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(54) Method of folding packing blanks

(57) A method of folding packing blanks (3) whereby each blank (3) is fed into a respective packing pocket (29) in a given prepacking configuration; each blank (3) being fed along an input portion (P1) of a folding path (P) to be weakened along respective preformed bend lines (4-8), and being associated with a respective packing pocket (29) at a transfer station (S1); and a number of spindles (43) being fed in time with the packing pockets (29) through an insertion and parting station (S2) located along an output portion (P2) of the folding path (P) to intercept and insert the blanks (3) gradually inside the packing pockets (29), and to finish-fold the blanks into the prepacking configuration.

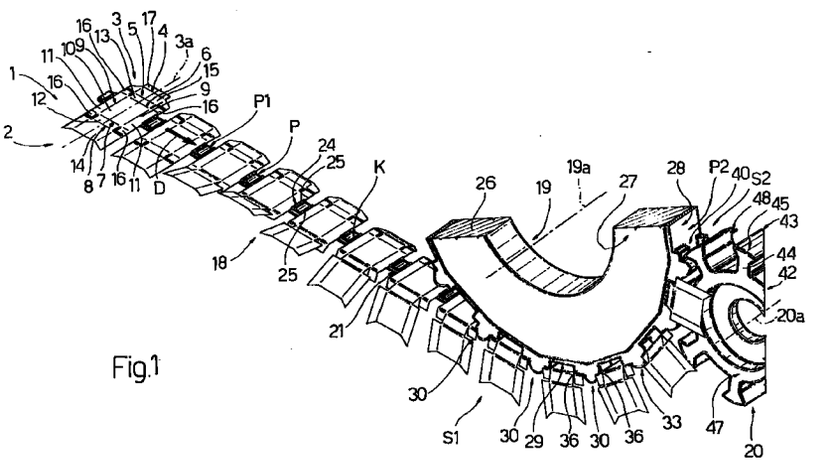

Fig.1

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Description

[0001] The present invention relates to a method of folding packing blanks. The present invention may be used to advantage on

[0002] cigarette packing machines and/or wrapping machines, which are referred to generally hereinafter as "packing machines", and to which the following description refers purely by way of example.

[0003] On packing machines, flat packing blanks are known to be folded about primary preformed bend lines parallel to the longitudinal axis of the blank, and about a number of secondary preformed bend lines crosswise to the longitudinal axis of the blank and which, together with the primary lines, define on the blank a number of panels and tabs.

[0004] On known packing machines, each blank is folded using a method comprising a given number of successive steps, the first of which normally comprises positioning the blank with a central panel facing a folding seat, and, by means of movable front-beveled folding spindles, partially folding two longitudinal lateral panels, connected to the central panel, into a U about the respective primary lines and on to respective beveled input edges of the folding seat. A product, defined by a wrapping containing a group of cigarettes, is then fed into the folding seat and on to the central panel; and the folding seat is then fed in steps along a path extending through a series of folding stations, at which the panels and tabs are folded about the respective primary and secondary lines and about the product to form a rigid hinged-lid packet of cigarettes.

[0005] The above method involves several drawbacks, due, firstly, to the high output capacity of modern packing machines and the extremely high operating speed of the folding spindles substantially "jerking" the longitudinal lateral panels about the respective primary lines. Secondly, despite the primary and secondary preformed bend lines, the rigidity of the blank, at least initially, is such as not only to prevent full rotation of the panels about the primary and second lines, but also to result, at times, in partial springback of the blank.

[0006] Consequently, as opposed to being folded, the two lateral panels may be pierced by the folding spindles, thus damaging the blank irreparably, and the residual rigidity of the blank may result in damage to the product, by the product being used as a reaction element by which to complete the folding of the panels. Moreover, again on account of the initial rigidity of the blanks, some of the panels of the finished but not yet stabilized packets of cigarettes, i.e. on which the gum used to join the panels has not yet be dried, may slip out of place, thus resulting in deformation of the packets.

[0007] Finally, abrupt folding of the longitudinal lateral panels results in "whiplashing" of the tabs connected to each panel. And since at least some of the tabs are gummed beforehand, the whiplash effect normally results in fouling of the immediate area with drops of gum.

[0008] It is an object of the present invention to provide a method of folding packing blanks, designed to overcome the aforementioned drawbacks.

