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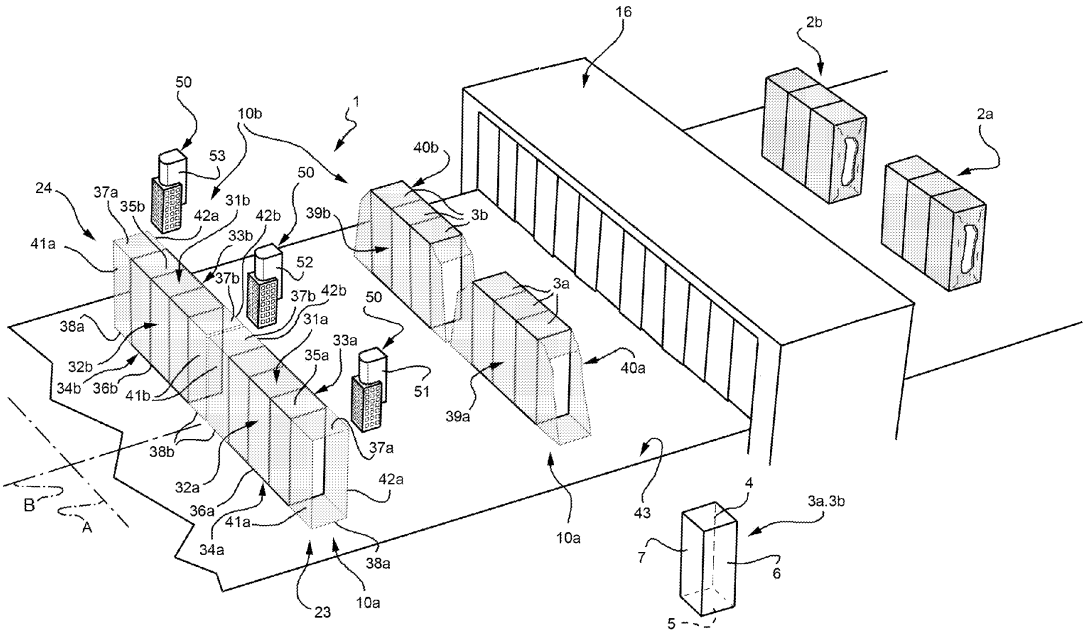
(54) Unit and method for manufacturing at least one multi-pack comprising a plurality of packages wrapped in a sheet of heat-shrinkable material

(57) There is described a unit (1) for manufacturing at least one multi-pack (2a; 2b) comprising a plurality of packages (3a; 3b) wrapped in a sheet (23; 24) of heat-shrinkable material; the unit (1) comprises a wrapping station (15) for wrapping a batch (10a; 10b) of packages (3a; 3b) in a sheet (23; 24) of heat-shrinkable material and an oven (16) adapted to receive and to heat batch (10a; 10b) wrapped in sheet (23; 24), so as to heat-shrink sheet (23, 24) and to form multi-pack (2a, 2b); the unit (1) further comprises pre-heating means (50; 51, 52, 53) arranged upstream from oven (16) with reference to an advancing direction of batch (10a, 10b) from wrapping station (15) towards oven (16); pre-heating means (50; 51, 52, 53) are adapted to pre-shrink sheet (23; 24).

FIG. 5



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Description

[0001] The present invention relates to a unit and to a method for manufacturing at least one multi-pack comprising a plurality of packages wrapped in a sheet of heat-shrinkable material.

[0002] As is known, many food products, such as fruit juice, pasteurized or UHT (ultra-high-temperature treated) milk, wine, tomato sauce, etc., are sold in packages made of sterilized packaging material.

[0003] A typical example of this type of package is the parallelepiped-shaped package for liquid or pourable food products known as Tetra Brik Aseptic (registered trademark), which is made by folding and sealing laminated strip packaging material.

[0004] The packaging material has a multilayer structure substantially comprising a base layer for stiffness and strength, which may comprise a layer of fibrous material, e.g. paper, or of mineral-filled polypropylene material; and a number of layers of heat-seal plastic material, e.g. polyethylene film, covering both sides of the base layer.

[0005] In the case of aseptic packages for long-storage products, such as UHT milk, the packaging material also comprises a layer of gas- and light-barrier material, e.g. aluminium foil or ethyl vinyl alcohol (EVOH), which is superimposed on a layer of heat-seal plastic material, and is in turn covered with another layer of heat-seal plastic material forming the inner face of the package eventually contacting the food product.

[0006] As is known, packages of this sort are produced on fully automatic packaging machines, on which a continuous tube is formed from the web-fed packaging material; the web of packaging material is sterilized on the packaging machine, e.g. by applying a chemical sterilizing agent, such as a hydrogen peroxide solution, which, once sterilization is completed, is removed from the surfaces of the packaging material, e.g. evaporated by heating; and the web of packaging material so sterilized is maintained in a closed, sterile environment, and is folded and sealed longitudinally to form a vertical tube.

[0007] The tube is filled continuously downwards with the sterilized or sterile-processed food product, and is sealed and then cut along equally spaced cross sections to form pillow packs, which are then fed to a folding unit to form the finished, e.g. substantially parallelepiped-shaped packages.

[0008] As is known, a certain number of folded packages, for example three, may be grouped and shrink-wrapped, so as to form a multi-pack.

[0009] For this purpose, a unit for manufacturing of multi-packs is arranged downstream from the folding station.

[0010] The unit substantially comprises:

- one or more, for example two, first linear conveyors for conveying respective rows of packages;
- a separating assembly fed with rows advancing along the first direction and adapted to separate one or more, for example two, batches of packages from the rest of respective rows;
- an aligning device which receives batches advancing along a first direction, and which is adapted to align packages of each batch along a second direction slanted with respect to first direction and to advance aligned packages of each batch along a third direction orthogonal to second direction; and
- an oven to heat-shrink the material which wraps batches, so as to complete the formation of relative multi-packs.

[0011] Furthermore, the unit comprises:

- a storage which houses one or more reels of a film of heat-shrinkable material;
- a second conveyor which receives the batches from the aligning devices and advances the batches along the third direction;
- a transversal cutter for cutting the film along the second direction, so as to separate the portion of the film intended to wrap the multi-packs from the remaining part of the film; and
- a wrapping station for wrapping the batches with the heat-shrinkable material wound off from the reels.

[0012] More precisely, the wrapping station is arranged upstream from the oven and substantially comprises:

- a plurality of bars which extend along the second direction and cyclically move along a path at a speed greater than the speed at which batches are advanced by the conveyor;
- a longitudinal cutter for cutting the film along the third direction and forming two sheets of heat-shrinkable material intended to wrap respective batches; and
- a dividing curved rod arranged downstream from the longitudinal cutter and upstream from the oven, and adapted to divide the two sheet of heat-shrinkable material from one another.

[0013] In actual use, the film is transversally cut along the second direction and fed to the conveyor, which moves the film and batches along the third direction and at the same speed.

[0014] The longitudinal cutter cuts the film parallel to the third direction so as to form two sheets of heat-shrinkable material which wrap respective batches and have respective longitudinal edges adjacent one another. Subsequently, the dividing rod separates such longitudinal edges, so dividing the two sheets of heat-shrinkable material from one another.

[0015] The path of the bars comprises a work portion along which bars move in the same direction of batches and wrap such batches, and a return portion along which bars move opposite to the batches.

[0016] More precisely, bars move along return portion below conveyor, engage a transversal edge of the portion of the film intended to wrap the multi-packs and overlap such portion onto the packages of the batches.

[0017] As the batches move over the conveyor and are wrapped with the respective sheet of heat-shrinkable material, a first portion of the respective sheet is interposed between conveyor and the bottom walls of the packages of the respective batch, while a second portion is arranged on the opposite side of corresponding first portion.

