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(54) **Folding unit for machines for packaging pourable food products**

Falteinrichtung für Vorrichtungen zum Verpacken von giessbaren Lebensmitteln

Dispositif de pliage pour machine pour l'emballage de produits alimentaires versables

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Description

[0001] The present invention relates to a high-speed folding unit for packaging machines for continuously producing sealed packages of pourable food products from a tube of packaging material.

[0002] Many pourable food products, such as drinks, 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 comprising a layer of paper material covered on both sides with layers of heat-seal plastic material, e.g. polyethylene. In the case of aseptic packages 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 a layer of heat-seal plastic material defining the inner face of the package eventually contacting the food product.

[0005] 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. More specifically, the web of packaging material is unwound off a reel and fed through an aseptic chamber on the packaging machine, where it is sterilized, e.g. by applying a sterilizing agent such as hydrogen peroxide, which is subsequently evaporated by heating, and/or by subjecting the packaging material to radiation of appropriate wavelength and intensity; and the sterilized web is maintained in a closed, sterile environment, and is folded into a cylinder and sealed longitudinally to form a continuous tube in known manner.

[0006] The tube of packaging material, which in effect forms an extension of the aseptic chamber, is fed continuously in a vertical direction, is filled with the sterilized or sterile-processed food product, and is fed through a forming unit to form the individual packages. That is, inside the forming unit, the tube is sealed at a number of equally spaced cross sections to form a continuous strip of pillow packs connected to one another by respective transverse sealing bands, i.e. extending perpendicularly to the travelling direction of the tube. The pillow packs are separated by cutting the relative transverse sealing bands, and are conveyed to a folding station where they are folded mechanically to form respective finished parallelepiped-shaped packages.

[0007] More specifically, each pillow pack comprises a parallelepiped-shaped main portion; and opposite, respectively top and bottom, end portions flaring from the main portion to respective transverse sealing lines of the pack. Each end portion has respective substantially triangular flaps projecting from opposite sides of the main portion; and a respective low rectangular tab projecting from the relative sealing line.

[0008] Packaging machines of the above type are known on which the pillow packs are folded to form the parallelepiped-shaped packages on automatic folding units, which substantially comprise a conveyor for feeding the packs in steps along a conveying surface defining a forming path; a first folding assembly located along the forming path to fold the flaps and tabs of each pack onto respective walls of the pack; a heating assembly for heating the flaps to a suitable temperature for heat sealing to the relative walls; and a second or final folding assembly which cooperates with each pack to hold the folded flaps in contact with the relative walls as the flaps cool.

[0009] More specifically, the first and second folding assembly comprise a number of interacting members located along the forming path, and movable in steps to and from the conveyor to perform respective forming operations on the packs travelling along the conveyor.

[0010] A major drawback of known folding units lies in the step motion of the interacting members being characterized by successive braking and restarting which, as the output rate increases, cause sharp deceleration and acceleration of the moving parts, which may result in dynamic problems over and above given maximum output rates.

[0011] To eliminate the above drawback, the Applicant has recently developed a folding unit (described in detail in European Patent Application n. EP-A-0887261) in which the conveyor operates continuously, and the interacting members of the first and second folding assembly are set up in fixed positions along the forming path, and cooperate with the packs simply by virtue of the movement of the conveyor.

[0012] More specifically, the interacting members of the first folding assembly are substantially defined by fixed beams, while the second folding assembly is defined by three belts, each placed at 90° from the adjacent one, fitted to respective pairs of idle pulleys, and defining, between them and with the conveying surface of the conveyor, a forming passage having a constant rectangular cross section defining the outer shape of the finished packages.

[0013] More specifically, two of the belts are located on opposite sides of the conveying surface of the conveyor, and have respective parallel, facing work branches; and the third belt has a work branch perpendicular to the work branches of the first two belts and facing and parallel to the conveying surface of the conveyor.

[0014] The pillow packs are fed along the forming path with one of the flared end portions facing downwards and resting on the conveying surface with the relative tab engaging a relative groove in the conveying surface, and with the other flared end portion facing upwards to cooperate with the work branch of the second folding assembly belt facing the conveyor; which belt has equally spaced shaped projections to increase pressure on the top flared end portions of the packs.

[0015] Though advantageous in many respects, e.g.

by permitting high output rates (e.g. 8000-24000 packages an hour) by eliminating dynamic problems caused by sharp acceleration and deceleration of the moving parts of step-operated systems, the solution described above still leaves room for further improvement, particularly as regards shaping the packages.

[0016] The shape quality of the finished packages, in fact, has been found to be impaired by friction and slide occurring, in use, between the packs and the interacting members of the folding assemblies, particularly where greater pressure is exerted by the interacting members, as for example at the second folding assembly, the belts of which are moved by the movement of the packs.

[0017] Moreover, failing perfect timing between the projections on the second folding assembly belt facing the conveying surface of the conveyor, and the grooves in the conveying surface, interaction between said belt and the pillow packs being folded may be impaired, thus resulting in stoppage of the machine.

[0018] It is an object of the present invention to provide a folding unit for machines for packaging pourable food products, designed to eliminate the aforementioned drawbacks of known folding units, and which in particular is reliable and provides for high-quality shaping of the packages.

[0019] According to the present invention, there is provided a folding unit for machines for packaging pourable food products, as claimed in Claim 1.

[0020] 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 shows an exploded view in perspective of a high-speed folding unit, in accordance with the present invention, for machines for packaging pourable food products;

Figure 2 shows a larger-scale side view in perspective of the unit according to the invention, with parts removed for clarity and from the opposite side to Figure 1;

Figure 3 shows a larger-scale top side view in perspective of the Figure 1 unit, with parts removed for clarity;

Figure 4 shows a larger-scale front-side view in perspective, with parts removed for clarity, of a final folding device of the Figure 1 unit;

Figure 5 shows a larger-scale section along line V-V in Figure 2;

Figures 6 to 10 show schematic front views of a preferred folding sequence performed by the Figure 1 unit on a pillow pack to form a parallelepiped-shaped package.

[0021] With reference to Figures 1 to 3, number 1 indicates as a whole a high-speed folding unit for a packaging machine (not shown) for continuously producing sealed parallelepiped-shaped packages 2 (Figure 10) of a pourable food product, e.g. pasteurized or UHT milk, fruit juice, wine, etc., from a known tube (not shown) of packaging material.

[0022] The tube is formed in known manner upstream from unit 1 by longitudinally folding and sealing a known web (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 aseptic packages 2 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 a layer of heat-seal plastic material defining the inner face of the package eventually contacting the food product.

[0023] 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 3 (Figure 6), which are then sent to unit 1 where they are folded mechanically to form respective packages 2.

[0024] With reference to Figure 6, each pack 3 has an axis A, and comprises a parallelepiped-shaped main portion 4; and opposite, respectively top and bottom, end portions 6, 7 flaring from portion 4 towards respective sealing lines 8 and 9, perpendicular to axis A, of pack 3.

[0025] More specifically, portion 4 of each pack 3 is bounded laterally by two flat rectangular walls 10 parallel to each other, to axis A, and to sealing lines 8, 9, and by two flat rectangular walls 11 extending between walls 10.

[0026] Each portion 6, 7 is defined by two walls 12 substantially in the form of an isosceles trapezium, sloping slightly with respect to a plane perpendicular to axis A, and having minor edges defined by respective end edges of walls 10 of portion 4, and major edges joined by respective sealing line 8, 9.

[0027] Each pack 3 also comprises, for each portion 6, 7, an elongated, substantially rectangular tab 13, 14 projecting from respective sealing line 8, 9; and two substantially triangular flaps 15, 16 projecting laterally on opposite sides of portion 4 and defined by end portions of relative walls 12.

[0028] To form a package 2, unit 1 presses portions 6, 7 of relative pack 3 towards each other, while at the same time folding respective tabs 13, 14 onto portions 6, 7; folds and seals flaps 15 of portion 6 onto relative walls 12; and folds and seals flaps 16 of portion 7 onto respective walls 11 of portion 4.

[0029] With reference to Figures 1 to 3, unit 1 comprises a supporting frame 20 (shown separated into its component parts in Figure 1, with parts removed for clarity); a chain conveyor 21 fitted to frame 20 and for feeding packs 3 continuously along a predominantly straight, horizontal forming path B from a feed station 22 to an output station 23; a number of folding devices 24, 25, 26 fitted to frame 20 in fixed positions along path B and cooperating with packs 3 to perform respective folding operations on the packs; a heating device 27 which acts on the flaps 15, 16 to be folded of each pack 3 to heat seal flaps 15, 16 to respective walls 12, 11; and a final folding

device 28 located downstream from folding devices 24, 25, 26 along path B, and cooperating with each pack 3 to hold relative flaps 15, 16 in contact with relative walls 12, 11 as flaps 15, 16 cool.

[0030] More specifically, frame 20 is defined by a base structure 17, and by a top structure 18, which is hinged to base structure 17, at the output station 23 end, about a horizontal axis C perpendicular to path B, and is secured releasably to base structure 17 at the opposite end.

