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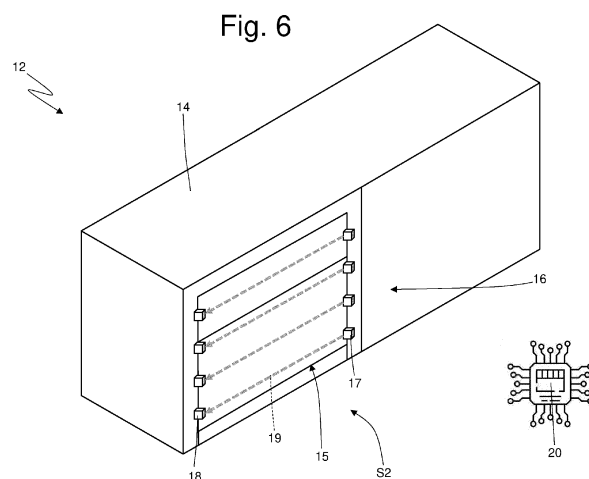
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(54) **PACKER MACHINE AND WRAPPING METHOD TO PRODUCE A PACK USING AT LEAST ONE WRAPPING MATERIAL**

(57) A packer machine (1) and a wrapping method to produce a pack (2). The following are present: a wrapping line (7), which is provided with a plurality of movable wrapping devices (8); a first actuator (9), which is designed to cause the movable wrapping devices (8) to move; an insertion station (S1), which is arranged along the wrapping line (7) and where the wrapping line (7) receives one single wrapping material to be folded; an input station (S2), which is separate from the wrapping line (7) and has a loading opening (15); a transfer unit (12), which is designed to receive wrapping material groups in the input station (S2) and to direct the wrapping material towards the wrapping line (7); and at least one second actuator (13) which is independent of the first actuator (9) and is designed to move the transfer unit (12); a sensor device (16), which is designed to detect the presence of a body in the loading opening (15) of the input station (S2); and a control unit (20), which is configured to stop, when the packer machine (1) is working, the sole second actuator (13), thus allowing the first actuator (9) to normally operate, if the sensor device (16) detects the presence of a body in the loading opening (15) and to automatically restart the second actuator (13) if the sensor device (16) stops detecting the presence of a body in the loading opening (15).



Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This Patent Application claims priority from Italian Patent Application No. 102021000004145 filed on February 23, 2021.

TECHNICAL FIELD

[0002] The present invention relates to a packer machine and to a wrapping method for producing a pack.

[0003] The present invention is advantageously applied to the production of a rigid cigarette pack with a hinged lid and containing a group of cigarettes, to which the following disclosure will explicitly refer without thereby losing generality.

PRIOR ART

[0004] The production of a rigid cigarette pack with a hinged lid provides for folding a metallized wrapping sheet around a group of cigarettes so as to form an inner wrap and thus for folding around the inner wrap a collar and a blank so as to form a rigid outer container. Generally, the metallized wrapping sheet and the collar are separated by means of a transverse cut by corresponding continuous belts unwound by coils while the blank is retrieved from the bottom of a hopper.

[0005] Alongside the packer machine a storage area of materials is defined in which a pallet is arranged supporting a group of bundles of blanks; an operator has to regularly retrieve bundles from the pallet so as to insert the bundles in a suitable material loading opening of the packer machine.

[0006] The loading opening is potentially hazardous because it could enable the hands of the operator to reach moving parts of the packer machine. In order to protect the safety of the operator it has been suggested to close the loading opening with a (at least one) (physical or also virtual) door provided with sensors: when the door is opened, the packer machine is immediately stopped so as to lock all the moving parts; however, this solution entails the stopping of the packer machine every time it is necessary to load new materials with a consequent reduction in the average productivity of the packer machine (measured as number of cigarette packs produced in a relatively long period of time such as for example an eight-hour work shift). Alternatively, in order to protect the safety of the operator it has been suggested to shift the loading opening far from the moving parts of the packer machine (and thus from the material treatment zone) so that the operator can use the loading opening also when the packer machine is in movement; however, this solution remarkably increases the bulks of the packer machine.

[0007] Patent applications No. DE3827915A1 and No. US2020002034A1 describe a packer machine for pro-

ducing a cigarette pack and provided with a feeding unit of stacks of blanks.

[0008] Patent application No. EP2325116A1 describes a device for loading stacks of blanks to a packer machine.

[0009] Patent application No. US2011090040A1 describes a safety system for detecting the presence of an undesired object in a safety area and for starting a stop sequence of the machine based on signals received from distance measurement sensors.

DESCRIPTION OF THE INVENTION

[0010] The object of the present invention is to provide a packer machine and a wrapping method for producing a pack which are devoid of the above-described drawbacks and at the same time are simple and cost-effective to embody.

[0011] In accordance with the present invention, a packer machine and a wrapping method for producing a pack are provided, according to what claimed in the appended claims.

[0012] The claims describe embodiments of the present invention forming integral part of the present description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention will now be described with reference to the accompanying drawings, which illustrate a non-limiting example embodiment thereof, wherein:

- Figure 1 is a front perspective view and with parts removed for clarity of a packer machine manufactured in accordance with the present invention;
- Figure 2 is a perspective and schematic view of part of the packer machine of Figure 1;
- Figures 3, 4 and 5 are three different rear perspective views and with parts removed for clarity of the packer machine of Figure 1; and
- Figure 6 is a perspective and schematic view of part of the packer machine of Figure 1.

PREFERRED EMBODIMENTS OF THE INVENTION

[0014] In Figure 1, reference numeral 1 indicates, as a whole, a packer machine which is designed to produce a rigid cigarette pack 2 with a hinged lid and operates with an intermittent motion (i.e. a motion that provides for a cyclical alternation of motion steps and still steps).

[0015] The cigarette pack 2 comprises a cup-shaped outer container made of cardboard or rigid paperboard and a wrap 3 (illustrated in Figure 2) containing a group of cigarettes and housed inside the container; in particular, the container is made by folding a blank 4 (illustrated in Figure 2) and a collar 5 (illustrated in Figure 2) around the wrap 3.

