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(54) **A METHOD FOR CONTROLLING A PACKING MACHINE MANUFACTURING PACKETS OF SMOKING ARTICLES, EACH CONTAINING TWO DISTINCT GROUPS OF SMOKING ARTICLES**

VERFAHREN ZUR STEUERUNG EINER VERPACKUNGSMASCHINE, DIE PAKETE VON RAUCHARTIKELN HERSTELLT, MIT JEWEILS ZWEI UNTERSCHIEDLICHEN GRUPPEN VON RAUCHARTIKELN

PROCÉDÉ DE COMMANDE D'UNE MACHINE D'EMBALLAGE POUR LA FABRICATION DE PAQUETS D'ARTICLES À FUMER, CONTENANT CHACUN DEUX GROUPES DISTINCTS D'ARTICLES À FUMER

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DescriptionPRIORITY CLAIM

[0001] This application claims priority from Italian Patent Application No. 102017000055610 .filed on May 23, 2017.

TECHNICAL FIELD

[0002] The present invention relates to a method for controlling a packing machine manufacturing packets of smoking articles, each containing two distinct groups of smoking articles.

[0003] The present invention finds advantageous application to a cigarette packing machine which manufactures so-called "twin" packets of cigarettes each containing two distinct groups of cigarettes, wrapped in separate wrappers, to which the following discussion will make explicit reference without thereby incurring any loss of generality.

PRIOR ART

[0004] For several years, a packet of cigarettes commercially called a "twin" packet has been known, the packet comprising a rigid outer container which houses within it two identical groups of cigarettes (i.e. "twins" from which the commercial name of the packet of cigarettes derives), which are arranged side by side and wrapped in corresponding wrappers. The patent US4258528A1 describes part of a packing machine for producing a "twin" packet of cigarettes; this packing machine comprises two rectilinear wrapping lines, twin and side by side, to manufacture in parallel two inner wraps (each consisting of a group of cigarettes wrapped in a wrapper of metallised paper) which are then coupled to a common blank which is folded around the two inner wraps to form a corresponding rigid external container. Each rectilinear wrapping line originates at a hopper from whose mouths the groups of cigarettes are extracted and ends at a wrapping drum provided with pockets suitable for storing the blanks.

[0005] A packing machine for producing a "twin" packet of cigarettes is also described in the patent application WO2017064659A1 (corresponding to the Italian patent application 102015000062561).

[0006] The hopper has an upper inlet portion connected with a feeding channel for a mass of cigarettes and a lower portion with a plurality of output mouths. Each output mouth is associated with a predefined number of vertical channels (or veins) along each of which a row of cigarettes falls by gravity and is cyclically engaged by a respective extractor which extracts an ordered group of cigarettes from the bottom of the hopper and feeds the group of cigarettes to a pocket of a forming conveyor which is stationary in front of the output mouth. Each extractor is comb-shaped and has a number of teeth

which go through the grooves of the output mouth transversely to push a group of cigarettes out of the channels and feed the group of cigarettes to the pocket of the forming conveyor.

5 **[0007]** In use, the hopper is completely filled with a mass of cigarettes, which are fed from the feeding channel, fall down through the hopper by gravity, and all have the same longitudinal orientation which is necessary to allow the cigarettes to enter the vertical channels which
10 lead to the output mouths; as the groups of cigarettes are extracted from the output mouths, the cigarettes fall down through the hopper by gravity and new cigarettes are fed into the hopper through the feeding channel. It can happen that during the fall down through the hopper
15 by gravity a cigarette gets "crossed up", i.e. it is arranged transversely with respect to the other cigarettes; a possible "crossed up" cigarette cannot enter a vertical channel which leads to an output mouth and remains lodged over the entrance of some adjacent vertical channels, constituting a barrier which also prevents other correctly
20 aligned cigarettes from entering these vertical channels. When a cigarette is crossed up it is often necessary to interrupt the operation of the packing machine and it is always necessary for an operator to intervene, who must
25 manually eliminate the "crossed up" cigarette; as a result, "crossed up" cigarettes tend to decrease the long-term productivity of the packing machine, i.e. the number of packets of cigarettes correctly produced over a long period of time (for example an 8-hour conventional work
30 shift, 1-day work shift, 1-week work shift, 1-month work shift, 1-year work shift, etc.).