[0031] More specifically, base structure 17 comprises two parallel vertical walls 17a elongated in the travelling direction of packs 3 along path B, and supporting conveyor 21 in between; and two uprights 17b extending vertically towards top structure 18 from respective end portions 17c of walls 17a.

[0032] Top structure 18 comprises a frame member 18a extending in a horizontal plane, substantially defined by two rectangles of different sizes with one side in common, and bounded perpendicularly to path B by end cross members, one of which is hinged between respective top free ends of uprights 17b of base structure 17.

[0033] At the opposite end cross member, top structure 18 comprises two uprights 18b extending towards base structure 17, and connected to respective ends 17d, opposite end portions 17c, of vertical walls 17a by means of respective releasable fastening devices 19.

[0034] Being connected as described above, top structure 18, when fastening devices 19 are released, can be rotated upwards about axis C with respect to base structure 17 to inspect unit 1.

[0035] Top structure 18 is fitted with two fixed projecting sides 37 (only one shown in Figures 1 and 3) for laterally retaining packs 3 along path B, and which are located on opposite sides of conveyor 21, are fixed to respective uprights 18b, and extend between station 22 and final folding device 28.

[0036] Conveyor 21 comprises at least one gear, and, in the example shown, two, respectively drive and driven, gears 29, 30; and an articulated chain 31 looped about and meshing with gears 29, 30, and supporting a number of flat rectangular paddles 32, each projecting from chain 31 and cooperating with and exerting thrust on a corresponding wall 10 of a relative pack 3 to feed the pack along path B.

[0037] More specifically, drive gear 29 is operated by a known drive assembly 38 (not described in detail) located alongside base structure 17 of frame 20 and supported by frame 20 in a position facing one of vertical walls 17a.

[0038] Chain 31 comprises a straight, horizontal top branch 33; a bottom branch 34 substantially parallel to branch 33; and two curved, C-shaped portions 35, 36, which are positioned with their concavities facing, connect branches 33 and 34, and respective middle portions of which define feed station 22 and output station 23 respectively.

[0039] Path B comprises a straight main portion B_1 defined by branch 33 of chain 31; and two, respectively feed and output, end portions B_2, B_3 defined by respective top portions 35a, 36a of portions 35, 36 of chain 31 extending between corresponding stations 22, 23 and branch 33. Branch 33 and portions 35a, 36a of portions 35, 36 therefore define a conveying branch or surface of chain 31 to feed packs 3 from station 22 to station 23, while branch 34 and the remaining portions 35b, 36b of portions 35, 36 define a return branch of chain 31 to feed paddles 32 from station 23 to station 22.

[0040] Chain 31 comprises a number of articulated links 40 defined by flat, rectangular plates, from which respective paddles 32 project perpendicularly. More specifically, each paddle 32 extends asymmetrically from relative link 40, and divides link 40 into two rectangular portions 41, 42 of different lengths along path B and located respectively upstream and downstream from paddle 32 along path B. More specifically, portion 41 is longer along path B than portion 42.

[0041] Each link 40 is spaced slightly apart from the adjacent links 40, with which it defines respective gaps 43 for the purposed explained later on.

[0042] Given the structure of conveyor 21, paddles 32 are positioned vertically along portion B_1 of path B, and assume a horizontal position at stations 22, 23.

[0043] Each pack 3 is positioned on conveyor 21 with portion 7 contacting the conveying surface of chain 31, with one of walls 10 resting against relative paddle 32, and with axis A parallel to paddle 32, so that flaps 15, 16 of each pack 3 extend crosswise to path B.

[0044] Packs 3 are fed to conveyor 21 in a horizontal input position, in which portion 7 contacts portions 42, 41 of adjacent links 40, and tab 14 is inserted loosely inside relative gap 43. Similarly, each finished package 2 is removed from conveyor 21 in a horizontal output position.

[0045] Folding device 24 (Figures 1-3) comprises an elongated guide member 44 which is fitted to frame member 18a of frame 20 in a fixed position facing and detached from the conveying surface of chain 31, extends at the junction between portions B_1 and B_2 of path B, and defines, towards chain 31, a concave contrasting surface S converging towards the conveying surface and which cooperates in sliding manner with portion 6 of each pack 3 to press portion 6 flat towards chain 31.

[0046] Folding device 25 (Figures 1 and 3) comprises two contrasting members 50, which are defined by parallel elongated beams, are fixed to the top edges of respective walls 17a of frame 20, are located adjacent to respective opposite lateral edges of branch 33 of chain 31, and cooperate in sliding manner with portion 7 of each pack 3 to fold tab 14 onto relative walls 12, and flaps 16 towards respective walls 11 of portion 4 of pack 3.

[0047] More specifically, each contrasting member 50 comprises a straight intermediate portion 52 parallel to branch 33 of chain 31; a curved upstream portion 53 extending towards branch 33 from intermediate portion 52; and a curved downstream portion 54 extending from intermediate portion 52 towards a guide member 55, of folding device 26, located over folding device 25.

[0048] Upstream portions 53 of contrasting members 50 cooperate in sliding manner with portion 7 of each pack 3 to fold flaps 16 towards walls 11 of pack 3, after folding tab 14 onto relative walls 12; intermediate portions 52 of contrasting members 50 cooperate in sliding manner with flaps 16 of each pack 3 to keep them facing respective walls 11 of pack 3; and downstream portions 54 cooperate in sliding manner with flaps 16 to bring them into contact with walls 11.

[0049] Guide member 55 (Figures 1 and 3) is defined by an elongated, substantially U-shaped beam fixed to top structure 18 of frame 20, is positioned facing and detached from branch 33 of chain 31, extends downstream from guide member 44 along path B, and cooperates with flaps 15 of portions 6 of packs 3 to fold flaps 15 onto respective walls 12.

[0050] Guide member 55 comprises two elongated contrasting arms 56 substantially extending over respective contrasting members 50 and respective opposite lateral edges of branch 33 of chain 31; and a connecting portion 57 crosswise to path B and connecting respective downstream ends of arms 56.

[0051] Folding device 26 also comprises a forming roller 58, which has an axis perpendicular to path B and parallel to axis C, is fitted idly to frame member 18a of frame 20, is interposed between arms 56 of guide member 55, and has opposite circular end surfaces 59 facing arms 56 and defining, with arms 56, respective seats in which to slide flaps 15 of each pack 3.

[0052] Proceeding along path B, arms 56 comprise first guide portions 60 diverging with respect to branch 33 of chain 31, and converging with each other to rotate flaps 15 of each pack 3 towards each other; second guide portions 61 parallel to each other and to branch 33, and positioned facing respective end surfaces 59 of roller 58 to keep flaps 15 in contact with surfaces 59; third guide portions 62 parallel to branch 33 and converging with each other to fold flaps 15 towards portion 6 of pack 3; and fourth guide portions 63 parallel to each other and to branch 33 to keep flaps 15 in the position assumed leaving third guide portions 62. And portion 57 of guide member 55 cooperates in sliding manner with flaps 15 of each pack 3 to bring them into contact with portion 6 of pack 3.

[0053] Heating device 27 (Figures 1 and 3) comprises an air-heating assembly 65 fitted to top structure 18 of frame 20; two first nozzles 66 connected to assembly 65 and located between guide portions 63 of arms 56 to direct hot air onto flaps 15 to be folded of each pack 3 before flaps 15 reach portion 57 of guide member 55; and two second nozzles 67 connected to assembly 65 and located between intermediate portions 52 of contrasting members 50 to direct hot air onto flaps 16 to be folded of each pack 3 before flaps 16 reach downstream portions 54 of contrasting members 50.

[0054] With reference to Figures 1-5 and 10, final folding device 28 comprises three endless belts 70, 71, 72, which are fitted movably to frame 20, are perpendicular to one another, and define, between them and with branch 33 of chain 31, a forming passage indicated P_1 in Figure 10, having a constant rectangular cross section, and defining the outer shape of the finished packages 2 leaving unit 1.

[0055] More specifically, two of said belts (70, 71) are located on opposite sides of branch 33 of chain 31, and are looped about respective pairs of pulleys 73, 74 fitted idly to base structure 17 of frame 20 and having vertical axes perpendicular to main portion B_1 of path B and to axis C.

[0056] Belts 70, 71 have respective facing work branches 75, 76 perpendicular to branch 33 of chain 31 and extending substantially along an extension of respective sides 37.

[0057] Each belt 70, 71 has a smooth outer surface 77 cooperating with packs 3; and a toothed inner surface 78 meshing with respective radial teeth of pulleys 73, 74.

[0058] Belt 72 is located over paddles 32, is looped about a pair of pulleys 80, 81 fitted idly to frame member 18a of frame 20 and having horizontal axes parallel to axis C, and comprises a work branch 82 parallel to branch 33 of conveyor 21 and perpendicular to work branches 75, 76 of belts 70, 71.

[0059] Like belts 70, 71, belt 72 also has a smooth outer surface 83 cooperating with packs 3; and a toothed inner surface 84 meshing with respective radial teeth of pulleys 80, 81.