[0016] The packer machine 1 comprises a frame 6 which rests on the ground by means of a plurality of feet (not illustrated) and supports a wrapping line 7 provided with a plurality of movable wrapping devices 8 (rotating conveyors, linear conveyors, pushers, folders...). According to what illustrated in Figure 2, along the wrapping line 7 an insertion station S1 is arranged in which the blanks 4 are fed one after the other to the wrapping line 7, i.e. get into the wrapping line 7.

[0017] According to what illustrated in Figure 1, the packer machine 1 comprises at least one actuator 9 which is designed to cause the movable wrapping devices 8 of the wrapping line 7 to move. According to a possible embodiment, the packer machine 1 comprises one single actuator 9 (normally an electric motor) which alone (through a series of mechanical transmissions) causes all the movable wrapping devices 8 of the wrapping line 7 to move. Alternatively, the packer machine 1 comprises a series of actuators 9 that cause all the movable wrapping devices 8 of the wrapping line 7 to move; in this case, there is a main or master actuator 9 (normally an electric motor) that generally moves the main conveyors, and a group of secondary or slave actuators 9 (normally electric motors) which follow the motion of the main or master actuator 9 so as to always be synchronized with the main or master actuator 9.

[0018] According to what illustrated in Figure 1, the packer machine 1 comprises a feeding unit 10 which feeds the blanks 4 (partially glued and partially folded) one after the other to the insertion station S1 and is provided with a vertical hopper 11 (actually tilted with respect to the vertical) which houses a stack of blanks 4. The hopper 11 has an upper input mouth in which bundles of blanks 4 are cyclically inserted and a lower output mouth from which single blanks 4 are extractable. The feeding unit 10 draws the motion (directly or indirectly) from the actuator 9 and thus the feeding unit 10 operates when also the wrapping line 7 operates and vice versa; in fact, the wrapping line 7 would not be able to operate without continuously receiving the blanks 4 from the feeding unit 10 and the feeding unit 10 cannot operate if the wrapping line 7 is stationary (since the stationary wrapping line 7 is not able to receive the blanks 4 provided by the feeding unit 10). According to what illustrated in Figures 3-6, the packer machine 1 comprises an input station S2 which is separate from the wrapping line 7 and from the feeding unit 10 (thus from the insertion station S1); in fact, the wrapping line 7 and the feeding unit 10 stand on a front wall of the frame 6, whereas the input station S2 stands on a rear wall of the frame 6. Furthermore, the packer machine 1 comprises a transfer unit 12 which is designed to receive groups of blanks 4 (in particular bundles of blanks 4 kept together by respective paper strips or previously deprived of the respective paper strips owing to a manual removal carried out by an operator) in the input station S2 and to release the groups (bundles) of blanks 4 (devoid of the paper strips) in the upper input mouth of the hopper 11; i.e. the transfer unit 12 is designed to

receive groups (bundles) of blanks 4 in the input station S2 so as to direct the blanks 4 towards the wrapping line 7 (i.e. towards the insertion station S1).

[0019] The packer machine 1 comprises at least one actuator 13 which is designed to cause the transfer unit 12 (i.e. the various movable components of the transfer unit 12) to move. According to a possible embodiment, the packer machine 1 comprises one single actuator 13 (normally an electric motor) which alone (through a series of mechanical transmissions) causes all the movable components of the transfer unit 12 to move. Alternatively, the packer machine 1 comprises a series of actuators 13 that cause all the movable components of the transfer unit 12 to move; in this case, there is a main or master actuator 13 (normally an electric motor) that generally moves the main conveyors and a group of secondary or slave actuators 13 (normally electric motors) that follow the motion of the main or master actuator 13 so as to always be synchronized with the main or master actuator 13. As an alternative to a physical master reference (i.e. a physical actuator which is taken as master reference to follow), a virtual master reference could be used.

[0020] According to what illustrated in Figures 3, 4 and 6, the packer machine 1 comprises a protection case 14 which encloses the input station S2, i.e. which prevents the direct access from the outside to the input station S2. The protection case 14 has a loading opening 15 through which the groups (bundles) of blanks 7 can be manually inserted in the input station S2.

[0021] A sensor device 16 is coupled to the loading opening 15, said sensor device 16 being designed to detect the presence of a body (object) in the loading opening 15 of the input station S2; in particular, the sensor device 16 is designed to detect any kind of body in the loading opening 15 of the input station S2 regardless of whether the body is a group (bundle) of blanks 4 or something else (such as, for example, the hand or the arm of an operator or also an object left by mistake). According to a preferred embodiment, the sensor device 16 only detects the possible presence of a body in the loading opening 15 of the input station S2; alternatively, the sensor device 16 could also be able to recognize the nature of the body present in the loading opening 15 (i.e. recognize whether the body present in the loading opening 15 is a group of blanks 4 or something else).

[0022] According to a possible embodiment illustrated in the accompanying figures, the loading opening 15 of the input station S2 is devoid of physical doors (i.e. is always open) and the sensor device 16 creates a virtual barrier that is interrupted by a (foreign) body that stands in the loading opening 15 of the input station S2 (i.e. by anybody, object, that stands in the loading opening 15 of the input station S2 when the loading opening 15 should be free, empty); in this case, the sensor device 16 comprises a plurality of emitters 17 and of receivers 18: the emitters emit electromagnetic radiations 19 (generally not visible to the human eye) which are received by the receivers 18 and are screened by a possible body

(such electromagnetic radiations 19 create the virtual barrier which is interrupted by a body). According to an alternative embodiment, the loading opening 15 of the input station S2 is normally closed by a physical door (i.e. is normally closed) which constitutes a physical barrier; in this embodiment, the sensor device 16 detects the opening of the door and assumes that a body is (potentially) present in the input station S2 when the door is open.

