(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 043 350 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
23.10.2024 Bulletin 2024/43

(21) Application number: **22155931.3**

(22) Date of filing: **09.02.2022**

(51) International Patent Classification (IPC):
B65B 19/20 *(2006.01)* ***B65B 19/22*** *(2006.01)*
B65B 19/24 *(2006.01)* ***B65B 19/02*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65B 19/025; B65B 19/20; B65B 19/223; B65B 19/226; B65B 19/24

(54) **PACKER MACHINE AND WRAPPING METHOD TO PRODUCE A RIGID PACK FOR SMOKING ARTICLES WITH A SEALED INNER WRAP**

VERPACKUNGSMASCHINE UND VERPACKUNGSVERFAHREN ZUR HERSTELLUNG EINER STEIFEN VERPACKUNG FÜR RAUCHARTIKEL MIT VERSIEGELTER INNERER UMHÜLLUNG

MACHINE D'EMBALLAGE ET PROCÉDÉ D'EMBALLAGE POUR PRODUIRE UN PAQUET RIGIDE POUR ARTICLES À FUMER PRÉSENTANT UNE ENVELOPPE INTÉRIEURE ÉTANCHE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **10.02.2021 IT 202100002912**

(43) Date of publication of application:
17.08.2022 Bulletin 2022/33

(73) Proprietor: **G.D Società per Azioni**
40133 Bologna (IT)

(72) Inventors:
- **MARRONE, Quintino**
  40133 Bologna (BO) (IT)
- **MECCAGNI, Mattia**
  40133 Bologna (BO) (IT)
- **SARTI, Stefano**
  40133 Bologna (BO) (IT)
- **SPIRITO, Gilberto**
  40133 Bologna (BO) (IT)
- **SQUARZONI, Michele**
  40133 Bologna (BO) (IT)
- **GAMBERINI, Giuliano**
  40133 Bologna (BO) (IT)

(74) Representative: **Studio Torta S.p.A.**
Via Viotti, 9
10121 Torino (IT)

(56) References cited:
EP-A1- 0 260 375
EP-A1- 2 944 575
EP-A1- 3 070 006
EP-A1- 3 222 532
EP-A1- 3 222 533
EP-A1- 3 725 690
WO-A1-2014/013478
WO-A1-2019/123497
US-A1- 2012 031 044
US-A1- 2015 336 696

EP 4 043 350 B1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102021000002912 filed on February 10, 2021.

TECHNICAL FIELD

[0002] The present invention relates to a packer machine and a wrapping method to produce a rigid pack for smoking articles with a sealed inner wrap.

[0003] The present invention finds advantageous application for manufacturing a rigid pack of cigarettes with a hinged lid and containing a group of cigarettes, to which the following disclosure will make explicit reference without thereby losing generality.

PRIOR ART

[0004] Document EP3725690 discloses a packer machine that produces a rigid pack for smoking articles comprising: a not sealed wrap, which is obtained by folding a wrapping sheet around a group of smoking articles, and an outer container, which is obtained by folding a blank around the sealed wrap; the packer machine comprises also a forming conveyor, a hopper, a first wrapping conveyor, a first transfer station, and a first feeding station. Document WO2019123497 discloses a packer machine that produces a rigid pack for smoking articles comprising: a first wrapping drum, a transfer station, and at least one sealing device 74 or 75.

[0005] Rigid packs of cigarettes with a hinged lid are the most popular packs of cigarettes currently on the market as they are simple to manufacture, are easy and practical to use and offer good protection to the cigarettes contained on the inside thereof. A rigid pack of cigarettes with a hinged lid comprises a wrap formed by a group of cigarettes wrapped in a wrapping sheet and a rigid outer casing that houses the wrap on the inside thereof. The outer casing is formed by a cup-shaped container, which houses the group of cigarettes and has an open upper end, and a lid, which is also cup-shaped and is hinged to the container to rotate, relative to the container, between an open position and a closed position of the open end.

[0006] In a traditional pack of cigarettes, the group of cigarettes is wrapped in a glue-free rectangular foil wrap. To preserve the integrity of the tobacco of the cigarettes, it has been proposed to form a sealed (waterproof) wrap formed by a wrapping sheet made of waterproof and heat-sealable material with a cigarette pull-out opening, which is closed by a reusable closing label.

[0007] It has been observed that the folding of the wrapping sheet made of waterproof material around the group of cigarettes can damage the ends of the cigarettes causing a localized deformation (both on the side of the filters and on the opposite side having the tobacco in sight) and/or a loss of tobacco (i.e., the emptying of the tips, obviously only on the side opposite the filters having the tobacco in sight). Furthermore, even the heat-sealing of the overlapping portions of the wrapping sheet made of waterproof material can damage the underlying cigarettes, as in order to carry out a good quality heat-sealing (i.e., to ensure sealing) and in a short time (modern packer machines work more than 500 packs per minute, therefore the heat-sealing must be completed in a fraction of a second) it is necessary to press the overlapping portions with a high pressure which is inevitably transmitted to the underlying cigarettes with obvious risks of permanent deformation of the cigarettes and it is necessary to heat the overlapping portions at a high temperature with obvious risks of excessive overheating of the tobacco contained in the underlying cigarettes (excessive overheating of the tobacco can cause local drying which alters the organoleptic characteristics).

[0008] In order to reduce damage to the cigarettes caused by folding a wrapping sheet made of waterproof material and by the subsequent heat-sealing of the overlapping portions of the wrapping sheet made of waterproof material, it has been proposed to use the so-called "*fin folds*", where two flaps of the wrapping sheet are folded towards one another so as to overlap the two flaps on top of one another to form a fin arranged perpendicularly to an underlying wall of the group of cigarettes. Some examples of cigarette inner wraps having "*fin folds*" are illustrated in the following documents: WO2015128812, WO2014013479A1, WO2011009520, WO2011110272, EP1686060A1, US4789060A1, GB1471086A1, and US3948389A1.

[0009] However, manufacturing the "*fin folds*" according to the currently known wrapping methods is relatively inefficient, namely, it does not allow to reach high productivity if maintaining a high final quality of the wrap is required.

[0010] The patent application EP3222532A1 describes a packer machine to produce a rigid pack of cigarettes with a sealed inner wrap and comprising: a first wrapping unit that forms the inner wrap around the group of smoking articles by folding a wrapping sheet, a second wrapping unit that forms the outer container around the inner wrap by folding a blank, and a positioning unit that receives the inner wrap from the first wrapping unit in an input station where the article is oriented according to an input plane, transfers the inner wrap to the second wrapping unit in an output station where the article is oriented according to an output plane oriented differently from the input plane, and comprises a positioning drum which is rotatable around a rotation axis and supports a parallelepiped-shaped pocket which moves along a positioning path between the input station and the output station .

DESCRIPTION OF THE INVENTION

[0011] The object of the present invention is to provide

a packer machine and a wrapping method to produce a rigid pack for smoking articles with a sealed inner wrap, which packer machine and wrapping method allow to obtain a high quality pack (namely, having extremely precise and squared off folds) even when operating at a high production speed (measured as packs of cigarettes produced in a unit of time) and at the same time minimize the overall dimensions while offering high accessibility to all parts.

[0012] According to the present invention a packer machine and a wrapping method to produce a rigid pack for smoking articles with a sealed inner wrap are provided, as claimed in the appended claims.

[0013] The claims describe embodiments of the present invention forming an integral part of the present description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention will now be described with reference to the attached drawings, which illustrate some non-limiting embodiments thereof, wherein:

- Figure 1 is a front perspective view and in a closed configuration of a rigid pack of cigarettes;
- Figure 2 is a rear perspective view of the pack of cigarettes of Figure 1 in a closed configuration;
- Figure 3 is a front perspective view of a sealed wrap of the pack of Figure 1;
- Figure 4 is a perspective view of a group of cigarettes coupled to a reinforcement element and contained in the sealed wrap of Figure 3;
- Figure 5 is a plan view devoid of folds of the reinforcement element of Figure 4;
- Figure 6 is a plan view of a wrapping sheet used to form the sealed wrap of Figure 3;
- Figure 7 is a plan view of a collar of the pack of cigarettes of Figure 1;
- Figure 8 is a plan view of a blank used to form an outer container provided with a hinged lid of the pack of cigarettes of Figure 1;
- Figures 9-16 illustrate some steps of the folding of the wrapping sheet of Figure 6 around the group of cigarettes of Figure 4 in order to obtain the sealed wrap of Figure 3;
- Figure 17 is a perspective schematic view and with parts removed for clarity of a packer machine that produces the pack of cigarettes of Figure 1 and is manufactured according to the present invention;
- Figure 18 is a schematic front view of part of the packer machine of Figure 17;
- Figure 19 is a plan and schematic view of an initial part of the packer machine of Figure 17;
- Figure 20 is a schematic view of a wrapping drum of the packer machine of Figure 17 highlighting the flow of products;
- Figure 21 is a perspective view and with parts removed for clarity of an intermediate part of the packer machine of Figure 17;
- Figure 22 is a perspective view showing the flow of products in an initial part of the packer machine of Figure 17;
- Figure 23 is an enlarged scale view of a detail of Figure 22;
- Figure 24 is a plan and schematic view of a different embodiment of an initial part of the packer machine of Figure 17; and
- Figure 25 is a plan and schematic view of a further embodiment of an initial part of the packer machine of Figure 17.

PREFERRED EMBODIMENTS OF THE INVENTION

[0015] In Figures 1 and 2, number 1 denotes as a whole a rigid pack of cigarettes with a hinged lid. The pack 1 of cigarettes comprises a cup-shaped outer container 2 made of cardboard or rigid paperboard and a sealed wrap 3 (illustrated in Figure 3) housed inside the container 2.

[0016] The outer container 2 has an open upper end and is provided with a lid 4, which is cup-shaped and is hinged to the outer container 2 along a hinge 5 (illustrated in Figure 2) so as to rotate, relative to the outer container 2, between an open position (not illustrated) and a closed position (illustrated in Figures 1 and 2) of the open upper end.

[0017] The sealed wrap 3 (illustrated in Figure 3) encloses a group 6 of cigarettes (partially illustrated in Figure 4) with a parallelepiped shape; each cigarette is provided with a filter 7 and therefore the group 6 of cigarettes has an upper wall formed by the circular ends (tips) of the filters 7 and a lower wall, opposite the upper wall, formed by the circular ends (tips) of the tobacco rods.

[0018] As illustrated in Figure 3, the sealed wrap 3 has a cigarette pull-out opening 8 at the top and in front, which is delimited by a pre-weakened tear-off line, is closed by a reusable closing label 9 and involves a portion of a front wall of the sealed wrap 3 and a portion of an upper wall of the sealed wrap 3. According to a preferred embodiment, the closing label 9 is fixed to the cigarette sealed wrap 3 by means of re-stick glue that does not dry, which is applied to the lower surface of the closing label 9 and is arranged all around the pull-out opening 8 so as to allow the closing label 9 to be partially separated several times from the sealed wrap 3 and then re-fixed to the sealed wrap 3.

[0019] According to a different embodiment not illustrated, the sealed wrap 3 is devoid of the pull-out opening 8 and of the relative closing label 9 and has a removable upper portion, which is separated from the rest of the sealed wrap 3 by a pre-weakened tear-off line to be removed by tearing at the first opening of the sealed wrap 3; in this embodiment, the sealed wrap 3 is preferably provided with a tear-off opening tape to facilitate breakage of the sealed wrap 3 along the pre-weakened line.

[0020] The sealed wrap 3 is obtained by folding a wrapping sheet 10 (illustrated in Figure 6), which has a rec-

tangular shape, comprises at least one layer of air-impermeable and heat-sealable plastic material, and is folded directly around the group 6 of cigarettes in order to be in direct contact with the cigarettes. Once the wrapping sheet 10 has been folded around the group 6 of cigarettes to form the sealed wrap 3, the shape of the sealed wrap 3 is stabilized by performing a heat-sealing of the overlapping portions of the wrapping sheet 10.

[0021] Before folding the wrapping sheet 10 around the group 6 of cigarettes, the wrapping sheet 10 is precut to define the pull-out opening 8; subsequently, the closing label 9 with glue on the lower part is applied to the wrapping sheet 10, that is, provided on its lower surface with the re-stick glue which inside the pull-out opening 8 determines the permanent gluing of the inner portion of the wrapping sheet 10 to the closing label 9 and on the outside of the pull-out opening 8 determines a re-stick gluing of the wrapping sheet 10 to the closing label 9.

[0022] As illustrated in Figure 4, the sealed pack 4 could comprise a "U"-shaped reinforcement element 11, which is made of cardboard or rigid paperboard and is arranged inside the sealed wrap 3 in contact with the group 6 of cigarettes. The function of the reinforcement element 11 is to give greater rigidity and greater stability of shape to the sealed wrap 3 so as to prevent the sealed wrap 3 from collapsing in on itself after having pulled out a part of the cigarettes contained in the sealed wrap 3, making it difficult to pull out the remaining cigarettes and in particular making the opening and subsequent reclosing of the closing label 9 extremely complicated. A further function of the reinforcement element 11 is to provide mechanical protection to the cigarettes during the folding of the wrapping sheet 10, a mechanical and thermal protection to the cigarettes during the heat-sealing of the overlapping portions of the wrapping sheet 10, and a mechanical protection to the cigarettes during handling of the sealed wrap 3.

[0023] As better illustrated in Figure 5, the reinforcement element 11 comprises a front wall 12 arranged in contact with the cylindrical side walls of the cigarettes of the group 6 of cigarettes, two side walls 13 arranged on opposite sides of the front wall 12 in contact with the cylindrical side walls of the cigarettes of the group 6 of cigarettes, a lower wall 14 arranged in contact with the tips of the cigarettes of the group 6 of cigarettes (namely, arranged in contact with the lower wall of the group 6 of cigarettes), and a (small) rear wall 15 arranged in contact with the cylindrical side walls of the cigarettes of the group 6 of cigarettes on the opposite side of the front wall 12. Preferably, the front wall 12 has an upper flare 16, which is arranged in the area of the cigarette pull-out opening 8 so that the front wall 12 does not overlap the cigarette pull-out opening 8.

[0024] With reference to what is illustrated in Figures 22 and 23, the forming of a sealed wrap 3 provides for initially forming a group 6 of cigarettes and then folding a reinforcement element 11 around the group 6 of cigarettes. Subsequently and as illustrated in Figures 9-16, the wrapping sheet 10 is folded around the group 6 of cigarettes coupled to the reinforcement element 11.

[0025] Figures 9-16 illustrate the folding steps of the wrapping sheet 10 around the group 6 of cigarettes that presents: two larger side walls that are opposite to one another and are formed by the cylindrical side walls of the cigarettes, two smaller side walls that are opposite to one another and are formed by the cylindrical side walls of the cigarettes, an upper wall formed by the ends of the filters 7, and a lower wall formed by the ends (tips) of the tobacco rods.

[0026] Initially, the group 6 of cigarettes is coupled to the unfolded wrapping sheet 10 by bringing the upper wall (on the side of the filters 7) of the group 6 of cigarettes into contact with the wrapping sheet 10 (Figure 9); subsequently, the wrapping sheet is folded in a "U" shape around the group 6 of cigarettes (Figure 10) so that the wrapping sheet 10 folded in a "U" shape is arranged in the area of the upper wall and of the two larger side walls of the group 6 of cigarettes and has two ends 17 and 18 that are parallel to the larger side walls and protrude from the larger side walls (namely, they continue beyond the larger side walls); it is important to note that the wrapping sheet 10 is fed asymmetrically in front of the group 6 of cigarettes (namely, the wrapping sheet 10 is placed asymmetrically against the upper wall of the group 6 of cigarettes) to define the two ends 17 and 18, which both protrude from the group 6 of cigarettes and have a different length (namely, the end 17 is longer than the end 18 and the difference in length between the end 17 and the end 18 is equal to the width of the lower wall of the group 6 of cigarettes). As illustrated in Figure 10, the end 17 is parallel to a first larger side wall of the group 6 of cigarettes and protrudes from the first lower wall of the group 6 of cigarettes continuing beyond the larger side wall; similarly, the end 18 is parallel to a second larger side wall of the group 6 of cigarettes and protrudes from the lower wall of the group 6 of cigarettes continuing beyond the second larger side wall.

[0027] As illustrated in Figure 11, the end 17 is folded by 90° relative to the first larger side wall of the group 6 of cigarettes and against the lower wall of the group 6 of cigarettes and, at the same time, a final part of the end 17 is folded by 90° to give the end 17 an "L" shape and then arrange the final part of the end 17 parallel and resting on the end 18 (which does not undergo, in this step, any type of folding, i.e., it remains parallel to the second larger side wall) giving the wrapping sheet 10 a tubular shape; in other words, at the same time (namely, with the same folding action) the end 17 is folded by 90° at two distinct points: a first folding by 90° around the edge between the first larger side wall and the lower wall and a second folding at the edge between the second larger side wall and the lower wall (namely, near the end 18) so as to give the end 17 an "L" shape and to rest the final part of the end 17 against the end 18.

[0028] When the end 17 is folded in an "L" shape and rests (in its final part) on the end 18, a tubular shape is

given to the wrapping sheet 10 with two open side edges (illustrated in Figure 16) in the area of the smaller side walls of group 6 of cigarettes. At this point, as illustrated in Figure 12, the overlapping portions of the ends 17 and 18 are heat-sealed one to the other to stabilize the tubular shape of the wrapping sheet 10 and form a sealing fin 19. Finally, the overlapping and heat-sealed ends 17 and 18 (namely, the sealing fin 19) are folded by 90° against the lower wall of the group 6 of cigarettes (as illustrated in Figure 13) and with the interposition of part of the wrapping sheet 10. Alternatively, the overlapping and heat-sealed ends 17 and 18 (namely, the sealing fin 19) are folded by 180° against the second larger side wall of the group 6 of cigarettes (as illustrated in Figure 14) and with the interposition of part of wrapping sheet 10. According to a further embodiment illustrated in Figure 15, the two ends 17 and 18 have the same length, are both folded in an "L" shape against the lower wall of the group 6 of cigarettes to form the sealing fin 19, and finally the sealing fin 19 (which is initially located at the centre of the lower wall of the group 6 of cigarettes) is folded by 90° against the lower wall of the group 6 of cigarettes.

[0029] Subsequently, and as illustrated in Figure 16, the two open side edges of the wrapping sheet 10 (which has a tubular shape around the group 6 of cigarettes) are closed by means of the so-called *"soap-bar fold"* which for each side edge provides for: folding two smaller flaps against the smaller side wall of the group 6 of cigarettes (in fact the smaller flap arranged in the area of the upper wall of the group 6 of cigarettes is folded beforehand when the wrapping sheet 10, for the first time, comes into contact with the group 6 of cigarettes and folds in a "U shape around the group 6 of cigarettes), folding one larger flap against the smaller side wall of group 6 of cigarettes and over the two smaller flaps previously folded, and finally folding the other larger flap against the smaller side wall of the group 6 of cigarettes and above the two smaller flaps and the larger flap previously folded. After having completed the folding of the wrapping sheet 10 around the group 6 of cigarettes, by closing the two side edges by means of respective lateral folds, these lateral folds are stabilized by heat-sealing, namely, by heat-sealing the overlapping parts of the wrapping sheet 10 in the area of the smaller side walls of the group 6 of cigarettes.