[0018] First and second portion of each sheet comprise:

- respective main areas which cooperate respective with bottom and top walls of packages of corresponding batches; and
- respective end areas which are opposite to one another and protrudes from relative main area substantially in a plane parallel to the top walls of the package.

[0019] Batches also comprise:

- first lateral walls orthogonal to third direction, interposed between top and bottom walls, and which are wrapped with third portions of respective sheets; and
- second lateral walls orthogonal to the second direction and to the first lateral walls, interposed between top and bottom walls, and which are left free of heat-shrinkable material by the wrapping station.

[0020] Oven receives and heats the batches wrapped with relative sheets, so causing the heat-shrinking of the heat-shrinkable material and completing the formation of the multi-packs. More precisely, the hot air circulating in the oven shrinks the end areas of first portion and second portions respectively upwards and downwards within the oven, so as to partially wrap also the second lateral walls of the batches.

[0021] Due to the fact that the end areas of each sheet protrude from the main area in a plane substantially parallel to the top wall of the packages, the action of hot air present in the oven tends to inflate the second portion of the sheets and to bend the end areas upwards, so contrasting the correct heat-shrinking of such end areas downwards and onto the lateral wall of the packages.

[0022] A need is felt within the industry to reduce as far as possible the upwards bending and the inflation of the sheets within the oven.

[0023] A need is also felt within the industry to avoid the formation of residual of material onto the film and/or the sticking of the film to the dividing rod, which are due to the interaction of dividing rod with the film of heat-shrinkable material may cause.

[0024] Finally, a need is felt within the industry to simplify the structure and to reduce the overall cost of the unit.

[0025] It is an object of the present invention to provide a unit for manufacturing at least one multi-pack comprising a plurality of packages wrapped in a sheet of heat-shrinkable material, designed to meet at least one of the above-identified requirement.

[0026] According to the present invention, there is provided a unit for manufacturing at least one multi-pack comprising a plurality of packages wrapped in a sheet of heat-shrinkable material, as claimed in Claim 1.

[0027] The present invention also relates to a method for manufacturing at least one multi-pack comprising a plurality of packages wrapped in a sheet of heat-shrinkable material, as claimed in Claim 8.

[0028] The present invention further relates to a unit for manufacturing at least a first and a second multi-pack each comprising a plurality of packages wrapped in a sheet of heat-shrinkable material, as claimed in Claim 12.

[0029] The present invention finally relates to a method for manufacturing at least a first and a second multi-pack each comprising a plurality of packages wrapped in a sheet of heat-shrinkable material, as claimed in Claim 15.

[0030] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 to 4 schematically show a unit for manufacturing at least one multi-pack comprising a plurality of packages wrapped in a sheet of heat-shrinkable material in accordance with the present invention;

Figure 5 shows an enlarged perspective view of some components of the unit of Figures 1 to 4, with parts removed for clarity; and

Figure 6 shows an enlarged lateral view of additional components of the unit of Figures 1 to 4, with parts removed for clarity.

[0031] Number 1 in Figure 1 indicates as a whole a unit for manufacturing a plurality, two in the embodiment shown, of multi-packs 2a, 2b. More precisely, each multi-pack 2a, 2b comprises a respective plurality of packages 3a, 3b, three in the embodiment shown, of a product which is pourable within a tube (not shown) of packaging material.

[0032] Packages 3a, 3b are, in the embodiment shown, parallelepiped-shaped and sealed.

[0033] Each package 3a, 3b substantially comprises (Figure 5)):

- a top wall 4 which lies on an horizontal plane;
- a bottom wall 5 which is opposite and parallel to a corresponding top wall 4;
- a pair of lateral walls 6 which are vertically interposed between relative top walls 4 and corresponding walls 5, and which are parallel and opposite to one another; and
- a pair of lateral walls 7 which are vertically interposed between relative top walls 4 and corresponding walls 5, are interposed between walls 6, and which are

parallel and opposite to one another.

[0034] Packages 3a, 3b preferably contain a pourable food product, such as pasteurized or UHT milk, fruit juice, wine, etc.

[0035] Packages 3a, 3b may also contain a food product, which is pourable within a tube of packaging material when producing packages 3a, 3b, and sets after packages 3a, 3b are sealed. One example of such a food product is a portion of cheese, which is melted when producing packages 3a, 3b and sets after packages 3a, 3b are sealed.

[0036] The tube is formed in known manner upstream from unit 1 by longitudinally folding and sealing a known film (not shown) of heat-seal sheet material, which comprises a layer of paper material covered on both sides with layers of heat-seal plastic material, e.g. polyethylene. In the case of an aseptic package 3a, 3b for long-storage products, such as UHT milk, the packaging material comprises a layer of oxygen-barrier material, e.g. aluminium foil, which is superimposed on one or more layers of heat-seal plastic material eventually forming the inner face of package 3a, 3b, 3c, 3d contacting the food product.

[0037] The tube of packaging material is then filled with the food product for packaging, and is sealed and cut along equally spaced cross sections to form a number of pillow packs (not shown), which are then transferred to a folding unit where they are folded mechanically to form respective packages 3a, 3b.

[0038] In case that they are intended to be part of a multi-pack 2a, 2b, packages 3a, 3b are transferred along two rows to unit 1. In particular, the rows advance packages 3a, 3b parallel to one another.

[0039] Unit 1 substantially comprises:

- a pair of linear conveyor (not shown) for advancing respective rows of packages 3a, 3b;
- a separating assembly (not shown) fed with rows and adapted to separate a pair of batches 10a, 10b from the rest of rows;
- an aligning assembly fed with batches 10a, 10b from unit 1, and adapted to align packages 3a, 3b of each batch 10a, 10b along a direction A and to feed them along a direction B orthogonal to direction A;

- a conveyor 18 onto which packages 3a, 3b of aligned batches 10a, 10b travel;
- a wrapping assembly 15 adapted to wrap batches 10a, 10b with a heat-shrinkable material; and
- an oven 16 to heat-shrink the material which wraps batches 10a, 10b, so as to complete the formation of relative multi-packs 2a, 2b.

[0040] In particular, directions A, B are respectively orthogonal to walls 6, 7 of packages 3a, 3b which are advancing onto conveyor.

[0041] Each batch 10a, 10b comprises a pair of lateral packages 3a, 3b and a central package 3a, 3b, which is interposed between lateral packages 3a, 3b.

[0042] Furthermore, unit 1 comprises:

- a storage 20 which houses a reel 21 of a film 22 of heat-shrinkable material;
- a conveyor 25 which receives batches 10a, 10b from conveyor 18 and advances the batches 10a, 10b along direction B; and
- a conveyor 43 fed with wrapped batches 10a, 10b by conveyor 25 and which feeds oven 16.

[0043] Finally, unit 1 comprises:

- a plurality of rollers 27a, 27b, cooperating with film 22 so as to thrust film 22 over conveyor 25 and below the packages 3a, 3b of batches 10a, 10b which are moved by conveyor 25;
- a movable roller 27c for varying the tension of the film 22 which is wound off from reel 21;
- a longitudinal cutter 26 to divide film 22 along a direction parallel to path P, so as to form a first and second webs 28, which have longitudinal edges adjacent to one another; and
- a transversal cutter 19 adapted to cut webs 28 along a direction orthogonal to path P and lying in the same plane of film 22, so as to separate sheets 23, 24 of film 22 intended to wrap batches 10a, 10b form the remaining portion of film 22.

[0044] Rollers 27a, 27b drive film 22 along a path P which extends from storage 20 to conveyor 25. In particular path P comprise an ascending end portion P_1 on the side of conveyor 25. Two pair of rollers 27b are arranged at end portion P_1.

[0045] Longitudinal cutter 26 is arranged upstream from rollers 27c with reference to an advancing direction of film 22 along path P.

[0046] Longitudinal cutter 26 is also arranged upstream from transversal cutter 31 with reference to the advancing sense of film 22 along path P.