[0023] The packer machine 1 comprises a control unit 20 which is configured to stop, when the packer machine 1 is working, the actuator 13 of the transfer unit 12, thus allowing the actuator 9 of the wrapping line 7 to normally operate, if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2, and to automatically restart the actuator 13 if the sensor device 16 stops detecting the presence of a body in the loading opening 15 of the input station S2. In particular, the control unit 20 is configured to automatically restart the actuator 13 of the transfer unit 12, if the sensor device 16 stops detecting the presence of a body in the loading opening 15 of the input station S2, from the same identical position the actuator 13 of the transfer unit 12 had when it was stopped. To such regard, it is important to observe that, if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2, the control unit 20 preferably instantly stops the actuator 13; in this manner, it is possible to minimize the distance between the loading opening 15 of the input station S2 and the moving members that stand inside the protection case 14 which encloses the input station S2. According to an alternative embodiment, if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2, the control unit 20 does not instantly stop the actuator 13, but stops the actuator 13 in a few seconds (1-3 seconds) so as to prevent leaving the actuator 13 stationary in a position that can make the following automatic restart of the actuator 13 difficult; the wait of a few seconds (1-3 seconds) between the instant when the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2 and the instant of complete stop of the actuator 13 is in no way hazardous since when entering from the loading opening 15 an operator has to anyway use many seconds before arriving in a zone where there are parts of the transfer unit 12 in quick movement.

[0024] According to a preferred embodiment illustrated in the accompanying figures, the transfer unit 12 comprises a horizontal conveyor belt 21 that starts in the input station S2 (or possibly also upstream of the input station S2) and is designed to support the bundles of blanks 7 moving (very slowly) the bundles of blanks 7 towards a loading device 22 that retrieves one single bundle of blanks 7 from the conveyor belt 21, eliminates (if still present, i.e. has not been previously removed) the strip that keeps the bundle of blanks 7 united, and thus inserts the bundle of blanks 7 in the upper input mouth of the hopper 11. In particular, the horizontal conveyor belt 21

can start upstream of the input station S2, i.e. upstream of the loading opening 15 of the input station S2; in this manner, it is also possible to load groups (bundles) of blanks on the conveyor belt 21 without engaging the loading opening 15 of the input station S2 and thus without causing the temporary stopping of the actuator 13 of the transfer unit 12.

[0025] According to a preferred embodiment, the control unit 20 is configured to completely stop the transfer unit 12 if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2; i.e. if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2, all the parts of the transfer unit 12 are stopped.

[0026] According to an alternative embodiment, the transfer unit 12 comprises an initial part in which the input station S2 is present and is moved by the actuator 13, and a final part in which the loading device 22 is present and is moved by a further actuator 23 (schematically illustrated in Figure 5) which is independent of the actuator 13; the control unit 20 could be configured to stop only the actuator 13 of the transfer unit 12, thus allowing the actuator 23 to normally operate, if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2. In particular, the control unit 20 could be configured to stop only the actuator 13 of the transfer unit 12, thus allowing the actuator 23 to operate at a reduced speed with respect to normal, if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2; or the control unit 20 could be configured to initially stop only the actuator 13 of the transfer unit 12, thus allowing the actuator 23 to operate, if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2 and to subsequently also stop the actuator 23 if the sensor device 16 continues to detect the presence of a body in the loading opening 15 of the input station S2 (i.e. if the presence of a body in the loading opening 15 of the input station S2 lasts, for example, for more than 5-10 seconds). To summarize what described above: the movable wrapping devices 8 of the wrapping line 7 are moved by means of the actuator 9 (which directly or indirectly also moves the feeding unit 10); the feeding unit 10 transfers to the wrapping line 7 single blanks 4 to be folded in the insertion station S1 arranged along the wrapping line 7; the bundles of blanks 4 are received in the input station S2 which is separate from the wrapping line 7; and the transfer unit 12, moved by the actuator 13, cyclically inserts the bundles in the upper input mouth of the hopper 11. Furthermore, the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2; the control unit 20 stops, when the packer machine 1 is working, the sole actuator 13, thus allowing the actuator 9 to normally operate, if the sensor device 16 detects the presence of a body in the loading opening 15 of the input station S2; and the control unit 20 automatically restarts the actuator 13 of the transfer unit 12 if the sensor device 16 stops detecting the presence of

a body in the loading opening 15 of the input station S2.

[0027] The embodiment illustrated in the accompanying figures refers to the production of a cigarette pack, but the present invention is also applicable without substantial modifications to the production of any other kind of pack of smoking articles (for example a pack of cigars, a pack of electronic cigarettes of the liquid vaporization type, a cigarette pack of next generation without combustion of the tobacco...).

[0028] The embodiments described herein can be combined with one another without departing from the scope of protection of the present invention.

[0029] The above-described packer machine 1 has numerous advantages.

[0030] Firstly, an operator can manually rest the bundles of blanks 4 on the conveyor belt 21 and through the loading opening 15 of the input station S2 in perfect safety and without having to stop the production of the cigarette packs 1 (i.e. without having to stop the wrapping line 7). It is important to observe that this result is obtained without shifting the loading opening 15 far from the moving parts of the packer machine 1, i.e. without increasing the bulks of the packer machine 1; in fact, this result is obtained thanks to the fact of stopping, during the manual loading of the bundles of blanks 4, only the transfer unit 12 (which is then restarted in a completely automatic manner), thus allowing the wrapping line 7 and the feeding unit 10 to always work.

[0031] In other words, the advantages of the above-described packer machine 1 consist in having one single sensor device 16, in having a simple operating logic, and in eliminating the need for tunnels and other elements for distancing the loading opening 15 from the moving parts of the packer machine 1 (thus reducing the bulks and/or maximizing the dimensions of the zone where it is possible to stock a pallet that carries the bundles of blanks 4).

