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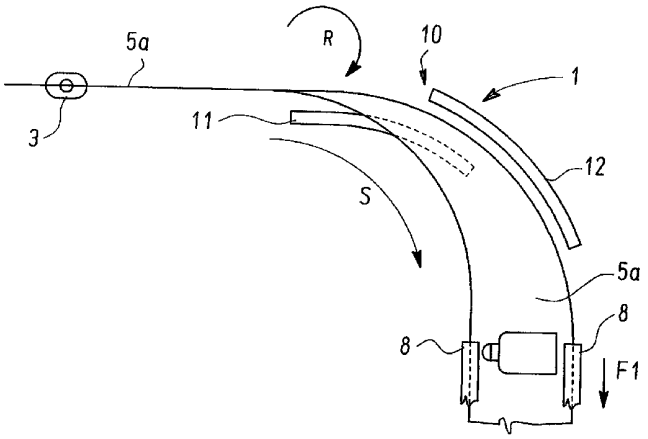
(54) Title: APPARATUSES AND METHODS



(57) Abstract: An apparatus for forming containers (3) from sheet material comprises in sequence a forming station in which precursors of said containers (3) are formed from a continuous strip (5) of said sheet material, said strip (5) being indexed along an advance direction (F, F2) in a substantially vertical position, a filling station in which said percursors are filled with product introduced through respective openings, a sealing station (2) in which said openings are sealed for closing said containers (3), a rotation station (1) in which said strip (5) is transferred from said vertical position to a horizontal position for being introduced into a severing station in which said containers (3) are severed from said strip (5), in said rotation station a lower edge (15) of said strip (5) being associated with support means (9) which substantially bears the weight of said containers (3); a method for obtaining containers (3) from sheet material comprises indexing along an advance direction (F, F2) a continuous strip (5) of said sheet material in substantially vertical position, forming precursors of said containers (3) in said strip (5), filling said precursors by inserting thereinto a product through respective openings, sealing said openings for closing said containers, rotation said strip (5) from said vertical position to a horizontal positon, servering said containers (3) from said strip (5), during said rotating, supporting said strip (5) through support means (9) being provided.

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Apparatuses and methods

The invention relates to a system for forming containers from a strip of sheet material.

Prior art comprises systems provided with a forming station in which precursors of containers are formed from sheet material arranged in a vertical position. The sheet material, forming a continuous strip in which the precursors have been obtained, is then indexed along an advance direction through a filling station in which a product is introduced into each precursor through an opening obtained at an upper portion thereof. Downstream of the filling station, a sealing station is provided in which sealing devices, such as sealing bars, seal the openings thus avoiding product spillage before the container being used.

The known apparatuses further comprise a severing station in which formed, filled and sealed containers are severed from the sheet material by severing means.

Between the sealing station and the severing station a rotation station is interposed comprising an operative space inside which the sheet material carrying the formed, filled and sealed containers is subjected to a double rotation: in a first rotation, the sheet material, originally arranged in a vertical plane, is driven to a horizontal plane, and, in a second rotation the sheet material is bent to a direction extending perpendicularly of the advance direction to enter into the severing station.

Te first and second rotations are carried out by merely introducing the sheet material in the above-mentioned operative space, and letting it assume a configuration defined by gravity forces. Thus, no restraint or guide elements are interposed between the outlet of the sealing station and the inlet of the severing station. The first and second rotation are achieved as a consequence of a certain elasticity of the sheet material and are facilitated by inlet and support means

provided at the inlet of the severing station, which causes the sheet material to be adequately positioned.

A disadvantage of this known system is that only containers of small dimensions can be processed.

In fact, in case of containers having a relatively high capacity, and consequently a relatively high weight, risks of damages, or failures, of the sheet material are present, with consequent waste of time and production defective containers.

In known systems, the severing means comprises punch-and-matrix means placed at opposite sides of the continuous strip which are operated so as to clamp the sheet material, sever the filled and sealed containers from the strip and then release the sheet material.

After the filled and sealed containers are severed, the remaining portion of the sheet material, i.e. the scrap, has to be discharged from the operating region of the machine.

The scrap is wound on reels arranged downstream of the severing means, which causes problems of encumbrance and subsequent handling.

An object of the present invention is to improve the known systems indicated above.

A further object is to provide a system for manufacturing formed, filled and sealed containers, in which containers may have relatively high dimensions, and capacity.

Another object is to improve the discharging systems for scrap of sheet material in thermo-forming machines.

A further object is to obtain an apparatus through which the manufacturing scrap of sheet material can be efficiently discharged.

A still further object is to reduce the encumbrance and consequently to facilitate handling and discharging of manufacturing scrap of sheet material.

In a first aspect of the invention, a forming apparatus for forming containers from sheet material is provided, comprising

in sequence a forming station in which precursors of said containers are formed from a continuous strip of said sheet material, said strip being indexed along an advance direction in a substantially vertical position, a filling station in which said precursors are filled with product introduced through respective openings, a sealing station in which said openings are sealed for closing said containers, a rotation station in which said strip is transferred from said vertical position to a horizontal position for introduction into a severing station in which said containers are severed from said strip, characterized in that in said rotation station a lower edge of said strip is associated with support means which substantially bears the weight of said containers.

In an advantageous version, the apparatus further comprises deflecting means associated with said support means and suitable for forcing the strip to advance during indexing along a transferring direction oblique with respect to the above-mentioned advance direction.

In another advantageous version, the transferring direction is substantially perpendicular to the advance direction.

In a second aspect of the invention, a method for forming containers from sheet material is provided, comprising indexing along an advance direction a continuous strip of said sheet material in a substantially vertical position, forming precursors of said containers in said strip, filling said precursors by introducing thereinto a product through respective openings, sealing said openings for closing said containers, rotating said strip from said vertical position to a horizontal position, severing said containers from said strip, characterized in that, during said rotating, supporting said strip through support means is provided.