[0009] According to the present invention, there is provided a method of folding packing blanks along two preformed primary bend lines parallel to a longitudinal axis of each blank, and along at least four preformed secondary bend lines crosswise to the primary lines; the lines defining, on each blank, a central panel, two longitudinal lateral panels connected to the central panel along the two primary lines, two transverse end panels connected to the central panel along a first and a second secondary line respectively, two front panels connected to the end panels along a third and a fourth secondary line respectively, and, for each longitudinal lateral panel, two tabs connected to the longitudinal lateral panel along the first and the second secondary line respectively, and located alongside said end panels; the method being characterized by comprising the steps of continuously feeding the blanks, crosswise to the respective longitudinal axes, along a path having an initial portion extending along a given conveying surface, the blanks being conveyed inside respective conveying pockets, and being initially positioned coplanar with the conveying surface; weakening each blank by imparting to a respective first end panel of said two end panels a given rotation about said first secondary line; squarely folding two first tabs of said longitudinal lateral panels by rotating the two first tabs about said first secondary line; imparting to said first end panel a counter-rotation greater than said rotation to set the first end panel to an inclined position with respect to said conveying surface; and inserting each blank inside a respective packing pocket, so that the respective said longitudinal lateral panels are folded squarely about the respective primary lines, and the blank is set to a given prepacking configuration.

[0010] A 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 a view in perspective, with parts in section and parts removed for clarity, of a first side of a central portion of a packing machine implementing the method according to the present invention;

Figure 2 shows a view in perspective, with parts in section and parts removed for clarity, of a second side of the central portion in Figure 1;

Figure 3 shows a larger-scale side view, with parts in section and parts removed for clarity, of a detail in Figure 1;

Figure 4 shows a larger-scale view in perspective, with parts in section and parts removed for clarity, of a detail in Figure 2.

[0011] Number 1 in Figures 1 and 2 indicates a central

portion of a packing machine, indicated as a whole by 2, for prefolding flat blanks 3 into a prepacking configuration.

[0012] More specifically, each blank 3 is of the type normally used in the tobacco industry for forming hinged-lid packets of cigarettes (not shown), is substantially in the form of an elongated rectangle extending along a major longitudinal axis 3a, and comprises a number of preformed transverse or "secondary" bend lines 4-8 crosswise to axis 3a, and two preformed longitudinal or "primary" bend lines 9 parallel to axis 3a. More specifically, lines 6 and 7 define, with lines 9, a central panel 10 and two longitudinal lateral panels 11 connected to panel 10 along lines 9; lines 5 and 6 and lines 7 and 8 define two transverse end panels 13 and 12 connected to panel 10 along respective lines 6 and 7; and line 8 and lines 4 and 5 define, with lines 9, two front panels 14 and 15 connected to respective panels 12 and 13 along respective lines 8 and 5. Each panel 11 has two tabs 16 connected to panel 11 along respective lines 7 and 6, and located at opposite ends of panel 11 and alongside respective panels 12 and 13; and panel 15 has a tongue 17 connected to panel 15 along line 4.

[0013] Central portion 1 comprises a pocket conveyor 18 extending along an input portion P1 of a folding path P to successively feed blanks 3 along portion P1; a packing drum 19 tangent to conveyor 18 at a transfer station S1 along path P, and rotating continuously about a horizontal axis 19a of rotation crosswise to a traveling direction D of blanks 3 along path P; and a folding drum 20, which cooperates with packing drum 19 to fold blanks 3, is substantially tangent to drum 19 at an insertion and parting station S2 along an output portion P2 of path P downstream from station S1 in direction D, and rotates continuously (in the opposite rotation direction to drum 19) about a respective axis 20a of rotation parallel to axis 19a.

[0014] As shown in Figure 3, conveyor 18 conveys blanks 3 crosswise to respective axes 3a, and comprises a belt 21 looped about two pulleys, of which only the one shown (and indicated 22) is located substantially at transfer station S1, and defines on belt 21, together with the other pulley (not shown), a conveying branch 23 extending along portion P1 and defining a conveying surface K for blanks 3. Conveyor 18 also comprises, for blanks 3, a number of conveying pockets 24 equally spaced along belt 21, and each defined by two projections 25 crosswise to direction D and integral with belt 21. More specifically, belt 21 is narrower than the length of each blank 3 measured parallel to axis 3a; projections 25 of each pocket 24 are separated by a distance equal to the width of blank 3 measured crosswise to axis 3a; and projections 25 of adjacent pockets 24 are separated by a given distance F.

[0015] Packing drum 19 comprises an annular element 26, which is defined axially by two lateral surfaces 27 crosswise to axis 19a and separated by a distance substantially equal to the distance between lines 6 and 7 of each blank 3, and is defined laterally by an outer peripheral surface 28, the section of which, crosswise to axis 19a, is defined by a polygon having a number of sides L crosswise to respective radial directions of element 26. Drum 19 also comprises a number of packing pockets 29, which are equally spaced about axis 19a, are equal in number to sides L of said polygon, and are each defined by two lateral walls 30 extending outwards from surface 28 and defined axially by surfaces 27. More specifically, each pocket 29 is substantially U-shaped, and comprises a bottom surface 31 defined by a respective side L, and two lateral surfaces 32 crosswise to respective surface 31 and separated by a distance equal to the distance between two lines 9; while each wall 30 is located astride two sides L of said polygon, and comprises a shaped outer surface 33 in turn comprising two flat lateral portions 34, and a curved central portion 35 connecting portions 34.