[0030] As illustrated in Figure 7, the pack 1 of cigarettes comprises, furthermore, a rigid collar 20, which is connected (by gluing) folded in a "U" shape inside the outer container 2 to partially protrude outside the open upper end of the outer container 2 and to engage a corresponding inner surface of the lid 4 when the lid 4 is arranged in the closed position.

[0031] As illustrated in Figure 8, the outer container 2 and the lid 4 are obtained by folding a blank 21 of a conventional type.

[0032] In Figure 17, number 22 denotes, as a whole, a packer machine which is designed to manufacture the pack 1 of cigarettes described above and operates with intermittent motion (namely, a motion which provides for a cyclical alternation of motion steps and stop steps).

[0033] The packer machine 22 comprises a forming unit A where the groups 6 of cigarettes are formed in succession, a wrapping unit B where a respective wrapping sheet 10 is wrapped around each group 6 of cigarettes to obtain a sealed wrap 3, and a wrapping unit C where a collar 20 and a blank 21 are wrapped around each sealed wrap 3 so as to obtain an outer container 2 provided with the lid 4.

[0034] As illustrated in Figures 17, 18 and 19, the forming unit A for the groups 6 of cigarettes comprises a hopper 23 provided with three output mouths 24 for simultaneously feeding three groups 6 of cigarettes to three respective pockets 25 of a forming conveyor 26 which supports a plurality of pockets 25. The forming conveyor 26 comprises an annular-shaped conveyor belt, which is wound around two end pulleys (one of which is motorized), supports the pockets 25 and moves in step so as to cyclically move the pockets 25 along a forming path P1. The forming path P1 develops between an input station S1 where each group 6 of cigarettes is pulled out from an output mouth 24 of the hopper 23 and enters a corresponding pocket 25 and a transfer station S2 where each group 6 of cigarettes is pulled out from the corresponding pocket 25.

[0035] According to a preferred embodiment, a control station, where the completeness of each group 6 of cigarettes and the correct filling of the cigarette tips of each group 6 of cigarettes is optically checked, and a subsequent discard station, where any defective group 6 of cigarettes signalled by the control station is discarded (for example by means of a mechanical or pneumatic expulsion from the respective pocket 25), are arranged along the forming conveyor 26.

[0036] The wrapping unit B comprises a wrapping conveyor 27 designed do move each group 6 of cigarettes along a straight and horizontal wrapping path P2. In particular, the wrapping path P2 extends from the transfer station S2 where the wrapping conveyor 27 pull outs each group 6 of cigarettes from the corresponding pocket 25 of the forming conveyor 26, passes through a feeding station S3 where each group 6 of cigarettes couples to a corresponding wrapping sheet 10 that folds in a "U" shape around the group 6 of cigarettes, and ends in a transfer station S4 where each sealed wrap 3 being formed (namely, only partially formed) leaves the wrapping conveyor 27.

[0037] The wrapping conveyor 27 comprises an annular-shaped conveyor belt 28, which is wound around two end pulleys (one of which is motorized) and supports a plurality of pushers, each of which is connected to the conveyor belt 28 by means of a support column (narrower than the pusher) and is designed to engage the upper wall (formed by the ends of the filters 7) of a corresponding group 6 of cigarettes to push the group 6 of cigarettes along the wrapping path P2. In other words, the wrapping conveyor 27 comprises a horizontal channel which is de-

limited at least at the bottom and laterally (preferably also at the top in its initial part), is arranged along the wrapping path P2, and contains each group 6 of cigarettes on the inside thereof while the group 6 of cigarettes moves along the wrapping path P2 pushed to the back by a corresponding pusher.

[0038] Along the wrapping path P2 (and therefore in the area of the wrapping conveyor 27) the feeding station S3 is provided, where each wrapping sheet 10 is arranged to be intercepted by a corresponding group 6 of cigarettes around which the wrapping sheet 10 folds in a "U" shape; in other words, each group 6 of cigarettes moving along the wrapping path P2 intercepts a corresponding wrapping sheet 10 arranged in the feeding station S3, causing the wrapping sheet 10 to be folded in a "U" shape.

[0039] The packer machine 22 comprises a feeding device 29 which cyclically feeds the wrapping sheets 21 into the feeding station S3, namely, arranges each wrapping sheet 10 in the feeding station S3 so that the wrapping sheet 10 is intercepted (as illustrated in Figure 9) by a corresponding group 6 of cigarettes that moves along the wrapping path P2. As illustrated in Figure 17, the feeding device 29 comprises an unwinding station where a tape of wrapping material is unwound from a reel and is moved towards a cutting member of a known type which is arranged above the feeding station S3 and cyclically performs a transversal cut of the tape of wrapping material to separate the individual wrapping sheets 10 from the tape of wrapping material.

[0040] For a detailed description of the feeding device 29, we refer to what is described in the patent application EP3725690A1.

[0041] As illustrated in Figure 19, the wrapping path P2 starts in the transfer station S2 (where the groups 6 of cigarettes enter the wrapping conveyor 27) and ends in the transfer station S4 (where the partially formed sealed wraps 3 leave the wrapping conveyor 27); along the wrapping path P2 only the "U"-shaped folding of the wrapping sheet 10 is performed around the group 6 of cigarettes (as illustrated in Figure 10) and the simultaneous folding of two smaller flaps against the smaller side wall of the group 6 of cigarettes.

[0042] The packer machine 22 comprises a wrapping drum 30 which is arranged (immediately) downstream of the wrapping conveyor 27, supports a plurality of pockets 31 (illustrated in Figure 21) each designed to contain the sealed wrap 3 being formed, and is mounted so as to rotate (with intermittent motion, namely, "in *step*") around a vertical rotation axis 32 perpendicular to the wrapping path P2 in order to move each pocket 31 along a wrapping path P3 with circular shape and coplanar to the wrapping path P2. As better illustrated in Figure 20, each pocket 31 of the wrapping drum 30 receives (directly from the wrapping conveyor 27) a sealed wrap 3 being formed in the transfer station S4, moves the sealed wrap 3 being formed through a series of folding and sealing stations where the sealing fin 19 is formed and subsequently folded, and lastly releases the sealed wrap 3 being formed in a transfer station S5.

[0043] It is important to note that the wrapping drum 30 moves the sealed wrap 3 being formed along the wrapping path P3 with the lower wall (from which the ends 17 and 18 protrude) arranged radially outwards.

[0044] As illustrated in Figure 20, a folding device 33 is arranged along the wrapping drum 30, namely, along the wrapping path P3, and immediately downstream of the transfer station S4, which performs the double folding of the end 17 of the wrapping sheet 10 illustrated in Figure 11 and previously described, which gives the end 17 the "L" shape; in other words, the folding device 33 folds the end 17 by 90° relative to the larger side wall of the group 6 of cigarettes and, at the same time, folds the final part of the end 17 in an "L" shape so as to arrange the final part of the end 17 against the end 18 which does not undergo, in this step, any type of folding. According to a preferred embodiment, the folding device 33 is of the passive type (namely, it is completely devoid of moving parts) and comprises only fixed folding helixes.

[0045] As illustrated in Figure 20, along the wrapping drum 30, namely, along the wrapping path P3, and immediately downstream of the folding device 33 a sealing device 34 is arranged, which performs the heat-sealing of the overlapping portions of the ends 17 and 18 (namely, forms the sealing fin 19) to stabilize the tubular shape of the wrapping sheet 10 as illustrated in Figure 12. According to a preferred embodiment illustrated in Figure 12, the sealing device 34 comprises a sealing clamp 35 provided with two mobile and heated jaws 36: during the movement step of the wrapping drum 30, the sealing clamp 35 is open (namely, the two jaws 36 are relatively far from one another) to allow the ends 17 and 18 of the wrapping sheet 10 (namely, the sealing fin 19) to pass through the sealing clamp 35 without sliding, while during the stop step of the wrapping drum 30 the sealing clamp 35 is closed (namely, the two jaws 36 are pushed against one another with a certain force to tighten the ends 17 and 18 of the wrapping sheet 10 together) so as to perform the heat-sealing (due to the simultaneous application of heat and pressure) of the overlapping portions of the ends 17 and 18 of the wrapping sheet 10. It is important to note that a single sealing device 34 is provided, namely, a single sealing clamp 35, which is arranged in a fixed position along the wrapping drum 30, namely, along the wrapping path P3, and is common to all the sealed wraps 3.

[0046] According to a possible embodiment, the folding device 33 only folds the end 17 of the wrapping sheet 10, giving the end 17 an "L" shape (as illustrated in Figure 11), leaving the sealing device 34 with the task of performing the heat-sealing of the overlapping portions of the ends 17 and 18. According to an alternative embodiment, the folding device 33 could also comprise (at least) a heated element to carry out, at the same time, both the folding of the end 17 of the wrapping sheet 10 giving the end 17 an "L" shape (as illustrated in Figure 11), and an

initial heat-sealing of the overlapping portions of the ends 17 and 18; subsequently, the sealing device 34 completes the heat-sealing of the overlapping portions of the ends 17 and 18 started by the folding device 33.

[0047] In the embodiment illustrated in the attached figures, the wrapping drum 30 comprises a single sealing device 34 arranged immediately downstream of the folding device 33; according to a different and perfectly equivalent embodiment, the wrapping drum 30 comprises two or more (typically no more than three) sealing devices 34 arranged in succession immediately downstream of the folding device 33.

[0048] As illustrated in Figure 20, a folding device 37 is arranged along the wrapping drum 30, namely, along the wrapping path P3, and immediately downstream of the sealing device 34, which performs the folding of the flaps 17 and 18 by 90°, which are overlapping and heat-sealed one to the other (namely, the sealing fin 19) illustrated in Figure 13; in other words, the folding device 37 folds the flaps 17 and 18, which are overlapping and heat-sealed one to the other (namely, the sealing fin 19) by 90° against the lower wall of the group 6 of cigarettes and with the interposition of part of the wrapping sheet 10. According to a preferred embodiment, the folding device 37 is of the passive type (namely, it is completely devoid of moving parts) and comprises only fixed folding helixes.

[0049] As illustrated in Figure 19, the packer machine 22 comprises a wrapping conveyor 38 which receives the sealed wraps 3 being formed in the transfer station S5 from the wrapping drum 30 and moves the sealed wraps 3 along a wrapping path P4 straight and perpendicular to the wrapping path P2 up to a transfer station S6 (where the completed sealed wraps 3 leave the wrapping conveyor 38). The wrapping conveyor 38 comprises an annular-shaped conveyor belt 39 (better illustrated in Figure 21), which is wound around two end pulleys (one of which is motorized) and moves in step to move the sealed wraps 3 being formed along the wrapping path P4 from the transfer station S5 to the transfer station S6.

[0050] As illustrated in Figure 19, the wrapping unit B comprises a pair of folding devices 40 which are arranged opposite one another along the wrapping path P4 (namely, the two folding devices 40 are arranged on opposite sides of the wrapping conveyor 38) and are designed to complete a folding of each wrapping sheet 10 around the corresponding group 6 of cigarettes (and therefore to finish the forming of the sealed wrap 3) in order to close, as illustrated in Figure 16, the two open side edges of the wrapping sheet 10 (which has a tubular shape around the group 6 of cigarettes) by means of the so-called *"soap-bar fold"* (previously described and illustrated in Figure 16). According to a preferred embodiment, each folding device 40 is of the passive type (namely, it is completely devoid of moving parts) and comprises only fixed folding helixes. The wrapping unit B comprises, furthermore, a series of pairs of sealing devices 41 which are arranged opposite one another along the wrapping path P4 (downstream of the folding device 40) and are designed to stabilize the folded shape of the wrapping sheet 10 around the corresponding group 6 of cigarettes (namely, the final shape of the sealed wrap 3); then the sealing devices 41 complete the forming of the sealed wrap 3. In other words, in each pair of sealing devices 41 the two sealing devices 41 are arranged on opposite sides of the wrapping conveyor 38. In the embodiment illustrated in the attached figures, four pairs of sealing devices 41 are provided, but according to other embodiments, generally two to five pairs of sealing devices 41 are provided.

[0051] The packer machine 22 comprises a transfer drum 42 which is arranged (immediately) downstream of the wrapping conveyor 38, supports a plurality of pockets 43 (better illustrated in Figure 21) each designed to contain the sealed wrap 3, and is mounted so as to rotate (with intermittent motion, namely, "*in step*") around a vertical rotation axis 44 parallel to the rotation axis 32 in order to move each pocket 43 along a wrapping path P5, having a circular shape and coplanar with the wrapping paths P3 and P4. Each pocket 43 of the transfer drum 42 receives (directly from the wrapping conveyor 38) a sealed wrap 3 completed in the transfer station S6 and transfers the completed sealed wrap 3 in a transfer station S7.

[0052] As illustrated in Figures 17 and 18, the packer machine 22 comprises a wrapping drum 45 that is arranged downstream of the transfer drum 42 (therefore also downstream of the wrapping conveyor 38), supports a plurality of pockets 46 each designed to contain the sealed wrap 3 and the collar 20, and is mounted so as to rotate (with intermittent motion, namely, *"in step")* around a horizontal rotation axis 47 parallel to the wrapping path P2 (and therefore perpendicular to the wrapping path P4) in order to move each pocket 46 along a wrapping path P6 having a circular shape and perpendicular to the wrapping path P2 (and therefore parallel to the wrapping path P4). Each pocket 46 of the wrapping drum 45 receives a collar 20 in a feeding station S8 arranged upstream of the transfer station S7 along the wrapping path P6, receives a sealed wrap 3 (which couples to the previously fed collar 20) in the transfer station S7, receives a blank 21 in a feeding station S8, which is arranged downstream of the transfer station S7 along the wrapping path P6, and releases together the sealed wrap 3, the collar 20 and the blank 21 in a transfer station S10 arranged downstream of the feeding station S8 along the wrapping path P6. In the feeding station S8, each collar 20 is placed on the outer surface of the wrapping drum 45, in the area of a pocket 46 and is held in this position by suction; in the transfer station S7 a sealed wrap 3, entering the corresponding pocket 46 couples to the collar 20 previously fed and causes the collar 20 to be folded in a "U" shape. In the feeding station S9, each blank 21 is placed on the outer surface of the wrapping drum 45 in the area of a pocket 46 and is held in this position by suction; in the transfer station S10, a sealed

wrap 3 exiting from the corresponding pocket 46, together with the collar 20, couples to the previously fed blank 21.

[0053] A pusher 48 is arranged in the transfer station S7, which cyclically moves from the bottom to the top to pull out a sealed wrap 3 from a pocket 43 of the transfer drum 42 and then insert the sealed wrap 3 into a pocket 46 of the wrapping drum 45.

[0054] From what has been described above, it is clear that the wrapping conveyor 27 moves each sealed wrap 3 being formed along the wrapping path P4 with the opposite side walls arranged parallel to the wrapping path P4, that the wrapping path P3 develops from the transfer station S4 to the transfer station S5 with an angle of 270° around the rotation axis 32, and that the wrapping drum 42 causes the completed sealed wrap 3 to rotate by 90° between the transfer station S6 and the transfer station S7 (namely, the wrapping path P5 develops from the transfer station S6 to the transfer station S7 with a width of 90° around the rotation axis 44) .

[0055] As illustrated in Figure 17, the packer machine 22 comprises a feeding device 49 which cyclically feeds the collars 20 into the feeding station S7, namely, arranges each collar 20 in front of a pocket 46. The feeding device 49 comprises an unwinding station where a tape of wrapping material is unwound from a reel (not illustrated) and is moved (passing behind the wrapping conveyor 38) towards a known type of cutting member which is arranged alongside the feeding station S8 and cyclically carries out a transversal cut of the tape of wrapping material to separate the individual collars 20 from the tape of wrapping material. Alternatively, the feeding device 49 could feed the collars 20 from the hopper.

[0056] As illustrated in Figure 17, the packer machine 22 comprises a feeding device 50 which cyclically feeds the blanks 21 into the feeding station S9, namely, arranges each blank 21 in front of a pocket 46. The feeding device 50 comprises a moving conveyor 51 that moves a plurality of stacks of blanks 21 towards a hopper (not illustrated); furthermore, the feeding device 50 comprises a feeding drum 52 which supports a plurality of suction holding heads (not illustrated) each designed to hold a corresponding blank 21, and is mounted so as to rotate (with intermittent motion, namely, "*in step*") around a horizontal rotation axis 53 parallel to the rotation axis 47 in order to move each suction holding head along a circular feeding path parallel to the wrapping path P6. The rotation of the feeding drum 52 cyclically moves each suction holding head from a pick-up station S11 where the suction holding head picks up a blank 21 from the bottom of the hopper to the feeding station S9, where the suction holding head transfers the blank 21 to the wrapping drum 45.

[0057] As illustrated in Figure 18, the packer machine 22 comprises a wrapping drum 54 which is arranged downstream of the wrapping drum 45, supports a plurality of pockets 55 each designed to contain a sealed wrap 3, a collar 20 and a blank 21, and is mounted so as to rotate (with intermittent motion, namely "in *step*") around a horizontal rotation axis 56 parallel to the rotation axis 47 (and therefore parallel to the wrapping path P2) in order to move each pocket 55 along a wrapping path P7 having a circular shape and being parallel to the wrapping path P6 (and therefore perpendicular to the wrapping path P2). Each pocket 55 of the wrapping drum 52 receives a sealed wrap 3, a collar 20 and a blank 21 in the transfer station S10, folds the blank 21 downstream of the transfer station S10, and releases an almost complete pack 1 of cigarettes into a transfer station S12 located downstream of the transfer station S10 along the wrapping path P7. In the transfer station S12, the folding of each blank 21 is completed (thus completing the formation of the corresponding pack 1 of cigarettes) by folding some flaps immediately downstream of the wrapping drum 54. Once the formation of each pack 1 of cigarettes is completed, the pack 1 of cigarettes is transferred to a belt drying conveyor 57 (illustrated in Figure 17) which moves the packs 1 of cigarettes in succession along a drying path P8 straight and perpendicular to the rotation axis 56 towards an output of the packer machine 22.