[0008] It has been observed that the number of "crossed up" cigarettes tends to increase as the length of the cigarettes decreases and tends to increase when
35 the cigarettes have a slightly conical (i.e. not perfectly cylindrical) shape.

[0009] The patent application EP1020357A1 describes a cigarette packing machine, wherein a group of cigarettes is formed by picking the cigarettes from one
40 or more output mouths of a hopper; the shutting-off, in response to a control signal, of the flow of cigarettes fed from any output mouth of the hopper involves the simultaneous shutting-off of the flow from all the output mouths competing with the shut-off output mouth for forming the group, without causing a simultaneous stoppage of the
45 entire packing machine.

[0010] The patent US4528801A describes a device for forming groups of cigarettes in a packing machine, wherein an exit hopper of a cigarette feeder has a plurality
50 of output mouths positioned side by side, each suitable to deliver successive layers of cigarettes. Pushing elements arranged under each output mouth insert these layers, overlapping them with each other, in drawers evenly distributed along a conveyor which is stepwise
55 mobile near the bottom of the hopper; each pusher can be operated independently of the others, and can be deactivated following the detection of certain abnormal situations within the drawers or during the starting or stop-

ping phases of the packing machine.

DESCRIPTION OF THE INVENTION

[0011] The object of this invention is to provide a method of controlling a packing machine which manufactures packets of smoking articles each containing two distinct groups of smoking articles, said control method making it possible to increase the productivity of the packing machine without, at the same time, increasing the quantity of cigarettes and wrapping material which is discarded.

[0012] In accordance with the present invention, a method is provided for controlling a packing machine manufacturing packets of smoking articles, each containing two distinct groups of smoking articles, as claimed in the attached Claims.

[0013] The dependent claims describe preferred embodiments of the present invention and form an integral part of the present description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention will now be described with reference to the accompanying drawings which illustrate a non-limiting embodiment example, wherein:

- Figure 1 is a front perspective view of a "twin" packet of cigarettes in a closed configuration;
- Figure 2 is a front perspective view of the "twin" packet of cigarettes of Figure 1 in an open configuration;
- Figure 3 is a perspective view of an inner wrap of the "twin" packet of cigarettes of Figure 1;
- Figure 4 is a perspective view of a group of cigarettes contained in the inner wrap of Figure 3;
- Figure 5 is a schematic front view of part of a packing machine which produces the "twin" packet of cigarettes of Figure 1 and is controlled in accordance with the control method of the present invention;
- Figure 6 is a schematic plan view of a forming unit for groups of cigarettes of the packing machine of Figure 5;
- Figure 7 is a schematic front view of a hopper of the forming unit of Figure 6; and
- Figure 8 is a schematic plan view of a variant of the forming unit of Figure 6.

PREFERRED EMBODIMENTS OF THE INVENTION

[0015] In Figures 1 and 2, the number 1 indicates, in its entirety, a rigid "twin" packet of cigarettes comprising a rigid outer container 2 provided with a hinged lid and a pair of inner wraps 3, which are arranged side by side and are housed in the outer container 2. Each inner wrap 3 (better shown in Figure 3) contains a parallelepiped-shaped group 4 of cigarettes (shown in Figure 4) and has a removable tear-off portion at the top that is removed to allow access to the cigarettes.

[0016] Each inner wrap 3 is manufactured by folding a

rectangular-shaped wrapper 5 (schematically illustrated in Figure 5) around the group 4 of cigarettes in a known manner. Each inner wrap 3 can be free of stabilisation (i.e. the corresponding wrapper 5 has no connections between the overlapping parts and therefore must always be firmly held to prevent the folds from unfolding by elastic return), can be stabilised by the use of glue, or can be stabilised by heat-sealing (in the latter case the inner wrap 3 is normally tightly sealed). According to an alternative embodiment, the inner wraps 3 are absent and each group 4 of cigarettes is directly housed in the outer container 2 without the interposition of the corresponding inner wrap 3.