[0016] Lateral portions 34 of wall 30 form two rounded edges 36 with the inner lateral surfaces 32 of two adjacent pockets 29, and two substantially acute angles 37 with the respective central portion 35, which is in turn defined by a substantially cylindrical surface 38 facing forwards in the rotation direction of drum 19, and by a substantially flat surface 39 facing rearwards in the rotation direction of drum 19 and connected to surface 38 substantially at the top of portion 35. Each wall 30 also comprises a central groove 40 extending inwards of wall 30 down to the level of surfaces 31 of two adjacent pockets 29 to divide wall 30 into two parallel walls 41 separated by a distance greater than the width of belt 21 of conveyor 18.

[0017] As shown in Figure 4, folding drum 20 comprises a hollow cylindrical annular element 42 coaxial with axis 20a; and a number of folding spindles 43 on the peripheral ends of respective radial arms 44 extending radially from element 42. Each spindle 43 is substantially in the form of an isosceles triangle, the vertex of which is embedded in respective arm 44, and the base of which is located radially outwards, is defined by a curved folding surface 45 coaxial with axis 20a, and forms two acute edges 46 with the respective sides. Both annular element 42 and spindles 43 are defined axially by two flat surfaces 47 crosswise to axis 20a, and each spindle 43 comprises a pair of parting elements 48, which are fitted substantially at edges 46 on one of the two surfaces 47 only, and are each defined by an L-shaped bar 49 having two perpendicular portions 50 and 51; portion 50 being parallel to axis 20a and inserted in spindle 43, and portion 51 being parallel to a tangential direction and projecting laterally from spindle 43 and from edge 46 of spindle 43.

[0018] Operation of central portion 1 of packing machine 2 will be described with reference to one blank 3 fed along path P by a pocket 24 of conveyor 18 and initially positioned coplanar with surface K, and with respective axis 3a crosswise to traveling direction D.

[0019] Blank 3 is fed continuously by conveyor 18 into

engagement with a known first folding plate (not shown) extending on one side of conveying branch 23 of conveyor 18 up to station S1, and into engagement with a known second folding plate (not shown) and a known stabilizing device (not shown) located in series on the opposite side of branch 23.

[0020] As shown in Figure 1, the first folding plate rotates panels 12 and 14 simultaneously about line 7 by a given angle and in a given rotation direction (upwards from surface K in Figure 1) so as, firstly, to weaken blank 3 at line 7 and, secondly, to detach panel 12 from, and so free, respective tabs 16, which are then in turn engaged by the first folding plate, are rotated 90° about line 7 on the opposite side of surface K to panels 12 and 14, and are folded squarely about line 7.

[0021] At substantially the same time tabs 16 are folded squarely, a top end portion of the first folding plate engages panels 12 and 14 downwards towards surface K, to counter-rotate panel 12 about line 7 to a greater extent than the previous rotation, so that panel 12 is inclined downwards with respect to surface K, and to counter-rotate to the same extent panel 14, which, however, is counter-rotated further about line 8 to also weaken blank 3 at line 8.

[0022] As shown in Figure 2, while the first folding plate folds panels 12 and 14 as described above, the second folding plate folds tongue 17 about line 4 and into a folded position directly contacting panel 15; the stabilizing device, normally defined by two opposed rollers on opposite sides of surface K, then compresses tongue 17 and panel 15 to stabilize the folded position of tongue 17; and, finally, an end portion of the second folding plate engages panel 15 downwards towards surface K to gradually fold panel 15 squarely on the opposite side of surface K to panels 12 and 14.

[0023] At this point, blank 3 is fed to transfer station S1 where it is initially associated with a pocket 29 of packing drum 19, and where it is picked up by drum 19. As stated, each pocket 29 of drum 19 comprises two lateral walls 30, and, as these are fed by drum 19 through station S1, the respective curved central portions 35 are inserted between one pocket 24 and the next, and the respective walls 41 are positioned on either side of belt 21 to allow conveying branch 23 to run inside grooves 40. The substantially flat shape of surface 39 allows portion 35 to be inserted between a blank 3 still housed entirely inside respective pocket 24, and a blank 3 by now substantially housed inside respective pocket 29; while the substantially cylindrical shape of surface 38 allows the next portion 35 of the same pocket 29 to approach blank 3 with the same movement as blank 3, to gradually engage a rear lateral edge of blank 3, and to push blank 3 against angle 37 of surface 39. Blank 3 is thus clamped on to pocket 29 by walls 30, with the lateral edges of panels 11 substantially inside angles 37, with panels 11 facing flat lateral portions 34, and with panel 10 between edges 36 and facing bottom surface 31.