[0058] According to a possible embodiment, even in the presence of the transfer drum 42 the collars 20 are fed to the pockets 46 of the wrapping drum 45 in the feeding station S8 arranged upstream of the transfer station S7 along the wrapping path P6 (namely, the feeding station S8 remains coupled to the wrapping drum 45); according to an alternative embodiment, the feeding station S8 for the collars 20 is moved in the area of the transfer drum 42 and therefore a pocket 43 of the transfer drum 42 initially receives a collar 20 in the feeding station S8, subsequently receives a sealed wrap 3 from the wrapping conveyor 38 in transfer station S6, and lastly transfers the sealed wrap 3 and the collar 20 together to wrapping drum 45 in the transfer station S7 (or a pocket 43 of transfer drum 42 could initially receive the sealed wrap 3 from the wrapping conveyor 38 in the transfer station S6 and subsequently a collar 20 in the feeding station S8).

[0059] Due to the effect of the transfer drum 42, each sealed wrap 3 is indirectly transferred from the wrapping conveyor 38 to a pocket 46 of the wrapping drum 45. The presence of the transfer drum 42 allows, among other things, to impart a different orientation to the sealed wraps 3 between the wrapping conveyor 38 and the wrapping drum 45; namely, the transfer drum 42 can only be used to impart a different orientation to the sealed wraps 3 leaving the feeding of the collars 20 to the pockets 46 of the wrapping drum 45 in the feeding station S8.

[0060] As illustrated in Figure 22, the packer machine 22 comprises a feeding device 58, which in a feeding station S13 (arranged upstream of the input station S1 relative to the moving direction of the forming conveyor 26), cyclically inserts the reinforcement elements 11 (that are arranged folded in a U-shape inside the pockets 25) into the empty pockets 25 of the forming conveyor 26.

[0061] As illustrated in Figure 23, a folding device 59

is coupled to the forming conveyor 26 that is arranged immediately upstream of the transfer station S2 relative to the moving direction of the forming conveyor 26 and is configured to complete the folding of the reinforcement element 11 against a corresponding group 6 of cigarettes carried by a pocket 25; in particular, the folding device 59 folds the lower wall 14 by 90° relative to the front wall 12 and against the group 6 of cigarettes and, at the same time, folds the rear wall 15 by 90° relative to the lower wall 14 and against the group 6 of cigarettes. Consequently, in the transfer station S2 a pusher of the wrapping conveyor 27 pulls out a group 6 of cigarettes coupled to a reinforcement element 11 by pushing on the lower wall of the group 6 of cigarettes and therefore with the interposition of the lower wall 14 of the reinforcement element 11. Thanks to the presence of the lower wall 14 of the reinforcement element 11 it is therefore possible to reduce the load stress on the group 6 of cigarettes, since the lower wall of the group 6 of cigarettes does not come into direct contact with a pusher.

[0062] As illustrated in Figures 22 and 23, it is important to note that the groups 6 of cigarettes are pulled out from the hopper 23 with the filters 7 frontwards so that the wrapping conveyor 27 moves the groups 6 of cigarettes along the wrapping path P2 with the filters 7 frontwards and consequently so that the "U"-shaped winding of a wrapping sheet 10 takes place astride the filters 7 (as illustrated in Figures 9 and 10). This orientation of the filters 7 is very advantageous for the manufacturing of the sealed wrap 3 (since it allows to arrange the pull-out opening in the area of the filters 7 as normally required by consumers of packs of cigarettes), but it can become a problem in the wrapping unit C during the folding of the blank 21 as it differs from the orientation in the case of a pack of cigarettes with a traditional (namely, unsealed) wrap; for this reason the presence of the wrapping drum 30 and the transfer drum 42 is important which allow to change the orientation of the sealed wraps 3 between the wrapping unit A and the wrapping unit C.

[0063] The presence of the wrapping drum 30 allows, among other things, not to give a different orientation to the sealed wraps 3 between the wrapping conveyor 27 and the wrapping conveyor 38: the sealed wraps 3 being formed are moved longitudinally along the wrapping conveyor 27 and this orientation allows an easy "U"-shaped folding of the wrapping sheet 10 around the group 6 of cigarettes, and the sealed wraps 3 being formed are moved longitudinally also along the wrapping conveyor 38 and this orientation also allows an easy folding of the two open side edges of the wrapping sheet 10 (which has a tubular shape around the group 6 of cigarettes) by means of the so-called "*soap-bar fold*" (previously described and illustrated in Figure 16) and the subsequent stabilization by heat-sealing. The conformation of the wrapping drum 30 illustrated in the attached figures gives the sealed wraps 3 being formed an overturning, since along the wrapping conveyor 27 the sealed wraps 3 being formed are moved longitudinally with the filters 7 of the groups 6 of cigarettes forward, while along the wrapping conveyor 38 the sealed wraps 3 being formed are moved longitudinally with the filters 7 of the groups 6 of cigarettes backwards.

[0064] The presence of the transfer drum 42 allows, among other things, to impart a different orientation to the sealed wraps 3 between the wrapping conveyor 38 and the wrapping drum 45; in particular, according to the positioning of the transfer drum 42, the presence of the transfer drum 42 can cause the sealed wraps 3 to rotate by 90° (as illustrated in the attached figures) or by 270° (but potentially also by180°).

[0065] The different orientation of the sealed wraps 3 imparted by the wrapping drum 30 and by the transfer drum 42 is particularly useful as it allows the conformation of the entire wrapping unit C not to be substantially modified, passing from the production of a pack 1 of cigarettes with a sealed wrap 3 to the production of a pack of cigarettes 1 with a traditional (unsealed) wrap or vice versa; namely, by adapting the packer machine 22 to the production of different packs of cigarettes instead of substantially modifying the conformation of the entire wrapping unit C to pass from a sealed wrap 3 to a traditional (unsealed) wrap or vice versa, a rotation is simply imparted to the sealed wraps 3 at the inlet of the wrapping unit C.

[0066] In the embodiment illustrated in Figure 19, along the wrapping conveyor 27 only the "U"-shaped folding of the wrapping sheet 10 is performed around the group 6 of cigarettes (as illustrated in Figure 10) and the simultaneous folding of two smaller flaps against the smaller side wall of the group 6 of cigarettes; whereas the closing of the two open side edges of the wrapping sheet 10 (which has a tubular shape around the group 6 of cigarettes) by means of the so-called *"soap-bar fold"* (previously described and illustrated in Figure 16) takes place along the wrapping conveyor 38 before their stabilization by heat-sealing (in fact, both the folding devices 40 and the sealing devices 41 are arranged along the wrapping conveyor 38) . In the different embodiment illustrated in Figure 24, the "U"-shaped folding of the wrapping sheet 10 around the group 6 of cigarettes is performed along the wrapping conveyor 27 (as illustrated in Figure 10) and with the simultaneous folding of two smaller flaps against the smaller side wall of the group 6 of cigarettes and along the wrapping conveyor 27, the closing of the two open side edges of the wrapping sheet 10 is also performed (which has a tubular shape around the group 6 of cigarettes) by means of the so-called *"soap-bar fold"* (previously described and illustrated in figure 16); in fact, the packer machine 22 illustrated in Figure 24 comprises two folding devices 60, which are arranged opposite one another along the wrapping path P2 and are designed to close the two open side edges of the wrapping sheet 10 by means of the so-called *"soap-bar fold"* (previously described and illustrated in Figure 16). According to a preferred embodiment, each folding device 60 is of the passive type (namely, it is completely devoid of moving parts)

and comprises only fixed folding helixes. In the embodiment illustrated in Figure 24, the folding devices 40 are absent (as they are replaced by the folding devices 60) and only the sealing devices 41 are arranged along the wrapping conveyor 38. It is important to note that in the embodiment illustrated in Figure 19 (which also refers to what is illustrated in Figure 16), the sealing fin 19 is formed before the two open side edges of the wrapping sheet 10 are closed by means of the so-called "*soap-bar fold*"; whereas, in the embodiment illustrated in Figure 24, the sealing fin 19 is obtained after closing the two open side edges of the wrapping sheet 10 by means of the so-called "*soap-bar fold*"*;* consequently what is illustrated in Figure 16 differs in part from what occurs in the embodiment illustrated in Figure 24.

[0067] In the further embodiment illustrated in Figure 25, the following are carried out along the wrapping conveyor 27: the "U"-shaped folding of the wrapping sheet 10 around the group 6 of cigarettes (as illustrated in Figure 10) and the simultaneous folding of two smaller flaps against the smaller side wall of the group 6 of cigarettes, the closing of the two open side edges of the wrapping sheet 10 (which has a tubular shape around the group 6 of cigarettes) by means of the so-called *"soap-bar fold"* (previously described and illustrated in Figure 16), and finally also the closing of the last open end of the wrapping sheet 10 (with the complete folding of the wrapping sheet 10, but without any stabilization of the folded shape of the wrapping sheet 10). In fact, the packer machine 22 comprises a folding device 61 which is arranged along the wrapping path P2 and is designed to close the last open end of the wrapping sheet 10. According to a preferred embodiment, the folding device 61 is of the active type (namely, it comprises moving parts) and is of the type described in the patent application EP3725690A1 and carries out the folding described and illustrated in this patent application. In the embodiment illustrated in Figure 25, along the wrapping drum 30 only the sealing devices 62 are arranged, which perform the sealing of the overlapping portions of the wrapping sheet 10 in the area of the lower wall of the sealed wrap 3.

[0068] As illustrated in Figure 21, the wrapping conveyor 38 comprises the annular-shaped conveyor belt 39, which is wound around two end pulleys (one of which is motorized) and supports a plurality of pushers 63, each of which is connected to the conveyor belt 39 by means of a support column 64 (narrow, namely, narrower than the pusher 63) and is designed to engage a wall of a corresponding sealed wrap 3 being formed in order to push the sealed wrap 3 being formed along the wrapping path P4. In other words, the wrapping conveyor 38 comprises a horizontal channel which is delimited at least at the bottom and laterally (preferably also at the top in its initial part), is arranged along the wrapping path P4, and contains on the inside thereof each sealed wrap 3 being formed, while the sealed wrap 3 being formed moves along the wrapping path P4 pushed to the back by a corresponding pusher 63. Each pocket 31 of the wrapping drum 30 has a through slot 65 (arranged at the bottom) which, in the transfer station S5, is oriented parallel to the wrapping path P4 and through which the support column 64 of a corresponding pusher 63 is designed to pass when the pocket 31 is in the transfer station S5. In other words, each pusher 63 of the wrapping conveyor 38 enters a pocket 31 of the wrapping drum 30 stopped in the transfer station S5 to pull out, from the same pocket 31, a corresponding sealed wrap 3 being formed and then move the sealed wrap 3 being formed along the wrapping path P4.

[0069] The embodiments described herein can be combined with one another.

[0070] The packer machine 22 described above has numerous advantages.

[0071] Firstly, the wrapping unit B of the packer machine 22 described above allows the sealed wraps 3 of the packs of cigarettes to be produced with a high production quality (namely, having extremely precise and squared folds of the wrapping sheet 10) even when operating at a high production speed (namely, with a high number of sealed wraps 3 produced in the unit of time). In particular, in the packer machine 22 described above it is possible to achieve an optimal heat-sealing (namely, both strong and precise) of the overlapping parts of the wrapping sheet 10 without damaging the group 6 of cigarettes contained in the sealed wrap 3; this result is obtained thanks to the fact of manufacturing the sealing fin 19 transversely (which being formed by means of the sealing clamp 35 allows to use both a very high sealing pressure and a very high sealing temperature) and thanks to the fact of making the longitudinal welds by means of numerous successive sealing devices 41 (the wrapping conveyor 38 is relatively very long and therefore has all the space necessary to house multiple successive sealing devices 41).

[0072] Furthermore, the packer machine 22 described above allows to change the format of the packs 1 of cigarettes in a relatively simple and fast way.

[0073] Finally, the packer machine 22 described above is compact and has optimal accessibility to all its components; in fact, an operator who is in front of the packer machine 22 is able to reach, with his/her own hands, all the active parts of the packer machine 22 in a simple, fast and ergonomic way. In particular, an operator who is in front of the packer machine 22 can easily reach, with his own hands, the hopper 23, the forming conveyor 26, the wrapping conveyor 27, the wrapping conveyor 38, and the wrapping drums 45 and 52.

[0074] The embodiment illustrated in the attached figures refers to the manufacturing of a pack of cigarettes, but the present invention can also be applied without substantial modifications to the manufacturing of any other type of pack of smoking articles (for example, a pack of cigars, a pack of electronic cigarettes of the liquid vaporization type, a pack of new generation cigarettes without tobacco combustion...).

Claims

1. A packer machine (22) to produce a rigid pack (1) for smoking articles comprising: a sealed wrap (3), which is obtained by folding a wrapping sheet (10) around a group (6) of smoking articles, and an outer container (2), which is obtained by folding a blank (21) around the sealed wrap (3); the packer machine (22) comprises:

   a forming conveyor (26), which moves at least a first pocket (25) along a forming path (P1);
   a hopper (23), which is arranged in front of the forming conveyor (26) and along the forming path (P1) and is provided with at least one output mouth (24), from which the group (6) of smoking articles can be pulled out;
   a first wrapping conveyor (27), which is designed to move the group (6) of smoking articles and the wrapping sheet (10) along a first straight and horizontal wrapping path (P2) so as to at least partially fold the wrapping sheet (10) around the group (6) of smoking articles;
   a first transfer station (S2), where the group (6) of smoking articles is directly transferred from the first pocket (25) of the forming conveyor (26) to the first wrapping conveyor (27); and
   a first feeding station (S3), which is arranged downstream of the first transfer station (S2) and where the wrapping sheet (10) is coupled to the group (6) of smoking articles moving along the first wrapping path (P2);
   the packer machine (22) is **characterized in that** it comprises:

      a first wrapping drum (30), which supports at least one second pocket (31) designed to contain the sealed wrap (3) being formed and is mounted so as to rotate around a first vertical rotation axis (32) in order to move the second pocket (31) along a second wrapping path (P3) with a circular shape;
      a second transfer station (S4), where the sealed wrap (3) being formed is directly transferred from the first wrapping conveyor (27) to the second pocket (31) of the first wrapping drum (30);
      and
      at least one first sealing device (34; 62), which is arranged along the second wrapping path (P3) downstream of the second transfer station (S4) and is configured to seal overlapping portions of the wrapping sheet (10) in the area of a lower wall of the sealed wrap (3) being formed.

2. The packer machine (22) according to claim 1, wherein the first wrapping drum (30) moves the sealed wrap (3) being formed along the second wrapping path (P3) with the lower wall radially arranged towards the outside.

3. The packer machine (22) according to claim 1 or 2 and comprising:

   a second wrapping conveyor (38), which is designed to move the sealed wrap (3) being formed along a third straight and horizontal wrapping path (P4), which is perpendicular to the first wrapping path (P2);
   a third transfer station (S5), where the sealed wrap (3) being formed is directly transferred from the second pocket (31) of the first wrapping drum (30) to the second wrapping conveyor (38); and
   at least one pair of second sealing devices (41), which are arranged on opposite sides along the third wrapping path (P4) downstream of the third transfer station (S4) and are configured to seal overlapping portions of the wrapping sheet (10) in the area of opposite side wall of the sealed wrap (3) being formed.

4. The packer machine (22) according to claim 3, wherein:

   the second wrapping conveyor (38) moves the sealed wrap (3) being formed along the third wrapping path (P4) with the opposite side walls arranged parallel to the third wrapping path (P4); and
   the second wrapping path (P3) develops from the second transfer station (S4) to the third transfer station (S5) with an angle of 270° around the first rotation axis (32).

5. The packer machine (22) according to claim 3 or 4 and comprising a pair of first folding devices (40), which are arranged on opposite sides along the third wrapping path (P4) between the third transfer station (S5) and the second sealing devices (41) and are configured to close the wrapping sheet (10) in the area of the side walls of the sealed wrap (3) being formed.

6. The packer machine (22) according to claim 3 or 4 and comprising a pair of second folding devices (60), which are arranged on opposite sides along the first wrapping path (P2) between the first feeding station (S3) and the second transfer station (S4) and are configured to close the wrapping sheet (10) in the area of the side walls of the sealed wrap (3) being formed.

7. The packer machine (22) according to one of the claims from 3 to 6 and comprising:

a second wrapping drum (42), which supports at least one third pocket (43) designed to contain the completed sealed wrap (3) and is mounted so as to rotate around a second vertical rotation axis (44), which is parallel to the first rotation axis (32), to move the third pocket (43) along a fourth wrapping path (P5) with a circular shape; and

a fourth transfer station (S6), where the completed sealed wrap (3) is directly transferred from the second wrapping conveyor (38) to the third pocket (43) of the second wrapping drum (42).

8. The packer machine (22) according to claim 7 and comprising:

a third wrapping drum (45), which supports at least one fourth pocket (46) designed to contain the sealed wrap (3) and is mounted so as to rotate around a third horizontal rotation axis (47), which is parallel to the first wrapping path (P2), to move the fourth pocket (46) along a fifth wrapping path (P6) with a circular shape;

a fifth transfer station (S7), where the completed sealed wrap (3) is directly transferred from the third pocket (43) of the second wrapping drum (42) to the fourth pocket (46) of the third wrapping drum (45);

a second feeding station (S9), which is arranged downstream of the fifth transfer station (S7) and where the blank (21) is coupled to the fourth pocket (46);

a fourth wrapping drum (54), which supports at least one fifth pocket (55) designed to contain the sealed wrap (3) and the blank (21) and is mounted so as to rotate around a fourth horizontal rotation axis (56), which is parallel to the third rotation axis (47), to move the fifth pocket (55) along a sixth wrapping path (P7) with a circular shape; and

a sixth transfer station (S10), where the completed sealed wrap (3) and the blank (22) are directly transferred, together, from the fourth pocket (46) of the third wrapping drum (45) to the fifth pocket (55) of the fourth wrapping drum (54).

9. The packer machine (22) according to claim 8, wherein the second wrapping drum (42) causes the completed sealed wrap (3) to make a 90° rotation between the fourth transfer station (S6) and the fifth transfer station (S7).

10. The packer machine (22) according to one of the claims from 1 to 9, wherein:

the first sealing device (34) is designed to create a first sealing fin (19);

a third folding device (37) is provided, which is arranged along the second wrapping path (P3) downstream of the first sealing device (34) and is configured to fold the sealing fin (19) against a wall of the sealed wrap (3) being formed; and

a fourth folding device (33) is provided, which is arranged along the second wrapping path (P3) upstream of the first sealing device (34) and is configured to make a double fold of an end (17) of the wrapping sheet (10) so as to cause the end (17) to become "L"-shaped.

11. The packer machine (22) according to one of the claims from 1 to 9 and comprising a fifth folding device (61), which is arranged along the first wrapping path (P2) upstream of the second transfer station (S4) and is designed to close the wrapping sheet (10) in the area of the lower wall of the sealed wrap (3) being formed.