[0017] Each rigid outer container 2 is provided with a hinged lid manufactured in a known way by folding an elongated rectangular-shaped blank 6 around a side by side pair of inner wraps 3.

[0018] According to a possible embodiment shown in Figure 2, the rigid outer container 2 comprises two collars 7, each of which is folded in a "U" to envelop a corresponding inner wrap 3 and connected (by gluing) to the outer container 2 to partially protrude outwards from an open top end of the outer container 2 and engage a corresponding inner surface of the lid when the lid is in the aforementioned closed position. According to an alternative non-illustrated embodiment, the rigid outer container 2 comprises a single collar 7, which is folded in a "U" to envelop both inner wraps 3.

[0019] In Figure 5, the number 8 indicates in its entirety a packing machine (only partially shown in Figure 5) which is suitable for manufacturing the above described packet 1 of cigarettes.

[0020] The packing machine 8 comprises a forming unit 9 (shown only schematically in Figure 5) wherein groups 4 of cigarettes are formed in succession, a wrapping unit 10 wherein the wrapper 5 is folded around each group 4 of cigarettes to form the corresponding inner wrap 3, a coupling unit 11 wherein the inner wraps 3 (i.e. groups 4 of cigarettes contained in the inner wraps 3) are coupled two by two to form the contents of the packets 1 of cigarettes, and a wrapping unit 12 wherein the collar 7 and the blank 6 are folded around each pair of inner wraps 3 (i.e. around each pair of groups 4 of cigarettes contained in the inner wraps 3) to form the corresponding outer container 2.

[0021] As shown in Figure 5, the wrapping unit 10 comprises a wrapping drum 13 which is mounted so it can rotate continuously (i.e. with a motion in which the various moving parts move at a constant speed without any resting phases) around a horizontal axis of rotation 14 perpendicular to the plane of Figure 5 and supports a plurality of (in particular twelve) wrapping heads 15 (only one of which, for simplicity, is shown in Figure 5). The rotation of the wrapping drum 13 around the axis of rotation 14 carries each wrapping head 15 through a feeding station S1 wherein the wrapping head 15 receives a wrapper 5, a transfer station S2 where the wrapping head 15 receives a group 4 of cigarettes from the forming unit 9,

and a transfer station S3 where the wrapping head 15 dispenses an inner wrap 3 to the coupling unit 11. Between the feeding station S1 and the transfer station S3, each wrapper 5 is folded around a group 4 of cigarettes to form a corresponding inner wrap 3.

[0022] As shown in Figure 5, the coupling unit 11 comprises a coupling drum 16 which is mounted so that it can rotate continuously around an axis of rotation 17 parallel to the axis of rotation 14 and supports a plurality of (in particular six) support bodies 18 (only one of which, for simplicity, is shown in Figure 5). Each support body 18 is mounted so that it can rotate on the coupling drum 16 and supports a pair of housing heads 19, which in turn are mounted so that they can rotate on the support body 18 and are arranged side by side; each housing head 19 supports a corresponding coupling pocket which is suitable to accommodate (contain) an inner wrap 3 (i.e. a group 4 of cigarettes contained in an inner wrap 3). The rotation of the coupling drum 16 around the axis of rotation 17 carries each support body 18 through the transfer station S3 wherein the two corresponding housing heads 19 receive in succession two respective inner wraps 3 and through a transfer station S4 wherein both housing heads 19 simultaneously dispense the two inner wraps 3 side by side; in the transfer station S3, the two housing heads 19 of the same support body 18 are (relatively) far from each other to receive the two inner wraps 3 in succession, and then the two housing heads 19 come together to provide the two nearby (side by side) inner wraps 3 so that the two coupled inner wraps 3 are transferred together in the S4 transfer station (i.e. they leave the two housing heads 19 of the same support body 18 together).