[0047] Transversal cutter 19 is interposed between the pairs of rollers 27b and cuts sheets 23, 24 along respective edges 29, which extend orthogonally to direction P and in the same plane of film 22.

[0048] Wrapping assembly 15 comprises a plurality of bars 30 (only one of which is shown in Figures 2 to 4) extending along direction A, and movable along a path S (only shown in Figures 2 to 4) having a work portion S_1 parallel to direction B and a return portion S_2.

[0049] As they move along return portion S_2, bars 30 move below conveyor 25 and in the opposite sense of conveyor 25. On the contrary, as they move along work portion S_1, bars 30 move above conveyor 25 and in the same sense of such conveyor 25. The speed of bars 30 is greater than the speed at which batches 10a, 10b are advanced by conveyor 25.

[0050] Each bar 30 engages transversal edges 29 of

webs 28 at an end of return portion S_2, and folds sheets 23, 24 over batches 10a, 10b.

[0051] More precisely, each bar 30 folds:

- portions 31a, 31b of respective sheets 23, 24 over walls 4 of packages 3a, 3b of corresponding batches 10a, 10b; and
- portions 32a, 32b; 33a, 33b of respective sheets 23, 24 over opposite walls 7 of packages 3a, 3b of corresponding batches 10a, 10b.

[0052] Furthermore, once wrapping assembly 15 has wrapped
batches 10a, 10b with respective sheets 23, 24, walls 6 of lateral packages remain unwrapped; and portions 34a, 34b of respective sheets 23, 24 are interposed between conveyor 25 and walls 5 of packages 3a, 3b of corresponding batches 10.

[0053] More precisely, each portion 31a, 31b; 34a, 34b comprises a respective main area 35a, 35b; 36a, 36b which cooperates with respective walls 4, 5 of packages 3a, 3b of corresponding batches 10a, 10b. Each portions 31a, 31b; 34a, 34b further comprises a pair of end areas 37a, 37b; 38a, 38b which protrudes on opposite sides of respective main areas 35a, 35b; 36a, 36b.

[0054] In particular, end areas 37a, 37b; 38a, 38b lie on the same horizontal plane of corresponding main areas 35a, 35b; 36a, 36b. End areas 37b of sheets 23, 24 are adjacent to one another and are interposed between end areas 37a.

[0055] Portions 32a, 32b; 33a, 33b of respective sheets 23, 24 comprise:

- respective main areas 39a, 39b; 40a, 40b which cooperate with respective walls 7 of corresponding batches 10a, 10b and which are interposed between respective main areas 35a, 35b; 36a, 36b; and
- respective end areas 41a, 41b; 42a, 42b which protrude on relative opposite sides of corresponding main areas 39a, 39b; 40a, 40b and are vertically interposed between end areas 37a, 37b; 38a, 38b.

[0056] End areas 41b, 42b are adjacent to one another and interposed between corresponding end areas 41a, 42a.

[0057] Unit 1 advantageously comprises pre-heating means 50 arranged upstream from oven 16 with reference to an advancing direction of batches 10a, 10b from wrapping assembly 15 towards oven 16; pre-heating means 50 are adapted to pre-shrink sheets 23, 24.

[0058] More precisely, pre-heating means 50 are blowing means for blowing towards end areas 37a, 37b of sheets 23, 24 a current of a hot gas, air in the example shown.

[0059] In particular the term "hot gas" means in the present description that the gas is blown at a temperature ranging between 400°C and 500°C. Preferably, temperature at which air is blown towards end areas 37a, 37b ranges between 450°C and 500°C. A still more preferred value of the temperature at which air is blown towards end areas 37a, 37b is 450°C.

[0060] Blowing means comprise a plurality, three in the embodiment shown, of nozzles 51, 52, 53 (shown farther away from oven 16 than they are for sake of clarity), which are arranged over conveyor 43 and batches 10a, 10b travelling onto conveyor 25, and direct air downwards and towards end areas 37a, 37b of sheets 23, 24.

[0061] Nozzles 51, 52, 53 are aligned along direction A and nozzle 52 is interposed between nozzles 51, 53 along direction A.

[0062] In greater detail, nozzle 51 directs a first jet of air towards end area 37a of sheet 23, nozzle 52 directs a second jet of air towards end areas 37b of sheets 23, 24, and nozzle 53 directs a third jet of air towards end area 37a of sheet 24.

[0063] In this way, nozzles 51, 52, 53 form separating means for separating sheets 23, 24 from one another along respective longitudinal edges and before that batches 10a, 10b reach oven 16.

[0064] It is important to stress that it is not necessary that the temperature of the gas ranges between 400°C and 500°C in order to separate sheets 23, 24. In other words, nozzles 51, 52, 53 separate sheets 23, 24 regardless of the temperature at which they blow the gas.

[0065] Furthermore, as shown in Figure 1, the jets blown by nozzles 51, 52, 53 bend end areas 37a, 37b downwards and towards walls 6, so preventing end areas 37b of sheets 23, 24 from sealing to one another within oven 16.

[0066] The operation of unit 1 will be hereinafter described with reference to only one pair of batches 10a, 10b, which are formed by respective plurality, three in the embodiment shown, of packages 3a, 3b and to only one bar 30 of wrapping assembly 15.

[0067] Packages 3a, 3b are formed upstream from unit 1, and are subsequently transferred in two rows to such unit 1.

[0068] The separating assembly separates batches 10a, 10b from the rest of respective rows and the aligning assembly aligns packages 3a, 3b along direction A.

[0069] Aligned packages 3a, 3b advance at first onto conveyor 18 and are then transferred to conveyor 25.

[0070] At the same time, film 22 is wound off from reel 21 and is moved along path P by rollers 27a, 27b, 27c.

[0071] Longitudinal cutter 26 cuts film 22 parallel to path P, so as to form webs 28 of film 22. More precisely, once film 22 has been cut by longitudinal cutter 26, webs 28 have respective longitudinal edges parallel to path P adjacent one another. In particular, sheets 23, 24 are intended to wrap respective batches 10a, 10b.

[0072] After that film 22 has been cut parallel to path P, webs 28 are cut orthogonally to path P and along edges 29 by transversal cutter 19. More precisely, cutter 19 separates sheets 23, 24 from the remaining portion of film 22.

[0073] Sheets 23, 24 are transferred to conveyor 25. More precisely, sheets 23, 24 are interposed between

conveyor 25 and bottom walls 5 of packages 3a, 3b of batches 10a, 10b (Figure 1).

[0074] Bar 30 moves along path S at a speed which is greater than the speed at which packages 3a, 3b and sheets 23, 24 travel onto conveyor 25.

[0075] In greater detail, bar 30 grips edges 29 of sheets 23, 24 at the end of portion S_2 of path S and folds sheets 23, 24 over batches 10a, 10b as it move along portion S_1 of path S (Figure 2).

[0076] Bar 30 folds portions 32a, 32b and 33a, 33b over opposite walls 7 of packages 3a, 3b of corresponding batches 10a, 10b; and folds portions 31a, 31b of respective sheets 23, 24 over walls 4 of packages 3a, 3b of corresponding batches 10a, 10b (Figure 3).

[0077] Furthermore, once bar 30 has completed portion S_1 of path S, portions 34a, 34b of respective sheets 23, 24 are interposed between conveyor 25 and walls 5 of packages 3a, 3b of corresponding batches 10a, 10b; and walls 6 of lateral packages 3a, 3b of corresponding batches 10a, 10b do not cooperate with the heat-shrinkable material of sheets 23, 24.

[0078] In particular, main areas 35a, 35b; 36a, 36b of respective portions 31a, 31b; 34a, 34b are led to contact respective walls 4, 5 of packages 3a, 3b by bar 30. End areas 37a, 37b; 38a, 38b of respective portions 31a, 31b; 34a, 34b are arranged by bar 30 in such a position that they protrude on opposite sides of respective main areas 35a, 35b; 36a, 36b. More precisely, bar 30 arranges end areas 37a, 37b; 38a, 38b substantially on the same plane of main area 35a, 35b; 36a, 36b. End area 37b of sheet 23 is arranged by bar 30 adjacent to end area 37b of sheet 24. End areas 37b are interposed between end areas 37a.