[0060] Unit 1 advantageously also comprises actuating means for moving work branches 75, 76, 82 of belts 70, 71, 72 in the same direction and at the same travelling speed as packs 3, so as to avoid any slide in contact with packs 3.

[0061] In a preferred embodiment, said actuating means are defined by a transmission 85 for transferring motion from drive gear 29 of conveyor 21 to pulleys 73, 74, 80, 81 of belts 70, 71, 72.

[0062] In the example shown, transmission 85 is fitted to frame 20, on the opposite side with respect to drive assembly 38, and substantially comprises a gear transmission 86 for transferring motion from an output shaft 87 of drive gear 29 of conveyor 21 to a parallel shaft 88 fitted to a relative vertical wall 17a; a first belt drive 89 for transferring motion from shaft 88 to a shaft 90 fitted to frame member 18a and advantageously coaxial with axis C; and a second belt drive 91 for transferring motion from shaft 90 to a shaft 92 also fitted to frame member 18a and connected angularly to pulley 81.

[0063] More specifically, gear transmission 86 comprises a sprocket 93 fitted to shaft 87; and a driven gear 94 meshing with sprocket 93 and angularly integral with shaft 88.

[0064] Belt drive 89 comprises two toothed pulleys 95, 96 fitted to shafts 88, 90 respectively; and a toothed belt 97 looped about and meshing with pulleys 95, 96.

[0065] In the same way, belt drive 91 comprises two toothed pulleys 98, 99 fitted to shafts 90, 92 respectively; and a toothed belt 100 looped about and meshing with

pulleys 98, 99.

[0066] Shaft 90 being coaxial with the hinge axis C between base structure 17 and top structure 18 of frame 20, the settings of transmission 85 are advantageously maintained when frame 20 is opened (dash line in Figure 2) for inspection.

[0067] As shown in detail in Figure 5, shaft 92 is connected angularly to a shaft 101 supporting pulley 81.

[0068] Shafts 92 and 101 are advantageously connected angularly by means of a joint 102, e.g. a known Oldham joint, allowing vertical movement of shaft 101 with respect to shaft 92 supported in a fixed axial position by frame member 18a of frame 20. As such, pulley 81 and, hence, belt 72 are allowed to move slightly in a direction perpendicular to the conveying surface defined by chain 31, so as to adapt the height of passage P_1 perfectly to that of packs 3.

[0069] In the Figure 5 embodiment, joint 102 comprises a first and second substantially parallelepiped-shaped projection 106, 107 projecting from respective shafts 92, 101 in a direction parallel to the axes of shafts 92, 101; and a cylindrical intermediate member 108 having, at opposite axial ends, respective rectangular grooves 109, 110 engaged by respective projections 106, 107 in sliding manner in a direction perpendicular to the conveying surface of packs 3.

[0070] To transmit motion from belt 72 to belts 70, 71, the shaft fitted with pulley 80 is fitted at opposite axial ends with respective bevel gears 103 meshing with corresponding bevel gears 105 fitted to the top ends of the shafts fitted with pulleys 73. Given the vertical movement allowed belt 72 to adapt to the actual height of packs 3 with which it interacts, gears 105 are loaded elastically upwards to mesh at all times with respective gears 103.

[0071] Operation of unit 1 will be described with reference to one pack 3, and as of the instant in which pack 3 is fed to a relative paddle 32 of conveyor 21 in the horizontal input position, in which tab 14 of portion 7 engages relative gap 43.

[0072] By virtue of the movement and thrust of paddle 32, pack 3 is up-ended along portion B_2 of path B, so as to be positioned upright on engaging portion B_1 of path B. During this movement, portion 6 of pack 3 cooperates in sliding manner with guide member 44 which, as stated, has a profile converging towards chain 31, and therefore, together with chain 31, presses portions 6 and 7 down flat (Figures 7 and 8).

[0073] As or soon after portion 6 of pack 3 nears the downstream portion of guide member 44, portion 7 of pack 3 comes into contact with upstream portions 53 of contrasting members 50, so that tab 14 is folded onto portion 7, and flaps 16 are rotated towards walls 11 of pack 3 (Figure 8).

[0074] Next, flaps 15 of portion 6 of pack 3 reach guide portions 60 of arms 56, where they are rotated upwards into a vertical position parallel to each other; at which point, flaps 15 pass between guide portions 61 of arms 56 and end surfaces 59 of forming roller 58, and are then folded further towards walls 12 of portion 6 by guide portions 62 of arms 56 (Figure 9).

[0075] As pack 3 travels between guide portions 63 of arms 56 and between intermediate portions 52 of contrasting members 50, nozzles 66, 67 direct hot air onto respective flaps 15, 16 to partly and locally melt the layer of heat-seal plastic material covering flaps 15, 16; and, as pack 3 travels beneath portion 57 of guide member 55 and between downstream portions 54 of contrasting members 50, flaps 15, 16 are folded completely onto respective walls 12, 11.

[0076] Finally, the movement of conveyor 21 pushes pack 3 through passage P_1 defined by branch 33 of conveyor 21 and by work branches 75, 76, 82 of belts 70, 71, 72. Inside passage P_1, flaps 15, 16 are cooled and, by virtue of the pressure applied on them, are sealed to respective walls 12, 11 to form a finished package 2 (Figure 10).

[0077] Powering belts 70, 71, 72 to travel at the same speed as packs 3 prevents any slide between the packs and work branches 75, 76, 82 of belts 70, 71, 72, thus improving the finish quality of finished packages 2.

[0078] In other words, as opposed to being drawn by friction by packs 3, belts 70, 71, 72 are operated independently of packs 3, which has been found to greatly improve the formation of finished packages 2, which are no longer subjected to slide which may impair the finished shape.

[0079] Moreover, by virtue of Oldham joint 102, the distance between top belt 72 and the conveying surface defined by chain 31 adapts automatically to the actual height of packs 3, thus preventing excessive pressure which may also impair the finish quality of packages 2 or even result in packs 3 jamming inside passage P_1, thus resulting in stoppage of the machine.

[0080] Moreover, unit 1 has only one power member: drive assembly 38, which therefore simplifies control, and improves the reliability, of unit 1 and the packaging machine on which unit 1 is installed.

[0081] Finally, unit 1 is highly compact, by virtue of all the members (44, 50, 55, 58, 70, 71, 72) which interact with packs 3 being mounted substantially "on" conveyor 21, or more specifically on frame 20 supporting conveyor 21.

[0082] Clearly, changes may be made to unit 1 without, however, departing from the protective scope as defined in the accompanying Claims.

[0083] In particular, belts 70, 71, 72 may even be powered by a dedicated drive member independent of drive assembly 38.

Claims

1. A folding unit (1) for machines for packaging pourable food products, comprising:

conveying means (21) for continuously feeding

along a forming path (B) a succession of sealed packs (3) containing a pourable food product, and each having a portion (15, 16) to be folded and sealed onto respective wall (12, 11) of such pack (3) to form a relative finished package (2); folding means (70, 71, 72) having at least one interacting surface (75, 76, 82) interacting with said packs (3) to perform at least one forming operation on the packs; said interacting surface (75, 76, 82) defining at least partly a forming passage (P_1) of a predetermined cross section, through which said packs (3) travel to be formed into a given shape;

said folding means (70, 71, 72) comprising at least one endless top belt (72) having a work branch (82), which defines said interacting surface (75, 76, 82), extends parallel to a conveying surface (33, 35a, 36a), defined by said conveying means (21), for conveying the packs (3), and is located at a distance from the conveying surface (33, 35a, 36a);

said folding means also comprising two endless lateral belts (70, 71) located on opposite sides of and perpendicular to said top belt (72), and having respective work branches (75, 76) defining, with the work branch (82) of the top belt (72) and with said conveying surface (33, 35a, 36a), said forming passage (P_1);

said portion (15, 16) being sealed, in use, onto respective said wall (12, 11) inside said forming passage (11) by virtue- of the pressure applied by said work branches (75, 76, 82);

characterized by comprising actuating means (85) for moving said working branches (75, 76, 82) in the same direction and at the same travelling speed as said packs (3), so as to avoid slide in contact with the packs (3).

2. A unit as claimed in Claim 1, **characterized in that** said conveying means comprise a conveyor (21) for feeding said packs (3) along said forming path (B), and drive means (38) for continuously operating said conveyor (21); and **in that** said actuating means comprise transmission means (85) for transferring motion from said drive means (38) to said folding means (70, 71, 72).

3. A unit as claimed in Claim 2, **characterized in that** said top belt (72) is fitted to at least one pulley (81) fitted to a relative shaft (101), and **in that** said actuating means (85) comprise an output shaft (92) connected angularly to said shaft (101) of said pulley (81) by coupling means (102) permitting movement between said shafts (92, 101) in a direction perpendicular to said conveying surface (33, 35a, 36a), so as to automatically adapt the distance between the work branch (82) of said top belt (72) and the conveying surface (33, 35a, 36a) to the actual height of said packs (3).