[0023] As shown in Figure 5, the wrapping unit 12 comprises a wrapping drum 20 which is mounted so that it can rotate continuously around an axis of rotation 21 parallel to the axis of rotation 17 and supports a plurality of (in particular six) wrapping heads 22 (only one of which, for simplicity, is shown in Figure 5). The rotation of the wrapping drum 20 around the axis of rotation 21 carries each wrapping head 22 through a feeding station S5 where the wrapping head 22 receives the collar 7 (or alternatively a pair of collars 7), through the transfer station S4 where the wrapping head 22 receives two coupled inner wraps 3, and through a transfer station S6 where the wrapping head 22 dispenses the pair of inner wraps 3 together with the collar 7.

[0024] The wrapping unit 12 comprises a feeding drum 23 which is mounted so that it can rotate continuously around an axis of rotation 24 axis of rotation parallel to the axis of rotation 21 and supports a plurality of (in particular three) feeding heads 25 (only one of which, for simplicity, is shown in Figure 5). The rotation of the feeding drum 23 around the axis of rotation 24 carries each feeding head 25 through the feeding station S5 where the feeding head 25 dispenses the collar 7 and a wrapping head 22 to the wrapping drum 20.

[0025] As shown in Figure 5, the wrapping unit 12 com-

prises a wrapping drum 26 which is mounted so that it can rotate continuously around an axis of rotation 27 parallel to the axis of rotation 21 and supports a plurality of (in particular six) wrapping heads 28 (only one of which, for simplicity, is shown in Figure 5). The rotation of the wrapping drum 26 around the axis of rotation 27 carries each wrapping head 28 through a feeding station S7 wherein the wrapping head 28 receives a blank 6, through the transfer station S6 wherein the wrapping head 28 receives the inner wraps 3 together with the collar 7, and through the transfer station S8 wherein the wrapping head 28 dispenses the packet 1 of cigarettes to a drying conveyor 29 which carries the packets 1 of cigarettes towards the output of the packing machine 8. Between the feeding station S7 and the transfer station S8, each blank 6 is folded around two inner wraps 3 coupled together with a collar 7 to form a corresponding outer container 2.

[0026] According to a preferred embodiment, the "even" wrapping heads 15 of the wrapping drum 13 follow a different course of motion to that of the "odd" wrapping heads 15 of the wrapping drum 13: in other words, in order to dispense two internal wrappings 3 (which will then be coupled to be put into the same packet 1 of cigarettes) to the two housing heads 19 of the same support body 18, the "even" wrapping head 15 which dispenses the first inner wrap 3 into a housing head 19 follows a different course of motion with respect to the "odd" wrapping head 15 which dispenses the second inner wrap 3 into the other housing head 19; obviously, the course of motion of the "even" wrapping heads 15 of the wrapping drum 13 differs from the course of motion of the "odd" wrapping heads 15 of the wrapping drum 13 only at the transfer station S3 where the inner wraps 3 pass from the wrapping heads 15 of the wrapping drum 13 to the housing heads 19 of the wrapping drum 20. Similarly and necessarily, in each support body 18 of the coupling drum 16, the "left" housing head 19 follows a different course of motion to that of the "right" housing head 19 since they must interact with respective heads 15 of the wrapping drum 13 which follow different courses of motion from each other.

[0027] As shown in Figure 6, the forming unit 9 for groups 4 of cigarettes comprises a hopper 30 (better shown in Figure 7) provided with six output mouths 31 (identified by the letters A-F) from which groups 4 of cigarettes are extracted in succession. The forming unit 9 further comprises a forming conveyor belt 32 (only partially illustrated) which supports a series of drawers 33, each of which is suitable to receive and house a corresponding group 4 of cigarettes. The forming unit 9 further comprises six extraction devices 34, each of which is coupled to a corresponding output mouth 31 of the hopper 30 and is suitable to cyclically extract a group 4 of cigarettes from the output mouth 31 to insert the group 4 of cigarettes into a corresponding drawer 33 which is stationary in front of the output mouth 31. In the embodiment shown in Figure 6, each extraction device 34 com-

prises a comb pusher 35 which is suitable to fit inside a corresponding output mouth 31 and a linear electric motor 36 which moves the pusher 35 cyclically by imparting an alternating motion to it.