[0032] In fact, the above-described packer machine 1 provides, in the area of the loading opening 15 of the bundles of blanks 4, for a barrier (for example immaterial) which if opened (or passed through) interrupts the movement of the hazardous members (belonging to the transfer unit 12) reachable by the operator while carrying out the loading of the bundles of blanks 4; the movements of the transfer unit 12 that are interrupted are not indispensable (in a strictly continuous manner) for the operation of the wrapping line 7 which can anyway continue operating. That is, the movements of the transfer unit 12 that are interrupted are only those relative to the loading in the packer machine 1 of the bundles of blanks 4 and are part of a separate work cycle and much slower than a work cycle of the wrapping line 7. The moment when the barrier is closed (or stops being passed through), the movements of the transfer unit 12 that had been interrupted, immediately and automatically restart, without generating a hazard for the operator who is no longer in the hazardous zone; in restarting the movements, the work cycle that had been interrupted is continued resum-

ing from the same point, without the need to reset or to reactivate movements or motors. In this manner, the cycle restarts and can continue exploiting all the moments in which the operator does not have his/her hands (or other parts of the body) in the zone near the potentially hazardous parts, i.e. in which the operator is not inside the loading opening 15 of the input station S2.

[0033] In use, between the loading of one or more bundles of blanks 4, while the operator momentarily moves away from the loading opening 15 of the input station S2 for retrieving the following bundles of blanks 4, the loading cycle continues from where it had remained, essentially allowing loading the bundles of blanks 4 without there being repercussions on the working of the wrapping line 7.

Claims

1. A packer machine (1) to produce a pack (2); the packer machine (1) comprises:

a protection case (14);
a wrapping line (7), which is provided with a plurality of movable wrapping devices (8);
at least one first actuator (9), which is designed to cause the movable wrapping devices (8) to move;
an insertion station (S1), which is arranged along the wrapping line (7) and where the wrapping line (7) receives one single wrapping material to be folded;
an input station (S2), which is separate from the wrapping line (7) and has a loading opening (15) obtained in the protection case (14);
a transfer unit (12), which is designed to receive wrapping material groups in the input station (S2) and to direct the wrapping material towards the wrapping line (7); and
at least one second actuator (13), which is independent of the first actuator (9) and is designed to move the transfer unit (12);
the packer machine (1) is **characterized in that** it comprises:

a sensor device (16), which is designed to detect the presence of a body in the loading opening (15) of the input station (S2); and
a control unit (20), which is configured to stop, when the packer machine (1) is working,
the sole second actuator (13), thus allowing the first actuator (9) to normally operate, if the sensor device (16) detects the presence of a body in the loading opening (15) and to automatically restart the second actuator (13) if the sensor device (16) stops detecting the presence of a body in the loading open-

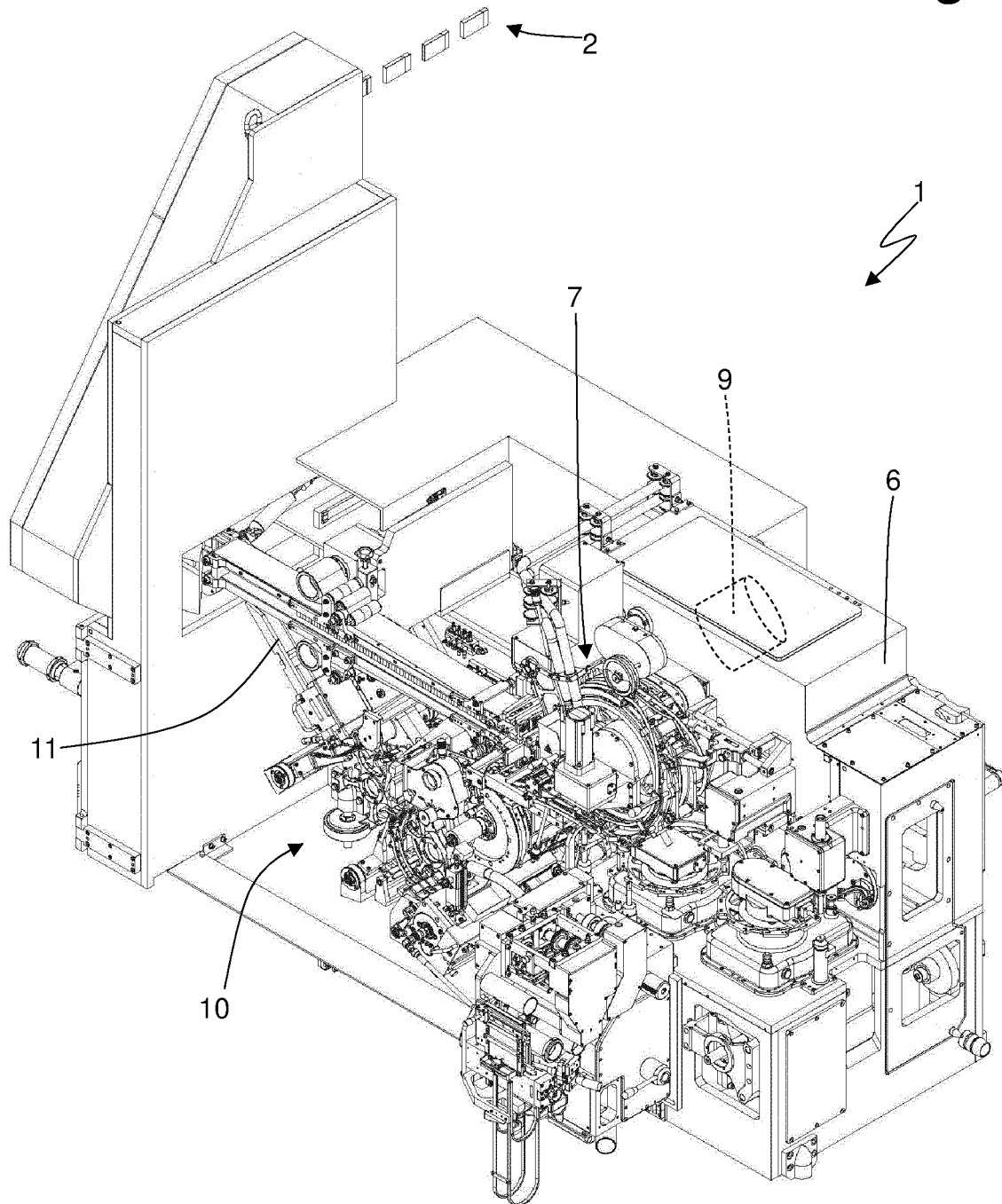
ing (15).