[0024] Once picked up at station S1, blank 3 is fed by respective pocket 29 along portion P2 of path P, and panels 11 and panel 10 are maintained coplanar with one another in the pickup position by a fixed curved plate 52 along the periphery of drum 19, while panel 13 and respective tabs 16 are rotated about line 6 by a further known folding plate (not shown) to the side of drum 19. Rotation of panel 13 and respective tabs 16, i.e. the tabs 16 on either side of panel 13, weakens blank 3 at line 6 so that panel 13 is inclined with respect to panel 10.

[0025] At this point, pocket 29 is fed, together with respective blank 3, through station S2 in time with a respective spindle 43, one of the two edges 46 of which intercepts blank 3 at a respective line 9 and, partially inserting the blank inside pocket 29, folds the respective panel 11 squarely using edge 36 as a reaction element. As drums 19 and 20 rotate, surface 45 rolls over panel 10, which is gradually inserted inside pocket 29 and on to bottom surface 31. When the other edge 46 also intercepts blank 3 at the other line 9, the other panel 11 is also folded squarely using respective edge 36 as a reaction element.

[0026] As panels 11 are being folded squarely, the tabs 16 previously folded squarely along portion P1 of path P are positioned facing respective panel 12, while the other tabs 16, partially folded by said further folding plate, intercept portions 51 of parting elements 48, and, as opposed to remaining coplanar with respective panels 11, are parted to form a V with the vertex facing inwards of pocket 29. At this point, blank 3 is fully inserted inside pocket 29 in a prepacking configuration, ready to receive a respective inner wrapping (not shown) containing a group of cigarettes (not shown), and wherein: panels 10 and 11 are positioned respectively contacting bottom surface 31 and lateral surfaces 32; panel 12 is positioned substantially obliquely with respect to panel 10; panel 14 is positioned crosswise to panel 10; two tabs 16 are positioned facing panel 12; the other two tabs 16 are parted and located outside pocket 29; and panel 13 is inclined with respect to panel 10.

[0027] Central portion 1 as described therefore provides, not only for preweakening blanks 3 along most of the bend lines, but also for easing blanks 3 gently inside respective packing pockets 29 with no risk of blanks 3 being damaged or torn.

Claims

1. A method of folding packing blanks along two preformed primary bend lines (9) parallel to a longitudinal axis (3a) of each blank (3), and along at least four preformed secondary bend lines (4-8) crosswise to the primary lines (9); the lines (9, 4-8) defining, on each blank (3), a central panel (10), two longitudinal lateral panels (11) connected to the central panel (10) along the two primary lines (9),

two transverse end panels (12, 13) connected to the central panel (10) along a first and a second secondary line (7, 6) respectively, two front panels (14, 15) connected to the end panels (12, 13) along a third and a fourth secondary line (8, 5) respectively, and, for each longitudinal lateral panel (11), two tabs (16) connected to the longitudinal lateral panel (11) along the first and the second secondary line (7, 6) respectively, and located alongside said end panels (12, 13); the method being characterized by comprising the steps of continuously feeding the blanks (3), crosswise to the respective longitudinal axes (3a), along a path (P) having an initial portion (P1) extending along a given conveying surface (K), the blanks (3) being conveyed inside respective conveying pockets (24), and being initially positioned coplanar with the conveying surface (K); weakening each blank (3) by imparting to a respective first end panel (12) of said two end panels (12, 13) a given rotation about said first secondary line (7); squarely folding two first tabs (16) of said longitudinal lateral panels (11) by rotating the two first tabs (16) about said first secondary line (7); imparting to said first end panel (12) a counter-rotation greater than said rotation to set the first end panel (12) to an inclined position with respect to said conveying surface (K); and inserting each blank (3) inside a respective packing pocket (29), so that the respective said longitudinal lateral panels (11) are folded squarely about the respective primary lines (9), and the blank (3) is set to a given prepacking configuration.

2. A method as claimed in Claim 1, characterized in that a first front panel (14) of said two front panels (14, 15) is rotated partially about a respective third secondary line (8), and is positioned crosswise to said conveying surface (K) during counter-rotation of said first end panel (12).