[0028] As will be better explained below, each output mouth 31 has an associated output mouth 31, so that two output mouths 31 are associated with each another when the two output mouths 31 are used to extract two corresponding groups 4 of cigarettes which will be coupled to one another so as to be part of the same packet 1 of cigarettes.

[0029] As shown in Figure 7, the hopper 30 comprises an upper part 37 and a lower part 38, both of which are delimited at the front and rear by respective vertical walls. The lower part 38 of the hopper 30 comprises the six equidistant lower output mouths 31, which are internally subdivided by a plurality of defining walls or baffles of the channels within which the cigarettes are arranged in essentially vertical stacks.

[0030] The upper part 37 of the hopper 30 is subdivided, starting from the upper inlet, into two separate channels 39 which are mirror images of each other, arranged respectively on the right and left and discharging into an empty chamber belonging to the lower part 38 of the hopper 30 and positioned immediately above the output mouths 31.

[0031] As shown in Figure 7, the hopper 30 is provided with sensors 40 (for example, optical sensors 40), each of which is coupled to a corresponding output mouth 31 and is suitable to detect the presence of cigarettes along the channels of the output mouth 31 (each output mouth 31 may comprise a single sensor 40 or several sensors 40 arranged in line). The function of the sensors 40 is to detect an occlusion (typically due to a "crossed-up" cigarette) in an output mouth 31 which prevents the correct flow of cigarettes along the output mouth 31; in other words, a "crossed-up" cigarette (i.e., positioned transversely with respect to the other cigarettes) may arrive over an output mouth 31 and rest on top of the corresponding channels constituting a "bridge" which thus prevents other properly aligned cigarettes from entering the channels and in this case the output mouth 31 becomes empty (at least partially, or at least in one of the channels) of cigarettes since it can no longer receive new cigarettes.

[0032] According to one embodiment, a (normally optical) sensor 41 is provided downstream of the output mouths 31, which checks each group 4 of cigarettes carried by a corresponding drawer 33 in order to verify both the completeness of the group 4 of cigarettes (i.e. that the group 4 of cigarettes has all the cigarettes provided), and the degree of filling of the tips of the cigarettes (i.e. that in each cigarette the corresponding tip is sufficiently "full" of tobacco); defective (incomplete or containing at least one cigarette with an "empty" tip) groups 4 of cigarettes are discarded by a discarding device (known and not shown) located downstream of sensor 41.

[0033] In use, each output mouth 31 can be identified as correctly functioning when complete groups 4 of cig-

arettes (i.e. those having all the foreseen cigarettes) are extracted from the output mouth 31 or it can be identified as malfunctioning when incomplete groups 4 of cigarettes (i.e. those lacking at least one of the foreseen cigarettes) are extracted from the output mouth 31.

[0034] Each output mouth 31 can be identified as malfunctioning when at least one of the corresponding channels is devoid of cigarettes (i.e. when the respective sensor 40 detects that at least one of the corresponding channels is devoid of cigarettes); this type of identification is "preventive", in that it can identify an output mouth 31 as malfunctioning before an incomplete group 4 of cigarettes is actually extracted from the exit port 31 (if at least one of the channels is empty or is emptying, it is clear that in the short term only incomplete groups 4 of cigarettes can be extracted from the output mouth 31).

[0035] Alternatively or in addition to the above, each output mouth 31 may be identified as malfunctioning when the sensor 41 detects that incomplete groups 4 of cigarettes (generally several consecutive incomplete groups 4 of cigarettes or a high percentage of incomplete groups 4 of cigarettes in a given time window) are being extracted from the output mouth 31; this type of identification is "final", since it can only identify an output mouth 31 as malfunctioning only after the exit mouth 31 has actually extracted incomplete groups 4 of cigarettes.

[0036] The following describes the operation of the packing machine 8 with reference to the management of an occlusion in an output mouth 31 detected by a corresponding sensor 40.