In an advantageous version, during said rotating, deflecting said strip through suitable deflecting means is further

provided for moving said strip along a transferring direction oblique with respect to said advance direction.

In another advantageous version, the transferring direction is substantially perpendicular to the advance direction.

Owing to these aspects of the invention, it is possible to obtain a system for working a continuous strip of sheet material for manufacturing formed, filled and sealed containers therefrom, in which the range of dimensions of the containers which can be formed is remarkably increased.

Advantageously, this is obtained without using motorized devices arranged for rotating the strip, which assures extreme constructive simplicity, extremely small maintenance needs and limited risk of damaging the strip.

In a third aspect of the invention, an apparatus is provided, comprising severing means for severing filled and sealed containers from sheet material indexed through said severing means along an advance direction, and scrap discharging means of said sheet material arranged downstream of said severing means along said advance direction, characterized in that said discharging means comprises conveyor means arranged for receiving said scrap.

In a fourth aspect of the invention, a method is provided comprising severing filled and sealed containers from sheet material indexed through severing means along an advance direction and discharging scrap of said sheet material downstream of said severing means along said advance direction, characterized in that said discharging comprises discharging said scrap on conveyor means.

Owing to these aspects of the invention, the scrap can be discharged in a quite efficient manner, since the scrap can be split into portions which are collected by conveyor means.

The invention can be better understood and carried out with reference to the attached drawings, which show some

exemplifying and not restrictive embodiments thereof, in which:

Figure 1 is a sketched front view of a rotation station of the apparatus according to the invention, in which a strip of sheet material is subjected to a single rotation;

Figure 2 is a sketched top view of the rotation station of Figure 1;

Figure 3 is a view like Figure 1, showing a strip subjected to a double rotation;

Figure 4 is a sketched top view of the rotation station of Figure 3;

Figure 5 is a view like Figure 4, showing a strip moved along a curvilinear path before being subjected to a double rotation;

Figure 6 is a top view of the apparatus according to the invention, according to a preferred embodiment;

Figure 7 is a front, partially sectioned view of the apparatus of Figure 6, in a starting configuration of a working cycle;

Figure 8 is a view like Figure 2 in a working configuration.

With reference to Figures 1 and 2, a strip 5 of sheet material is shown in which containers 3 have been formed and filled respectively at a forming station and a filling station, not shown. The strip 5 is then indexed along an advance direction F through a sealing station 2 in which a pair of sealing elements 4 mutually approachable and movable away, as indicated by the arrows A and B, seal open ends of the containers 3 through which the containers 3 have been filled with a product. The strip 5 comprises a first film 6 and a second film 7 of sheet material mutually facing. In a version not shown, the strip 5 can comprise a single film folded around a middle longitudinal axis thereof so as to obtain a pair of overlapped edge of sheet material.

In a rotation station 1, the strip 5 is rotated from a vertical plane, occupied during the preceding forming, filling

and sealing operations, until it reaches a horizontal position before being introduced into a severing station, not shown.

A portion 5a of the strip 5, comprised between the outlet of the sealing station 2 and driving means 8 placed upstream of the severing station, does not interact with guide elements which provide for holding said portion 5a in vertical position, thereby said portion 5a rotates by gravity, as represented by the arrow R, until it reaches a horizontal position. During the rotation, the portion 5a is supported by support means 9 which, by interacting with a lower edge 15 of the strip 5, supports the weight of the containers 3 associated thereto, so preventing possible failure risks of the strip 5.

As shown in Figures 3 and 4, the rotation station 1 can comprises deflecting means 10, comprising a pair of guides 11, 12 fixed by connecting elements 13 to the support means 9 and arranged for driving the strip 5 during the rotation indicated by the arrow S which causes the strip 5 to be moved toward the following severing station by proceeding along a transferring direction F1 perpendicular to the advance direction F, following which the above mentioned strip 5 has been passed through the forming, filling and sealing stations. For this purpose, the guides 11, 12 are conformed so as to show a curvilinear profile which acts like an invitation in relation with an intermediate portion 14 of the strip 5 in order to cause the strip 5 to carry out the desired rotation.

With reference to Figure 5, a version of the rotation station 1 is shown, in which the guides 11, 12 are conformed so that the strip 5 is caused to advance along a double curve before the rotation of the strip 5 is carried out.

Advantageously, the double curve shows an S-like profile.

With reference to the Figures 6 to 8, an apparatus is shown comprising a severing station 22 toward which filled and sealed containers 3 are indexed along an advance direction F2

by not shown indexing means, the containers 3 being slidably engaged in longitudinal edge regions, parallel to the advance direction F2, by a pair of guides 26.

Upstream of the severing station 22, thermo-forming means may be provided arranged for thermo-forming cavities from said sheet material so as to define precursors of containers to be filled having a closed contour except for regions intended for allowing a content to be introduced into said containers 3, filling means arranged for filling the cavities through said regions with a product at least initially flowing and sealing means arranged for sealing the filled cavities so as to obtain the containers 3.

When the containers 3 reach the severing station 22, they are joined to a strip of sheet material 28 from which they have been initially formed.

In the severing station 22, severing means are provided comprising a severing punch 30 provided with punching portions 31 operatively associated with edges 32 of a severing matrix 33, the severing punch 30 and the severing matrix 33 being positioned at opposite sides with respect to a severing plane of the sheet material 28 defined by the guides 26 and being operated to be tightened on the sheet material 28 by not shown actuating means in the direction indicated by the arrows F3, F4 so as to sever a container 3, or groups of containers 3, from the sheet material 28 and subsequently to be moved away from the sheet material 28.