12. The packer machine (22) according to one of the claims from 1 to 11, wherein the first wrapping conveyor (27) moves the group (6) of smoking articles along the first wrapping path (P2) with the filters (7) ahead and, as a consequence, so that an initial "U"-shaped wrapping of the wrapping sheet (10) takes place astride the filters (7).

13. The packer machine (22) according to one of the claims from 1 to 12 and comprising a feeding device (58), which, in a third feeding station (S13), cyclically inserts a reinforcement element (11), which is suited to embrace the group (6) of cigarettes, into the first empty pocket (25) of the forming conveyor (26).

14. The packer machine (22) according to claim 13 and comprising a sixth folding device (59), which is arranged upstream of the first transfer station (S2) relative to the moving direction of the forming conveyor (26) and is configured to fold a lower wall (14) of the reinforcement element (11) against the lower wall of the group (6) of cigarettes.

15. A wrapping method to produce a rigid pack (1) for smoking articles comprising: a sealed wrap (3), which is obtained by folding a wrapping sheet (10) around a group (6) of smoking articles, and an outer container (2), which is obtained by folding a blank (21) around the sealed wrap (3); the wrapping method comprises the steps of:

moving a plurality of first pockets (25) along a forming path (P1) by means of a forming conveyor (26);

pulling the group (6) of smoking articles out of an output mouth (24) of a hopper (23), which is arranged in front of the forming conveyor (26)

and along the forming path (P1);
moving, by means of a wrapping conveyor (27), which is arranged downstream of the forming conveyor (26), the group (6) of smoking articles and the wrapping sheet (10) along a first straight and horizontal wrapping path (P2) so as to at least partially fold the wrapping sheet (10) around the group (6) of smoking articles;
directly transferring, in a first transfer station (S2), the group (6) of smoking articles from the first pocket (25) of the forming conveyor (26) to the wrapping conveyor (27); and
coupling the wrapping sheet (10) to the group (6) of smoking articles moving along the first wrapping path (P2) in a feeding station (S3), which is arranged downstream of the first transfer station (S2).
the wrapping method is **characterized in that** it comprises the further steps of:

moving, by means of a wrapping drum (30) mounted so as to rotate around a vertical rotation axis (32), at least one second pocket (31) designed to contain the sealed wrap (3) being formed along a second wrapping path (P3) with a circular shape;
directly transferring, in a second transfer station (S4), the sealed wrap (3) being formed from the first wrapping conveyor (27) to the second pocket (31) of the first wrapping drum (30); and
sealing overlapping portions of the wrapping sheet (10) in the area of a lower wall of the sealed wrap (3) being formed by means of at least one sealing device (34; 62), which is arranged along the second wrapping path (P3) downstream of the second transfer station (S4).

Patentansprüche

1. Verpackungsmaschine (22) zum Herstellen einer festen Verpackung (1) für Rauchartikel, umfassend: eine versiegelte Hülle (3), die durch Falten einer Umhüllungsfolie (10) um eine Gruppe (6) von Rauchartikeln erhalten wird, und einen Außenbehälter (2), der durch Falten eines Zuschnitts (21) um die versiegelte Hülle (3) erhalten wird; wobei die Verpackungsmaschine (22) umfasst:

ein Formungsförderer (26), der zumindest ein erstes Fach (25) entlang eines Formungspfades (P1) bewegt,
einen Einfülltrichter (23), der vor dem Formungsförderer (26) und entlang des Formungspfades (P1) angeordnet ist und mit mindestens einer Auslassöffnung (24) versehen ist, aus der die Gruppe (6) von Rauchartikeln herausgezogen werden kann;
einen ersten Umhüllungsförderer (27), der ausgelegt ist, um die Gruppe (6) von Rauchartikeln und die Umhüllungsfolie (10) entlang eines ersten geraden und horizontalen Umhüllungspfades (P2) zu bewegen, um die Umhüllungsfolie (10) zumindest teilweise um die Gruppe (6) von Rauchartikeln zu falten;
eine erste Transferstation (S2), in der die Gruppe (6) von Rauchartikeln von dem ersten Fach (25) des Formungsförderers (26) zu dem ersten Umhüllungsförderer (27) direkt transferiert wird; und
eine erste Zuführstation (S3), die stromabwärts der ersten Transferstation (S2) angeordnet ist und in der die Umhüllungsfolie (10) an die Gruppe (6) von Rauchartikeln, die sich entlang des ersten Umhüllungspfades (P2) bewegt, gekoppelt wird;
wobei die Verpackungsmaschine (22) **dadurch gekennzeichnet ist, dass** sie umfasst:

eine erste Umhüllungstrommel (30), die mindestens ein zweites Fach (31) trägt, das dafür ausgelegt ist, die sich bildende versiegelte Hülle (3) zu enthalten, und die montiert ist, um sich um eine erste vertikale Drehachse (32) zu drehen, um das zweite Fach (31) entlang eines zweiten Umhüllungspfades (P3) mit einer Kreisform zu bewegen;
eine zweite Transferstation (S4), in der die sich bildende versiegelte Hülle (3) von dem ersten Umhüllungsförderer (27) zu dem zweiten Fach (31) der ersten Umhüllungstrommel (30) direkt transferiert wird; und
mindestens eine erste Versiegelungsvorrichtung (34; 62), die entlang des zweiten Umhüllungspfades (P3) stromabwärts der zweiten Transferstation (S4) angeordnet ist und konfiguriert ist, überlappende Abschnitte der Umhüllungsfolie (10) in dem Bereich einer unteren Wand der sich bildenden versiegelten Hülle (3) zu versiegeln.

2. Verpackungsmaschine (22) nach Anspruch 1, wobei die erste Umhüllungstrommel (30) die sich bildende versiegelte Hülle (3) entlang des zweiten Umhüllungspfads (P3) bewegt, wobei die untere Wand radial nach außen angeordnet ist.

3. Verpackungsmaschine (22) nach Anspruch 1 oder 2, und umfassend:

einen zweiten Umhüllungsförderer (38), der ausgelegt ist, um die sich bildende versiegelte Hülle (3) entlang eines dritten geraden und ho-

rizontalen Umhüllungspfades (P4), der senkrecht zu dem ersten Umhüllungspfad (P2) ist, zu bewegen;
eine dritte Transferstation (S5), in der die sich bildende versiegelte Hülle (3) von dem zweiten Fach (31) der ersten Umhüllungstrommel (30) zu dem zweiten Umhüllungsförderer (38) direkt transferiert wird; und
mindestens ein Paar von zweiten Versiegelungsvorrichtungen (41), die auf gegenüberliegenden Seiten entlang des dritten Umhüllungspfades (P4) stromabwärts der dritten Transferstation (S4) angeordnet sind und konfiguriert sind, überlappende Abschnitte der Umhüllungsfolie (10) in dem Bereich der gegenüberliegenden Seitenwand der sich bildenden versiegelten Hülle (3) zu versiegeln.

4. Verpackungsmaschine (22) nach Anspruch 3, wobei:

der zweite Umhüllungsförderer (38) die sich bildende versiegelte Hülle (3) entlang des dritten Umhüllungspfades (P4) bewegt, wobei die gegenüberliegenden Seitenwände parallel zu dem dritten Umhüllungspfad (P4) angeordnet sind, und
der zweite Umhüllungspfad (P3) sich aus der zweiten Transferstation (S4) mit einem Winkel von 270° um die erste Drehachse (32) zu der dritten Transferstation (S5) entwickelt.

5. Verpackungsmaschine (22) nach Anspruch 3 oder 4, und umfassend ein Paar von ersten Faltvorrichtungen (40), die auf gegenüberliegenden Seiten entlang des dritten Umhüllungspfades (P4) zwischen der dritten Transferstation (S5) und den zweiten Versiegelungsvorrichtungen (41) angeordnet sind und konfiguriert sind, die Umhüllungsfolie (10) in dem Bereich der Seitenwände der sich bildenden versiegelten Hülle (3) zu verschließen.

6. Verpackungsmaschine (22) nach Anspruch 3 oder 4, und umfassend ein Paar von zweiten Faltvorrichtungen (60), die auf gegenüberliegenden Seiten entlang des ersten Umhüllungspfades (P2) zwischen der ersten Zuführstation (S3) und der zweiten Transferstation (S4) angeordnet sind und konfiguriert sind, die Umhüllungsfolie (10) in dem Bereich der Seitenwände der sich bildenden versiegelten Hülle (3) zu verschließen.

7. Verpackungsmaschine (22) nach einem der Ansprüche 3 bis 6, und umfassend:

eine zweite Umhüllungstrommel (42), die mindestens ein drittes Fach (43) trägt, das dafür ausgelegt ist, die fertiggestellte versiegelte Hülle (3) zu enthalten und montiert ist, um sich um eine zweite vertikale Drehachse (44), die parallel zu der ersten Drehachse (32) ist, zu drehen, um das dritte Fach (43) entlang eines vierten Umhüllungspfades (P5) mit einer Kreisform zu bewegen; und
eine vierte Transferstation (S6), in der die fertiggestellte versiegelte Hülle (3) von dem zweiten Umhüllungsförderer (38) zu dem dritten Fach (43) der zweiten Umhüllungstrommel (42) direkt transferiert wird.

8. Verpackungsmaschine (22) nach Anspruch 7, und umfassend:

eine dritte Umhüllungstrommel (45), die mindestens ein viertes Fach (46) trägt, das ausgelegt ist, um die versiegelte Hülle (3) zu enthalten, und montiert ist, um sich um eine dritte horizontale Drehachse (47) zu drehen, die parallel zu dem ersten Umhüllungspfad (P2) ist, um das vierte Fach (46) entlang eines fünften Umhüllungspfades (P6) mit einer Kreisform zu bewegen;
eine fünfte Transferstation (S7), in der die fertiggestellte versiegelte Hülle (3) von dem dritten Fach (43) der zweiten Umhüllungstrommel (42) zu dem vierten Fach (46) der dritten Umhüllungstrommel (45) direkt transferiert wird;
eine zweite Zuführstation (S9), die stromabwärts der fünften Transferstation (S7) angeordnet ist, und in der der Zuschnitt (21) an das vierte Fach (46) gekoppelt wird;
eine vierte Umhüllungstrommel (54), die mindestens ein fünftes Fach (55) trägt, das dafür ausgelegt ist, die versiegelte Hülle (3) und den Zuschnitt (21) zu enthalten, und montiert ist, um sich um eine vierte horizontale Drehachse (56), die parallel zu der dritten Drehachse (47) ist, zu drehen, um das fünfte Fach (55) entlang eines sechsten Umhüllungspfades (P7) mit einer Kreisform zu bewegen; und
eine sechste Transferstation (S10), in der die fertiggestellte versiegelte Hülle (3) und der Zuschnitt (21) von dem vierten Fach (46) der dritten Umhüllungstrommel (45) zu dem fünften Fach (55) der vierten Umhüllungstrommel (54) zusammen direkt transferiert werden.

9. Verpackungsmaschine (22) nach Anspruch 8, wobei die zweite Umhüllungstrommel (42) veranlasst, dass die fertiggestellte versiegelte Hülle (3) eine 90°-Drehung zwischen der vierten Transferstation (S6) und der fünften Transferstation (S7) macht.

10. Verpackungsmaschine (22) nach einem der Ansprüche 1 bis 9, wobei:

die erste Versiegelungsvorrichtung (34) dafür ausgelegt ist, eine erste Versiegelungsrippe (19) zu erzeugen;
eine dritte Faltvorrichtung (37) vorgesehen ist, die entlang des zweiten Umhüllungspfades (P3) stromabwärts der ersten Versiegelungsvorrichtung (34) angeordnet ist und konfiguriert ist, die Versiegelungsrippe (19) gegen eine Wand der sich bildenden versiegelten Hülle (3) zu falten; und
eine vierte Faltvorrichtung (33) vorgesehen ist, die entlang des zweiten Umhüllungspfades (P3) stromaufwärts der ersten Versiegelungsvorrichtung (34) angeordnet ist und konfiguriert ist, eine Doppelfaltung eines Endes (17) der Umhüllungsfolie (10) zu machen, um zu veranlassen, dass das Ende (17) L-förmig wird.

11. Verpackungsmaschine (22) nach einem der Ansprüche 1 bis 9, und umfassend eine fünfte Faltvorrichtung (61), die entlang des ersten Umhüllungspfades (P2) stromaufwärts der zweiten Transferstation (S4) angeordnet ist und dafür ausgelegt ist, die Umhüllungsfolie (10) in dem Bereich der unteren Wand der sich bildenden versiegelten Hülle (3) zu verschließen.

12. Verpackungsmaschine (22) nach einem der Ansprüche 1 bis 11, wobei der erste Umhüllungsförderer (27) die Gruppe (6) von Rauchartikeln entlang des ersten Umhüllungspfades (P2) mit den Filtern (7) voraus und, als eine Konsequenz, derart bewegt, dass eine anfängliche U-förmige Umhüllung der Umhüllungsfolie (10) an der Spitze der Filter (7) stattfindet.

13. Verpackungsmaschine (22) nach einem der Ansprüche 1 bis 12, und umfassend eine Zuführvorrichtung (58), die, in einer dritten Zuführstation (S13), ein Verstärkungselement (11), das dafür geeignet ist, die Gruppe (6) von Zigaretten zu umschließen, in das erste leere Fach (25) des Formungsförderers (26) zyklisch einsetzt.

14. Verpackungsmaschine (22) nach Anspruch 13, und umfassend eine sechste Faltvorrichtung (59), die stromaufwärts der ersten Transferstation (S2) relativ zu der Bewegungsrichtung des Formungsförderers (26) angeordnet ist und konfiguriert ist, eine untere Wand (14) des Verstärkungselements (11) gegen die untere Wand der Gruppe (6) von Zigaretten zu falten.

15. Umhüllungsverfahren zum Herstellen einer starren Packung (1) für Rauchartikel, umfassend: eine versiegelte Hülle (3), die durch Falten einer Umhüllungsfolie (10) um eine Gruppe (6) von Rauchartikeln erhalten wird, und einen Außenbehälter (2), der durch Falten eines Zuschnitts (21) um die versiegelte Hülle (3) erhalten wird; wobei das Umhüllungsverfahren die Schritte umfasst:

Bewegen mehrerer erster Fächer (25) entlang eines Formungspfades (P1) mittels eines Formungsförderers (26),
Ziehen der Gruppe (6) von Rauchartikeln auf einer Auslassöffnung (24) eines Einfülltrichters (23), der vor dem Formungsförderer (26) und entlang des Formungspfades (P1) angeordnet ist,
Bewegen, mittels eines Umhüllungsförderers (27), der stromabwärts des Formungsförderers (26) angeordnet ist, der Gruppe (6) von Rauchartikeln und der Umhüllungsfolie (10) entlang eines ersten geraden und horizontalen Umhüllungspfades (P2), um die Umhüllungsfolie (10) zumindest teilweise um die Gruppe (6) von Rauchartikeln zu falten;
direktes Transferieren in einer ersten Transferstation (S2) der Gruppe (6) von Rauchartikeln aus dem ersten Fach (25) des Formungsförderers (26) zu dem Umhüllungsförderer (27), und Koppeln der Umhüllungsfolie (10) an die Gruppe (6) von Rauchartikeln, die sich entlang des ersten Umhüllungspfads (P2) bewegt, in einer Zuführstation (S3), die stromabwärts der ersten Zuführstation (S2) angeordnet ist,
wobei das Umhüllungsverfahren **dadurch gekennzeichnet ist, dass** es die weiteren Schritte umfasst:

Bewegen mittels einer Umhüllungstrommel (30), die montiert ist, um sich um eine vertikale Drehachse (32) zu drehen, mindestens eines zweiten Fachs (31), das dafür ausgelegt ist, die sich bildende versiegelte Hülle (3) zu enthalten, entlang eines zweiten Umhüllungspfades (P3) mit einer Kreisform;
direktes Transferieren in einer zweiten Transferstation (S4) der sich bildenden versiegelten Hülle (3) von dem ersten Umhüllungsförderer (27) zu dem zweiten Fach (31) der ersten Umhüllungstrommel (30); und
Versiegeln von überlappenden Abschnitten der Umhüllungsfolie (10) in dem Bereich einer unteren Wand der sich bildenden versiegelten Hülle (3) mittels mindestens einer Versiegelungsvorrichtung (34; 62), die entlang des zweiten Umhüllungspfades (P3) stromabwärts der zweiten Transferstation (S4) angeordnet ist.

Revendications

1. Machine d'emballage (22) pour produire un paquet rigide (1) pour des articles à fumer comprenant : une enveloppe étanche (3), qui est obtenue en pliant une feuille d'emballage (10) autour d'un groupe (6) d'articles à fumer, et un contenant externe (2), qui est obtenu en pliant une découpe (21) autour de l'enveloppe étanche (3) ; la machine d'emballage (22) comprenant :

un transporteur de mise en forme (26), qui déplace au moins une première poche (25) le long d'un trajet de mise en forme (P1) ;
une trémie (23), qui est agencée devant le transporteur de mise en forme (26) et le long du trajet de mise en forme (P1) et est dotée d'au moins une embouchure de sortie (24), à partir de laquelle le groupe (6) d'articles à fumer peut être extrait ;
un premier transporteur d'emballage (27), qui est conçu pour déplacer le groupe (6) d'articles à fumer et la feuille d'emballage (10) le long d'un premier trajet d'emballage droit et horizontal (P2) de manière à plier au moins partiellement la feuille d'emballage (10) autour du groupe (6) d'articles à fumer ;
une première station de transfert (S2), où le groupe (6) d'articles à fumer est directement transféré de la première poche (25) du transporteur de mise en forme (26) au premier transporteur d'emballage (27) ; et
une première station d'alimentation (S3), qui est agencée en aval de la première station de transfert (S2) et où la feuille d'emballage (10) est accouplée au groupe (6) d'articles à fumer se déplaçant le long du premier trajet d'emballage (P2) ;
la machine d'emballage (22) est **caractérisée en ce qu'**elle comprend :

un premier tambour d'emballage (30), qui supporte au moins une deuxième poche (31) conçue pour contenir l'enveloppe étanche (3) formée et est monté de manière à tourner autour d'un premier axe de rotation (32) vertical afin de déplacer la deuxième poche (31) le long d'un deuxième trajet d'emballage (P3) avec une forme circulaire ;
une deuxième station de transfert (S4), où l'enveloppe étanche (3) formée est directement transférée du premier transporteur d'emballage (27) à la deuxième poche (31) du premier tambour d'emballage (30) ;
et
au moins un du premier dispositif d'étanchéité (34 ; 62), qui est agencé le long du deuxième trajet d'emballage (P3) en aval de la deuxième station de transfert (S4) et est configuré pour assurer l'étanchéité de parties se chevauchant de la feuille d'emballage (10) dans la zone d'une paroi inférieure de l'enveloppe étanche (3) formée.