4. A unit as claimed in any one of the foregoing Claims, **characterized by** comprising angular connecting means (103, 105) between said lateral belts (70, 71) and said top belt (72).

5. A unit as claimed in any one of the foregoing Claims, and also comprising a frame (20) for supporting said conveying means (21) and said folding means (70, 71, 72); said unit (1) being **characterized in that** said frame (20) comprises a first and a second structure (17, 18) secured at one end about a hinge axis (C), and fixed to each other at the opposite end by releasable fastening means (19); and **in that** said actuating means (85) comprise at least one shaft (90) coaxial with said hinge axis (C).

6. A unit as claimed in any one of the foregoing Claims, for folding pillow packs (3) having a number of flaps (15, 16) to be folded and sealed to respective walls (12, 11) of the packs (3) to form parallelepiped-shaped finished packages (2); **characterized by** comprising folding members (44, 50, 55, 58) located upstream from said folding means (70, 71, 72) along said forming path (B), and which cooperate with said flaps (15, 16) to be folded of each pack (3) so as to set them in predetermined fold positions; and heating means (27) which act on said flaps (15, 16) to be folded of each said pack (3) to heat seal the flaps (15, 16) to the respective said walls (12, 11); said forming passage (P_1) having a rectangular cross section; and said folding means (70, 71, 72) keeping said flaps (15, 16) in contact with the relative said walls (12, 11) as the flaps (15, 16) cool.

7. A unit as claimed in Claim 6, **characterized in that** said folding members (44, 50, 55, 58) are of fixed size, and cooperate with said packs (3) by virtue of the motion of said conveying means (21).

8. A unit as claimed in Claim 6 or 7, for folding pillow packs (3), each comprising a substantially parallelepiped-shaped main portion (4); a first end portion (7) flaring from said main portion (4) towards a relative sealing line (9), and positioned contacting said conveying surface (33, 35a, 36a); and an opposite second end portion (6) also flaring from said main portion (4) towards a relative sealing line (8); each said pack (3) having, for each of said first and second end portions (7, 6), two said flaps (16, 15) projecting laterally from opposite sides of said main portion (4) and crosswise to said forming path (B);

characterized in that said folding members comprise an elongated first guide member (44) which faces said conveying surface (33, 35a, 36a), extends at an upstream portion (B_1) of said forming path (B),

and defines a contrasting surface (S) converging towards said conveying surface (33, 35a, 36a) and cooperating in sliding manner with, to flatten, said second end portion (6) of each said pack (3).

9. A unit as claimed in Claim 8, **characterized in that** said folding members also comprise:

- two fixed first contrasting members (56) defined by elongated beams, and which are located downstream from said first guide member (44) along said forming path (B), are spaced apart from said conveying surface (33, 35a, 36a), and face respective opposite lateral edges of the conveying surface (33, 35a, 36a); and

two fixed second contrasting members (50) defined by elongated beams and located adjacent to respective opposite lateral edges of said conveying surface (33, 35a, 36a);
said first and second contrasting members (56, 50) cooperating respectively in sliding manner with said second (6) and said first (7) end portion of each said pack (3) to fold the respective said flaps (15, 16).

10. A unit as claimed in Claim 9, **characterized in that** said folding members also comprise an idle forming roller (58), which is interposed between said first contrasting members (56), has an axis perpendicular to said forming path (B), and has opposite end surfaces (59) facing said first contrasting members (56) and defining, with the first contrasting members (56), respective seats in which respective said flaps (15) of each said pack (3) slide.

Patentansprüche

1. Falteinheit (1) für Maschinen zum Verpacken von schütt- bzw. fließfähigen Nahrungsmittelprodukten, umfassend:

Fördermittel (21) zum kontinuierlichen Zuführen, entlang eines Formpfads (B), einer Abfolge von versiegelten Pakkungen (3), die ein fließfähiges Nahrungsmittelprodukt enthalten, und wobei jedes einen Abschnitt (15, 16) hat, der auf eine entsprechende Wand (12, 11) einer solchen Packung (3) zu falten und zu siegeln ist, um eine entsprechende fertige Verpackung (2) zu bilden,
Faltmittel (70, 71, 72) mit wenigstens einer interagierenden Fläche (75, 76, 82), die auf die Packungen (3) einwirkt, um wenigstens einen Formvorgang an den Pakkungen auszuführen, wobei die interagierende Fläche (75, 76, 82) zumindest teilweise eine Formpassage (P_1) mit vorbestimmtem Querschnitt definiert, durch die die Packungen (3) laufen, um in eine vorgegebene Form geformt zu werden,
wobei die Faltmittel (70, 71, 72) wenigstens ein oberes Endlosband (72) mit einem Arbeitszweig (82) umfassen, der die interagierende Fläche (75, 76, 82) definiert, sich parallel zu einer Förderfläche (33, 35a, 36a) erstreckt, die durch die Fördermittel (21) begrenzt wird, zum Befördern der Verpackungen (3), und mit Abstand zu der Förderfläche (33, 35a, 36a) angeordnet ist,
wobei die Faltmittel auch zwei Endlosseitenbänder (70, 71) umfassen, die auf gegenüberliegenden Seiten und senkrecht zum oberen Band (72) angeordnet sind, und entsprechende Arbeitszweige (75, 76) haben, die mit dem Arbeitszweig (82) des oberen Bands (72) und mit der Beförderungsfläche (33, 35a, 36a), die Formpassage (P_1) begrenzen,
wobei der Abschnitt (15, 16) bei Gebrauch auf die entsprechende Wand (12, 11) innerhalb der Formpassage (11) aufgrund des Drucks gesiegelt wird, der durch die Arbeitszweige (75, 76, 82) aufgebracht wird,

dadurch gekennzeichnet, dass sie Betätigungsmittel (85) umfasst, um die Arbeitszweige (75, 86, 82) in dieselbe Richtung zu bewegen und mit der gleichen Fahrgeschwindigkeit wie die Packungen (3), um ein Gleiten in Kontakt mit den Packungen (3) zu vermeiden.

2. Einheit nach Anspruch 1, **dadurch gekennzeichnet, dass** die Fördermittel einen Förderer (21) zum Zuführen von Packungen (3) entlang des Formpfads (B) umfassen, und Antriebsmittel (38) zum kontinuierlichen Betätigen des Förderers (21), und dass die Antriebsmittel Übertragungsmittel (85) zum Übertragen von Bewegung von den Antriebsmitteln (38) auf die Faltmittel (70, 71, 72) enthalten.

3. Einheit nach Anspruch 2, **dadurch gekennzeichnet, dass** das obere Band (72) an wenigstens einer Scheibe (81) angebracht ist, die an einer jeweiligen Welle (101) befestigt ist, und dass die Antriebsmittel (85) eine Abgangswelle (92) aufweisen, die winkelförmig mit der Welle (101) der Scheibe (81) durch Kupplungsmittel (102) verbunden ist, die Bewegung zwischen den Wellen (92, 201) in eine Richtung senkrecht zur Förderfläche (33, 35a, 36a) gestatten, um den Abstand zwischen dem Arbeitszweig (82) des oberen Bandes (72) und der Förderfläche (33, 35a, 36a) an die tatsächliche Höhe der Packungen (3) automatisch anzupassen.

4. Einheit nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie winkelförmige Verbindungsmittel (103, 105) zwischen den Seitenbändern (70, 71) und dem oberen Band (72) um-

fasst.

5. Einheit nach einem der vorhergehenden Ansprüche, und auch umfassend einen Rahmen (20) zum Stützen der Fördermittel (21) und der Faltmittel (70, 71, 72), wobei die Einheit (1) **dadurch gekennzeichnet ist, dass** der Rahmen (20) eine erste und eine zweite Struktur (17, 18) umfasst, die an einem Ende an einer Gelenkachse (C) gesichert sind und am gegenüberliegenden Ende durch lösbare Befestigungsmittel (19) aneinander befestigt sind, und dass die Betätigungsmittel (85) wenigstens eine koaxial zur Gelenkachse (C) verlaufende Welle (90) umfassen.

6. Einheit nach einem der vorhergehenden Ansprüche, zum Falten von Kissenpackungen mit einer Anzahl an Klappen (15, 16), die an entsprechende Wände (12, 11) der Packungen (3) zu falten und siegeln sind, um parallelepipedförmige fertige Verpackungen (2) zu bilden, **dadurch gekennzeichnet, dass** sie Faltelemente (44, 50, 55, 58) umfasst, die den Faltmitteln (70, 71, 72) vorgelagert entlang des Formpfads (B) angeordnet sind, und die mit den zu faltenden Klappen (15, 16) jeder Packung (3) zusammenwirken, um sie in vorbestimmte Faltpositionen zu bringen, und Heizmittel (27), die auf die von jeder Pakkung (3) zu faltenden Klappen (15, 16) einwirken, um die Klappen (15, 16) an die entsprechenden Seitenwände (12, 11) heißzusiegeln, wobei die Formpassage (P_1) einen rechteckigen Querschnitt hat, und wobei die Faltmittel (70, 71, 72) die Klappen (15, 16) in Kontakt mit den zugehörigen Wänden (12, 11) halten, wenn die Klappen (15, 16) abkühlen.