2. The packer machine (1) according to claim 1, wherein the control unit (20) is configured to automatically restart the second actuator (13), if the sensor device (16) stops detecting the presence of a body in the loading opening (15), from the same identical position the second actuator (13) had when it was stopped. 5
3. The packer machine (1) according to claim 1 or 2, wherein the control unit (20) is configured to completely stop the transfer unit (12) if the sensor device (16) detects the presence of a body in the loading opening (15). 10
4. The packer machine (1) according to claim 1, 2 or 3, wherein the sensor device (16) is designed to detect any kind of body in the loading opening (15) regardless of whether the object is a wrapping material group or something else. 15
5. The packer machine (1) according to one of the claims from 1 to 4, wherein the transfer unit (12) comprises a conveyor belt (21), which is designed to feed a series of wrapping material groups and starts in the area of the input station (S2) or upstream of the input station (S2). 20
6. The packer machine (1) according to one of the claims from 1 to 5, wherein the sensor device (16) creates a virtual barrier, which is interrupted by a body standing in the loading opening (15). 25
7. The packer machine (1) according to one of the claims from 1 to 5, wherein: 30
 - the loading opening (15) is normally closed by a door;
 - the sensor device (16) detects the opening and the closing of the door; and
 - the control unit (20) is configured to assume that there is a body in the input station (S2) when the door is open. 35
8. The packer machine (1) according to one of the claims from 1 to 7, wherein the wrapping material is a blank (4) and a wrapping material group is a bundle of blanks (4). 40
9. The packer machine (1) according to claim 8, wherein: 45
 - a feeding unit (10) is provided, which feeds the blanks (4) one after the other to the insertion station (S1) and is provided with a hopper (11), which houses a stack of blanks (4); and
 - the transfer unit (12) is designed to insert the50

wrapping material groups into the **hopper (11)**.

10. A wrapping method to produce a pack (2); the wrapping method comprises the steps of: 5
 - causing the movable wrapping devices (8) of a wrapping line (7) to move by means of at least one first actuator (9);
 - transferring to the wrapping line (7) one single wrapping material to be folded in an insertion station (S1) arranged along the wrapping line (7);
 - receiving, by means of a transfer unit (12), wrapping material groups in an input station (S2), which is separate from the wrapping line (7) and has a loading opening (15) obtained in a protection case (14);
 - directing the wrapping material towards the wrapping line (7) by means of the transfer unit (12); and
 - moving the transfer unit (12) by means of a second actuator (13), which is independent of the first actuator (9);
- the wrapping method is **characterized in that** it comprises the further steps of: 10
 - detecting the presence of a body in the loading opening (15) of the input station (S2) by means of at least one sensor device (16);
 - stopping, when the packer machine (1) is working, the sole second actuator (13), thus allowing the first actuator (9) to normally operate, if the sensor device (16) detects the presence of a body in the loading opening (15); and
 - automatically restarting the second actuator (13) if the sensor device (16) stops detecting the presence of a body in the loading opening (15). 15