2. Machine d'emballage (22) selon la revendication 1, dans laquelle le premier tambour d'emballage (30) déplace l'enveloppe étanche (3) formée le long du deuxième trajet d'emballage (P3) avec la paroi inférieure radialement agencée en direction de l'extérieur.

3. Machine d'emballage (22) selon la revendication 1 ou 2 et comprenant :

un second transporteur d'emballage (38), qui est conçu pour déplacer l'enveloppe étanche (3) formée le long d'un troisième trajet d'emballage droit et horizontal (P4), qui est perpendiculaire au premier trajet d'emballage (P2) ;
une troisième station de transfert (S5), où l'enveloppe étanche (3) formée est directement transférée de la deuxième poche (31) du premier tambour d'emballage (30) au second transporteur d'emballage (38) ; et
au moins une paire de seconds dispositifs d'étanchéité (41), qui sont agencés sur des côtés opposés le long du troisième trajet d'emballage (P4) en aval de la troisième station de transfert (S4) et sont configurés pour assurer l'étanchéité de parties se chevauchant de la feuille d'emballage (10) dans la zone de paroi latérale opposée de l'enveloppe étanche (3) formée.

4. Machine d'emballage (22) selon la revendication 3, dans laquelle :

le second transporteur d'emballage (38) déplace l'enveloppe étanche (3) formée le long du troisième trajet d'emballage (P4) avec les parois latérales opposées agencées parallèles au troisième trajet d'emballage (P4) ; et
le deuxième trajet d'emballage (P3) se développe de la deuxième station de transfert (S4) à la troisième station de transfert (S5) avec un angle de 270° autour du premier axe de rotation (32).

5. Machine d'emballage (22) selon la revendication 3 ou 4 et comprenant une paire de premiers dispositifs pliants (40), qui sont agencés sur des côtés opposés le long du troisième trajet d'emballage (P4) entre la troisième station de transfert (S5) et les seconds dispositifs d'étanchéité (41) et sont configurés pour fermer la feuille d'emballage (10) dans la zone des parois latérales de l'enveloppe étanche (3) formée.

6. Machine d'emballage (22) selon la revendication 3 ou 4 et comprenant une paire de seconds dispositifs pliants (60), qui sont agencés sur des côtés opposés le long du premier trajet d'emballage (P2) entre la première station d'alimentation (S3) et la deuxième station de transfert (S4) et sont configurés pour fermer la feuille d'emballage (10) dans la zone des parois latérales de l'enveloppe étanche (3) formée.

7. Machine d'emballage (22) selon l'une des revendications 3 à 6 et comprenant :

un deuxième tambour d'emballage (42), qui supporte au moins une troisième poche (43) conçue pour contenir l'enveloppe étanche (3) terminée et est monté de manière à tourner autour d'un deuxième axe de rotation vertical (44), qui est parallèle au premier axe de rotation (32), pour déplacer la troisième poche (43) le long d'un quatrième trajet d'emballage (P5) avec une forme circulaire ; et
une quatrième station de transfert (S6), où l'enveloppe étanche (3) terminée est directement transférée du second transporteur d'emballage (38) à la troisième poche (43) du deuxième tambour d'emballage (42).

8. Machine d'emballage (22) selon la revendication 7 et comprenant : un troisième tambour d'emballage (45), qui supporte au moins une quatrième poche (46) conçue pour contenir l'enveloppe étanche (3) et est monté de manière à tourner autour d'un troisième axe de rotation (47) horizontal, qui est parallèle au premier trajet d'emballage (P2), pour déplacer la quatrième poche (46) le long d'un cinquième trajet d'emballage (P6) avec une forme circulaire ;

une cinquième station de transfert (S7), où l'enveloppe étanche (3) terminée est directement transférée de la troisième poche (43) du deuxième tambour d'emballage (42) à la quatrième poche (46) du troisième tambour d'emballage (45) ;
une seconde station d'alimentation (S9), qui est agencée en aval de la cinquième station de transfert (S7) et où la découpe (21) est accouplée à la quatrième poche (46) ;
un quatrième tambour d'emballage (54), qui supporte au moins une cinquième poche (55) conçue pour contenir l'enveloppe étanche (3) et la découpe (21) et est monté de manière à tourner autour d'un quatrième axe de rotation horizontal (56), qui est parallèle au troisième axe de rotation (47), pour déplacer la cinquième poche (55) le long d'un sixième trajet d'emballage (P7) avec une forme circulaire ; et
une sixième station de transfert (S10), où l'enveloppe étanche (3) terminée et la découpe (21) sont directement transférées, ensemble, de la quatrième poche (46) du troisième tambour d'emballage (45) à la cinquième poche (55) du quatrième tambour d'emballage (54).

9. Machine d'emballage (22) selon la revendication 8, dans laquelle le deuxième tambour d'emballage (42) amène l'enveloppe étanche (3) terminée à réaliser une rotation de 90° entre la quatrième station de transfert (S6) et la cinquième station de transfert (S7).

10. Machine d'emballage (22) selon l'une des revendications 1 à 9, dans laquelle :

le premier dispositif d'étanchéité (34) est conçu pour créer une première ailette d'étanchéité (19) ;
un troisième dispositif de pliage (37) est fourni, qui est agencé le long du deuxième trajet d'emballage (P3) en aval du premier dispositif d'étanchéité (34) et configuré pour plier l'ailette d'étanchéité (19) contre une paroi de l'enveloppe étanche (3) formée ; et
un quatrième dispositif de pliage (33) est formé, qui est agencé le long du deuxième trajet d'emballage (P3) en amont du premier dispositif d'étanchéité (34) et est configuré pour réaliser un double pli d'une extrémité (17) de la feuille d'emballage (10) de manière à amener l'extrémité (17) à devenir en forme de « L ».

11. Machine d'emballage (22) selon l'une des revendications 1 à 9 et comprenant un cinquième dispositif de pliage (61), qui est agencé le long du premier trajet d'emballage (P2) en amont de la deuxième station de transfert (S4) et est conçu pour fermer la feuille d'emballage (10) dans la zone de la paroi inférieure de l'enveloppe étanche (3) formée.

12. Machine d'emballage (22) selon l'une des revendications 1 à 11, dans laquelle le premier transporteur d'emballage (27) déplace le groupe (6) d'articles à fumer le long du premier trajet d'emballage (P2) avec les filtres (7) devant et, en conséquence, de sorte qu'un emballage en forme de « U » initial de la feuille d'emballage (10) prenne place à cheval sur les filtres (7).

13. Machine d'emballage (22) selon l'une des revendications 1 à 12 et comprenant un dispositif d'alimentation (58), qui, dans une troisième station d'alimentation (S13), insère cycliquement un élément de renforcement (11), qui est adapté à épouser le groupe (6) de cigarettes, dans la première poche (25) vide du transporteur de mise en forme (26).

14. Machine d'emballage (22) selon la revendication 13

et comprenant un sixième dispositif de pliage (59), qui est agencé en amont de la première station de transfert (S2) par rapport à la direction de déplacement du transporteur de mise en forme (26) et est configuré pour plier une paroi inférieure (14) de l'élément de renforcement (11) contre la paroi inférieure du groupe (6) de cigarettes.

15. Méthode d'emballage pour produire un paquet rigide (1) pour articles à fumer comprenant : une enveloppe étanche (3), qui est obtenue en pliant une feuille d'emballage (10) autour d'un groupe (6) d'articles à fumer, et un contenant externe (2), qui est obtenu en pliant une découpe (21) autour de l'enveloppe étanche (3) ; la méthode d'emballage comprenant les étapes de :

déplacement d'une pluralité de premières poches (25) le long d'un trajet de mise en forme (P1) au moyen d'un transporteur de mise en forme (26) ;
traction du groupe (6) d'articles à fumer hors d'une embouchure de sortie (24) d'une trémie (23), qui est agencée devant le transporteur de mise en forme (26) et le long du trajet de mise en forme (P1) ;
déplacement, au moyen d'un transporteur d'emballage (27), qui est agencé en aval du transporteur de mise en forme (26), du groupe (6) d'articles à fumer et de la feuille d'emballage (10) le long d'un premier trajet d'emballage droit et horizontal (P2) de manière à plier au moins partiellement la feuille d'emballage (10) autour du groupe (6) d'articles à fumer ;
transfert direct, dans une première station de transfert (S2), du groupe (6) d'articles à fumer de la première poche (25) du transporteur de mise en forme (26) au transporteur d'emballage (27) ; et
accouplement de la feuille d'emballage (10) au groupe (6) d'articles à fumer se déplaçant le long du premier trajet d'emballage (P2) dans une station d'alimentation (S3), qui est agencée en aval de la première station de transfert (S2),
la méthode d'emballage est **caractérisée en ce qu'**elle comprend les étapes supplémentaires suivantes :

le déplacement, au moyen d'un tambour d'emballage (30) monté de manière à tourner autour d'un axe de rotation (32) vertical, d'au moins une deuxième poche (31) conçue pour contenir l'enveloppe étanche (3) formée le long d'un deuxième trajet d'emballage (P3) avec une forme circulaire ;
le transfert direct, dans une deuxième station de transfert (S4), de l'enveloppe étanche (3) formée du premier transporteur d'emballage (27) à la deuxième poche (31) du premier tambour d'emballage (30) ; et
l'étanchéification de parties se chevauchant de la feuille d'emballage (10) dans la zone d'une paroi inférieure de l'enveloppe étanche (3) formée au moyen d'au moins un dispositif d'étanchéité (34 ; 62), qui est agencé le long du deuxième trajet d'emballage (P3) en aval de la deuxième station de transfert (S4).