7. Einheit nach Anspruch 6, **dadurch gekennzeichnet, dass** die Faltelemente (44, 50, 55, 58) eine feste Größe haben und mit den Packungen (3) durch die Bewegung der Fördermittel (21) zusammenwirken.

8. Einheit nach Anspruch 6 oder 7, zum Falten von Kissenpackungen (3), jeweils umfassend einen im Wesentlichen parallelepipedförmigen Hauptabschnitt (4), einen ersten Endabschnitt (7), der vom Hauptabschnitt (4) hin zu einer jeweiligen Versiegelungslinie (9) aufweitet, und die Förderfläche (33, 34a, 36a) berührend angeordnet ist, und ein gegenüberliegender zweiter Endabschnitt (6), der auch vom Hauptabschnitt (4) hin zu einer jeweiligen Versiegelungslinie (8) aufweitet, wobei jede Pakkung (3) für jeden der ersten und zweiten Endabschnitte (7, 6) zwei Klappen (16, 15) hat, die seitlich von gegenüberliegenden Seiten des Hauptabschnitts (4) und quer zum Formpfad (B) vorstehen, **dadurch gekennzeichnet, dass** die Faltelemente ein längliches erstes Führungselement (44) umfassen, das der Förderfläche (33, 35a, 36a) zugewandt ist, sich an einem vorgelagerten Abschnitt (B_1) des Formpfads (B) erstreckt, und eine Kontrastfläche (S) definiert, die hin zur Förderfläche (33, 35a, 36a) konvergiert und gleitenderweise mit dem zweiten Endabschnitt (6) jeder Packung (3) zum Abflachen zusammenwirkt.

9. Einheit nach Anspruch 8, **dadurch gekennzeichnet, dass** die Faltmittel ebenfalls umfassen:

zwei feste erste Kontrastelemente (56), die durch längliche Balken definiert werden und, dem ersten Führungselement (44) nachgeordnet, entlang dem Formpfad (B) angeordnet sind, und entsprechenden gegenüberliegenden seitlichen Kanten der Förderfläche (33, 35a, 36a) zugewandt sind, und
zwei feste zweite Kontrastelemente (50), die durch längliche Balken definiert werden und an entsprechende gegenüberliegende seitliche Kanten der Förderfläche (33, 35a, 36a) angrenzend angeordnet sind,
wobei die ersten und zweiten Kontrastelemente (56, 50) jeweils gleitenderweise mit dem zweiten (6) und dem ersten (7) Endabschnitt jeder Pakkung (3) zusammenwirken, um die entsprechenden Klappen (15, 16) zu bilden.

10. Einheit nach Anspruch 9, **dadurch gekennzeichnet, dass** die Faltmittel ebenfalls eine leerlaufende Formwalze (58) umfassen, die zwischen die ersten Kontrastelemente (56) geschoben ist, eine Achse senkrecht zum Formpfad (B) hat, und die gegenüberliegende Endflächen (59) hat, die den ersten Kontrastelementen (56) zugewandt sind und mit den ersten Kontrastelementen (56) entsprechende Sitze bilden, in die jeweiligen Klappen (15) jeder Packung (3) gleiten.

Revendications

1. Dispositif de pliage (1) pour machine d'emballage de produits alimentaires versables, comprenant :

des moyens de transport (21) permettant de faire avancer en continu le long d'un chemin de formation (B) une suite de paquets fermés hermétiquement (3) contenant un produit alimentaire versable, et ayant chacun une partie (15, 16) qui doit être pliée et fermée hermétiquement sur la paroi respective (12, 11) du paquet (3) pour former un emballage fini relatif (2) ;
des moyens de pliage (70, 71, 72) ayant au moins une surface d'interaction (75, 76, 82) interagissant avec lesdits paquets (3) pour effectuer au moins une opération de formation sur les paquets ; ladite surface d'interaction (75, 76, 82) définissant au moins en partie un passage de formation (P_1) d'une section en coupe trans-

versale prédéterminée, à travers laquelle lesdits paquets (3) se déplacent pour être formés selon une forme donnée ;
lesdits moyens de pliage (70, 71, 72) comprenant au moins une courroie supérieure sans fin (72) ayant une branche de travail (82), qui définit ladite surface d'interaction (75, 76, 82), s'étend de façon parallèle à une surface de transport (33, 35a, 36a) définie par lesdits moyens de transport (21), pour transporter les paquets (3) et qui est située à une certaine distance de la surface de transport (33, 35a, 36a) ;
lesdits moyens de pliage comprenant également deux courroies latérales sans fin (70, 71) situées sur les côtés opposés de ladite courroie supérieure sans fin (72), et perpendiculaires à celle-ci, et ayant des branches de travail respectives (75, 76) définissant, avec la branche de travail (82) de la courroie supérieure (72) et avec ladite surface de transport (33, 35a, 36a), ledit passage de formation (P_1) ;
ladite partie (15, 16) étant fermée hermétiquement, en utilisation, sur ladite paroi respective (12, 11) à l'intérieur dudit passage de formation (P_1) en raison de la pression appliquée par lesdites branches de travail (75, 76, 82) ;

caractérisé par le fait de comprendre des moyens d'actionnement (85) permettant de déplacer lesdites branches de travail (75, 76, 82) dans la même direction et à la même vitesse de déplacement que lesdits paquets (3), de manière à éviter un coulissement en contact avec les paquets (3).

2. Dispositif selon la revendication 1, **caractérisé en ce que** lesdits moyens de transport comprennent un tapis roulant (21) permettant de faire avancer lesdits paquets (3) le long dudit chemin de formation (B), et des moyens d'entraînement (38) permettant de faire fonctionner en continu ledit tapis roulant (21) ; et **en ce que** lesdits moyens d'actionnement comprennent des moyens de transmission (85) permettant de transférer le mouvement desdits moyens d'entraînement (38) auxdits moyens de pliage (70, 71, 72).

3. Dispositif selon la revendication 2, **caractérisé en ce que** ladite courroie supérieure (72) est fixée à au moins une poulie (81) fixée à un arbre relatif (101), et **en ce que** lesdits moyens d'actionnement (85) comprennent un arbre de sortie (92) raccordé de manière angulaire audit arbre (101) de ladite poulie (81) par des moyens de couplage (102) permettant un mouvement entre lesdits arbres (92, 101) dans une direction perpendiculaire à ladite surface de transport (33, 35a, 36a) de manière à adapter automatiquement la distance entre la branche de travail (82) de ladite courroie supérieure (72) et la surface de transport (33, 35a, 36a) à la hauteur réelle desdits paquets (3).

4. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par** le fait de comprendre des moyens de raccordement angulaire (103, 105) entre lesdites courroies latérales (70, 71) et ladite courroie supérieure (72).

5. Dispositif selon l'une quelconque des revendications précédentes, et comprenant également un cadre (20) permettant de supporter lesdits moyens de transport (21) et lesdits moyens de pliage (70, 71, 72) ; ledit dispositif (1) étant **caractérisé en ce que** ledit cadre (20) comprend une première et une seconde structures (17, 18) fixées au niveau d'une extrémité autour d'un axe charnière (C), et fixées l'une à l'autre au niveau de l'extrémité opposée par des moyens de fixation amovibles (19) ; et **en ce que** lesdits moyens d'actionnement (85) comprennent au moins un arbre (90) coaxial avec ledit axe charnière (C).

6. Dispositif selon l'une quelconque des revendications précédentes, permettant de plier des paquets en forme de coussin (3) ayant un certain nombre de rabats (15, 16) qui doivent être pliés et fermés hermétiquement sur les parties respectives (12, 11) des paquets (3) pour former des emballages finis en forme de parallélépipède (2) ; **caractérisé par** le fait de comprendre des éléments de pliage (44, 50, 55, 58) situés en amont desdits moyens de pliage (70, 71, 72) le long dudit chemin de formation (B) ; et qui coopèrent avec lesdits rabats (15, 16) de chaque paquet (3) qui doivent être pliés, de manière à les mettre dans des positions de pliage prédéterminées ; et des moyens de chauffage (27) qui agissent sur lesdits rabats (15, 16) qui doivent être pliés de chaque dit paquet (3) pour thermosceller les rabats (15, 16) sur lesdites parois respectives (12, 11) ; ledit passage de formation (P_1) ayant une coupe transversale rectangulaire ; et lesdits moyens de pliage (70, 71, 72) maintenant lesdits rabats (15, 16) en contact avec lesdites parois relatives (12, 11) à mesure que les rabats (15, 16) refroidissent.

7. Dispositif selon la revendication 6, **caractérisé en ce que** lesdits éléments de pliage (44, 50, 55, 58) ont une taille fixée et coopèrent avec lesdits paquets (3) en raison du mouvement desdits moyens de transport (21).

