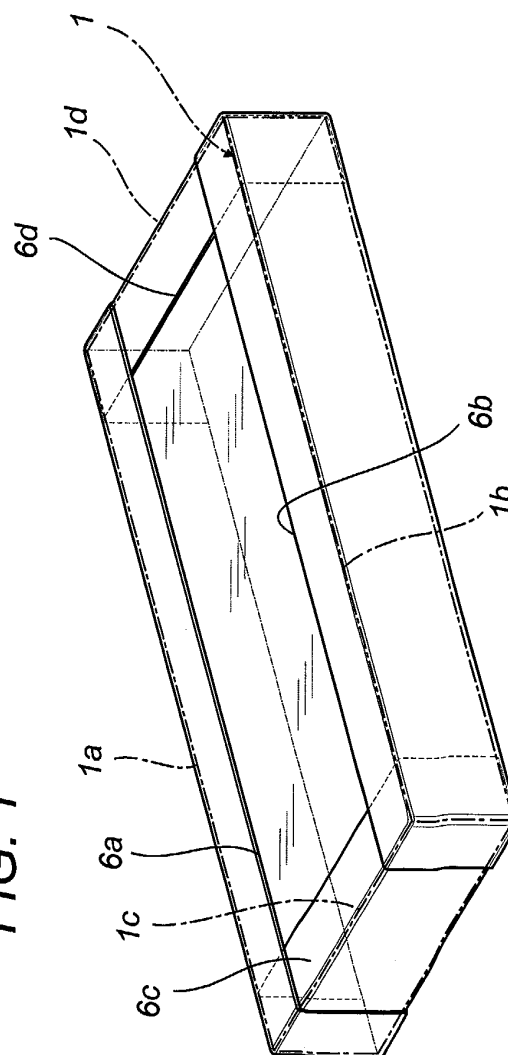
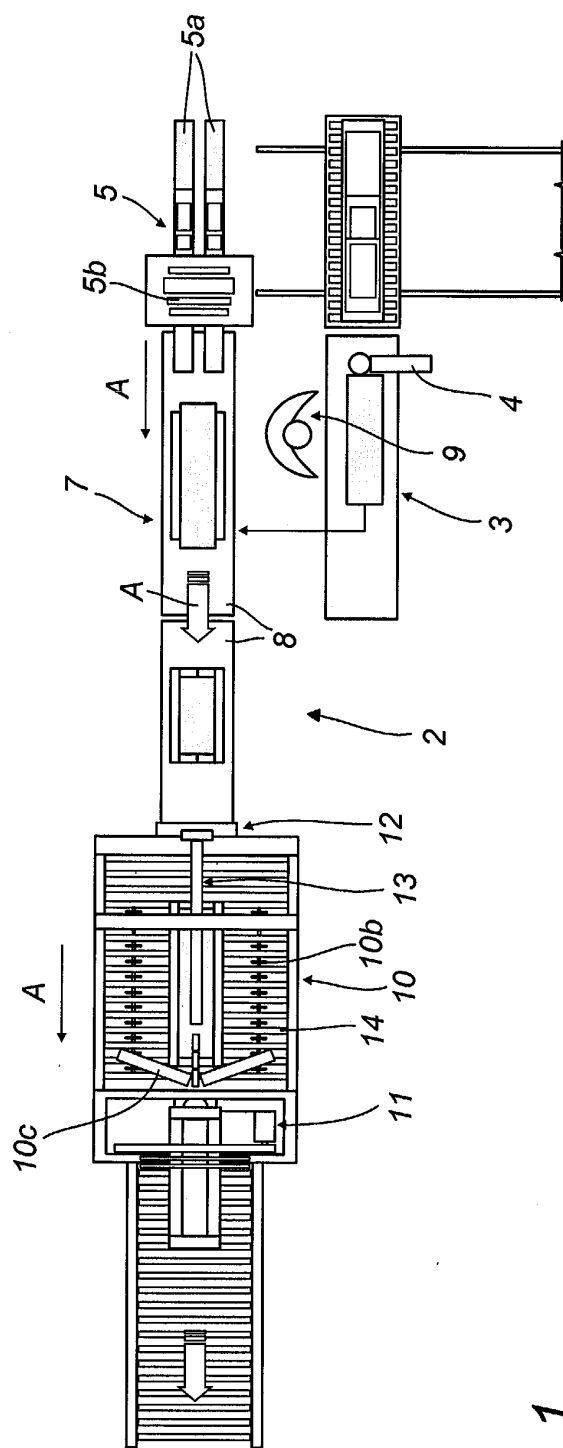