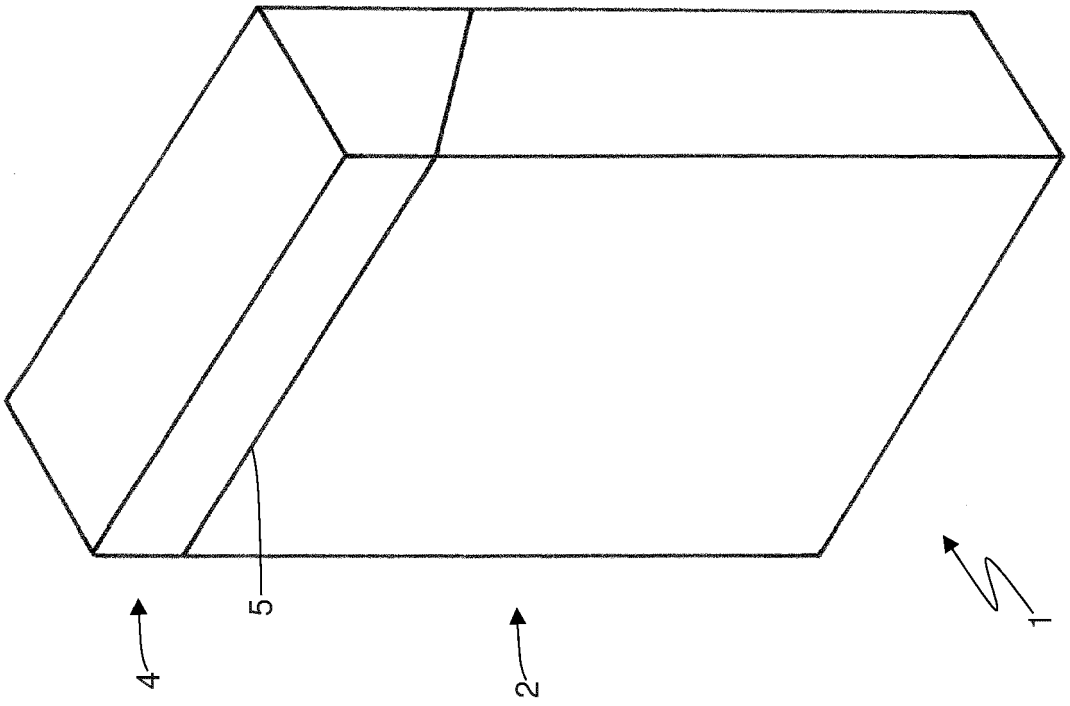


Fig. 2

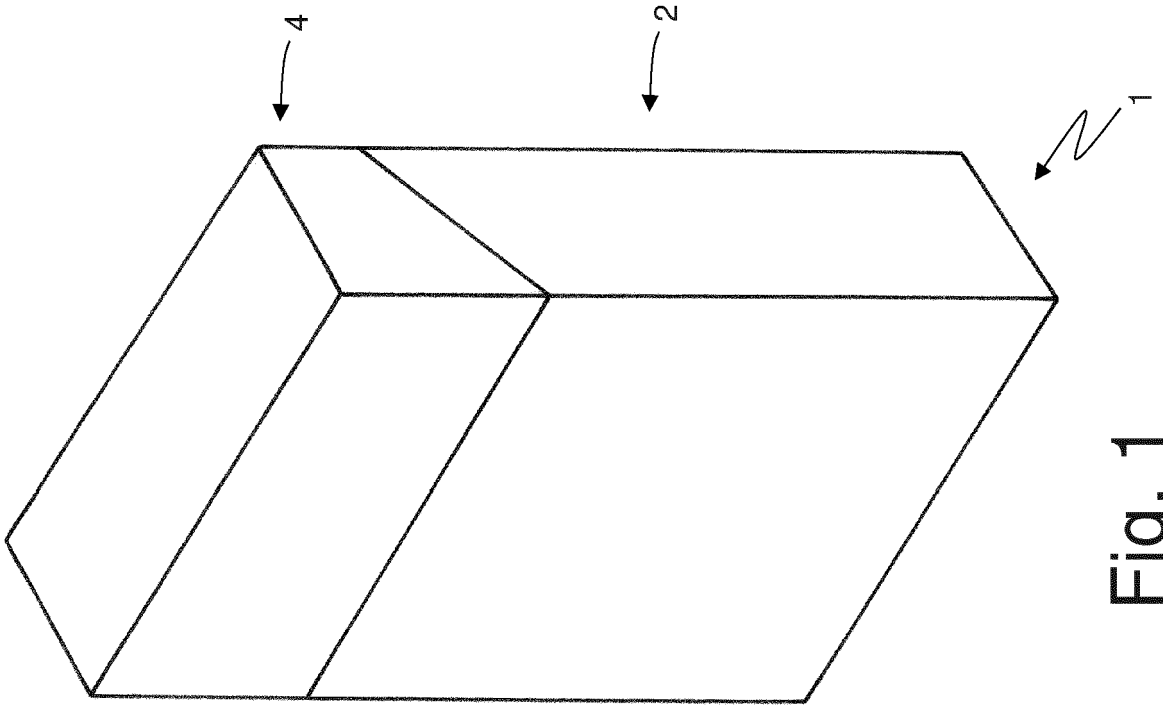


Fig. 1

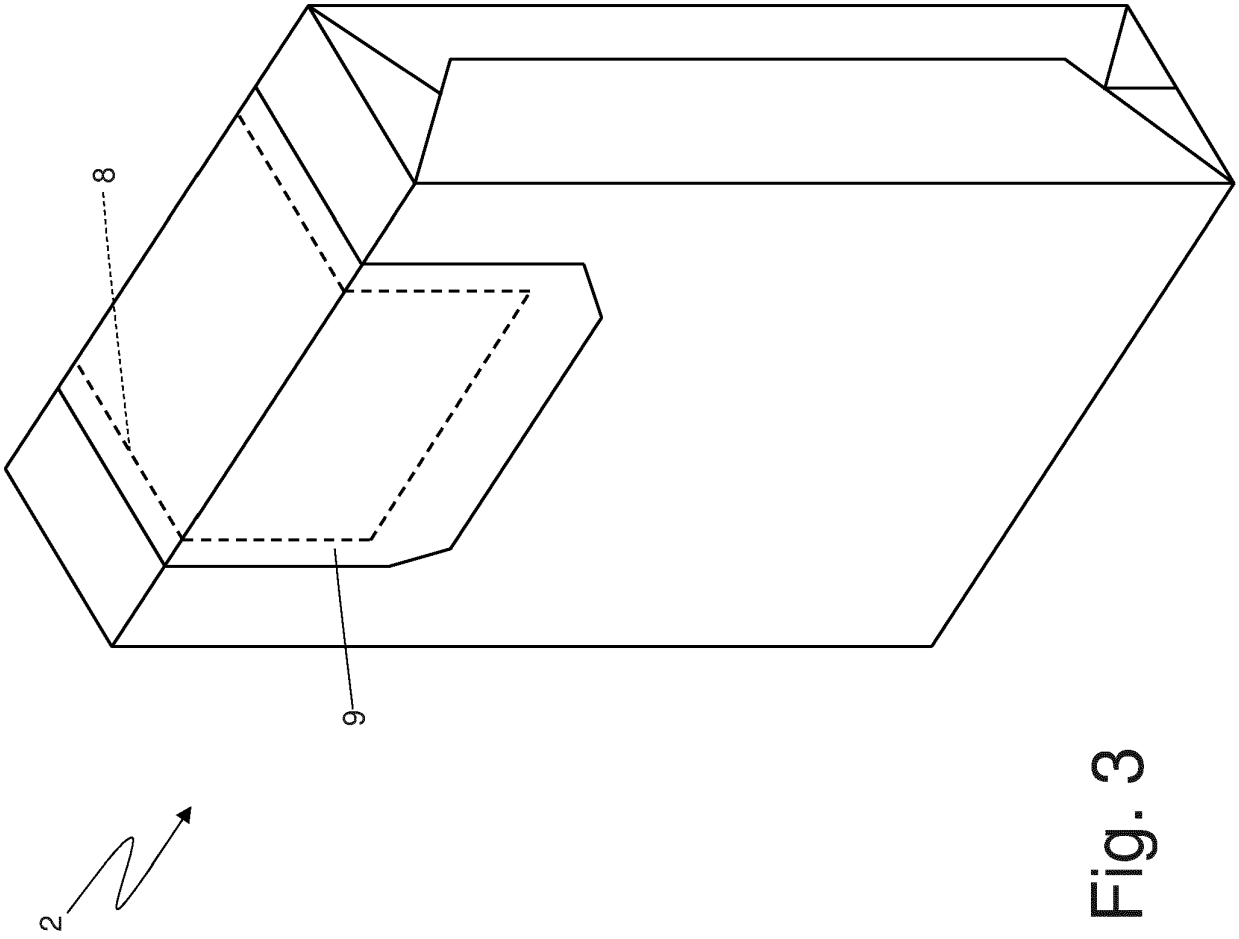


Fig. 3

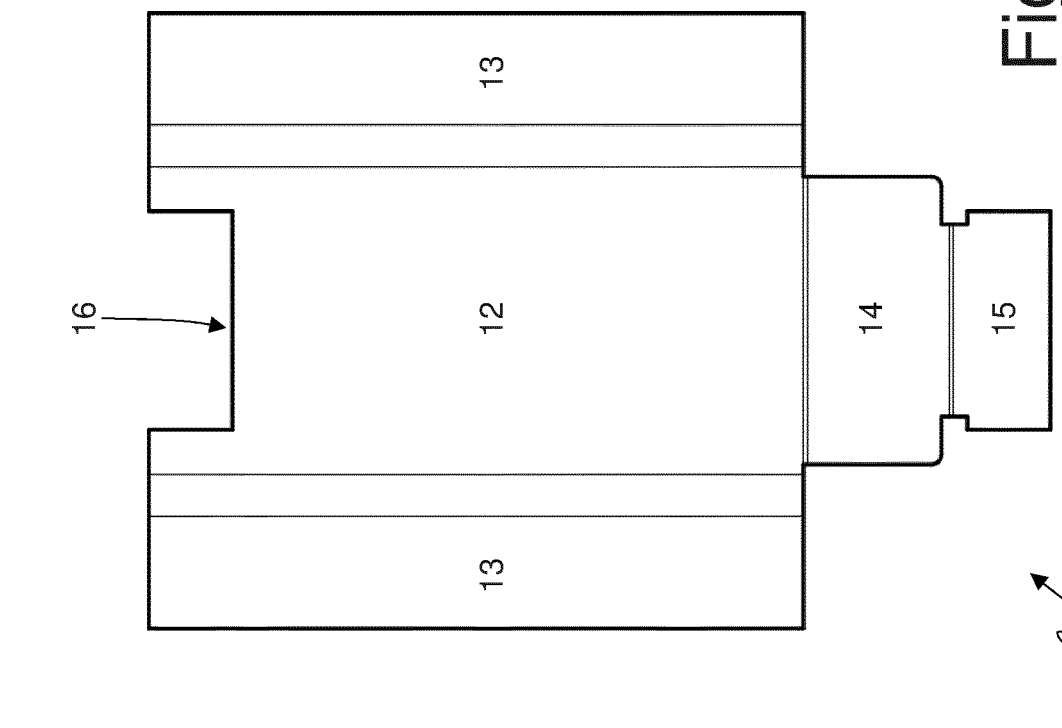


Fig. 5

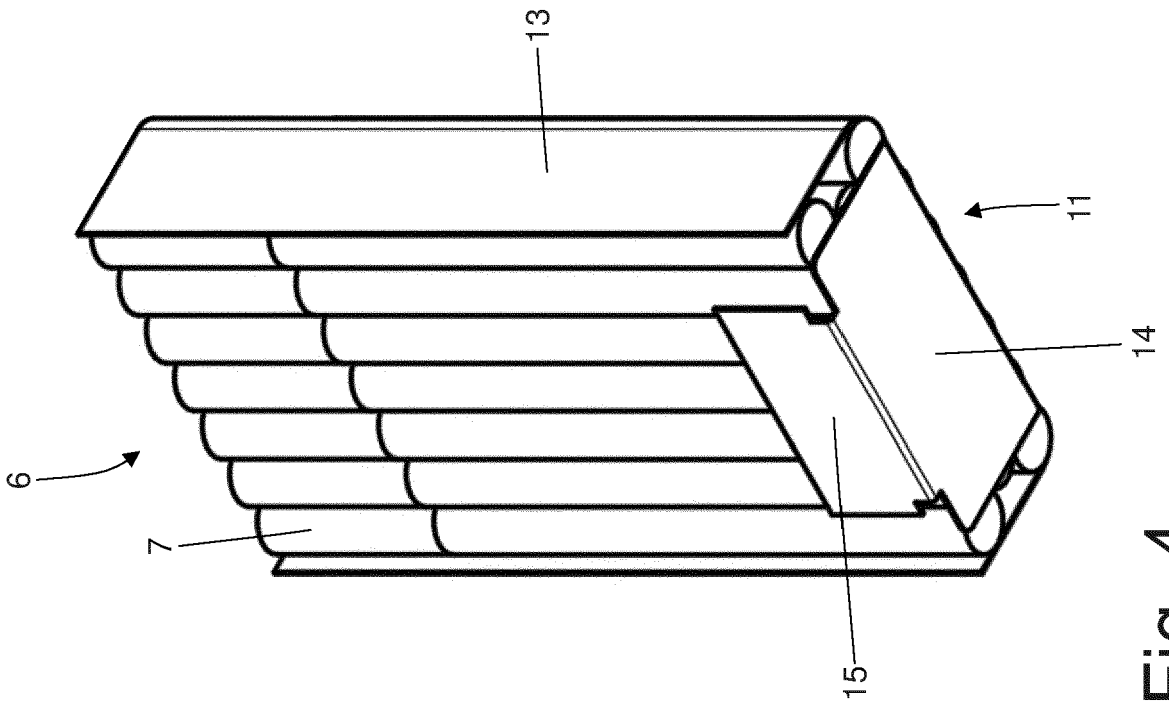


Fig. 4

Fig. 6

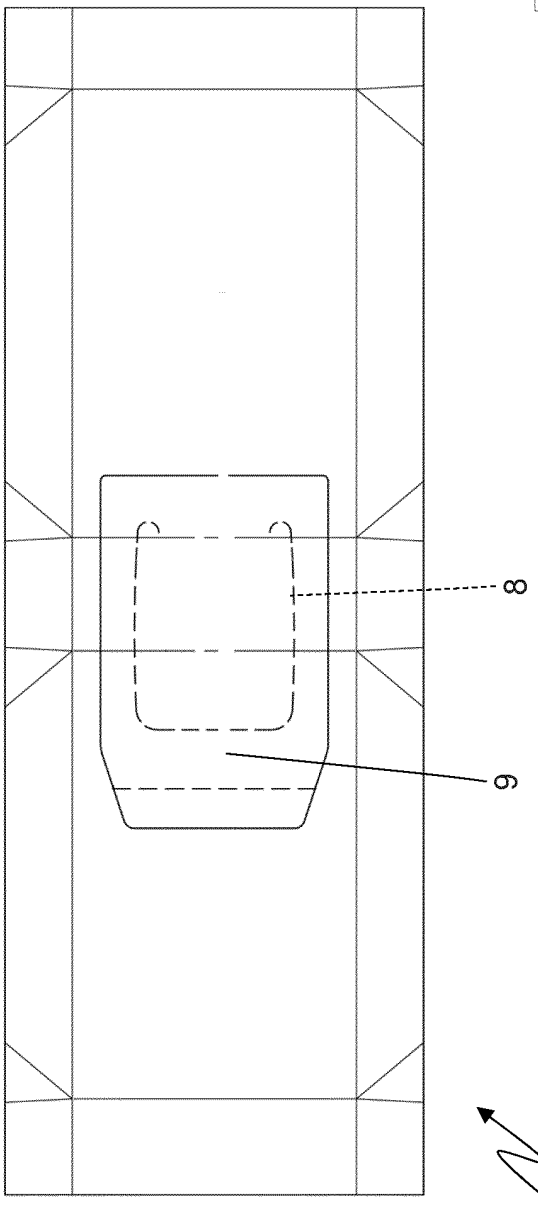


Fig. 7

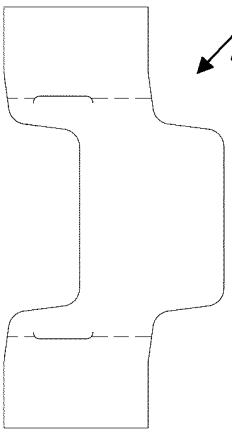
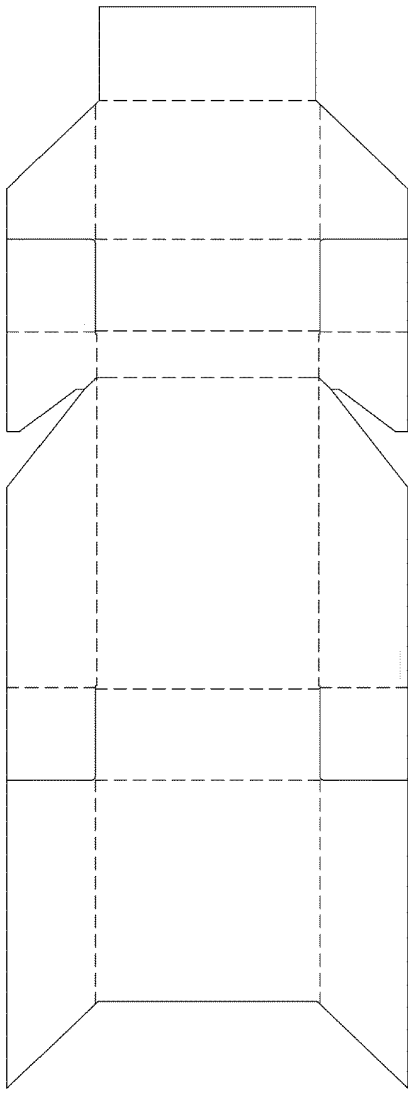