8. Dispositif selon la revendication 6 ou 7, permettant de plier des paquets en forme de coussin (3), comprenant chacun une partie principale sensiblement en forme de parallélépipède (4) ; une première partie d'extrémité (7) s'évasant depuis ladite partie principale (4) vers une ligne de scellage relative (9), et

positionnée pour être en contact avec ladite surface de transport (33, 35a, 36a) ; et une seconde partie d'extrémité opposée (6) s'évasant également depuis ladite partie principale (4) vers une ligne de scellage relative (8) ; chaque dit paquet (3) ayant, pour chacune desdites première et seconde parties d'extrémité (7, 6), deux dits rabats (16, 15) qui font saillie latéralement depuis les côtés opposés de ladite partie principale (4) et de façon diagonale par rapport audit chemin de formation (B) ;
caractérisé en ce que lesdits éléments de pliage comprennent un premier élément de guidage allongé (44) qui fait face à ladite surface de transport (33, 35a, 36a), s'étend au niveau d'une partie en amont (B_1) dudit chemin de formation (B) et définit une surface contrastée (S) qui converge vers ladite surface de transport (33, 35a, 36a) et qui coopère de manière coulissante, afin de l'aplanir, avec ladite seconde partie d'extrémité (6) de chaque dit paquet (3).

9. Dispositif selon la revendication 8, **caractérisé en ce que** lesdits éléments de pliage comprennent également :

- deux premiers éléments contrastés fixes (56) définis par des poutres allongées et qui sont situés en aval dudit premier élément de guidage (44) le long dudit chemin de formation (B), sont situés à distance de ladite surface de transport (33, 35a, 36a) et qui font face aux bords latéraux opposés respectifs de la surface de transport (33, 35a, 36a) ; et
- deux seconds éléments contrastés fixes (50) définis par des poutres allongées et situés de manière adjacente aux bords latéraux opposés respectifs de ladite surface de transport (33, 35a, 36a) ;

lesdits premiers et seconds éléments contrastés (56, 50) coopérant respectivement de manière coulissante avec ladite seconde (6) et ladite première (7) parties d'extrémité de chaque dit paquet (3) pour plier lesdits rabats respectifs (15, 16).

10. Dispositif selon la revendication 9, **caractérisé en ce que** lesdits éléments de pliage comprennent également un rouleau fou de formation (58) qui est interposé entre lesdits premiers éléments contrastés (56), a un axe perpendiculaire audit chemin de formation (B) et présente des surfaces d'extrémité opposées (59) qui font face auxdits premiers éléments contrastés (56) et qui définissent, avec les premiers éléments contrastés (56), des embases respectives sur lesquelles lesdits rabats respectifs (15) de chaque dit paquet (3) coulissent.

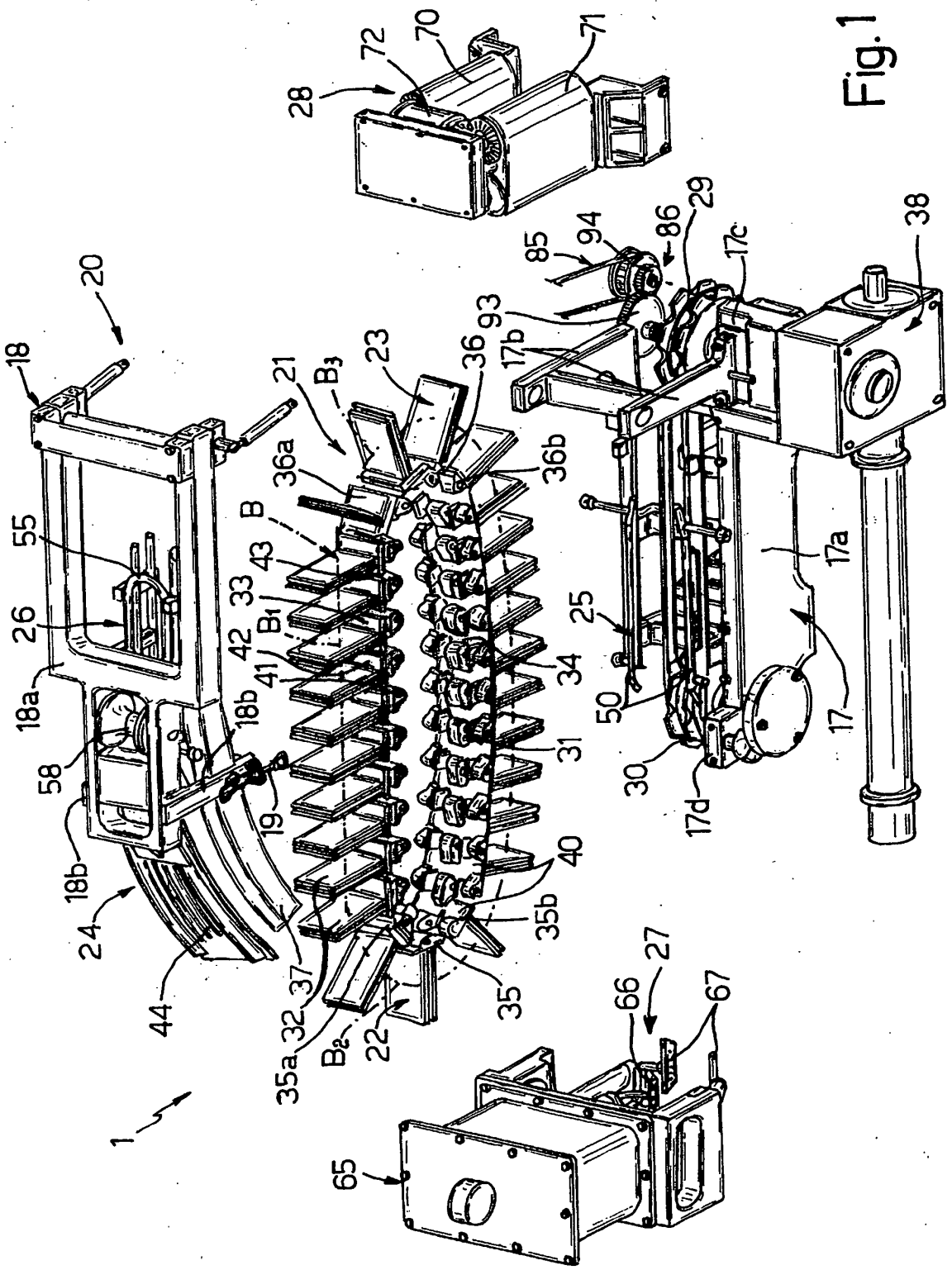
Fig. 1
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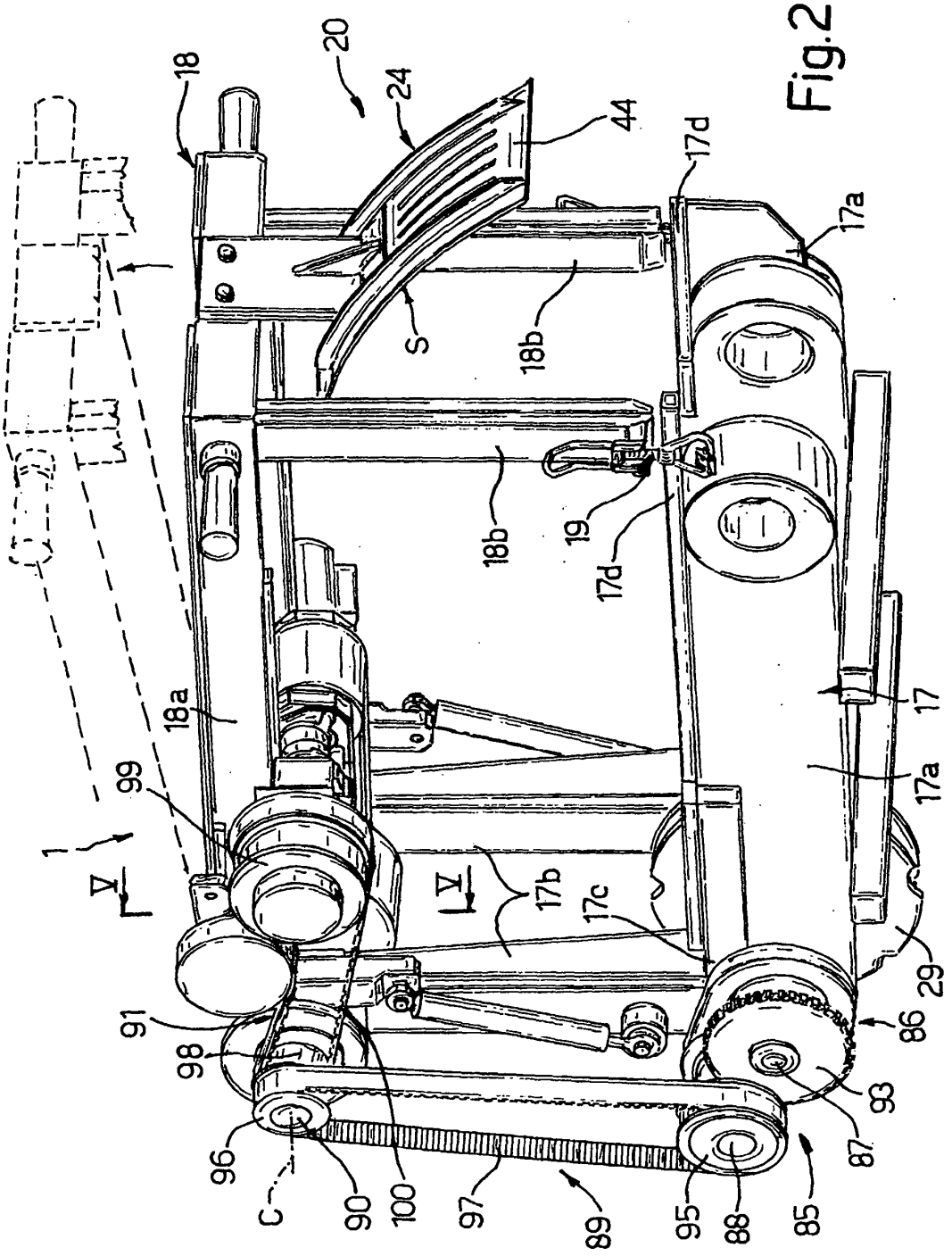
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Fig.2