FIG. 3

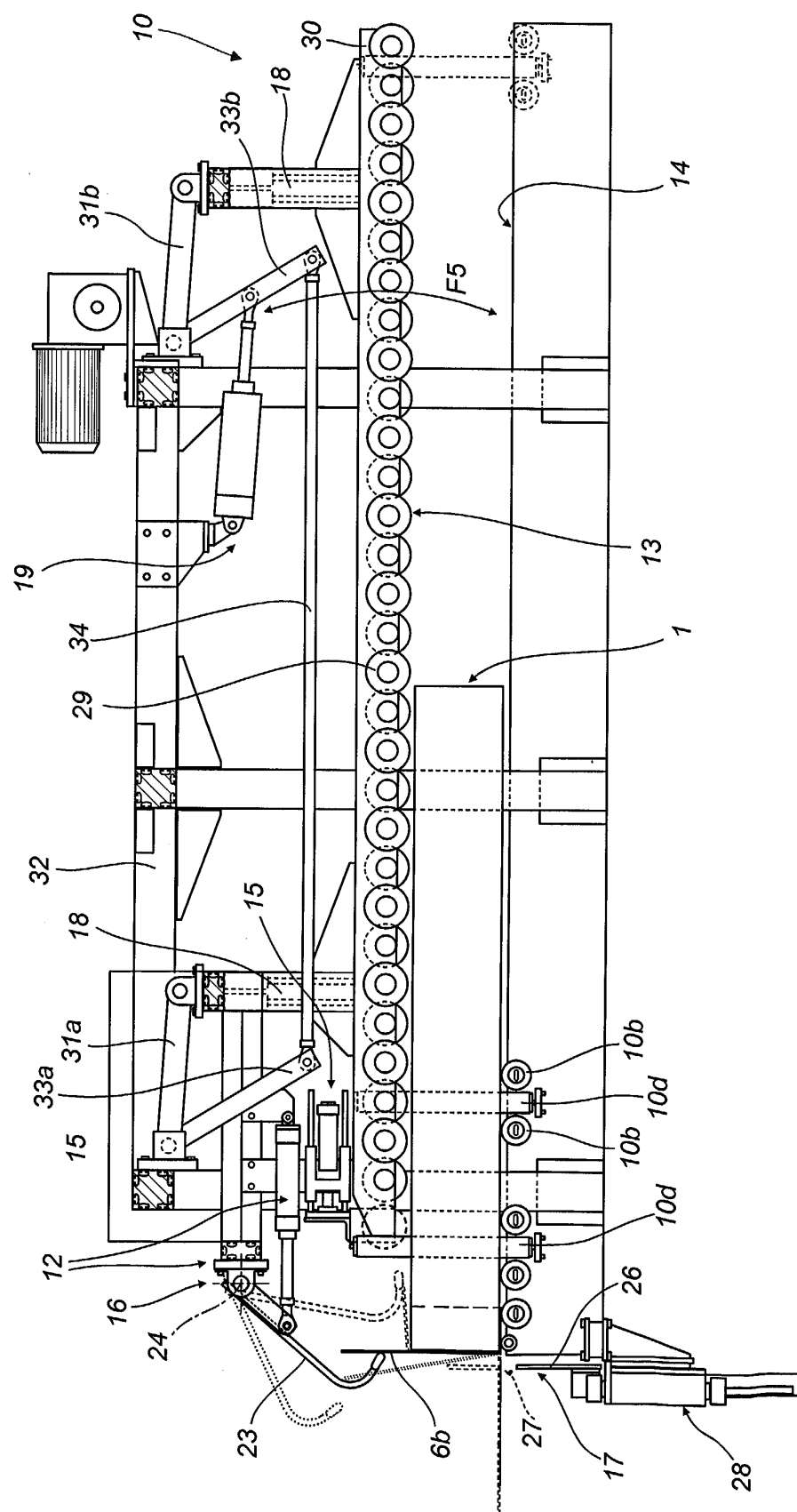


FIG. 4

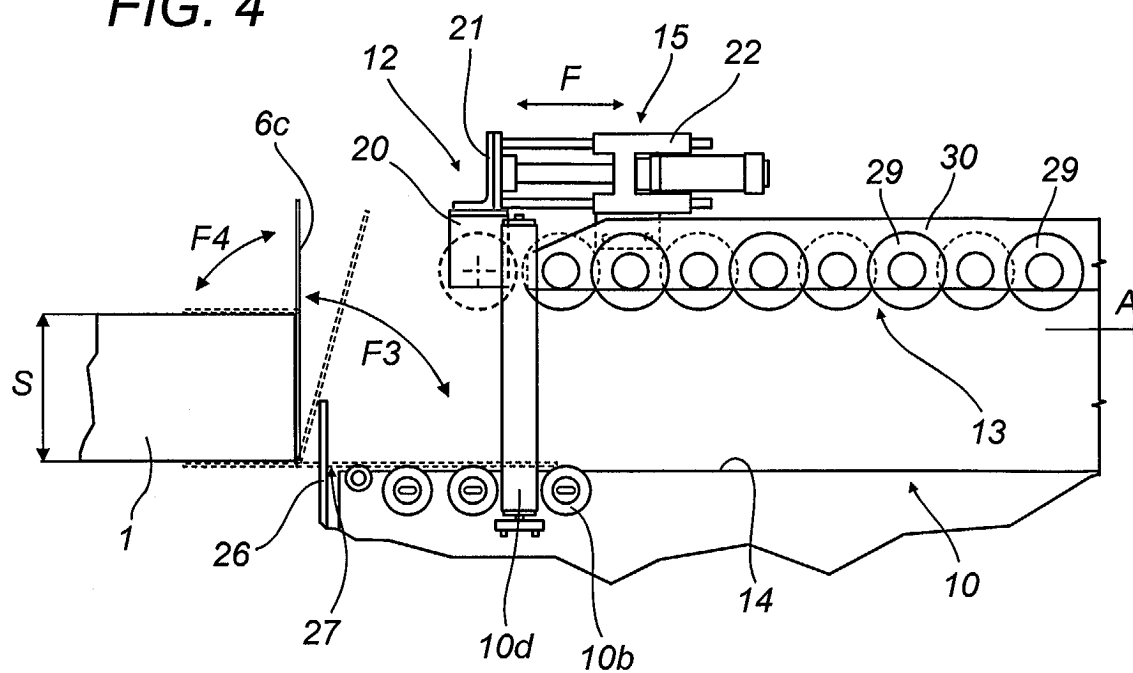
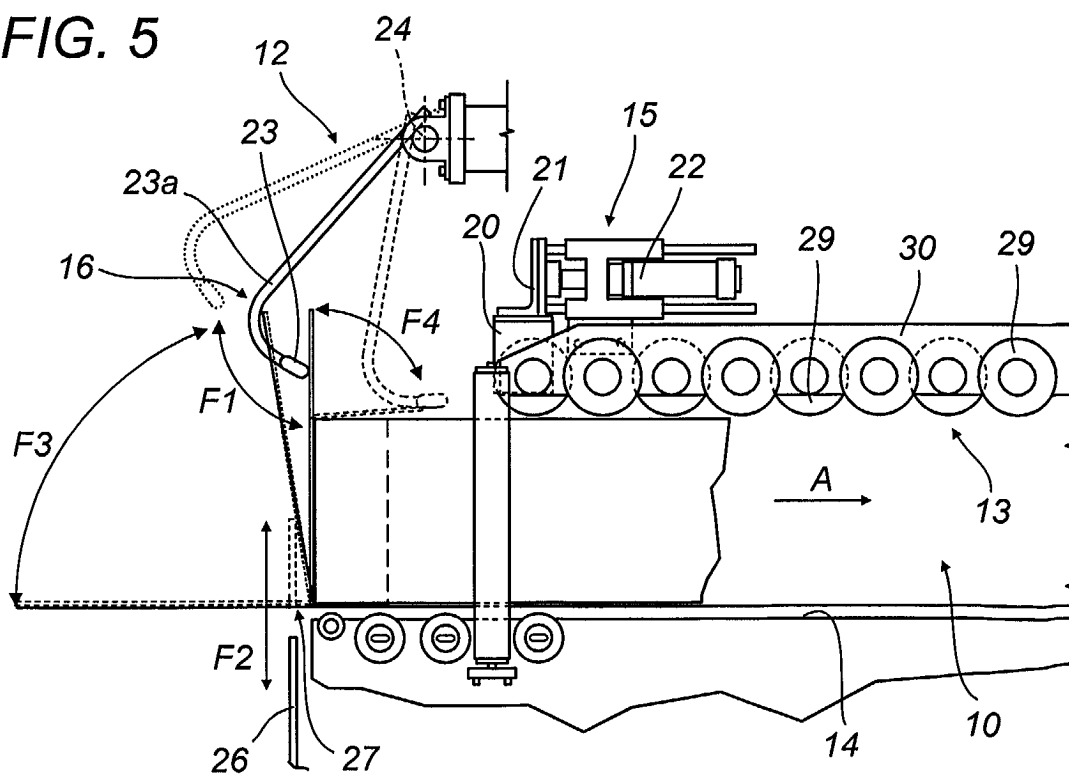


FIG. 5





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EUROPEAN SEARCH REPORT

Application Number
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 42 5359

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