[0037] When all the output mouths 31 are working correctly (i.e. when all the sensors 40 detect the presence of cigarettes in all the output mouths 31), the packing machine 8 is operating in normal conditions, all the drawers 33 of the forming conveyor 32 are always filled (i.e. they always receive corresponding groups 4 of cigarettes from the corresponding output mouths 31), all the wrapping heads 15 always receive a corresponding wrapper 5 and a corresponding group 4 of cigarettes, all the support bodies 18 always receive a pair of inner wraps 3, all the wrapping heads 22 always receive a corresponding collar 7 and a corresponding pair of side by side inner wraps 3, and all the wrapping heads 28 always receive a corresponding blank 6 and a corresponding pair of side by side inner wraps 3 together with a collar 7. In other words, in normal conditions, the entire packing machine 8, without exception, is involved in the manufacture of packets 1 of cigarettes.

[0038] When a malfunctioning output mouth 31 is detected (i.e. one that is occluded and therefore prevented from receiving cigarettes with the necessary continuity), it is possible to stop the packing machine 8, completely stopping the production of packets 1 of cigarettes and waiting for a technical intervention (cleaning and resetting of the hopper). This option is certainly simple, but on the other hand it significantly reduces the long-term productivity of the packing machine, 8 i.e. the number of packets 1 of cigarettes correctly produced in a long period

of time (for example, a conventional 8-hour work shift, a working day, a working week, a working month, a working year...).

[0039] Whereas, according to the present invention, when a malfunctioning output mouth 31 is detected (i.e. one that is occluded and therefore prevented from receiving cigarettes with the necessary continuity) it is possible to keep the packing machine 8 running by using only the correctly functioning output mouths 31, and not those associated with the malfunctioning output mouth 31, for forming the groups 4 of cigarettes. In this regard, it is important to note that two groups 4 of cigarettes, necessarily coming from two associated output mouths 31, are inserted into each packet 1 of cigarettes therefore the groups 4 of cigarettes flowing out of two associated output mouths 31 are destined to be coupled together to be inserted into the same packet 1 of cigarettes: when an output mouth 31 is no longer in use due to an occlusion, it is convenient to no longer use the associated output mouth 31 (even if it is functioning correctly) in order to avoid forming an "orphan" group 4 of cigarettes which would necessarily have to be discarded (thus with an obvious waste of cigarettes).

[0040] In order not to use the malfunctioning output mouth 31 (i.e. the one that is occluded and therefore prevented from receiving cigarettes with the necessary continuity) and the associated output mouth 31, the corresponding extraction devices 34 are disabled (i.e. not operated); in this regard, it is important to note that the extraction devices 34 are independent from each other and therefore can be individually activated/deactivated.

[0041] For example, if an occlusion occurs in the output mouth 31 indicated with the letter "A", the extraction device 34 of the output mouth 31 indicated with the letter "A" is deactivated together with the extraction device 34 of the output mouth 31 indicated with the letter "B", which is associated with the output mouth 31 indicated with the letter "A"; therefore, only the extraction devices 34 of the output mouths 31 indicated with the letters "C-F" remain in operation.

[0042] Operating as described above, i.e. disabling the extraction devices 34 of the malfunctioning output mouth 31 and the associated output mouth 31, the empty drawers 33 are cyclically formed and thus cyclically some wrapping heads 15 in the transfer station S2 do not receive the corresponding groups 4 of cigarettes; to avoid wasting wrapping material, in the feeding station S1 the feeding of wrappers 5 to the wrapping heads 15 is suspended (avoided), which will not receive the corresponding groups 4 of cigarettes in the transfer station S2. In the same way, in the transfer station S4 some wrapping heads 22 do not receive the corresponding pairs of inner wraps 3; in order to avoid wasting wrapping material, in the feeding station S5 the feeding of the collars 7 to the wrapping heads 22 is suspended (avoided), which will not receive the corresponding pairs of inner wraps 3 in the transfer station S4. In the same way, cyclically in the transfer station S6 some wrapping heads 28 do not re-

ceive the corresponding pairs of inner wraps 3 together with the collar 7; in order to avoid wasting wrapping material, in the feeding station S7 the feeding of the blanks 6 to the wrapping heads 28 is suspended (avoided), which will not receive the corresponding pairs of inner wraps 3 together with the collar 7 in the transfer station S6.