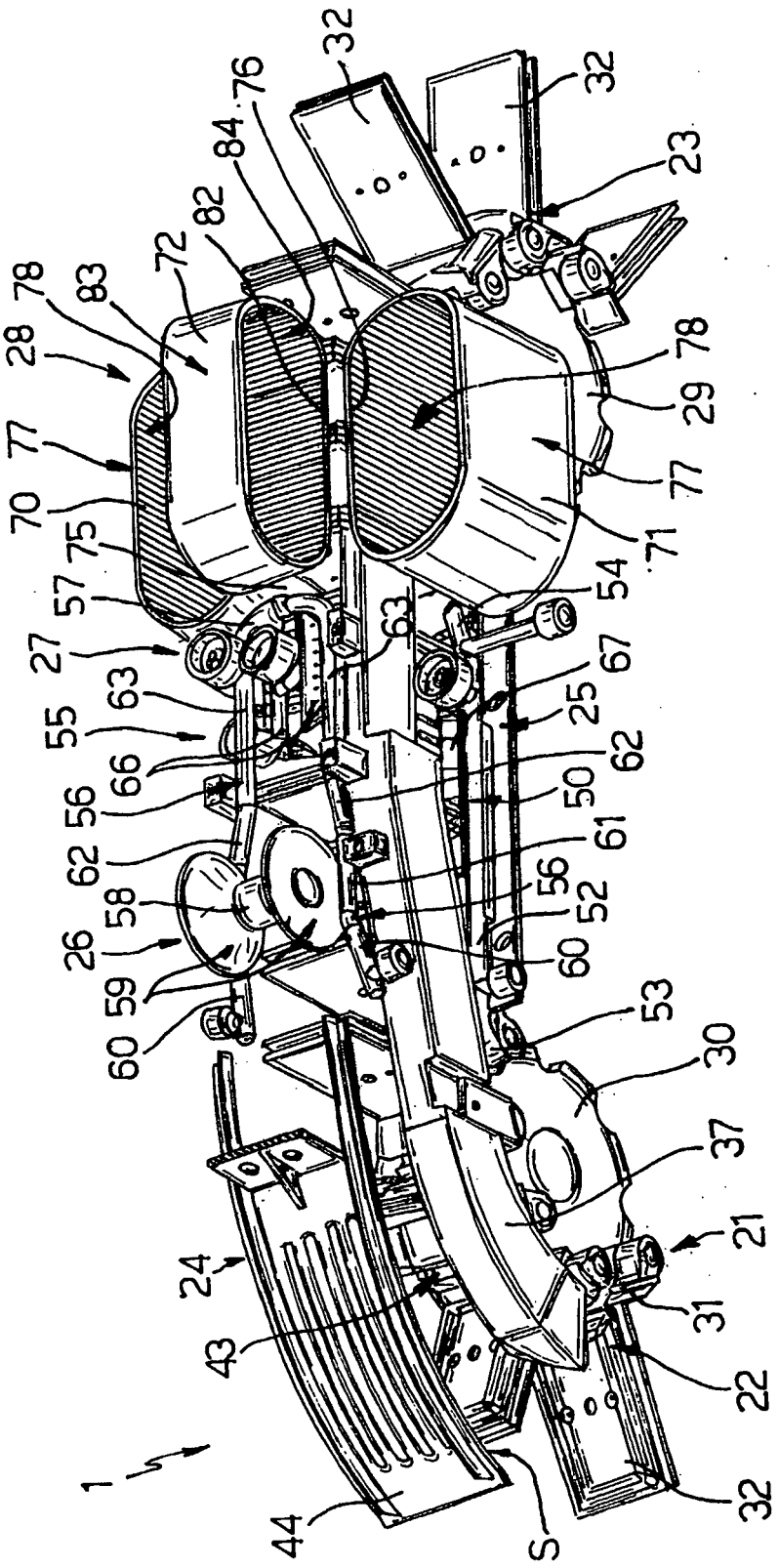
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Fig.3