After the first container 3 has been detached from the sheet material 28, the sheet material is further indexed along the direction F2 until a scrap 34 of sheet material 8 carrying an opening 36 corresponding to the outline of the detached container 3 protrudes from the severing means 30, 33 at the side opposed to the entry of the containers 3 into the severing station 22 (Figure 8).

The severing punch 30 is provided, at a portion thereof oriented toward the scrap 34, with a first knife blade 38, designed for being functionally associated with a second knife blade 40 provided on the severing matrix 33 when the severing punch means 30 and the severing matrix means 33 are actuated in the direction indicated by the arrows F3, F4 so as to detach the scrap 34 from the strip of sheet material 28.

The detached scrap 34 is received on a conveyor 42, placed therebelow immediately downstream of the severing station 30, the conveyor 42 conveying the detached scrap 34 along a discharging direction F5, orthogonal to the advance direction F3, toward a collecting container 44.

The containers 3 severed from the strip of sheet material 8 in the severing station 30 fall on a further conveyor belt 46 which advances the severed containers 3 along a further discharging direction F6, orthogonal to the discharging direction F5 and therefore parallel to the advance direction F2, toward a further container 50.

In the severing station 22, ejecting means, not shown, can be provided, arranged for facilitating the containers 3 to fall on the further conveyor belt 46 after the containers 3 have been severed from the sheet material 28.

The severing punch 30 and the severing matrix 33 can be provided with recesses 52, 54 respectively arranged for housing therein the containers 3, still to be severed from the sheet material 8, lying between the severing punch 30 and the severing matrix 33 when the severing punch 30 and the severing matrix 33 are tightened to each other for severing a more advanced container 3.

CLAIMS

1. Apparatus for forming containers (3) from sheet material, comprising in sequence a forming station in which precursors of said containers (3) are formed from a continuous strip (5) of said sheet material, said strip (5) being indexed along an advance direction (F, F2) in a substantially vertical position, a filling station in which said precursors are filled with product introduced through respective openings, a sealing station (2) in which said openings are sealed for closing said containers, a rotation station (1) in which said strip (5) is transferred from said vertical position to a horizontal position for introduction into a severing station in which said containers (3) are severed from said strip (5), characterized in that in said rotation station (1) a lower edge (15) of said strip (5) is associated with support means (9) which substantially bears the weight of said containers (3).

2. Apparatus according to claim 1, wherein said support means (9) comprises slide plane means arranged for receiving and supporting said strip (5).

3. Apparatus according to claim 1, or 2, and further comprising deflecting means (10) suitable for deflecting said strip (5) for driving said strip (5) along a transferring direction (F1) oblique with respect to said advance direction (F).

4. Apparatus according to claim 3, wherein said transferring direction (F1) is substantially perpendicular to said advance direction (F).

5. Apparatus according to claim 3, or 4, wherein said deflecting means (10) is associated with said support means (9).

6. Apparatus according to any one of claims 3 to 5, wherein said deflecting means (10) comprises guide

means (11, 12) suitable for interacting with an intermediate portion (14) of said strip (5) for driving said strip (5) along said transferring direction (F1).

7. Apparatus according to claim 6, wherein said guide means (11, 12) has a curvilinear profile.

8. Apparatus according to claim 6, or 7, wherein said guide means (11, 12) is arranged for defining a path for said strip (5) having a S-like shape.

9. Apparatus according to any one of claims 3 to 8, and further comprising driving means (8) suitable for driving said strip (5) along said transferring direction (F1).

10. Apparatus according to claim 9, wherein said driving means (8) slidably receives edge regions of said strip (5).

11. Apparatus according to any one of the preceding claims, and further comprising severing means (30, 33) suitable for severing said containers (3) from said strip (5).

12. Apparatus according to claim 11, and further comprising discharging means (42) suitable for discharging scrap (34) of said sheet material (5) produced by said severing means (30, 33).

13. Apparatus according to claim 12, wherein said discharging means (42) is arranged downstream of said severing means (30, 33) along said advance direction (F2).

14. Apparatus according to claim 12, or 13, wherein said discharging means comprises conveyor means (42) arranged for receiving said scrap (34).

15. Apparatus according to claim 14, wherein said conveyor means comprises belt conveyor means (42).

16. Apparatus according to claim 14, or 15, wherein said conveyor means (42) is arranged below a severing plane

at which said containers (3) are severed from said strip (5).

17. Apparatus according to any one of claims 14 to 16, wherein said conveyor means (42) is oriented according to a discharging direction (F5) which does not coincide with said advance direction (F2).

18. Apparatus according to claim 17, wherein said discharging direction (F5) is substantially orthogonal to said advance direction (F2).

19. Apparatus according to any one of claims 11 to 18, wherein said severing means (30, 33) comprises scrap severing means (38, 40).

20. Apparatus according to claim 19, wherein said scrap severing means comprises cutting means (38) associated with severing punch means (30) of said severing means (30, 33) and further cutting means (40) associated with severing matrix means (33) of said severing means (30, 33).

21. Apparatus according to any one of claims 11 to 20, and further comprising further conveyor means (46) arranged for receiving said containers (3) after said containers (3) have been severed from said strip (5) by said severing means (30, 33).

22. Apparatus according to claim 21, wherein said further conveyor means comprises further belt conveyor means (46).

23. Apparatus according to claim 22, as appended to claim 17, or 18, or to any one of claims 19 to 21 as appended to claim 17, or 18, wherein said further conveyor means (46) is oriented according to a further discharging direction (F6) which does not coincide with said discharging direction (F5).

24. Apparatus according to claim 23, wherein said further discharging direction (F6) is substantially orthogonal to said discharging direction (F5).