Fig. 8



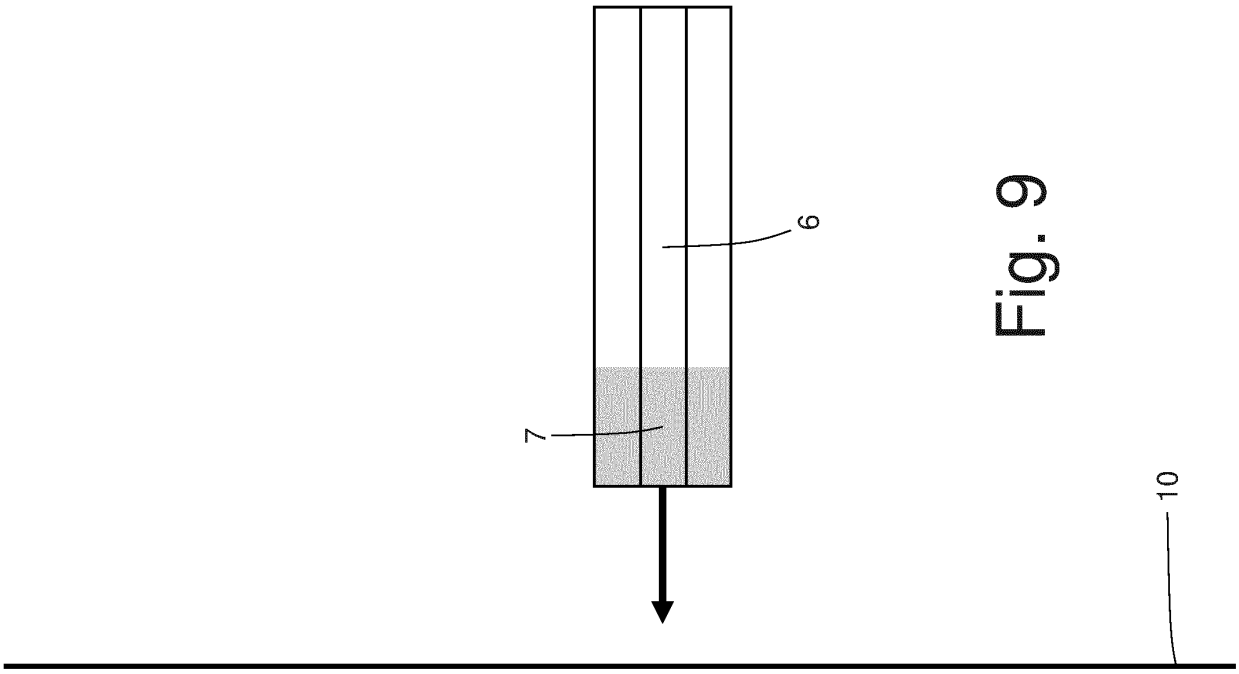


Fig. 9

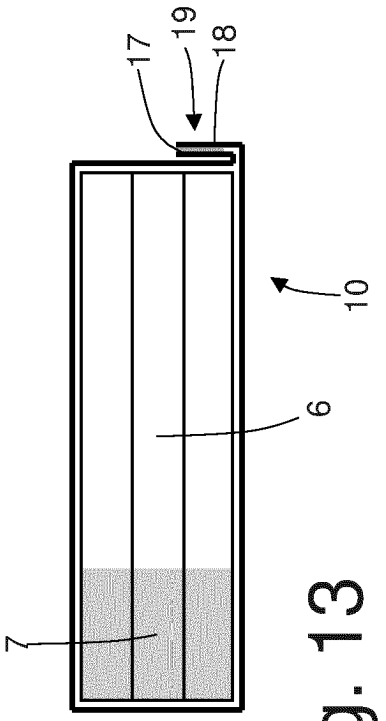


Fig. 13

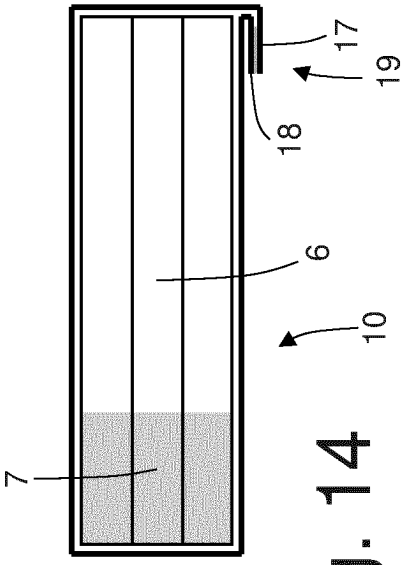


Fig. 14

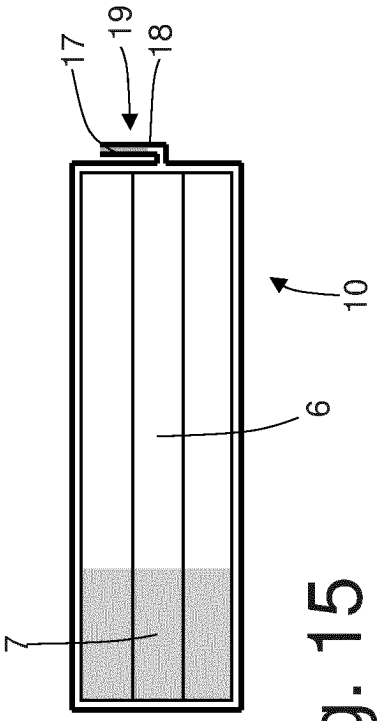


Fig. 15

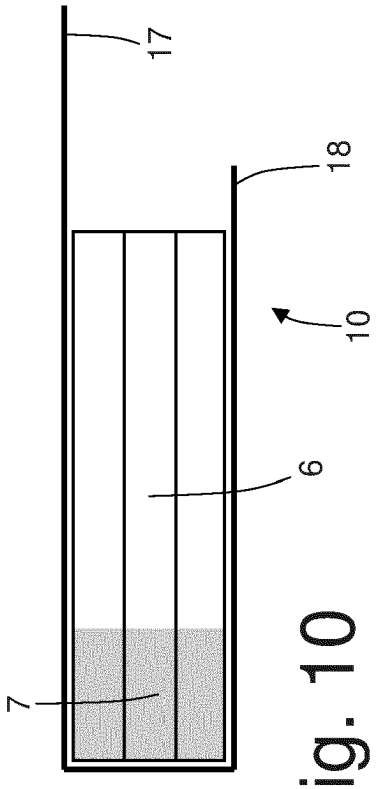


Fig. 10

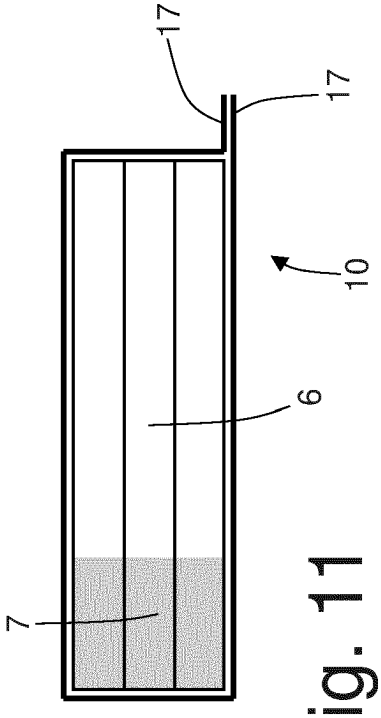


Fig. 11

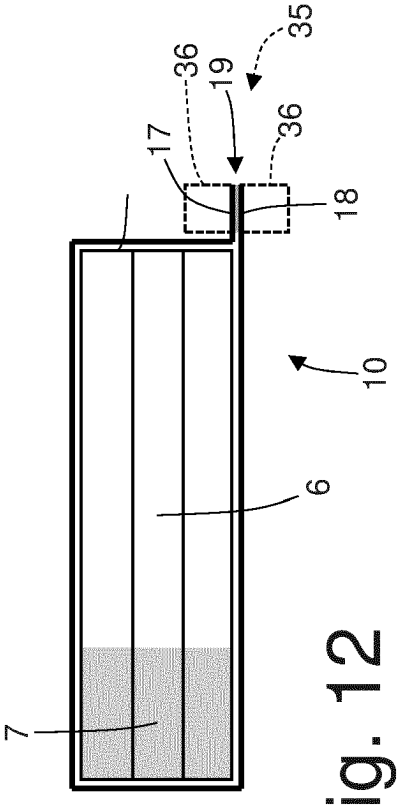


Fig. 12

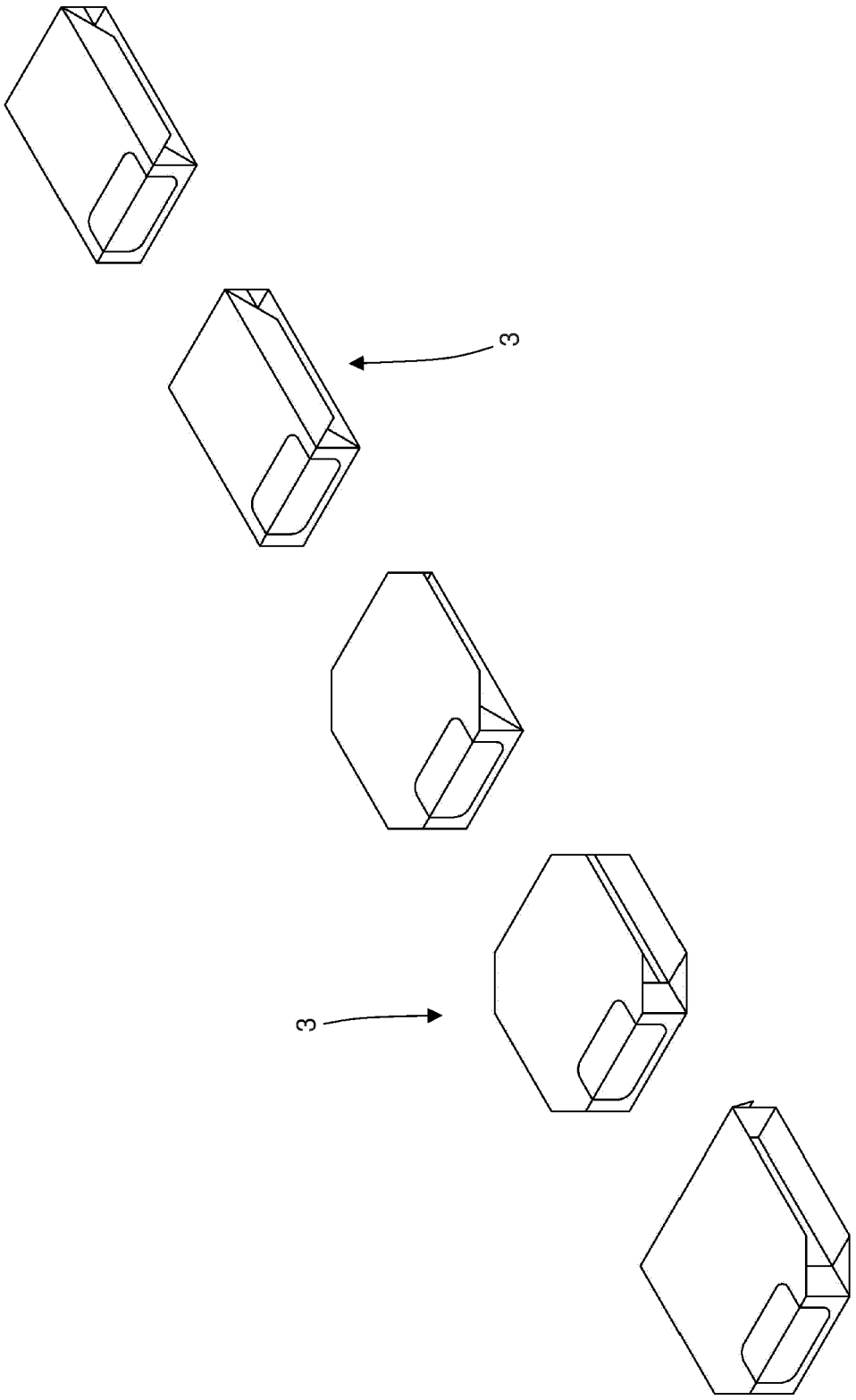
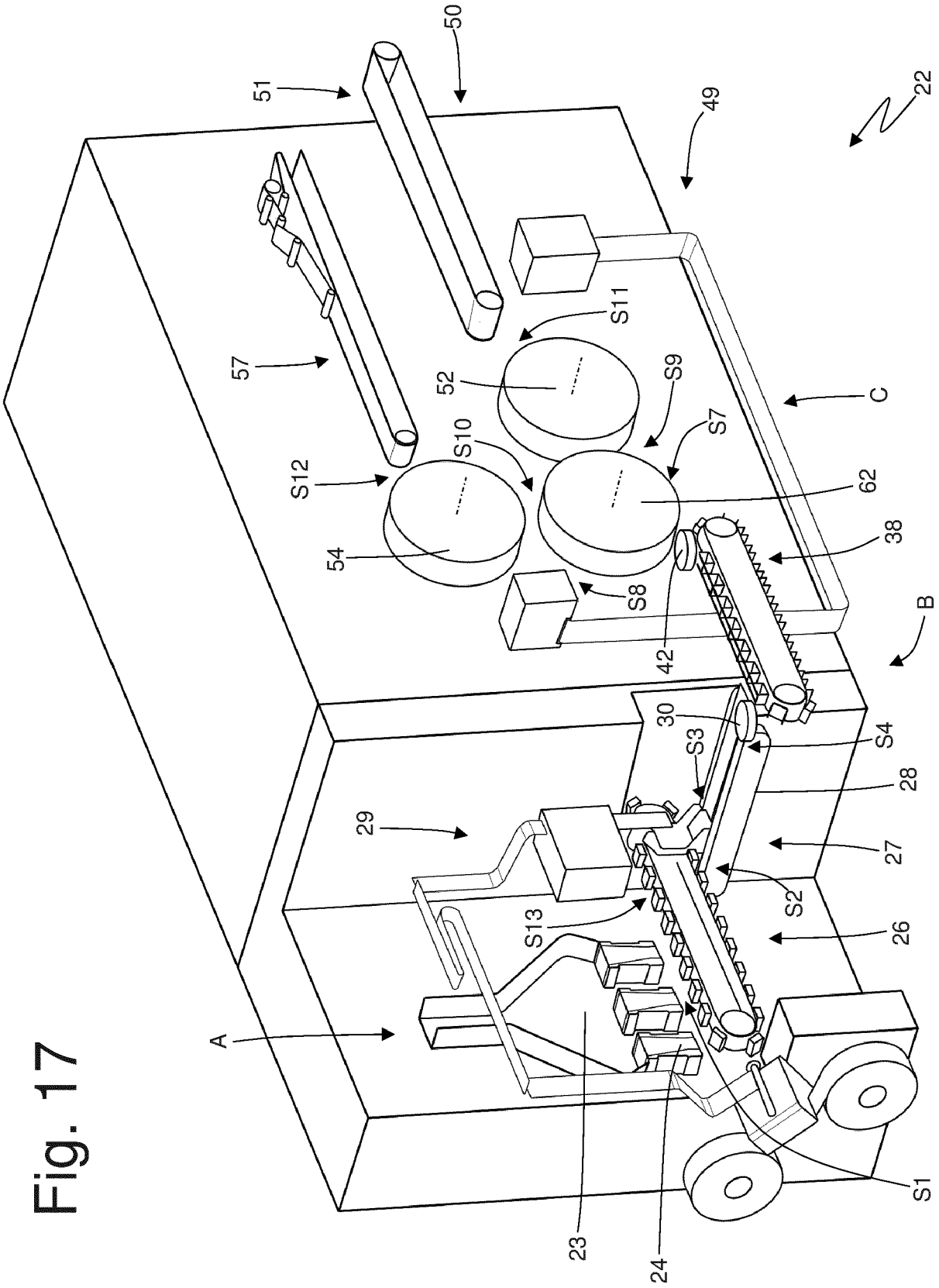