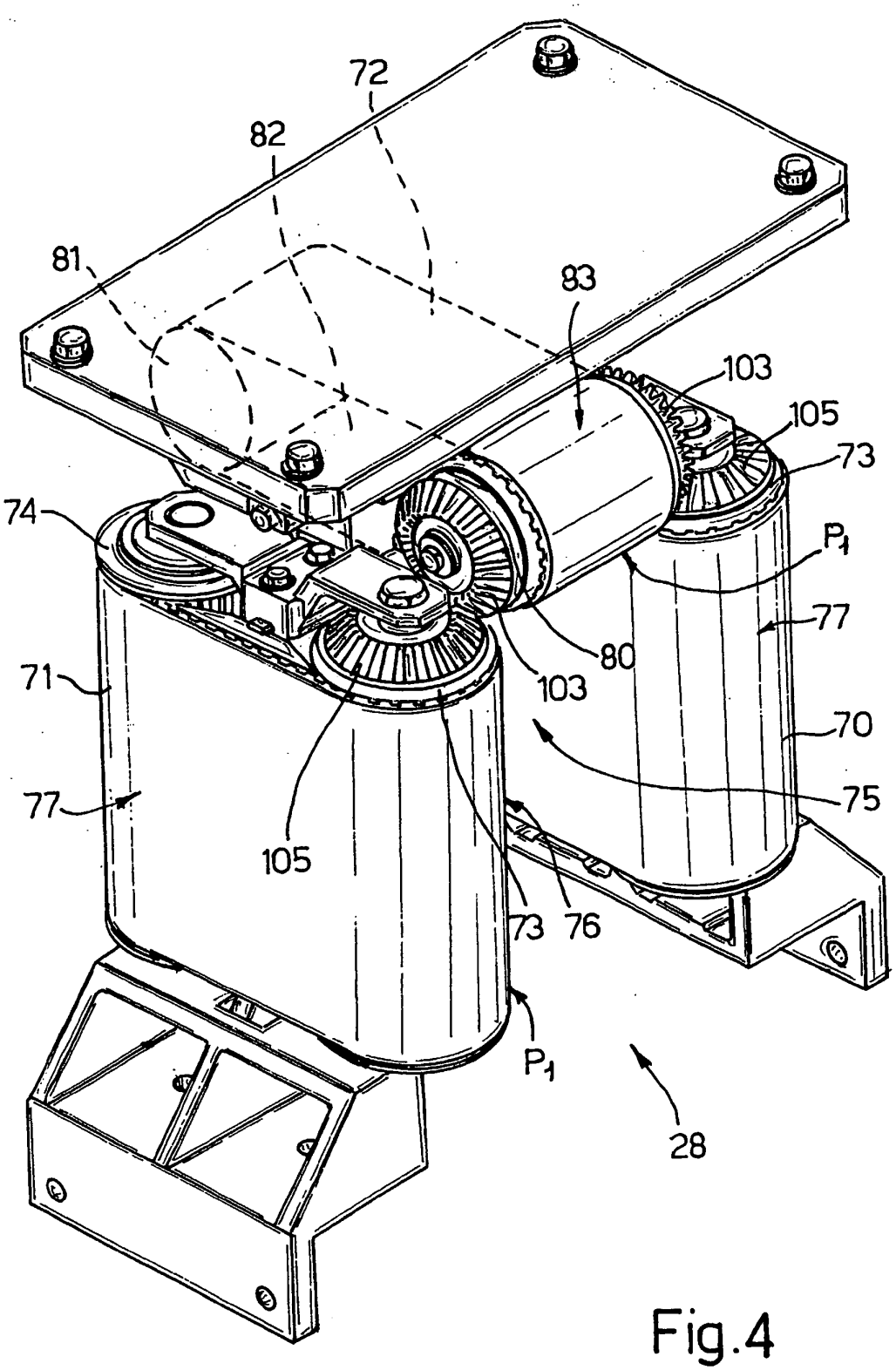

Fig.4

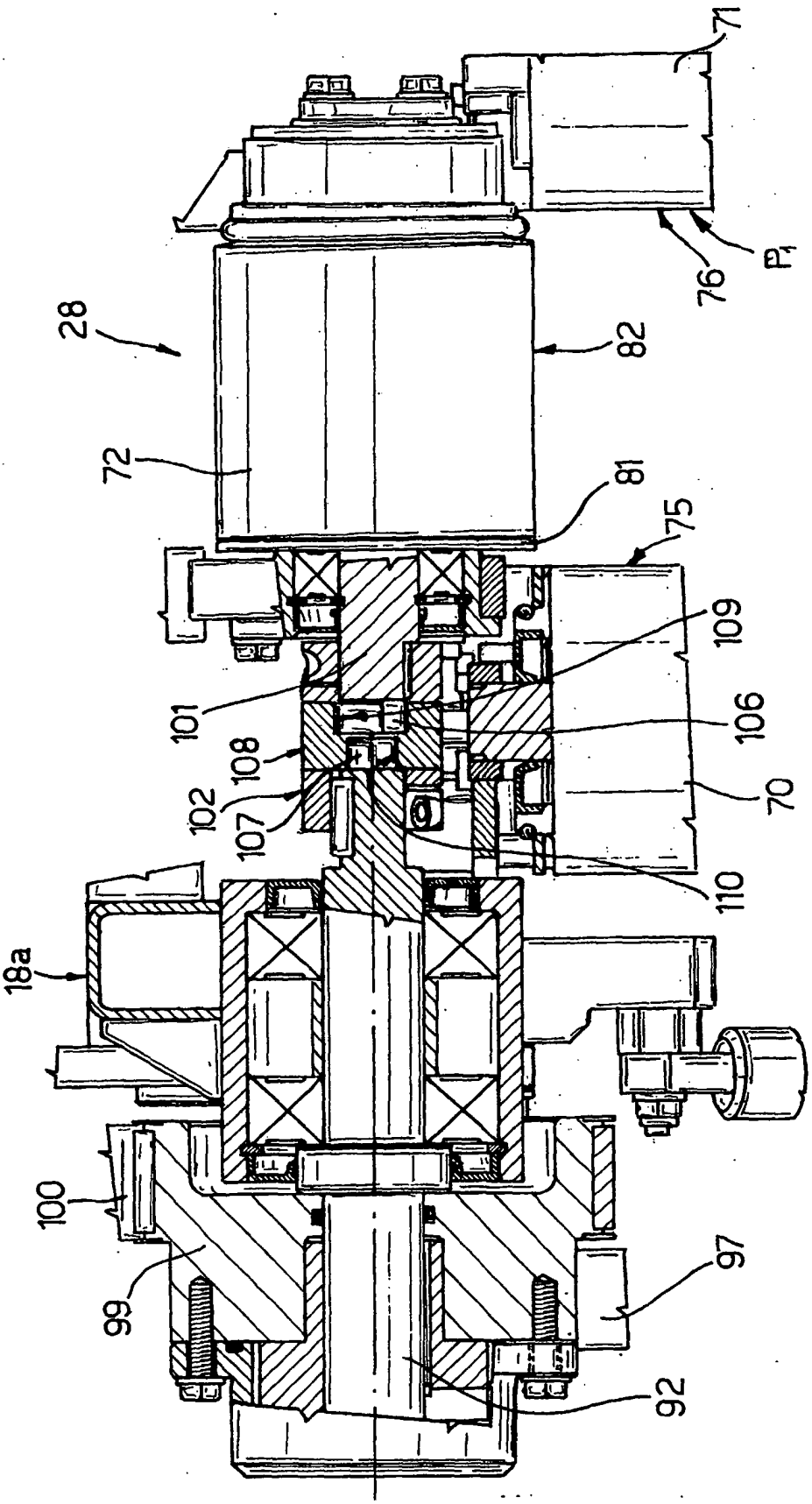
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Fig.5

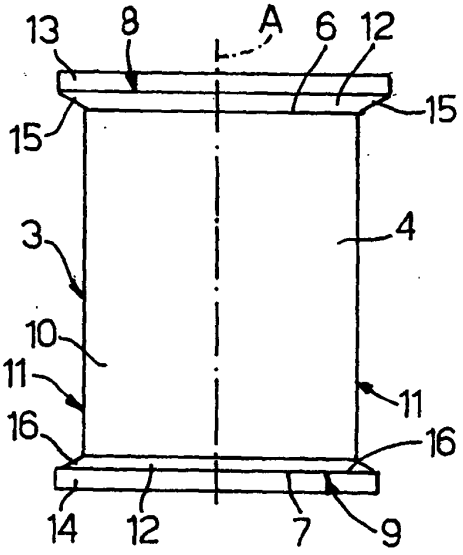

Fig. 6

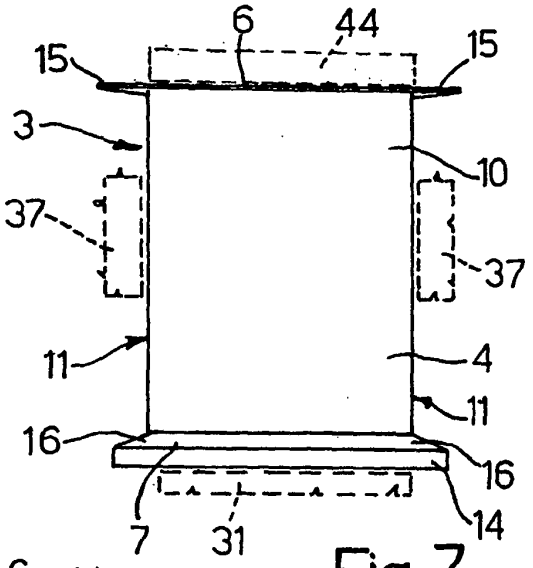

Fig. 7

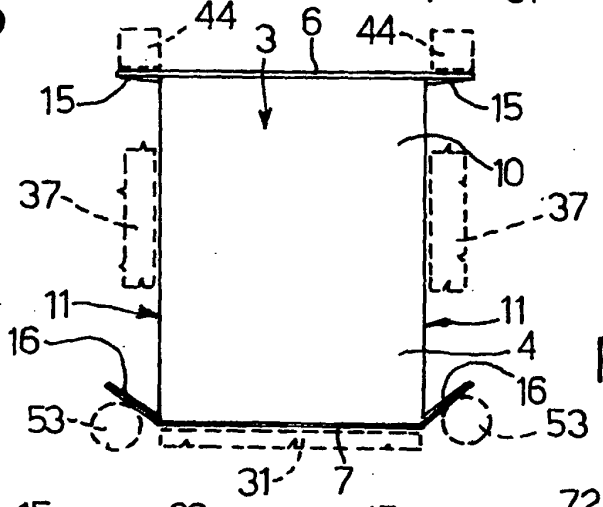

Fig. 8

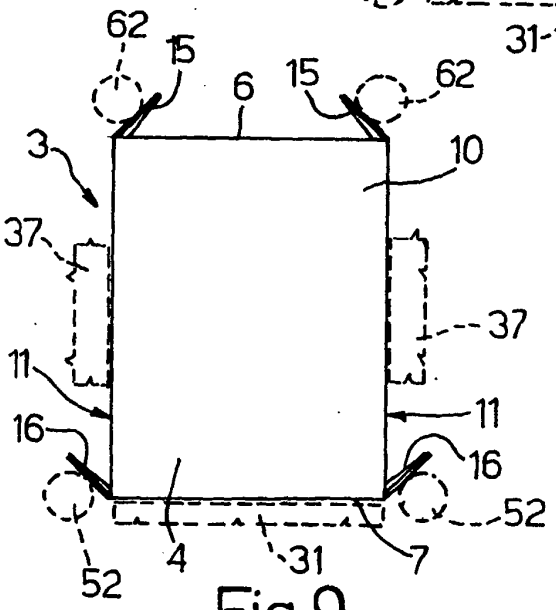

Fig.9

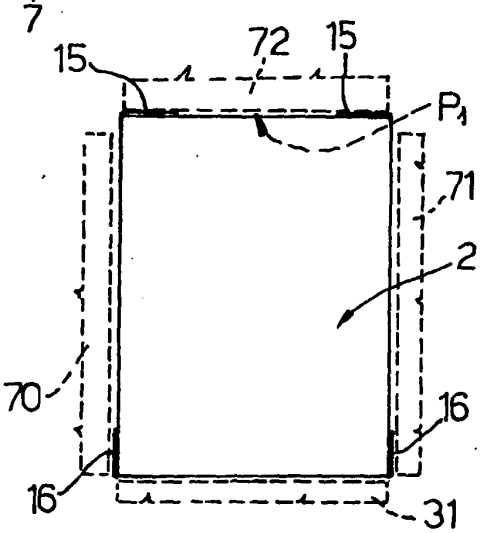

Fig.10

REFERENCES CITED IN THE DESCRIPTION

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