3. A method as claimed in Claim 2, characterized in that each of said blanks (3) also comprises a tongue (17) connected along a fifth preformed secondary bend line (4) to a second front panel (15) of said two front panels (14, 15); the method comprising the further steps of folding each tongue (17) about the respective said fifth secondary line (4) to set the tongue (17) to a folded position, and stabilizing each tongue (17) in the folded position.

4. A method as claimed in Claim 3, characterized in that said steps of weakening the blanks (3) and folding the respective tongues (17) are performed substantially simultaneously.

5. A method as claimed in Claim 3 or 4, characterized by comprising the further step of rotating said second front panel (15) about the respective fourth secondary line (5) into a position crosswise to said conveying surface (K) and on the opposite side of the conveying surface (K) to the respective said first front panel (14).

6. A method as claimed in any one of the foregoing Claims from 1 to 5, characterized by comprising the further step of transferring the blanks (3) from the respective conveying pockets (24) to said packing pockets (29) at a transfer station (S1) located along the initial portion (P1) of said path (P); said packing pockets (29) mating gradually with said conveying pockets (24), and each having two substantially flat locating elements (34, 36) for housing said longitudinal lateral panels (11) and maintaining the longitudinal lateral panels (11) coplanar with with the respective central panel (10).

7. A method as claimed in Claim 6, characterized in that said packing pockets (29) move continuously along an end portion (P2) of said path (P); the step of inserting each blank (3) inside a respective packing pocket (29) being performed by first engaging the central panel (10) of the blank (3) at a first primary line (9), and causing the central panel (10) to adhere gradually to a bottom wall (31) of the packing pocket (29); said locating elements (34, 36) acting as folding elements to fold the respective said longitudinal lateral panels (11) squarely.

8. A method as claimed in Claim 7, characterized in that said end portion (P2) extends along an insertion and parting station (S2) through which shaped spindles (43) are fed in time with said packing pockets (29); each shaped spindle (43) being inserted gradually inside a respective packing pocket (29) and rolling on the bottom wall (31) of the packing pocket (29).

9. A method as claimed in Claim 8, characterized in that said step of inserting each blank (3) inside a respective packing pocket (29) comprises the substep of parting two second tabs (16) of said longitudinal lateral panels (11) by rotating the two second tabs (16) about said second secondary line (6).

10. A method as claimed in Claim 9, characterized in that said spindles (43) comprise respective pairs of parting elements (48) for engaging said second tabs (16) as the respective said longitudinal lateral panels (11) are being folded squarely.

11. A method as claimed in any one of the foregoing Claims from 6 to 10, characterized in that said packing pockets (29) comprise respective pairs of shaped clamping elements (33); each shaped clamping element (33) cooperating with a respective said longitudinal lateral panel (11) to withdraw

the respective blank (3) from the respective conveying pocket (24) by inserting the longitudinal lateral panel (11) between the shaped clamping element (33) and the respective locating element (34, 36).

12. A method as claimed in Claim 11, characterized in that each said shaped clamping element (33) has an outer lateral surface (39) moving through said transfer station (S1) at a given speed equal to a traveling speed of the blanks (3) along the initial portion (P1) of said path (P).