[0079] Main areas 39a, 39b; 40a, 40b of portions 32a, 32b; 33a, 33b are led to contact respective walls 7 of packages 3a, 3b by bar 30. End areas 41a, 41b; 42a, 42b of portions 32a, 32b; 33a, 33b are arranged by bar 30 in such a position that they protrude on relative opposite sides of corresponding main portions 39a, 39b; 40a, 40b and are vertically interposed between end areas 37a, 37b; 38a, 38b. In particular, end areas 41b, 42b are adjacent to one another and interposed between respectively end areas 41a, 42a.

[0080] Subsequently, conveyor 25 feeds wrapped batches 10a, 10b to conveyor 43.

[0081] Nozzle 51 directs the first jet of air towards end area 37a of sheet 23, nozzle 52 directs the second jet of air towards end areas 37b of sheets 23, 24, and nozzle 53 directs the third jet of air towards end area 37b of sheet 24. More precisely, the temperature of air jets ranges from 400 and 500 °C.

[0082] In this way, end areas 37a, 37b of portions 31a, 31b of sheets 23, 24 pre-shrink, and bend downwards and towards wall 6 of lateral packages 2a, 2b.

[0083] More precisely, the air ejected by nozzles 51, 52, 53 pre-shrinks sheets 23, 24 around the corners between walls 4, 6 of lateral packages 3a, 3b of batches 10a, 10b.

[0084] Accordingly, nozzles 52 separate end area 37b of sheet 23 from end area 37b of sheet 24 before that batches 10a, 10b reach oven 16.

[0085] Subsequently, batches 10a, 10b enter oven 16. The hot air present within oven 16 cause the complete heat-shrinking of sheets 23, 24 onto batches 10a, 10b, so completing the formation of multi-packs 2a, 2b.

[0086] The advantages of unit 1 and of the method according to the present invention will be clear from the foregoing description.

[0087] In particular, the air ejected by nozzles 51, 52, 53 pre-shrink bends end areas 37a, 37b of portions 31a, 31b of sheets 23, 24 before that batches 10a, 10b reach oven 16. As a result of such pre-shrinking, end areas 37a, 37b bend downwards and towards walls 6 of lateral packages 2a, 2b.

[0088] In this way, end areas 37a, 37b are arranged in the correct shrinking position with respect to wall 6 before that batches 10a, 10b reach oven 16.

[0089] Due to the fact that end areas 37a, 37b bend downwards and towards walls 6 before batches 10a, 10b reach oven 16, the hot air circulating in the oven 16 is substantially prevented from removing such end areas 37a, 37b from such correct shrinking position. In particular, the Applicant has found that the corners between walls 4 and 6 of lateral packages 3a, 3b of each batches 10a, 10b constrain end areas 37a, 37b in the correct pre-shrinking position, so avoiding the inflating of such areas 37a, 37b.

[0090] Furthermore, the air ejected by nozzles 51, 52, 53 also separates sheet 23 from sheet 24 and separates, therefore, batch 10a from batch 10b.

[0091] Due to the fact that end areas 37b have been spaced apart by nozzle 52, it is avoided the sealing between the heat-shrinkable material of sheets 23 and 24 within oven 16.

[0092] As a consequence, differently from the known solutions cited in the introductory part of the present description, it is no longer necessary to provide a dividing roll arranged between longitudinal cutter 26 and oven 16.

[0093] Accordingly, it is possible to avoid the friction between the dividing roll and the film 22 as well as the sticking of film 22 to dividing roll and the formation of residual of material onto the film 22 and/or the sticking of the film 22 to the dividing roll.

[0094] Finally, the removal of dividing roll results in a linear trajectory of the film 22. Such linear trajectory is particularly easy to control. Furthermore, the removal of dividing roll results in a more compact and simplified structure of unit 1, which is, therefore, also more economic.

[0095] Clearly, changes may be made to unit 1 and to the method without, however, departing from the protective scope defined in the accompanying Claims.

[0096] In particular, unit 1 could manufacture only one multi-pack 2a, 2b.

Claims

1. A unit (1) for manufacturing at least one multi-pack (2a; 2b), comprising a plurality of packages (3a; 3b) wrapped in a sheet (23; 24) of heat-shrinkable material;
said unit (1) comprising:

- a wrapping station (15) for wrapping a batch (10a; 10b) of said first packages (3a; 3b) in a sheet (23; 24) of heat-shrinkable material; and
- an oven (16) adapted to receive and to heat said batch (10a; 10b) wrapped in said sheet (23; 24), so as to heat-shrink said sheet (23, 24) and to form said multi-pack (2a, 2b);

characterized by comprising pre-heating means (50; 51, 52, 53) arranged upstream from said oven (16) with reference to an advancing direction of said batch (10a, 10b) from said wrapping station (15) towards said oven (16); said pre-heating means (50; 51, 52, 53) being adapted to pre-shrink said sheet (23; 24).

2. The unit of claim 1, **characterized in that** said pre-heating means (50; 51, 52, 53) comprise blowing means (50; 51, 52, 53) for blowing towards said sheet (23; 24) a current of a hot gas.

3. The unit of claim 2, **characterized by** comprising a conveyor (25) for advancing said batch (10a; 10b) from said wrapping station (15) towards said oven (16);
said wrapping station (15) arranging, in use, a first portion (34a; 34b) of said sheet (23; 24) between said conveyor (25) and bottom faces (5) of said packages (3a; 3b), and overlapping a second portion (31a; 31b), opposite to said first portion (34a; 34b), of said sheet (23; 24) onto top faces (4) of said packages (3a; 3b); said wrapping station (15) leading, in use, a main area (35a, 35b) of said second portion (31a; 31b) to contact said top faces (4) of said packages (3a; 3b); a first end area (37a) and second end area (37b) protruding from opposite sides of said main area (35a; 35b);
said blowing means (50; 51, 52, 53) being arranged above said conveyor (25), so as to direct said jet downwards against said second portion (31a; 31b) of said first sheet (23, 24).

4. The unit of claim 3, **characterized in that** said blowing means (50; 51, 52, 53) comprise a first nozzle (51; 52) and a second nozzle (52; 53) which direct, in use, respective jets of said gas respectively against said first and second end areas (37a, 37b) of said second portion (31a; 31b) of said sheet (23; 24).

5. The unit of claim 1, **characterized in that** said wrapping station (15) arranges, in use, a first portion (34b; 34a) of a further sheet (24; 23) between said conveyor (25) and bottom faces (5) of further packages (3b; 3a) of a further batch (10b; 10a) intended to form a further multi-pack (2b; 2a), and overlaps a second portion (31b; 31a), opposite to said first portion (34b; 34a), of said further sheet (24; 23) onto said second portion (31b; 31a) of said further packages (3b; 3a); said wrapping station (15) leading, in use, a main area (35a; 35b) of said second portion (31b; 31a) of said second sheet (24; 23) to contact said top faces (4) of said further packages (3b; 3a); a first end area (37a) and second end area (37b) protruding from opposite sides of said main area (35b; 35a); said second end areas (37b) being adjacent to one another and interposed between said first end areas (37a).

6. The unit of claim 5, when appended to claim 4, **characterized in that** said blowing means (50; 51, 52, 53) comprise a third nozzle (53); said second nozzle (52) being interposed between said first and said third nozzles (51; 53); said second nozzle (52) being further adapted to direct a further jet of said gas against said second end areas (37b) of said second sheet (24; 23) wrapped onto said further packages (3b; 3a);
said third nozzle (53) being adapted to direct a respective jet of air against said first end area (37a) of said further sheet (24; 23) wrapped onto said further batch (10b; 10a).