25. Apparatus according to any one of claims 11 to 24, and further comprising indexing means arranged for indexing said sheet material towards said severing means.

26. Method for forming containers (3) from sheet material, comprising indexing along an advance direction (F, F2) a continuous strip (5) of said sheet material in a substantially vertical position, forming precursors of said containers (3) in said strip (5), filling said precursors by inserting thereinto a product through respective openings, sealing said openings for closing said containers (3), rotating said strip (5) from said vertical position to a horizontal position, severing said containers (3) from said strip (5), characterized in that, during said rotating, supporting said strip (5) through support means (9) is provided.

27. Method according to claim 26, wherein, during said rotating, deflecting said strip (5) through suitable deflecting means (10) is provided for moving said strip (5) along a transferring direction (F1) oblique with respect to said advance direction (F).

28. Method according to claim 27, wherein said transferring direction (F1) is substantially perpendicular to said advance direction (F).

29. Method according to claim 27, or 28, wherein said deflecting comprises causing an intermediate portion (14) of said strip (5) to interact with said deflecting means (10).

30. Method according to any one of claims 27 to 29, wherein said deflecting comprises deflecting said strip (5) along a path having a S-like shape.

31. Method according to any one of claims 26 to 30, and further comprising severing said containers (3) from said strip (5).

32. Apparatus according to claim 31, wherein said severing takes place during advancing said strip (5) through severing means (30, 33)

33. Method according to claim 31, or 32, wherein, after said severing, discharging scrap (34) of said sheet material is provided.

34. Method according to claim 33, wherein said discharging comprises discharging said scrap (34) on conveyor means (42).

35. Method according to claim 34, wherein said discharging takes place below a severing plane at which said containers (3) are severed from said strip (5).

36. Method according to any one of claims 33 to 35, wherein said discharging takes place along a discharging direction (F5) which does not coincide with said advance direction (F2).

37. Method according to claim 36, wherein said discharging direction (F5) is substantially orthogonal to said advance direction (F2).

38. Method according to any one of claims 31 to 37, and further comprising, after said severing, receiving said containers (3) on further conveyor means (46).

39. Method according to claim 38 as appended to claim 36, or 37, wherein said further conveyor means (46) is oriented according to a further discharging direction (F6) which does not coincide with said discharging direction (F5).

40. Method according to claim 39, wherein said further discharging direction (F6) is substantially orthogonal to said discharging direction (F5).

41. Method according to claim 32, or to any one of claims 33 to 40 as appended to claim 32, and further comprising indexing means arranged for indexing said sheet material through said severing means (30, 33) for causing said scrap (34) to exit from a side of said severing means (30, 33) opposed to the introduction side.

42. Apparatus, comprising severing means (30, 33) for severing filled and sealed containers (3) from sheet material (28) indexed through said severing means (30, 33) along an advance direction (F2), and scrap discharging means (42) of said sheet material (28) arranged downstream of said severing means (30, 33) along said advance direction (F2), characterized in that said discharging means (42) comprises conveyor means (42) arranged for receiving said scrap (34).

43. Apparatus according to claim 42, wherein said conveyor means comprises belt conveyor means (42).

44. Apparatus according to claim 42, or 43, wherein said conveyor means (42) is arranged below a severing plane at which said containers (3) are severed from said sheet material (28).

45. Apparatus according to any one of claims 42 to 44, wherein said conveyor means (42) is oriented according to a discharging direction (F5) which does not coincide with said advance direction (F2).

46. Apparatus according to claim 45, wherein said discharging direction (F5) is substantially orthogonal to said advance direction (F2).

47. Apparatus according to any one of claims 42 to 46, wherein said severing means (30, 33) comprises scrap severing means (38, 40).

48. Apparatus according to claim 47, wherein said scrap severing means comprises cutting means (38) associated

with severing punch means (30) of said severing means (30, 33) and further cutting means (40) associated with severing matrix means (33) of said severing means (30, 33).

49. Apparatus according to any one of claims 42 to 47, and further comprising further conveyor means (46) arranged for receiving said containers (3) after said container (3) have been severed from said sheet material (28) by said severing means (30, 33).

50. Apparatus according to claim 49, wherein said further conveyor means comprises further belt conveyor means (46).

51. Apparatus according to claim 49, or 50 as appended to claim 45, or 46, or to claim 47, or 48 as appended to claim 45, or 46, wherein said further conveyor means (46) is oriented according to a further discharging direction (F6) which does not coincide with said discharging direction (F5).

52. Apparatus according to claim 51, wherein said further discharging direction (F6) is substantially orthogonal to said discharging direction (F5).

53. Apparatus according to any one of claims 42 to 52, and further comprising indexing means arranged for indexing said sheet material (28) towards said severing means (30, 33).

54. Method, comprising severing filled and sealed containers (3) from sheet material (28) indexed through severing means (30, 33) along an advance direction (F2) and discharging scrap (34) of said sheet material (28) downstream of said severing means (30, 33) along said advance direction (F2), characterized in that, said discharging comprises discharging said scrap (34) on conveyor means (22).

55. Method according to claim 54, wherein said discharging takes place below a severing plane at which said containers (3) are severed from said sheet material (28).

56. Method according to claim 54, or 55, wherein said discharging takes place along a discharging direction (F5) which does not coincide with said advance direction (F2).

57. Method according to claim 56, wherein said discharging direction (F5) is substantially orthogonal to said advance direction (F2).

58. Method according to any one of claims 54 to 57, and further comprising severing said scrap (34) from said sheet material (28).

59. Method according to any one of claims 54 to 58, and further comprising receiving said containers (3) on further conveyor means (46) after said containers (3) have been severed from said sheet material (28) by said severing means (30, 33).