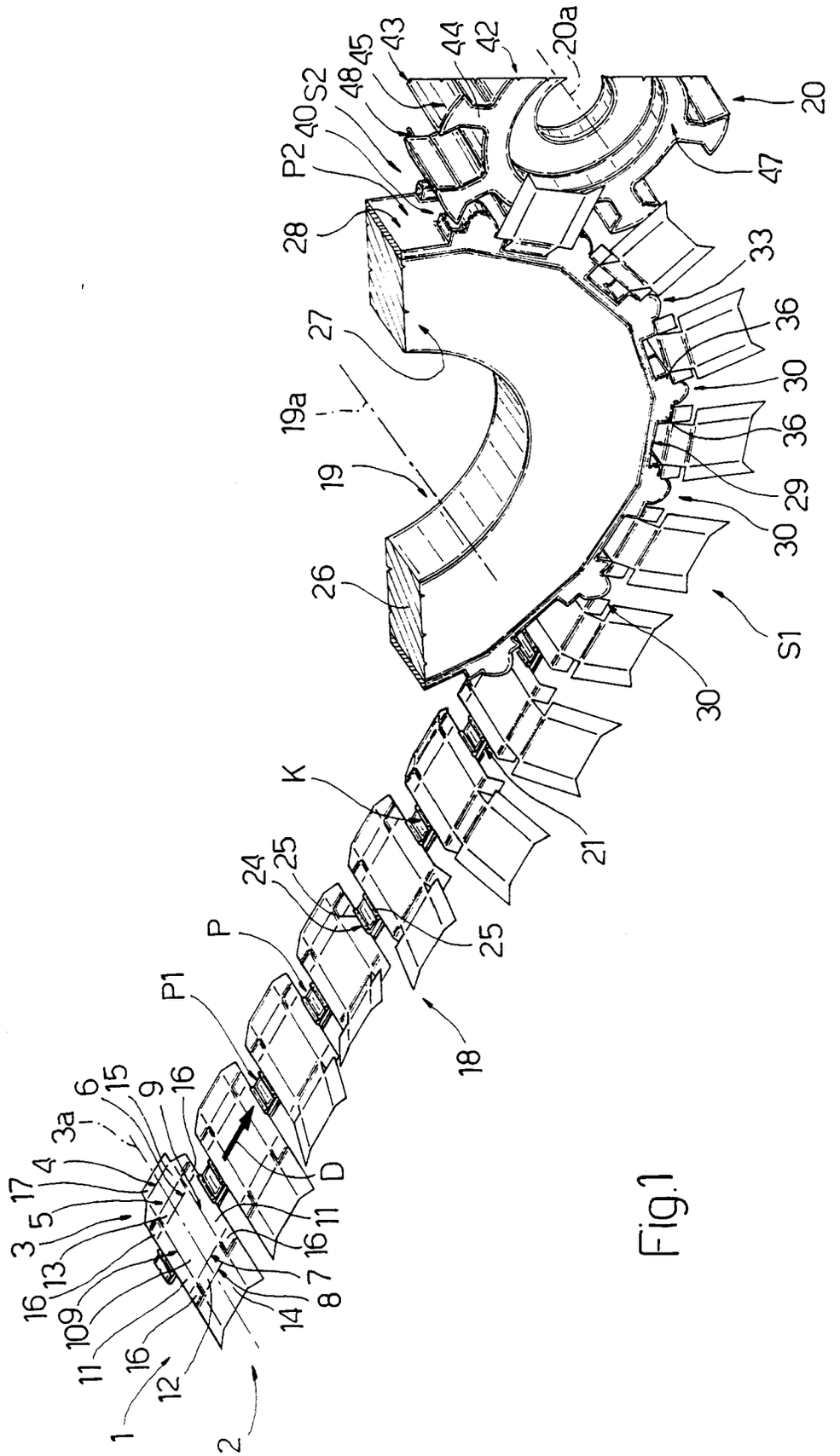
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Fig.1

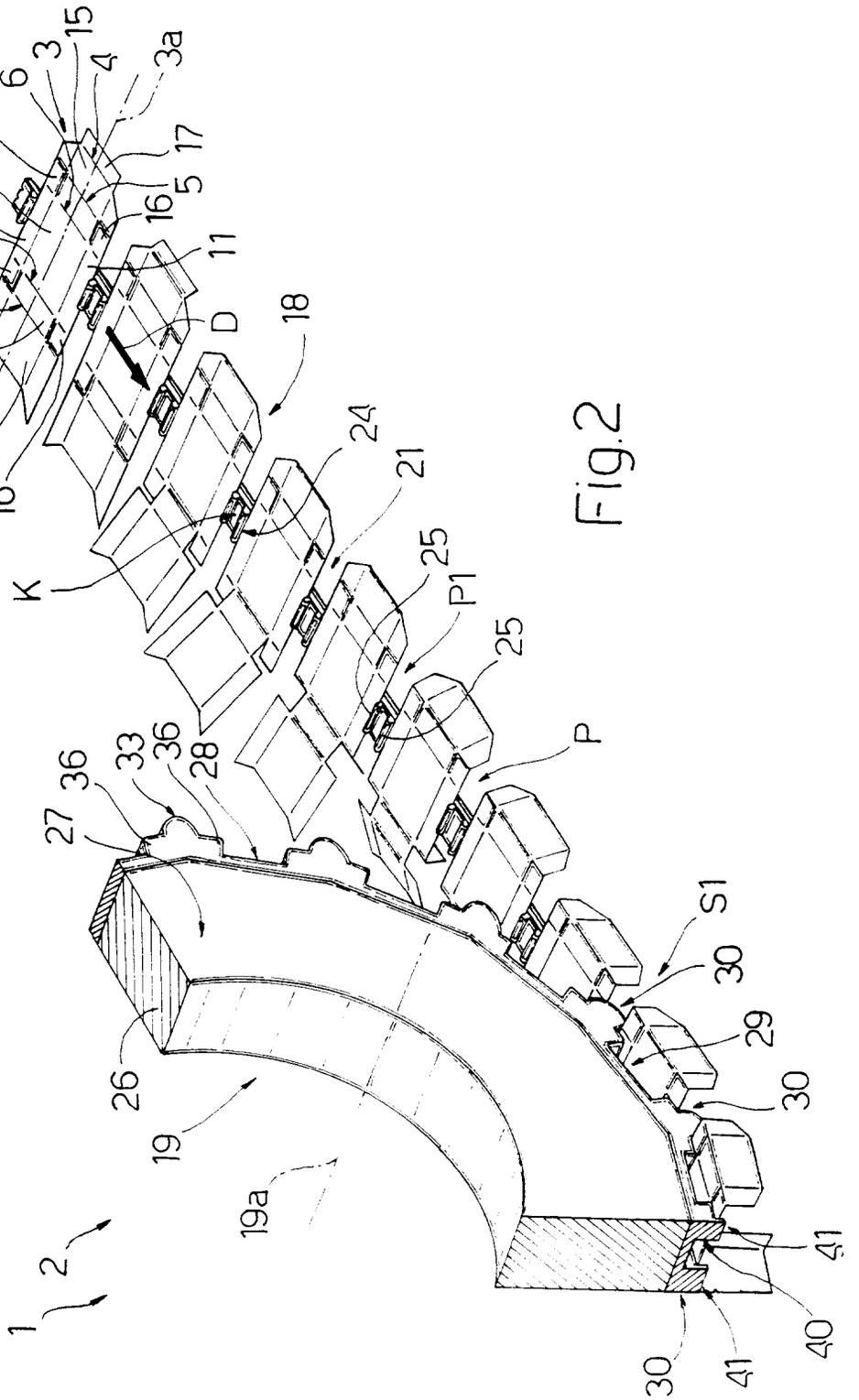
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Fig.2