7. The unit of claim 5 or 6, **characterized by** comprising:

- advancing means (21; 27a, 27b) for advancing a film (22) of said heat-shrinkable material along a path (P);
- a first cutter (26) for longitudinal cutting said film (22) parallel said direction (P), so as to form a first and a second web (28) which have respective longitudinal edges adjacent to another; and
- a second cutter (19) for transversal cutting said film (22) transversal to said direction (A), so as to separate said first and second web (28) from the remaining portion of said film (22) and to form said sheet (23) intended to wrap said batch (10a) and said further sheet (24) intended to wrap said further multi-pack (2b).

8. A method for manufacturing at least one multi-pack (2a; 2b) of a plurality of packages (3a; 3b) wrapped in a sheet (23; 24) of heat-shrinkable material, comprising the steps of:

- wrapping a batch (10a; 10b) of said packages

(3a; 3b) in said sheet (23; 24) of heat-shrinkable material; and
- heating said batch (10a; 10b) wrapped in said sheet (23; 24) within an oven (16), so as to form said multi-pack (2a; 2b);
characterized by comprising the step of pre-heating said batch (10a; 10b) wrapped in said sheet (23; 24) upstream from said oven (16) with reference to an advancing direction of said batch (10a, 10b) from said wrapping station (15) towards said oven (16), so as to pre-shrink first sheet (23; 24).

9. The method according to claim 8, **characterized in that** said step of pre-heating comprises the step of blowing towards said first sheet (23; 24) a current of a hot gas.

10. The method according to claim 9, **characterized by** comprising the steps of:

- advancing a film (22) of heat-shrinkable material along a path (P);
- longitudinally cutting said film (22) parallel to said path (P) so as to form a first and a second web (28); said first and second web (28) having respective longitudinal edges parallel to said path (P) and adjacent one another; and
- transversally cutting said first and second webs (28) so as to form said first sheet and a further sheet (23; 24);
said step of blowing comprising the step of separating said sheet and further sheet (23; 24) from one another before said step of heating;

11. The method according to claim 10, **characterized in that** said step of wrapping comprising the steps of:

- arranging a first portion (34a; 34b) of said sheet (23; 24) between a conveyor (25) and a bottom face (5) of said packages (3a; 3b), and a first portion (34b; 34a) of said further sheet (24; 23) between said conveyor (25) and a bottom face (5) of further packages (3b; 3a) of a further batch (10b; 10a); and
- overlapping second portions (31a; 31b), opposite to respective first portions (34a; 34b), of said sheet and further sheet (23; 24), onto respective top faces (4) of said packages and further packages (3a; 3b);
said step of overlapping comprising the steps of:

- leading main areas (35a; 35b) of said second portions (31a; 31b) to contact said top faces (4) of respective said packages and further packages (3a; 3b) within said wrapping station (15); and
- arranging a first and a second end area (37a; 37b) of each second portion (31a; 31b) externally and on opposite sides of relative main area (35a; 35b); said second end areas (37b) being adjacent to one another and interposed between said first areas (37a);
said step of blowing comprising the step of blowing said current towards said second end areas (37b).

12. A unit (1) for manufacturing at least one first and one second multi-pack (2a; 2b) each comprising respectively a plurality of first packages (3a) and second packages (3b) wrapped respectively in a first and a second sheet (23; 24) of heat-shrinkable material;
said unit (1) comprising:

- a first cutter (26) for longitudinally cutting said film (22) of said heat-shrinkable material parallel to said path (P), so as to form a first and a second web (28);
- a second cutter (19) for transversally cutting said film (22) transversally to said path (P), so as to form said first and second sheet (23; 24);
- a wrapping station (15) for wrapping a first batch (10a) of first packages (3) in said first sheet (23) and a second batch (10b) of second packages in said second sheet (24);
- an oven (16) adapted to receive and to heat said first and second batch (10a, 10b) wrapped respectively in said first and second sheets (23; 24), so as to heat-shrink said first and second sheet (23; 24) and to form respectively said first and second multi-pack (2a; 2b); and
- separating means (50; 51, 52, 53) for separating said first and second sheet (23; 24) upstream from said oven (16) with reference to an advancing direction of said first and second batch (10a; 10b) from said wrapping station (15) towards said oven (16);

characterized in that said separating means (50; 51, 52, 53) comprise blowing means (50; 51, 52, 53) for blowing a current of a gas towards said first and second sheets (23, 24).

13. The unit of claim 12, **characterized in that** said gas has a temperature ranging between 400°C and 500°C.

14. The unit of claim 12 or 13, **characterized by** comprising a conveyor (25) for advancing said first and second batches (10a; 10b) from said wrapping station (15) towards said oven (16); said wrapping station (15) arranging, in use, a first portion (34a) of said first sheet (23) between said conveyor (25) and bottom faces (5) of said first packages (3a), and arranging, in use, a first portion (34b) of said second sheet

(24) between said conveyor (25) and bottom faces (5) of said second packages (3b); said wrapping station (15) arranging, in use, second portions (31a) of said first and second sheet (23; 24) on the opposite side of respective first portions (34a; 34b); said wrapping station (15) further leading, in use, a main area (35a; 35b) of said second portions (31a; 31b) to contact relative top faces (4) of respective first and second packages (3a, 3b), and arranging first and second end areas (37a; 37b) of each said second portions (31a; 31b) externally to relative said first portions (34a; 34b); said second end area (37b) of said second portion (31a) of said first sheet (23) being adjacent to said second end area (37b) of said second portion (31b) of said second sheet (24); said second end areas (37b) being interposed between said first end areas (37a);
said blowing means (50; 51, 52, 53) comprising a first nozzle (51) for directing, in use, a first jet of said gas downwards and against said first end area (37a) of said second portion (31a) of said first sheet (23);

- a second nozzle (52) for directing, in use, a second jet of said gas downwards and against said second end areas (37b) of said second portion (31a; 31b) of said first and second sheet (23, 24); and
- a third nozzle (53) for directing, in use, a third jet of said gas downwards and against said first end area (37a) of said second top portion (31b) of said second sheet (24).

15. A method for manufacturing at least one first and one second multi-pack (2a; 2b) each comprising respectively a plurality of first packages (3a) and a plurality of second packages (3b) wrapped respectively in a first and a second sheet (23 24) of heat-shrinkable material, comprising the steps of:

- advancing a film (22) of said heat-shrinkable material along a first path (P);
- longitudinally cutting said film (22) of said heat-shrinkable material parallel to said path (P);
- transversally cutting said film (22), so as to form said first sheet (23) intended to wrap a first batch (10a) and said second sheet (24) intended to wrap a second batch (10b);
- wrapping said first and second batch (10a; 10b) with said first and second sheet (23; 24);
- heating in a oven (16) said first and second batch (10a; 10b) wrapped respectively in said first and second sheet (23; 24), so as to heat-shrink said first and second sheet (23; 24) and to form respectively said first and second multi-pack (2a; 2b); and
- separating said first and second sheet (23; 24) upstream from said oven (16) with a reference to an advancing direction of said first and second batch from said wrapping station (15) towards said oven (16);

characterized in that said step of separating comprises the step of blowing a current of a gas towards said second first and second sheet (23, 24).

16. The method of claim 15, **characterized in that** said gas has a temperature ranging between 400°C to 500°C.

17. The method of claim 15 or 16, **characterized in that** said step of wrapping comprises the steps of:

- arranging a first portion (34a; 34b) of said first sheet (23; 24) between a conveyor (25) and a bottom face (5) of said first packages (3a; 3b), and a first portion (34b; 34a) of said second sheet (24; 23) between said conveyor (25) and bottom faces (5) of second packages (3b; 3a) of a second batch (10b; 10a); and
- overlapping second portions (31a; 31b), opposite to respective first portions (34a; 34b), of said first and second sheets (23; 24), onto respective top faces (4) of said first and second packages (3a; 3b);
said step of overlapping comprising the steps of:
- leading main areas (35a; 35b) of said second portions (31a; 31b) to contact said top faces (4) of respective said first and second packages (3a; 3b) within said wrapping station (15); and
- arranging a first and a second end area (37a; 37b) of each second portion (31a; 31b) externally and on opposite sides of relative main area (35a; 35b); said second end areas (37b) being adjacent one another and interposed between said first areas (37a);
said step of blowing comprising the step of blowing said current of said gas against said end areas (37b).