60. Apparatus according to claim 59 as appended to claim 56, or 57, or to claim 58 as appended to claim 56, or 57, wherein said further conveyor means (26) is oriented according to a further discharging direction (F6) which does not coincide with said discharging direction (F5).

61. Method according to claim 60, wherein said further discharging direction (F6) is substantially orthogonal to said discharging direction (F5).

62. Method according to any one of claims 54 to 61, and further comprising indexing means arranged for indexing said sheet material (28) through said severing means (30, 33) for causing said scrap (34) to exit from a side of said severing means (30, 33) opposed to the introduction side.

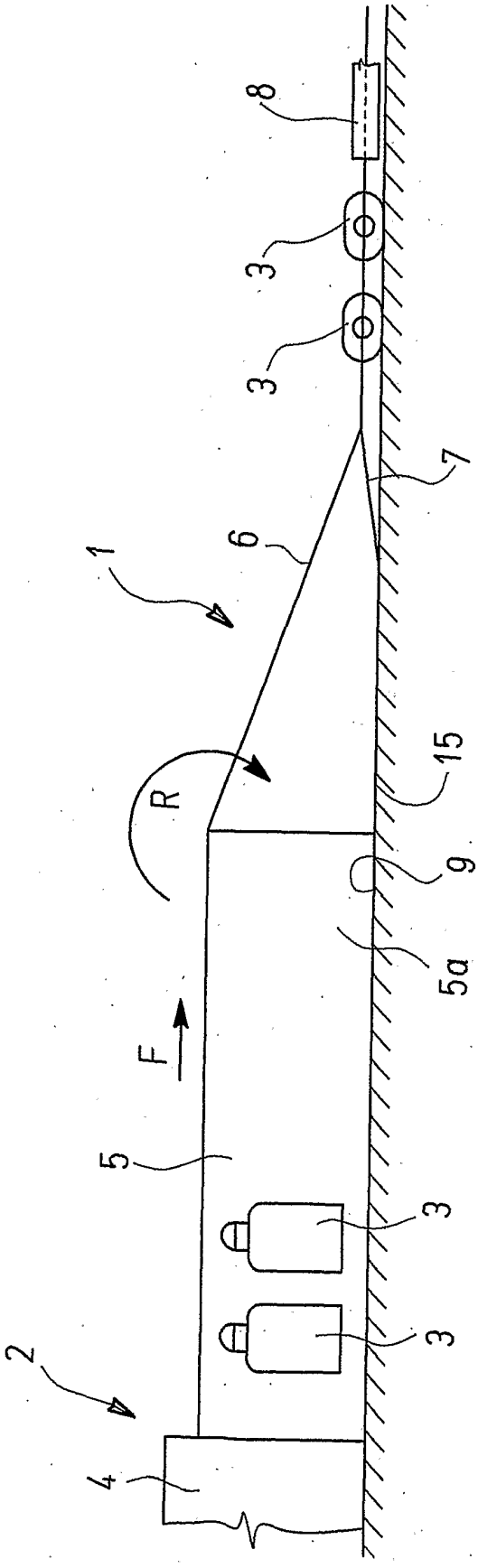

Fig.1

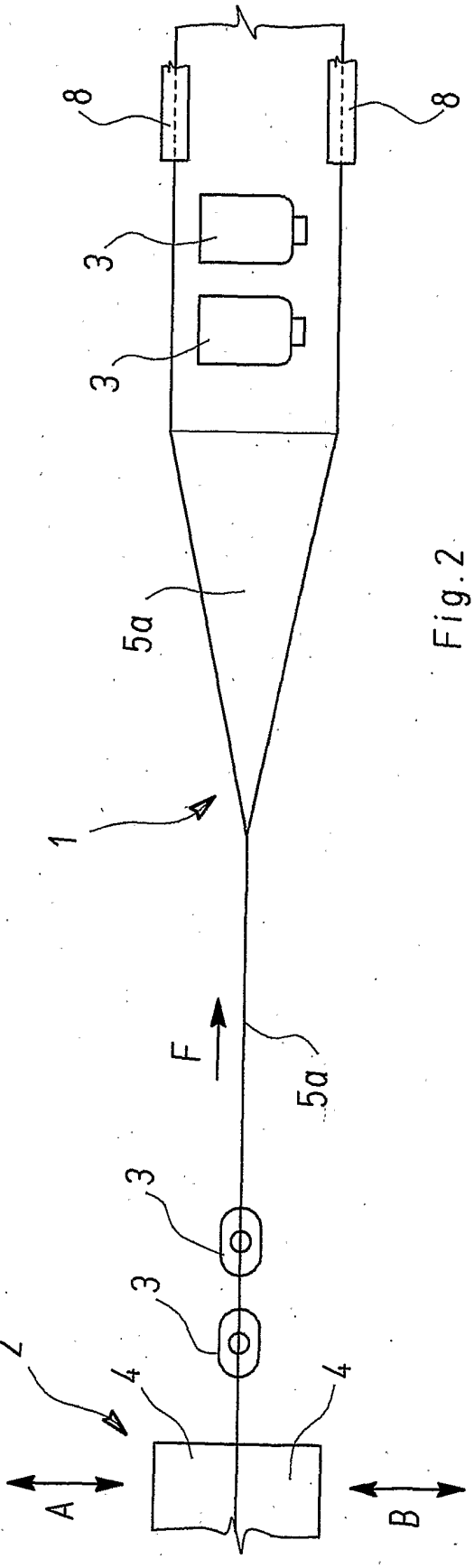

Fig.2

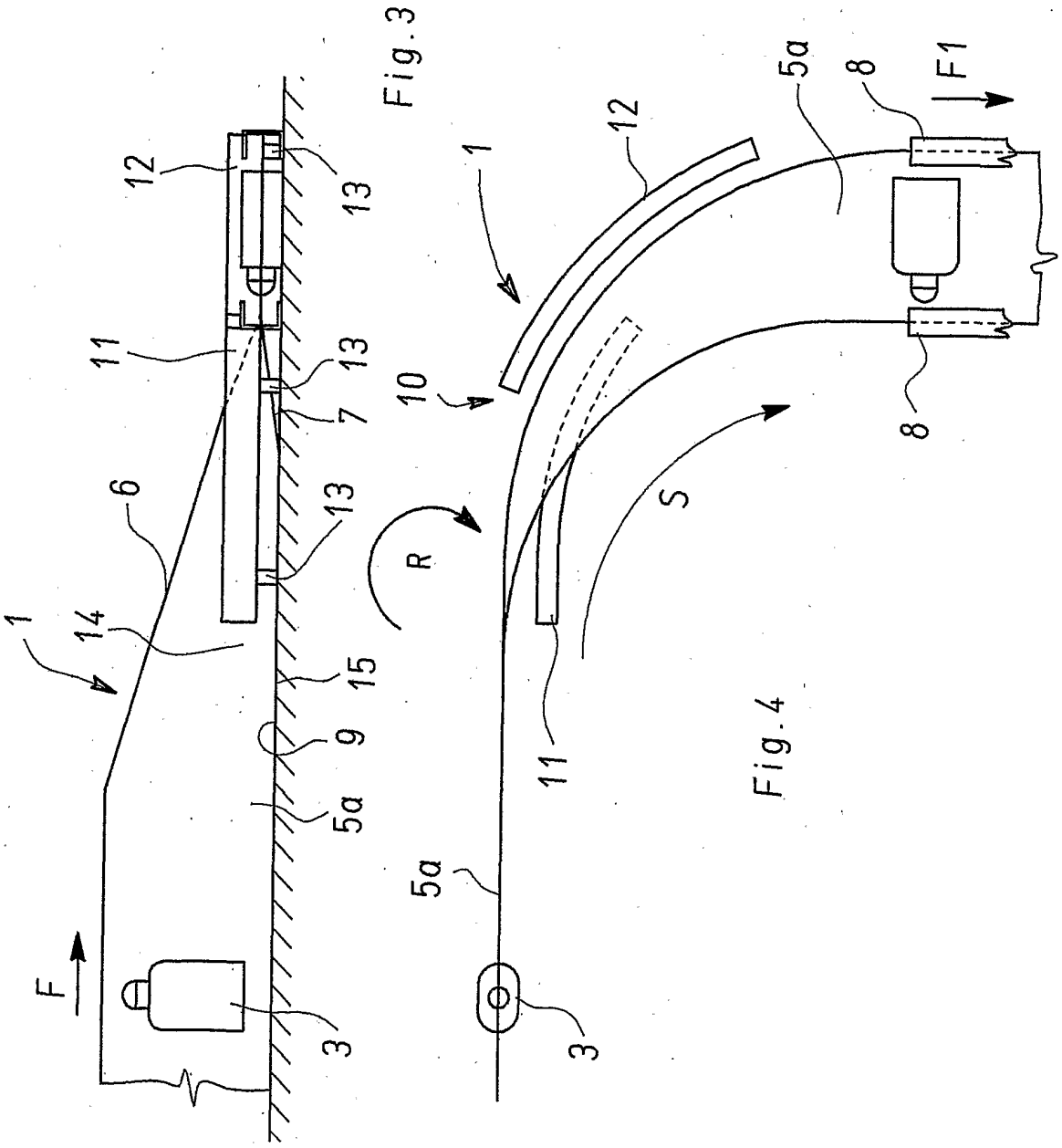

Fig.4