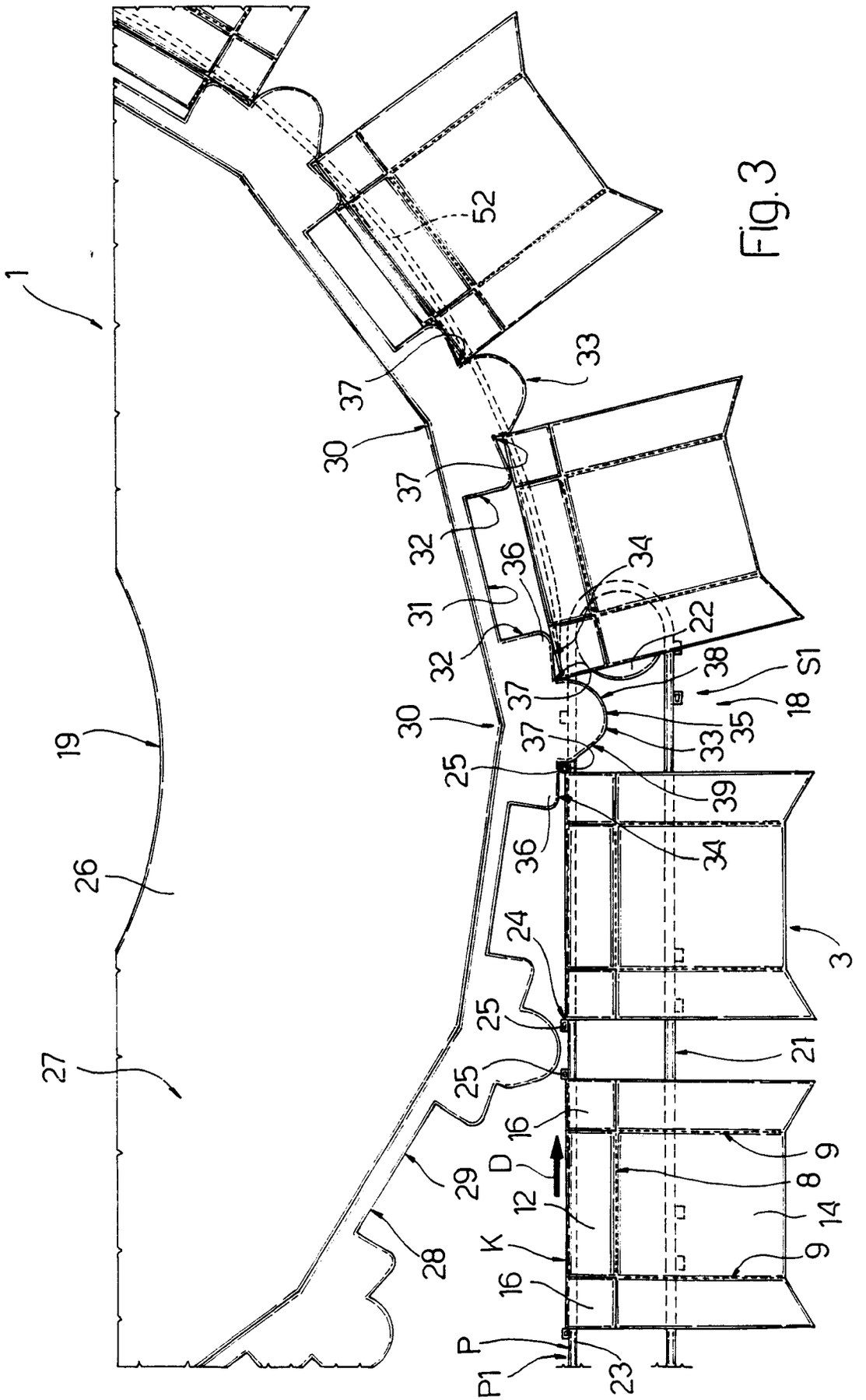
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Fig.3