FIG. 1

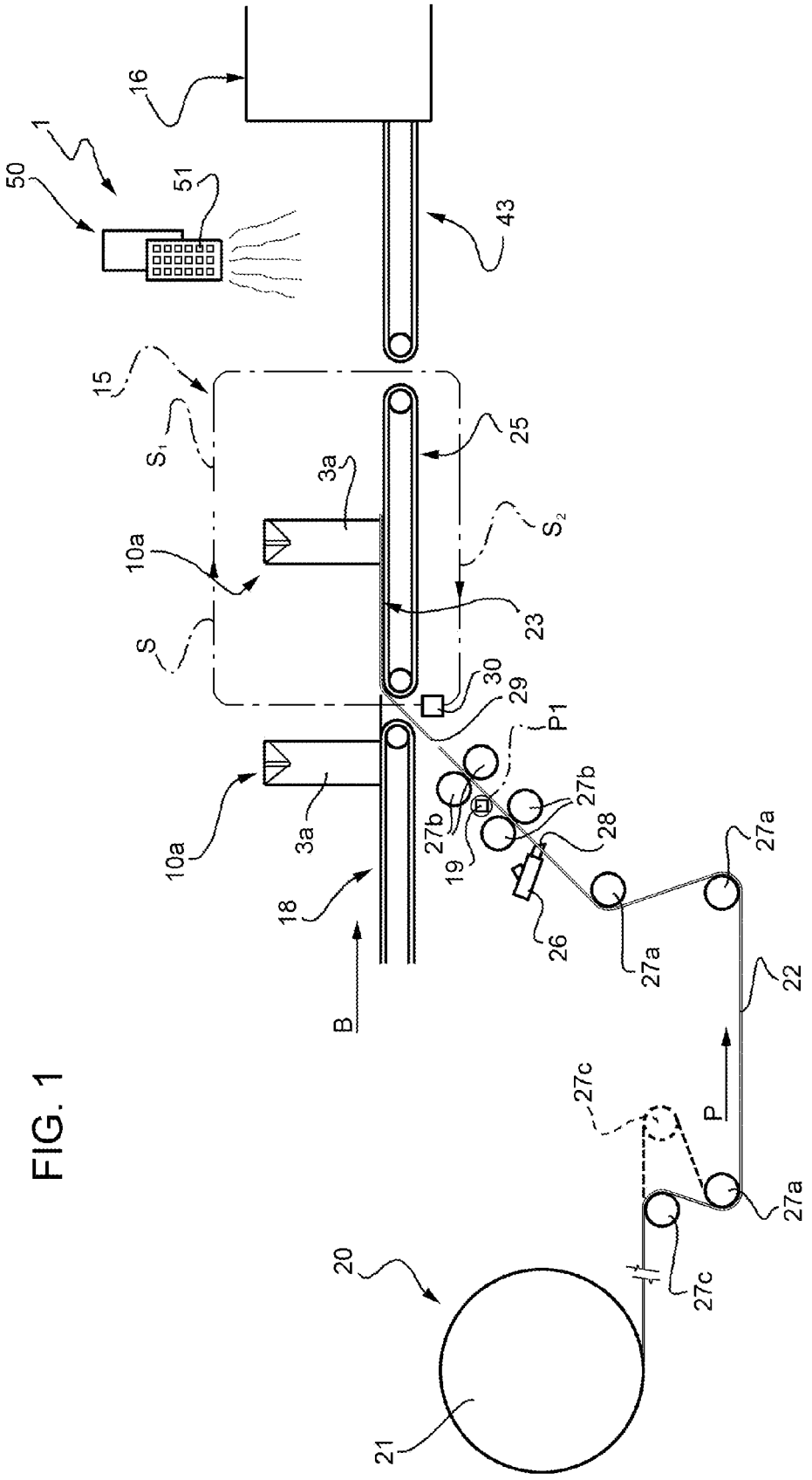
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FIG. 2

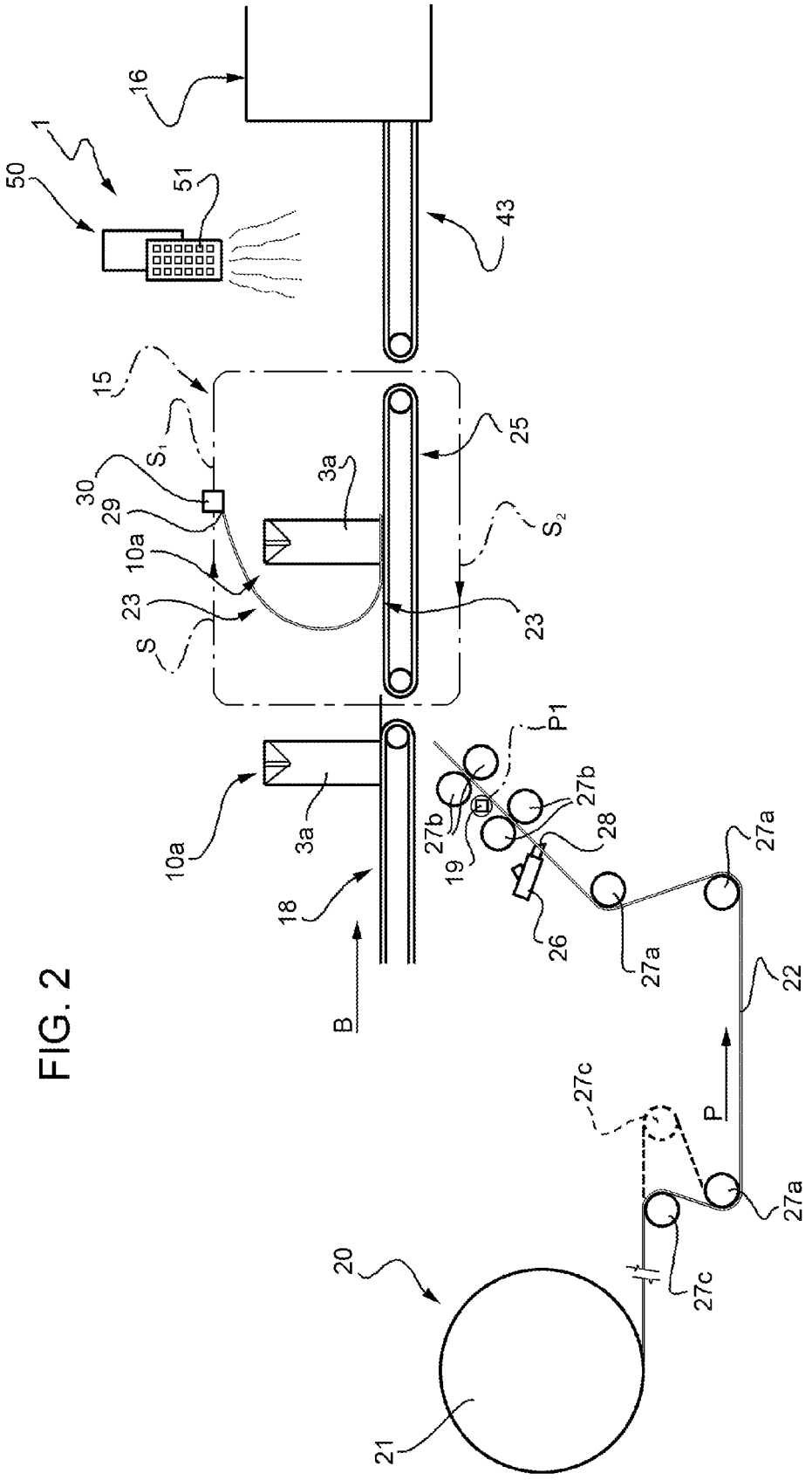
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FIG. 3