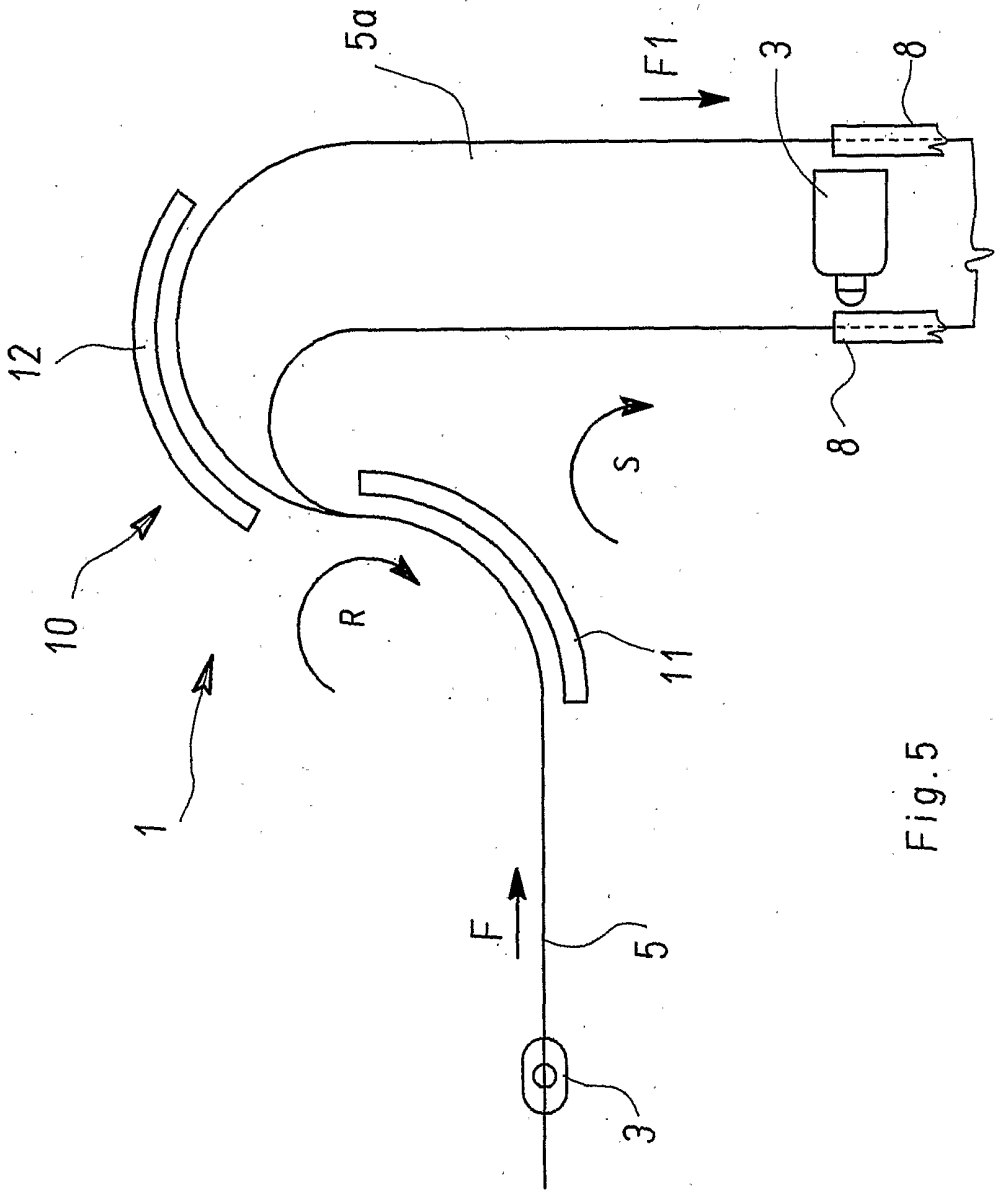

Fig.5

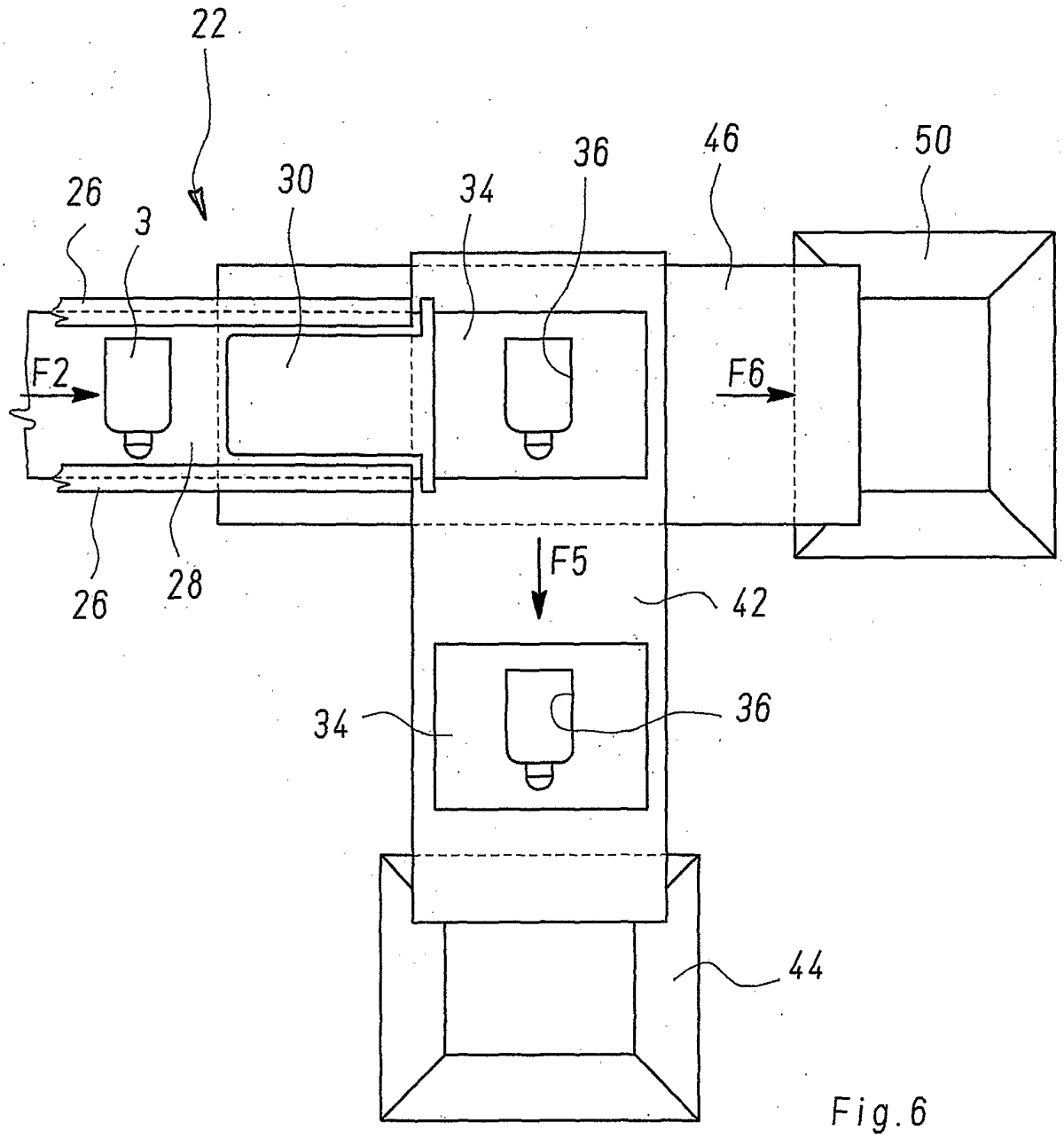

Fig.6

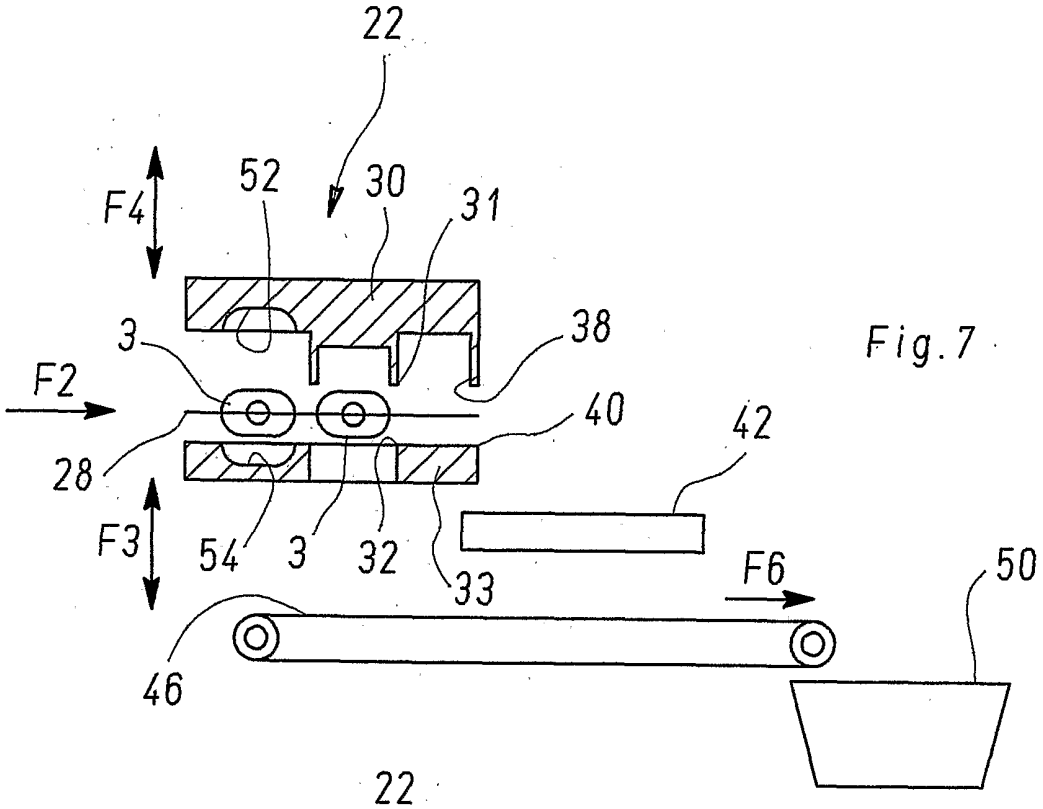
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Fig.7

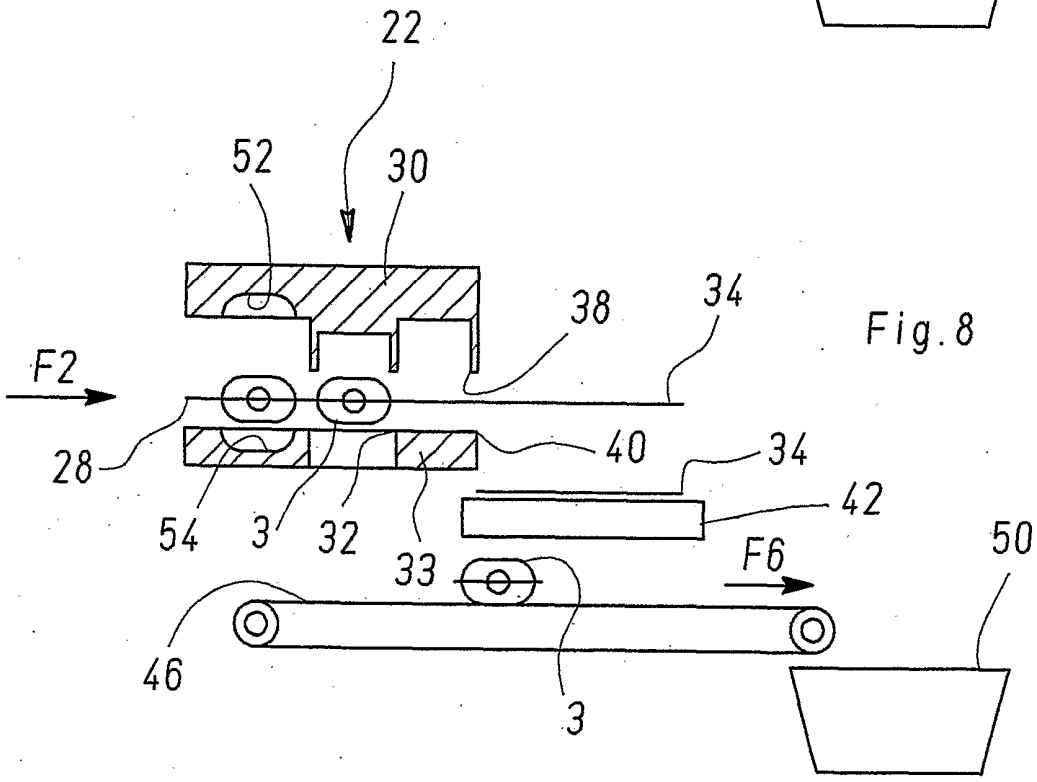
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Fig.8