Fig. 1



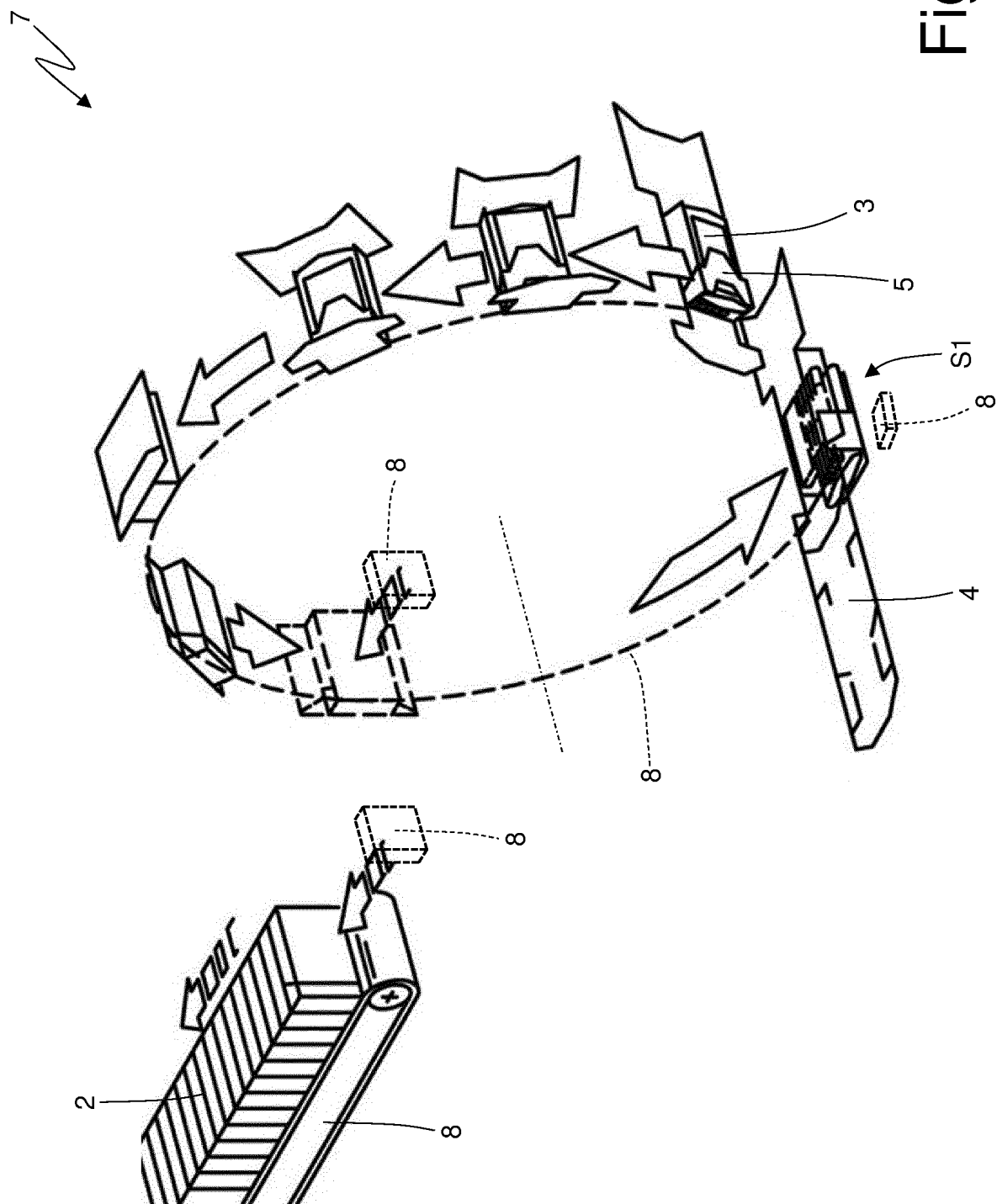
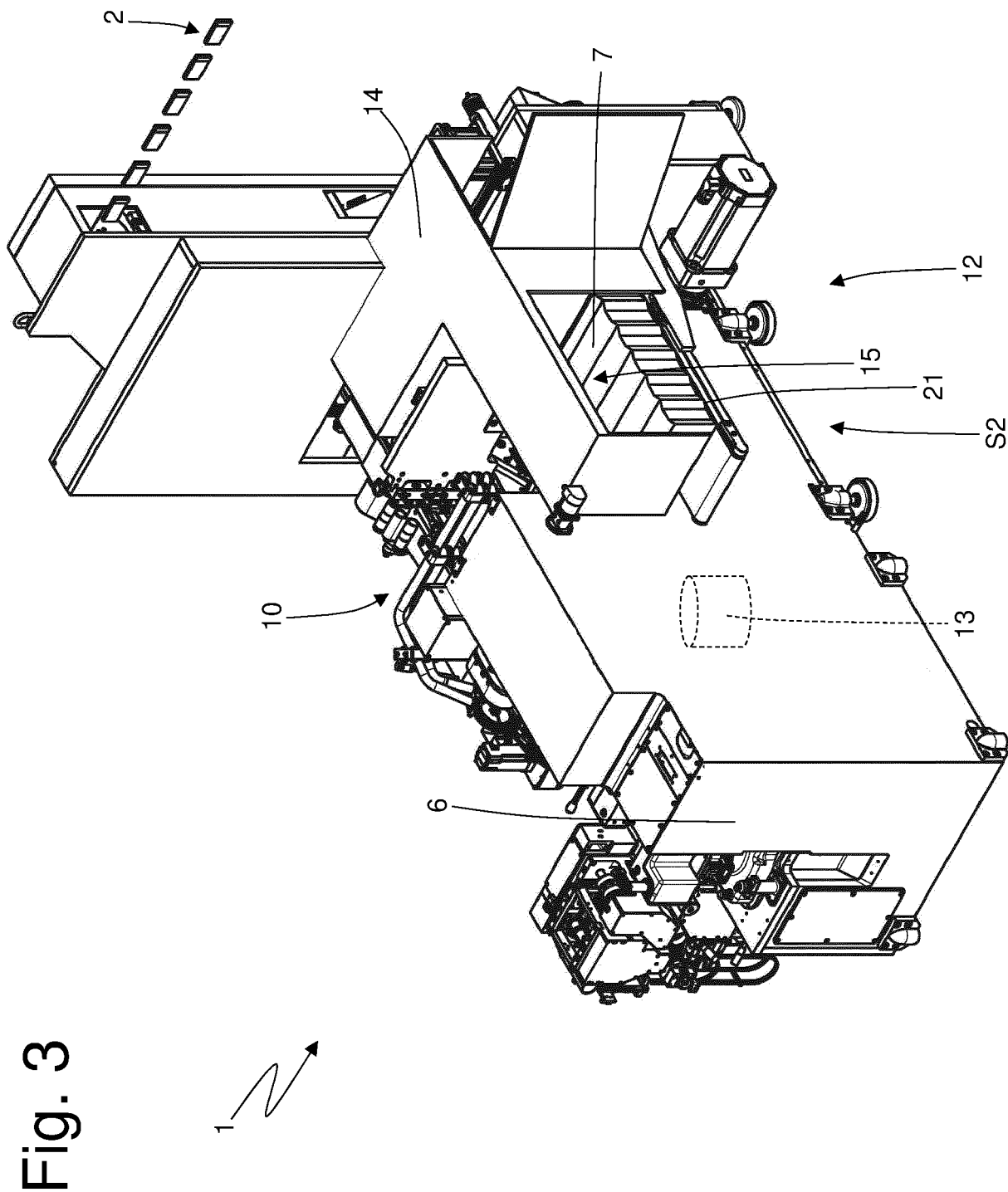