Fig. 16

Fig. 17


50
51
22
49
S11
57
52
S9
C
S10
S7
S12
62
54
38
S8
B
42
30
S3
S4
28
29
27
S2
S13
26
A
23
24
S1

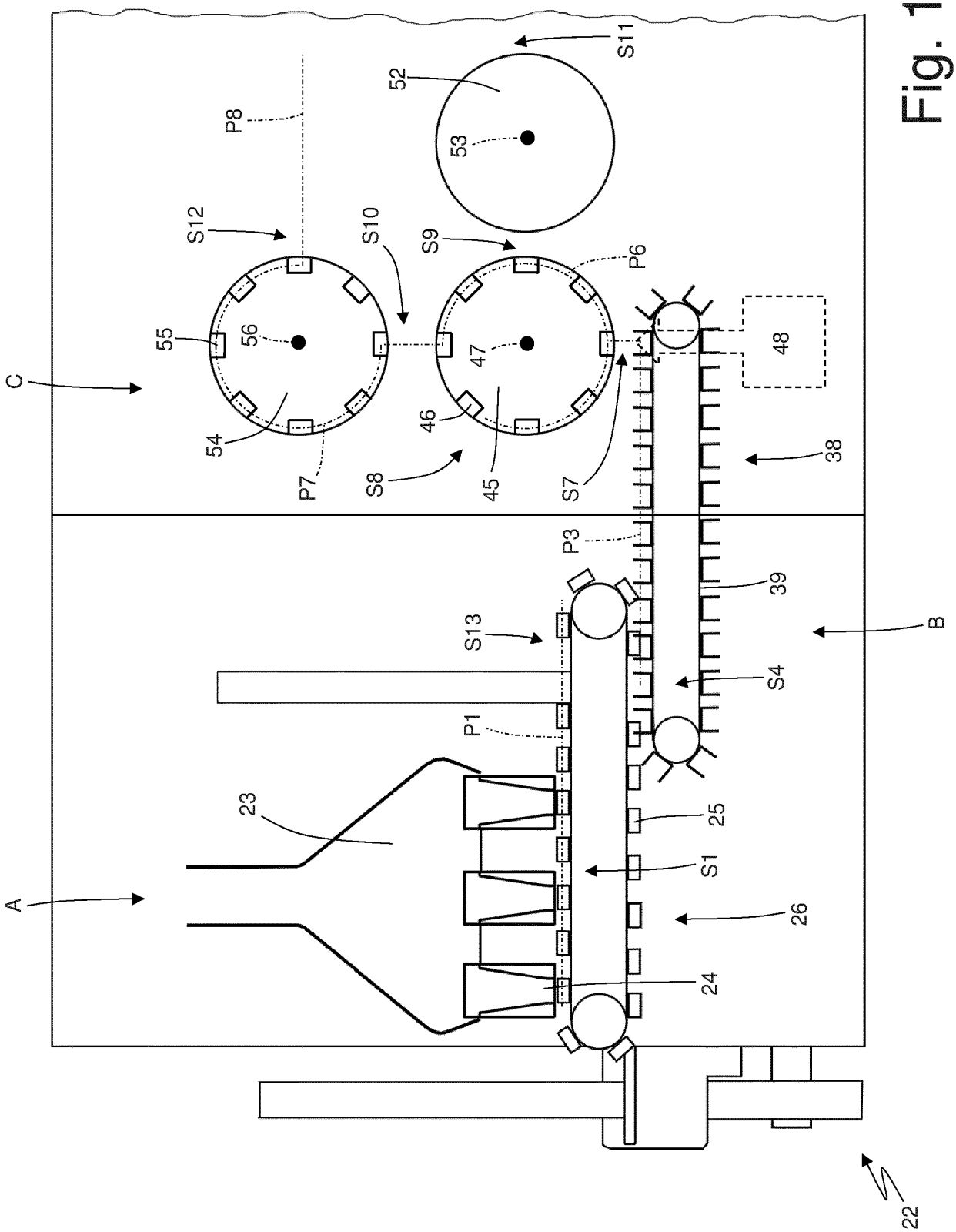

S11
52
53
P8
S12
S10
S9
P6
55
56
47
48
C
54
46
38
P7
S8
45
S7
P3
39
B
S13
S4
P1
23
25
S1
A
26
24
22

Fig. 18

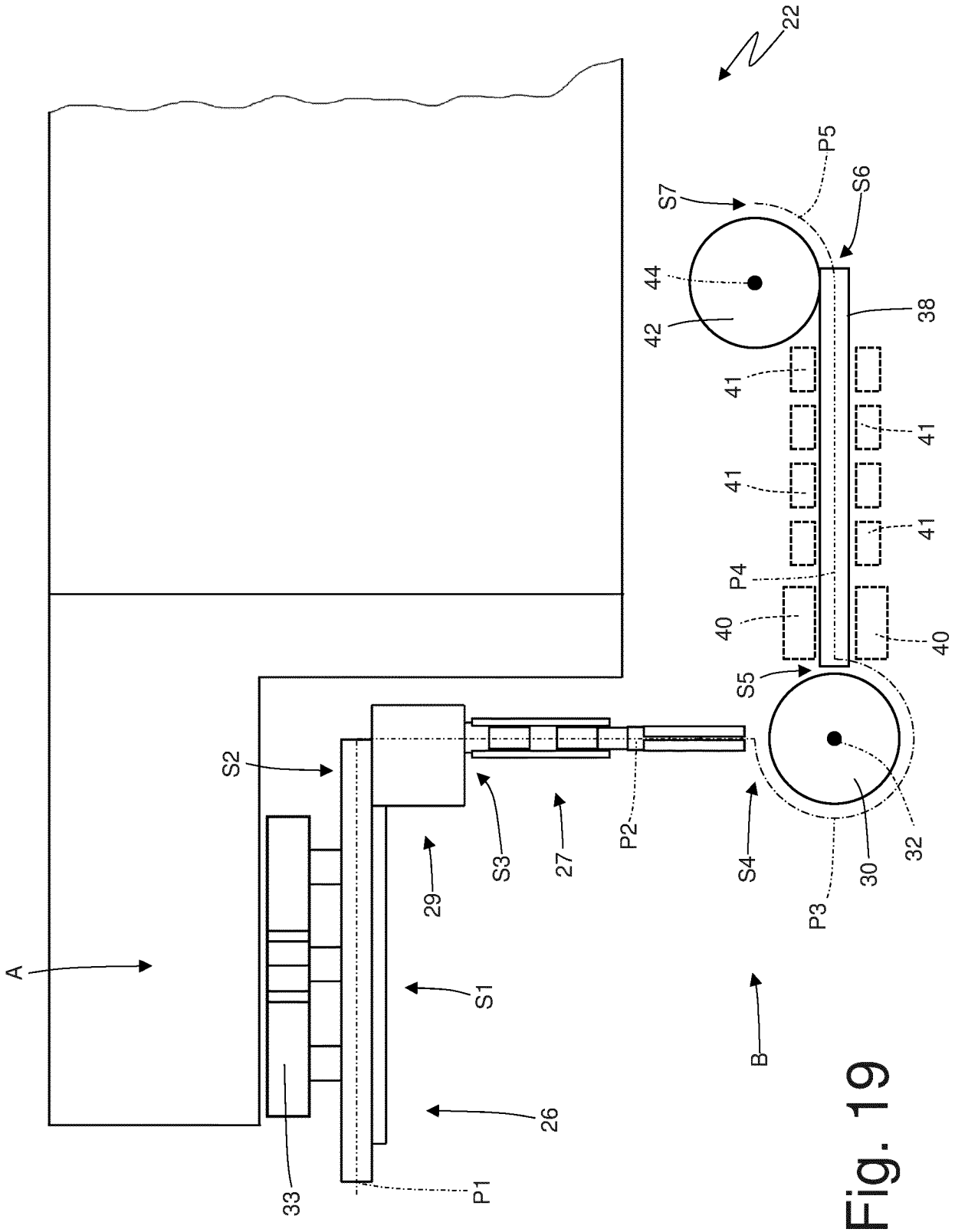

22
P5
S6
S7
44
42
38
41
41
41
41
P4
40
40
S5
S2
S3
27
P2
S4
29
30
32
P3
A
S1
B
26
33
P1

Fig. 19

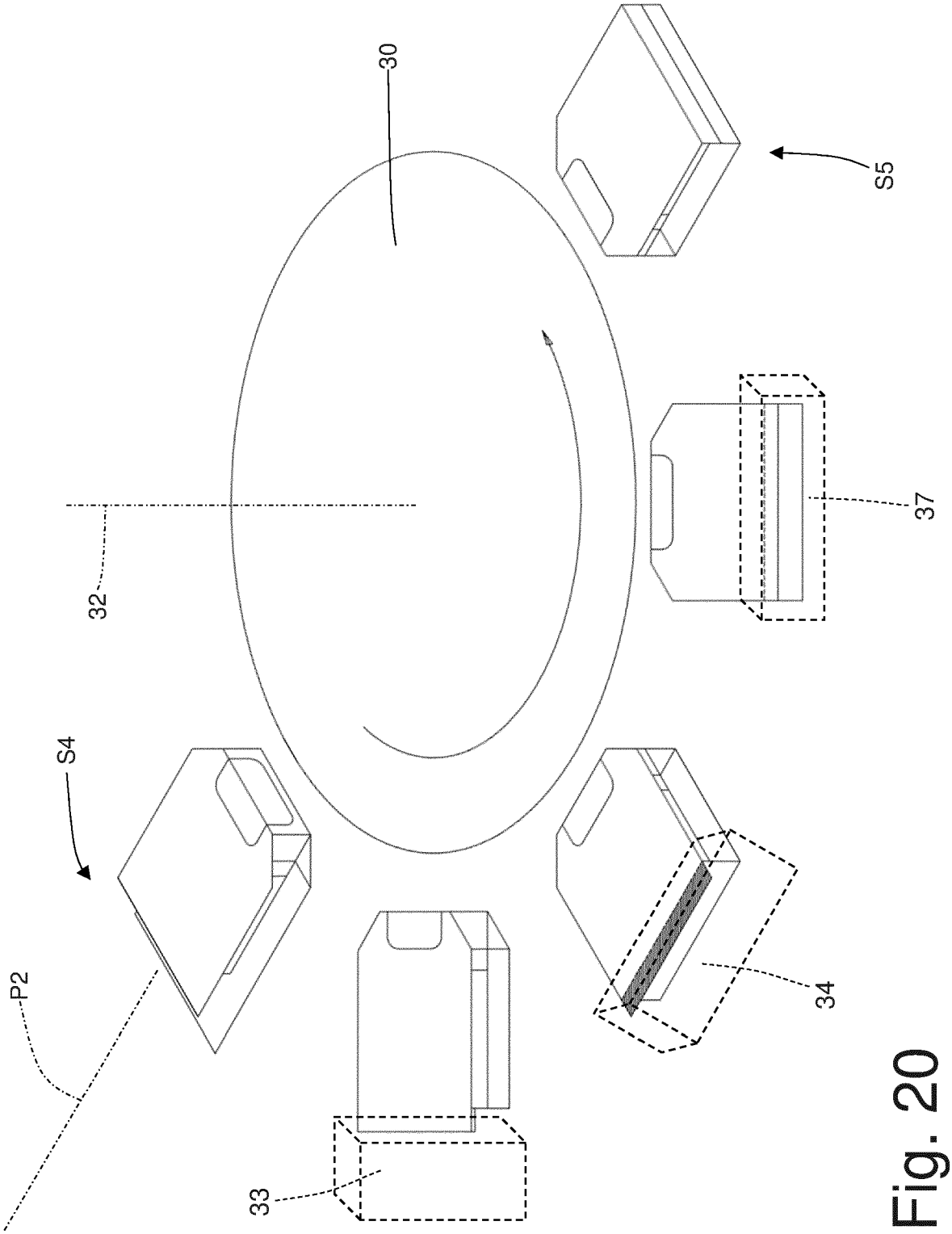


Fig. 20

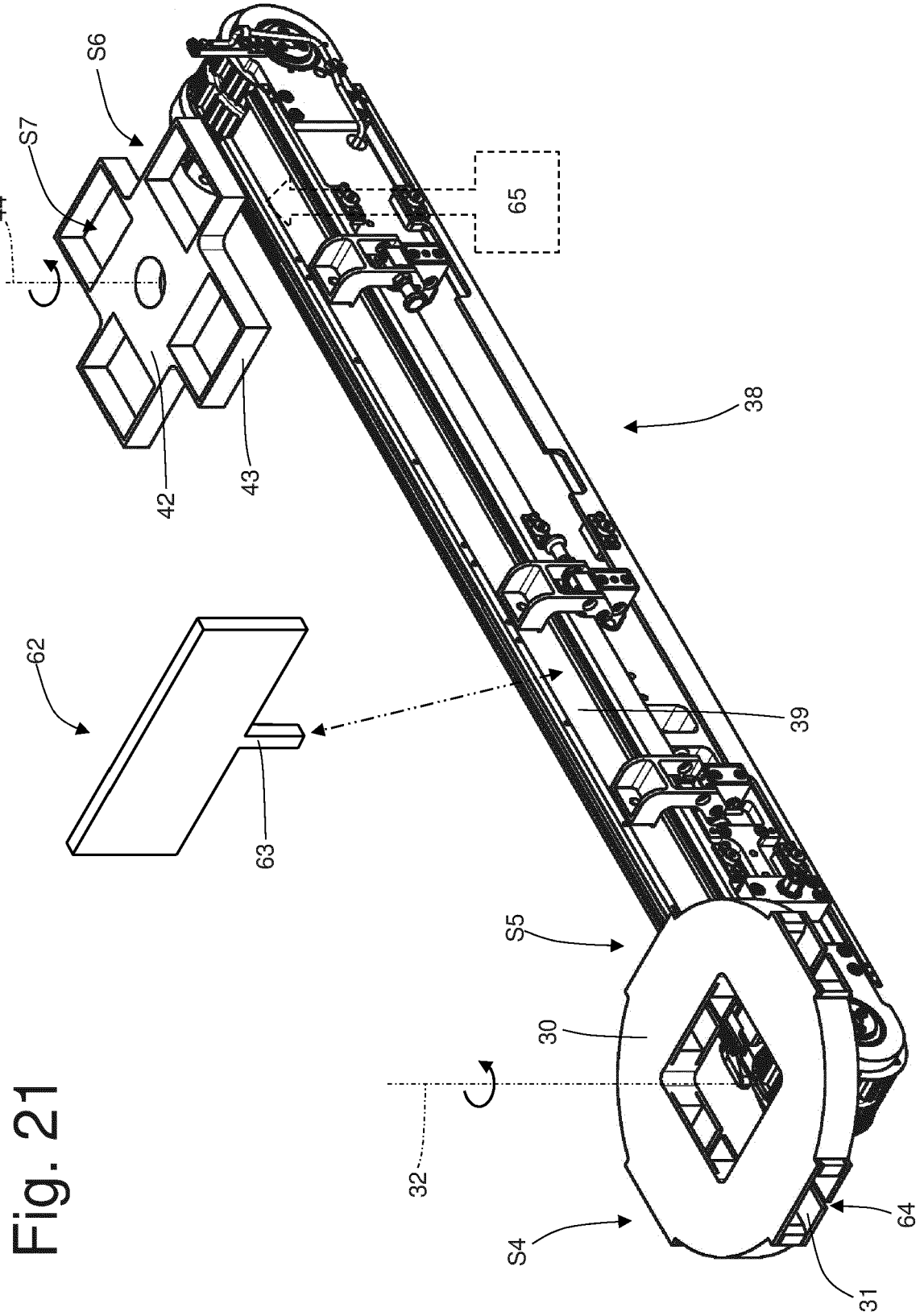


Fig. 21

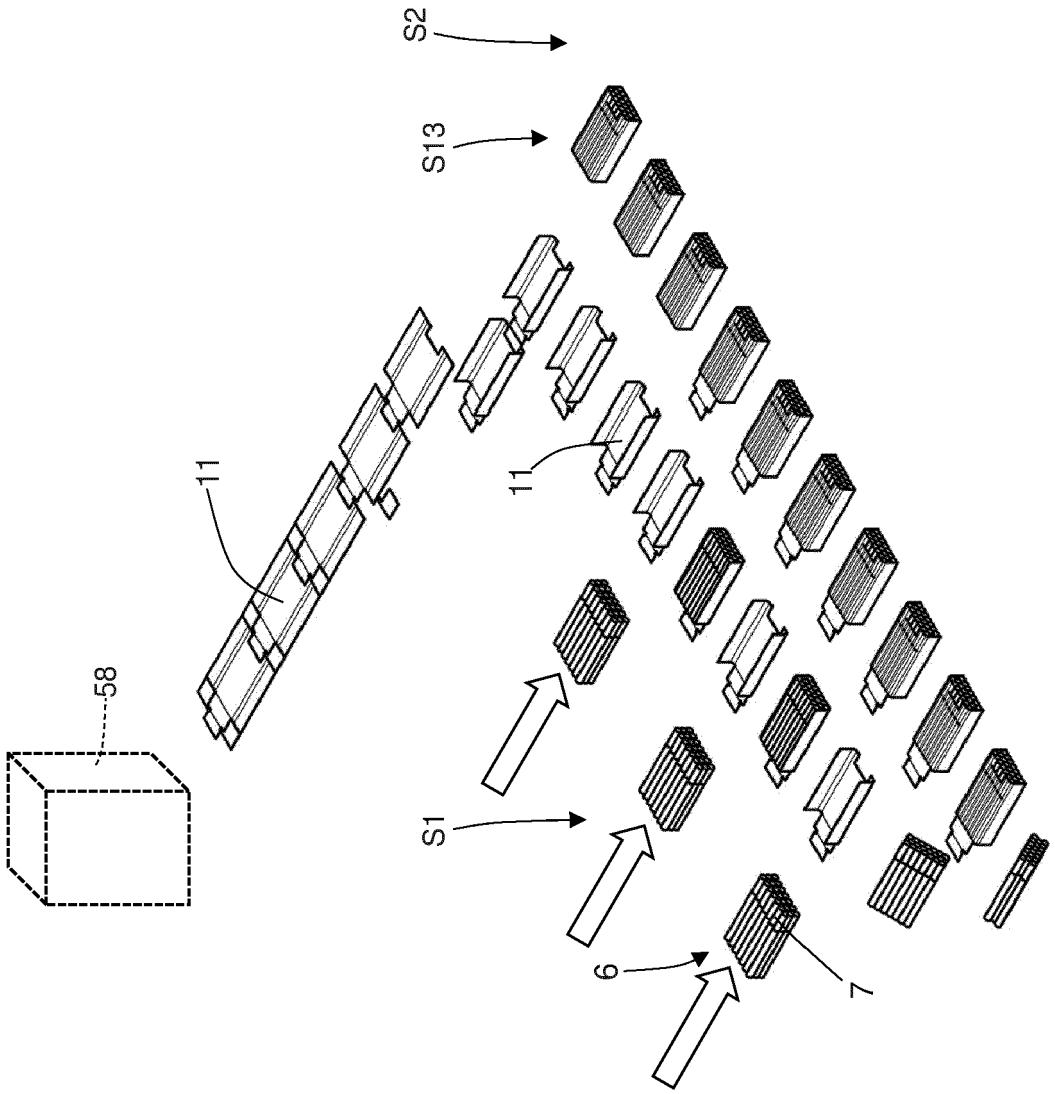


Fig. 22

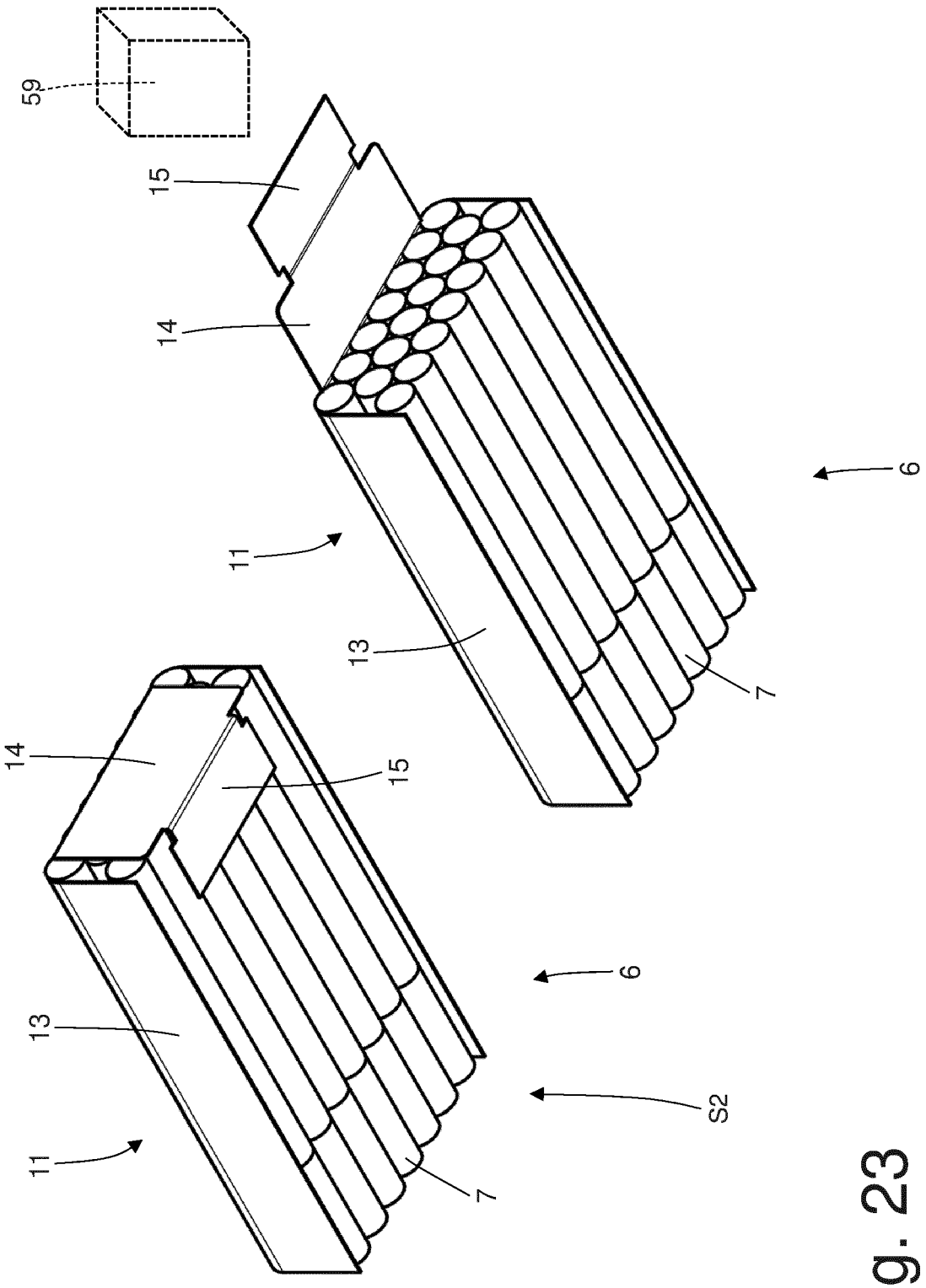


Fig. 23

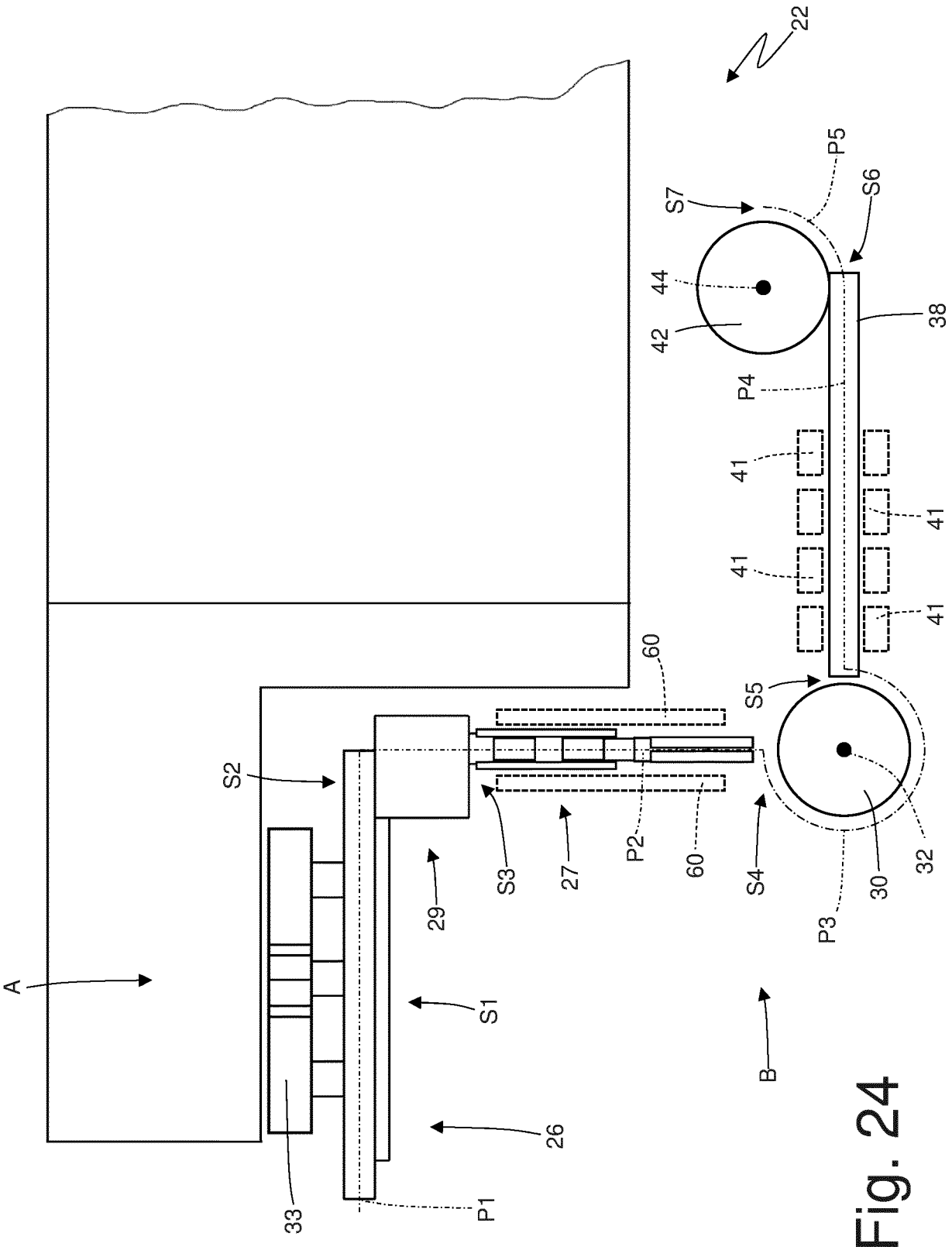

22
P5
S7
S6
44
42
38
P4
41
41
41
41
60
S5
S2
S3
27
P2
60
S4
30
32
P3
29
S1
26
A
B
33
P1

Fig. 24

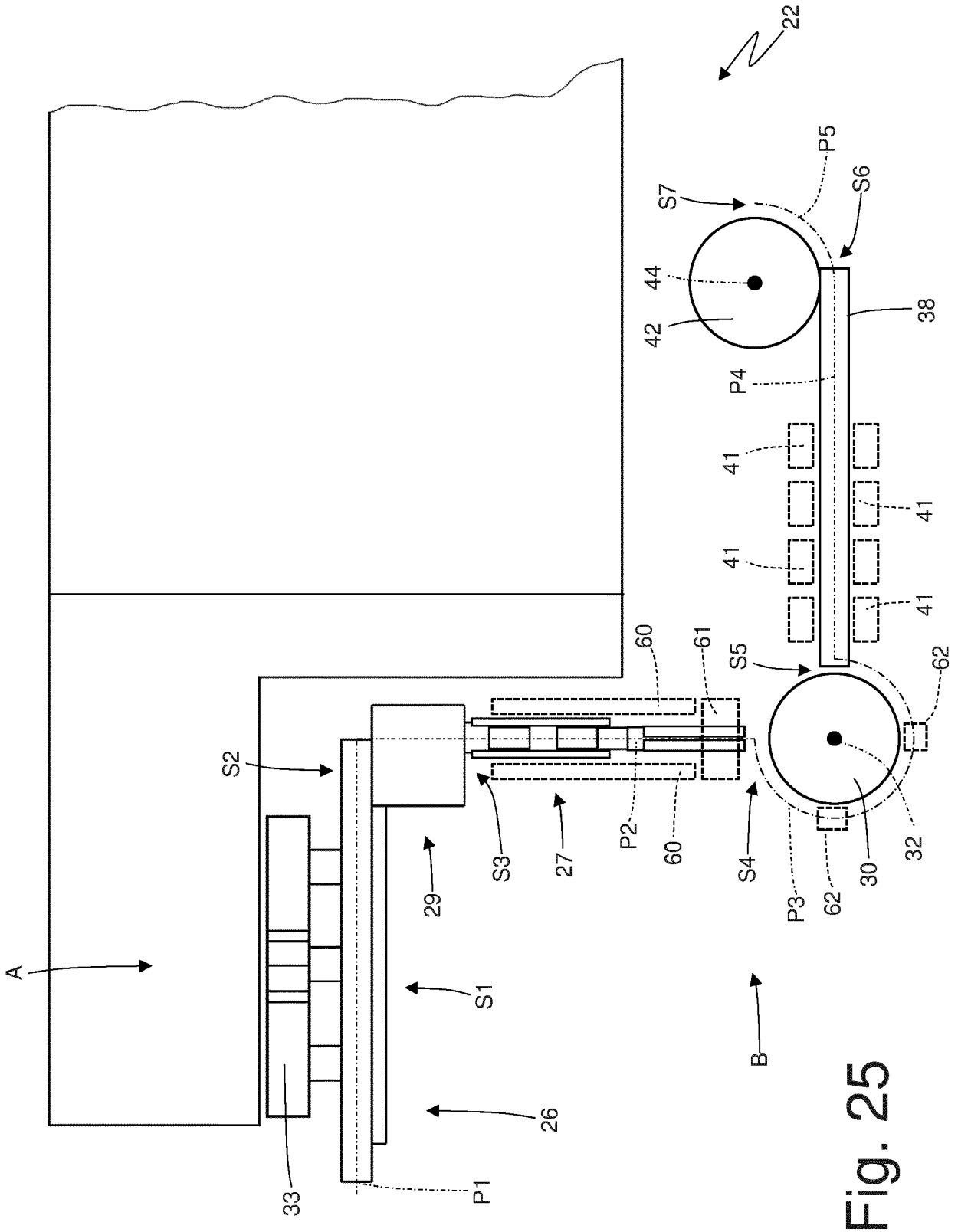

22
P5
S6
S7
44
42
38
P4
41
41
41
41
60
61
S5
62
S2
S3
27
P2
60
S4
P3
62
30
32
29
A
S1
B
26
33
P1

Fig. 25

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- IT 102021000002912 **[0001]**
- EP 3725690 A **[0004]**
- WO 2019123497 A **[0004]**
- WO 2015128812 A **[0008]**
- WO 2014013479 A1 **[0008]**
- WO 2011009520 A **[0008]**
- WO 2011110272 A **[0008]**
- EP 1686060 A1 **[0008]**
- US 4789060 A1 **[0008]**
- GB 1471086 A1 **[0008]**
- US 3948389 A1 **[0008]**
- EP 3222532 A1 **[0010]**
- EP 3725690 A1 **[0040] [0067]**