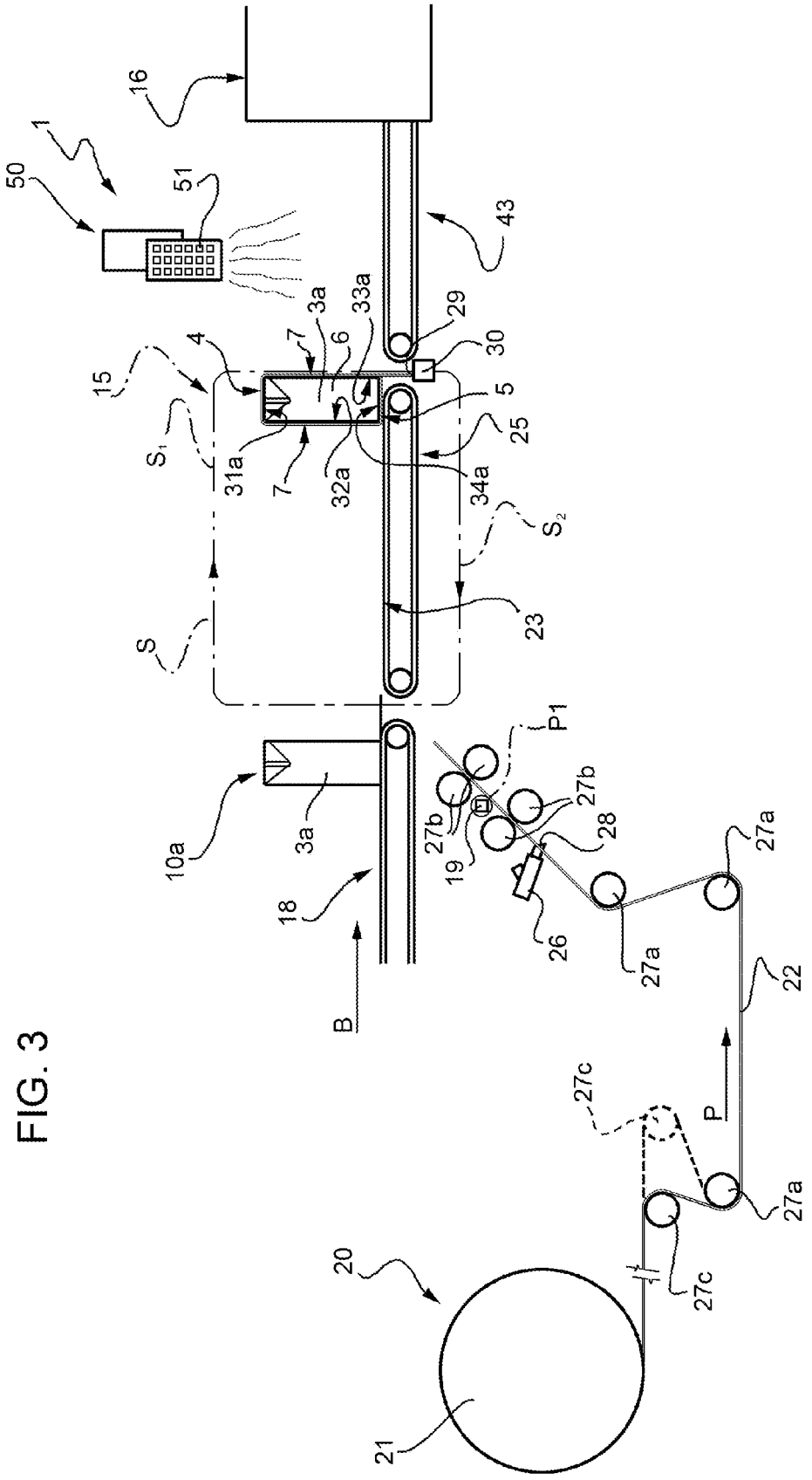
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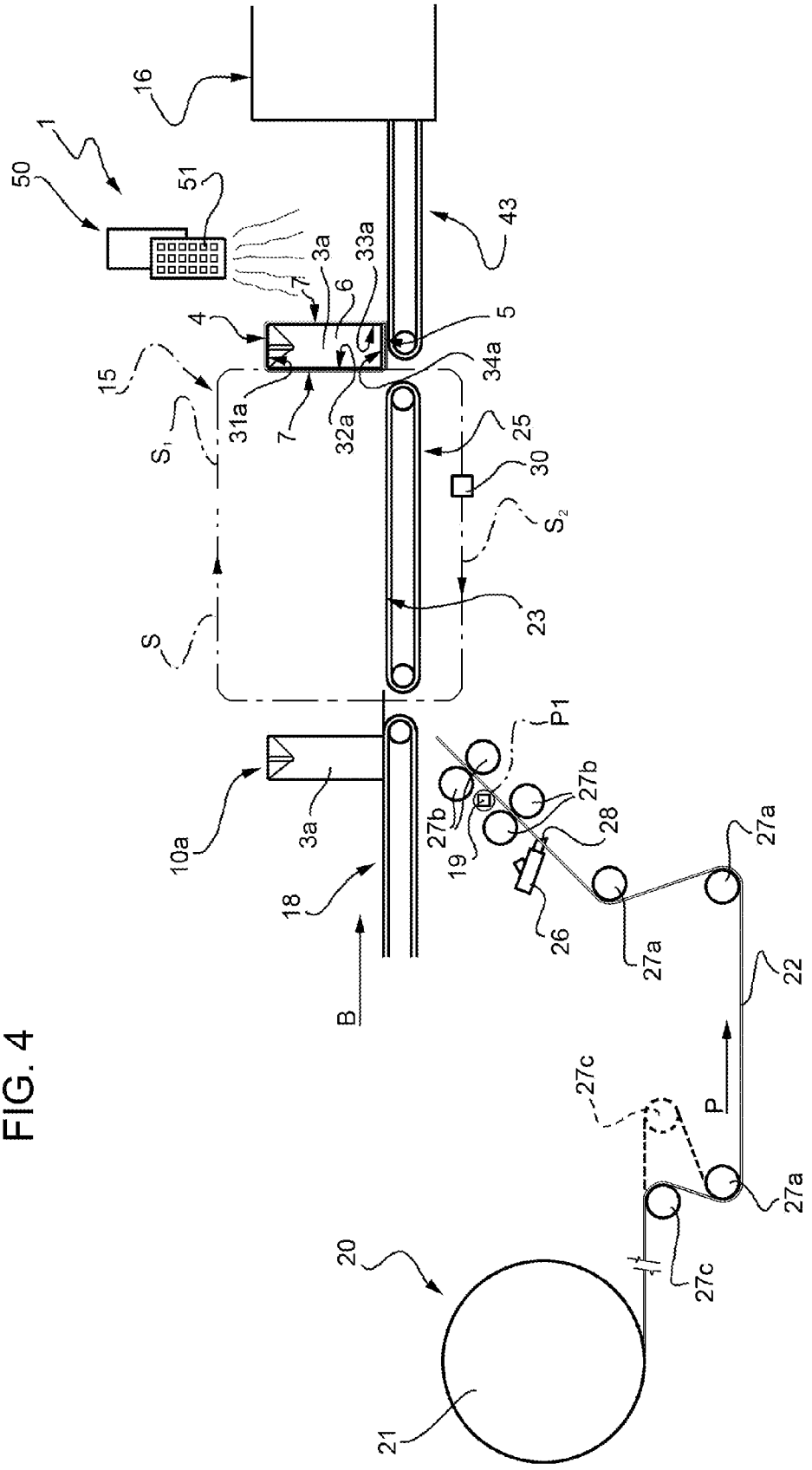
FIG. 4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10a
3a
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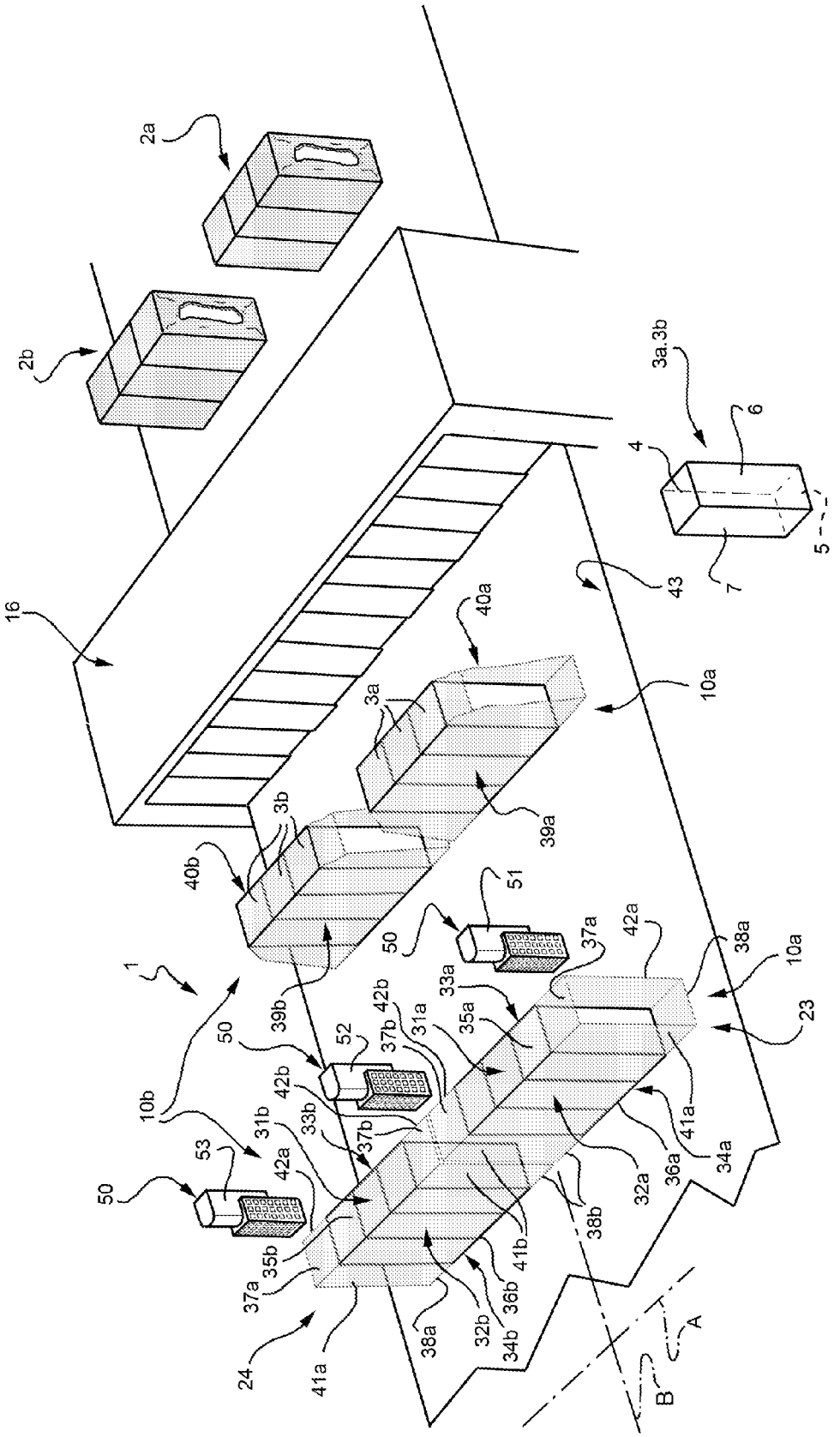