Fig. 2



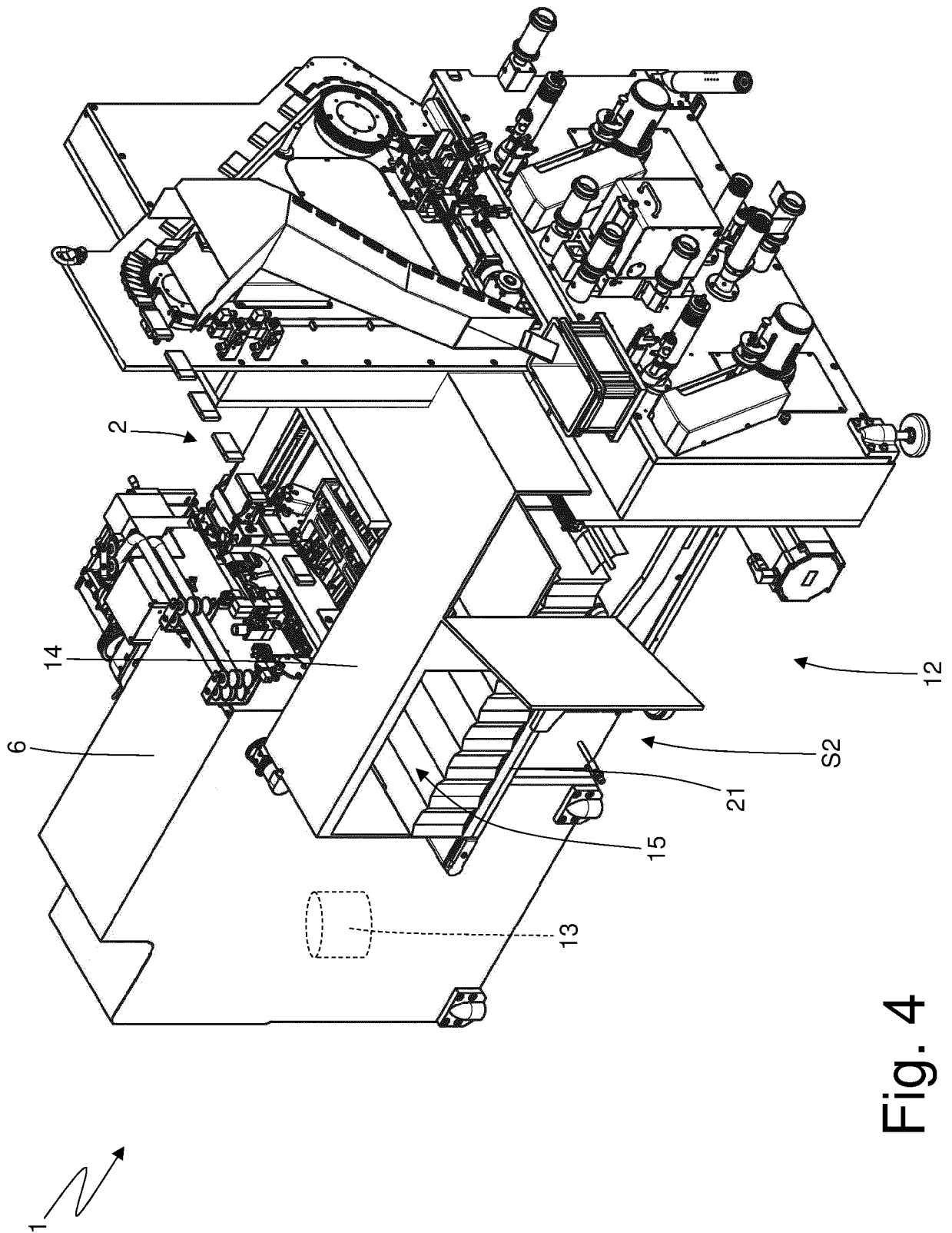


Fig. 4

Fig. 5

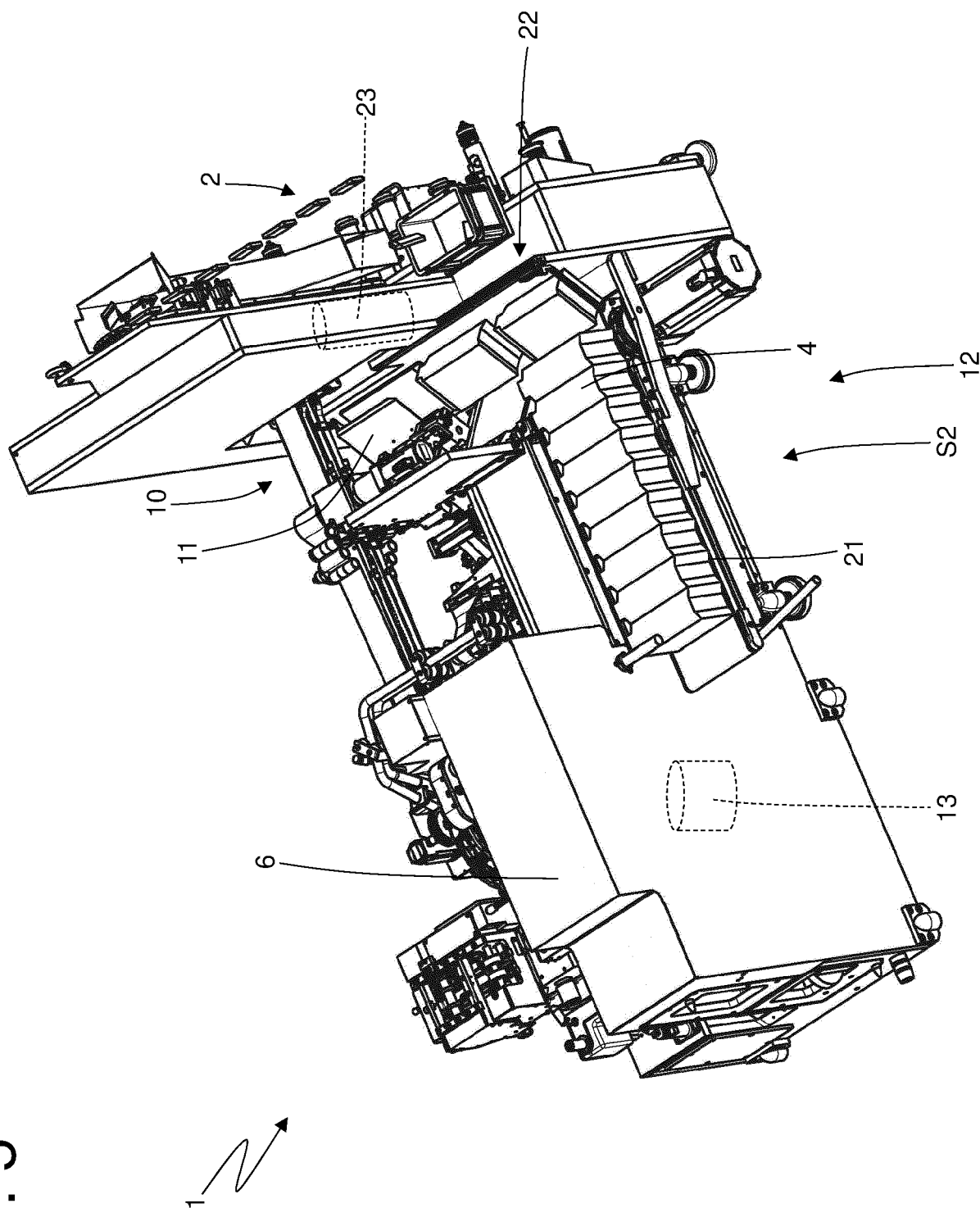
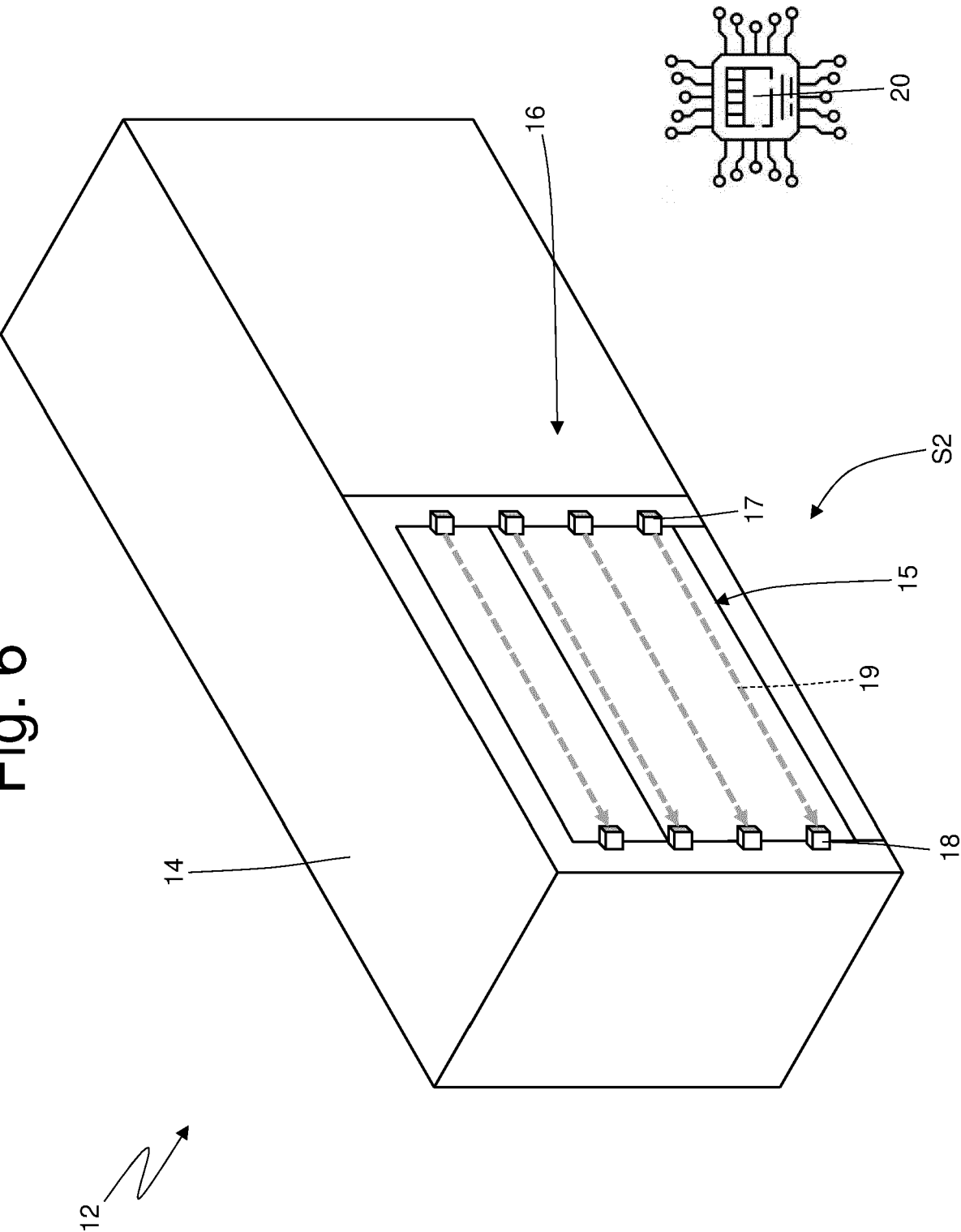


Fig. 6





EUROPEAN SEARCH REPORT

Application Number

EP 22 15 8349

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 38 27 915 A1 (FOCKE & CO [DE]) 1 March 1990 (1990-03-01) * figures 2-4, 8 * * column 2, lines 44-65 * * column 3, lines 35-52 * * column 5, lines 14-38 * -----	1-10	INV. B65B43/18 B65B43/44 B65B41/06 B65B19/22 B65B57/00 B65B57/04
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A	EP 2 325 116 A1 (VERPAMA AG [CH]) 25 May 2011 (2011-05-25) * figure 2 * * paragraphs [0002], [0003], [0023] - [0028], [0035], [0038] * -----	1-10	
A	US 2011/090040 A1 (ALLEN ROBERT M [US] ET AL) 21 April 2011 (2011-04-21) * figure 1 * * paragraphs [0028], [0034], [0040] * -----	1-10	TECHNICAL FIELDS SEARCHED (IPC) B65B B65H F16P
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		15 June 2022	Schmitt, Michel
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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