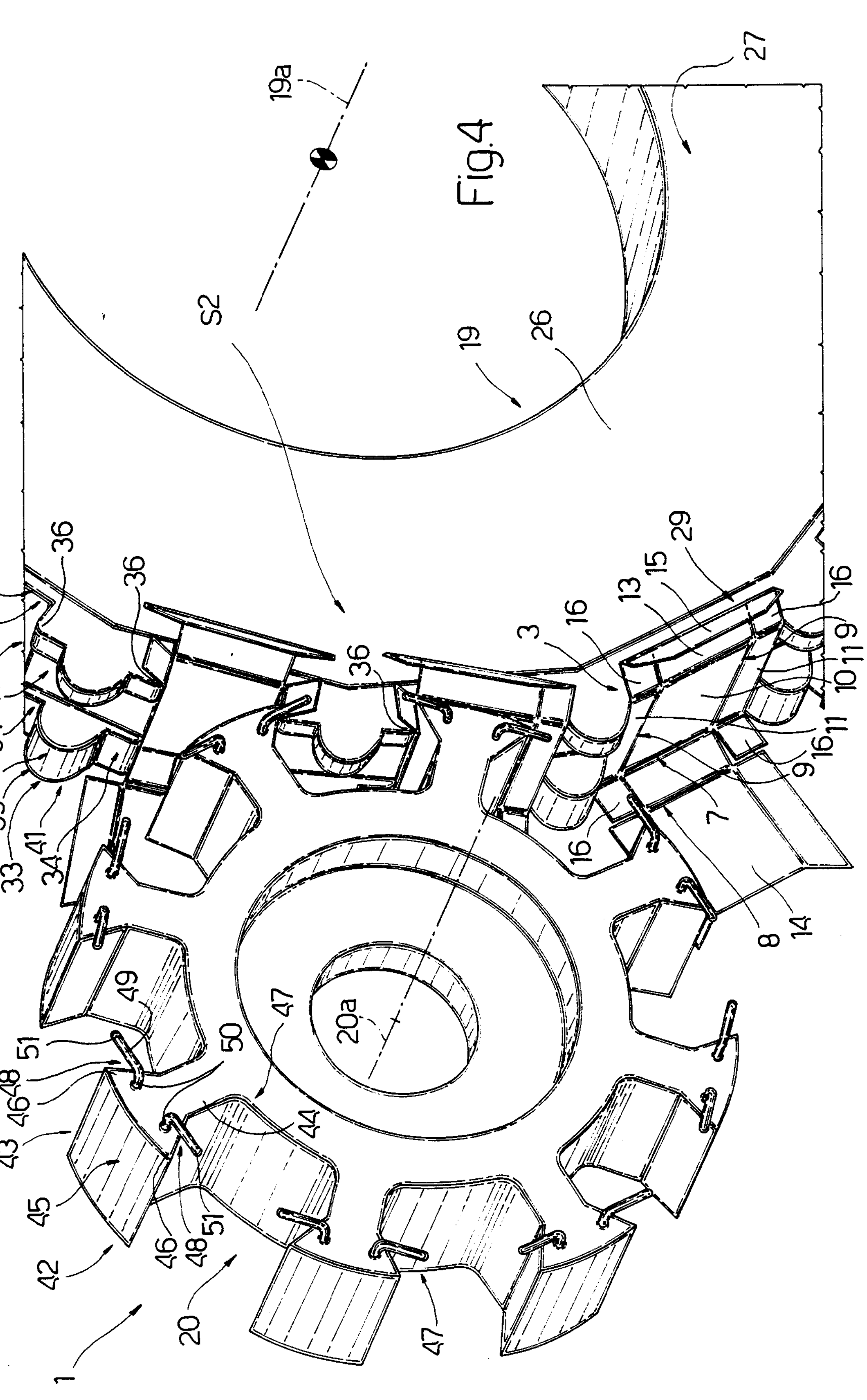

Fig.4

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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 6688

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B31B
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 December 1998	Pipping, L

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