FIG. 5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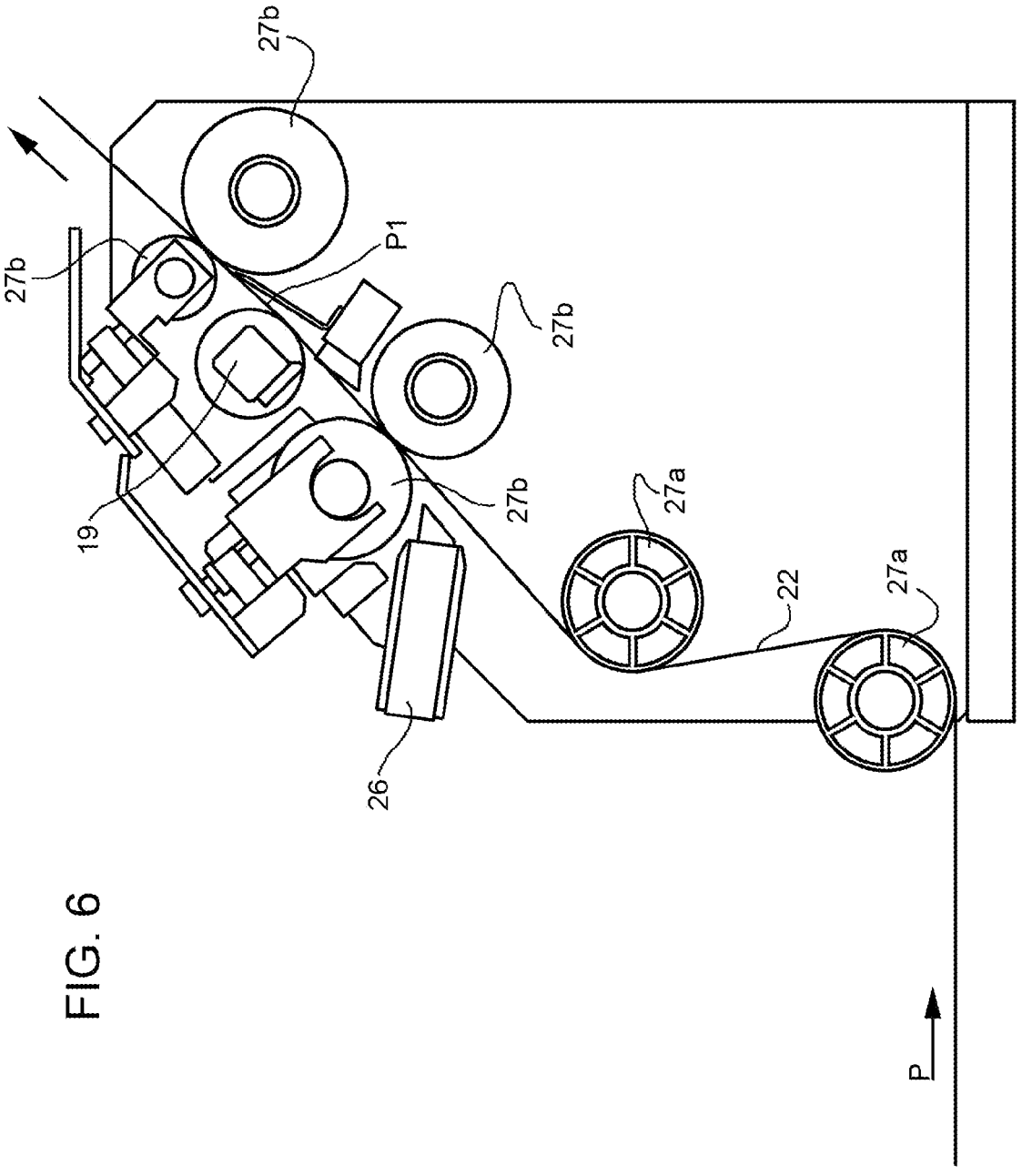

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 2437

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 June 2010	Jagusiak, Antony

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