[0043] This operating method makes it possible not to completely stop the packing machine 8 when a malfunctioning output mouth 31 is detected (i.e. one that is occluded and therefore prevented from receiving cigarettes with the necessary continuity); in fact, the packing machine 8 continues to operate normally with a penalty due to the temporary "loss" of two output mouths 31 (the malfunctioning output mouth 31 and the output mouth 31 associated with it) which, as a knock-on effect, causes a momentary "loss" of at least two wrapping heads 15 of the wrapping drum 13, at least one support body 18 of the coupling drum 16, at least one wrapping head 22 of the wrapping drum 20, and at least one wrapping head 28 of the wrapping drum 26. It is thus possible to significantly increase the long-term productivity of the packing machine 8.

[0044] In the embodiment shown in Figure 6, six fully independent pushers 35 are provided, i.e. driven by six corresponding linear electric motors 36. In the embodiment shown in Figure 8, only three linear electric motors 36 are provided, each of which drives a pair of pushers 35 together, so that a single linear electric motor 36 drives the two pushers 35 of two output mouths 31 associated with each other.

[0045] The embodiments described herein can be combined with each other without departing from the protective scope of the present invention.

[0046] The control method described above has numerous benefits.

[0047] Firstly, the control method described above makes it possible to significantly increase the long-term productivity of the packing machine 8 because when the malfunction (occlusion) of an output mouth 31 occurs, the packing machine 8 is not completely stopped, instead the packing machine 8 is kept in operation with a penalty due to the temporary "loss" of two output mouths 31 (the malfunctioning output mouth 31 and the output mouth 31 associated with it). In this regard, it is important to note that an operator can easily intervene in the hopper 30 to eliminate an occlusion without having to stop the packing machine 8 and therefore the full functionality of the packing machine 8 can be resumed without ever stopping the packing machine 8; in fact, the area of the hopper 30 in which the occlusions (i.e. the "crossed-up" cigarettes) occur is free of moving parts that could constitute a danger for the operator.

[0048] The control method described above does not lead to an increase in the number of cigarettes which are discarded, since blocking the malfunctioning (occluded) output mouth 31 together with the associated output mouth 31 avoids forming groups 4 of cigarettes destined

to be discarded as "orphans" (i.e. not associated with another group 4 of cigarettes to form the contents of a packet 1 of cigarettes). The control method described above does not lead to an increase in the quantity of discarded wrapping material, as the feeding of the wrapping material (wrappers 5, blanks 6, and collars 7) to the wrapping heads 15, 22 and 28 without groups 4 of cigarettes is interrupted.

[0049] Finally, the control method described above is simple and cost-efficient to implement since it does not require major changes to the physical structure of the packing machine 8.

[0050] The embodiment shown in the attached Figures refers to the manufacture of a packet of cigarettes, but the present invention is also applicable without substantial modification to the manufacture of any other type of packet of cylindrical smoking articles (for example, a packet of cigars, a packet of liquid vaporised electronic cigarettes, a packet of new generation cigarettes without tobacco combustion...).

LIST OF REFERENCE NUMBERS IN THE FIGURES

[0051]

| | |
|----|----------------------|
| 1 | packet of cigarettes |
| 2 | outer container |
| 3 | inner wrap |
| 4 | group of cigarettes |
| 5 | wrapper |
| 6 | blank |
| 7 | collar |
| 8 | packing machine |
| 9 | forming unit |
| 10 | wrapping unit |
| 11 | coupling unit |
| 12 | wrapping unit |
| 13 | wrapping drum |
| 14 | axis of rotation |
| 15 | wrapping head |
| 16 | coupling drum |
| 17 | axis of rotation |
| 18 | support body |
| 19 | housing heads |
| 20 | wrapping drum |
| 21 | axis of rotation |
| 22 | wrapping head |
| 23 | feeding drum |
| 24 | axis of rotation |
| 25 | feeding head |
| 26 | wrapping drum |
| 27 | axis of rotation |
| 28 | wrapping head |
| 29 | drying conveyor |
| 30 | hopper |
| 31 | output mouth |
| 32 | forming conveyor |
| 33 | drawers |

| | |
|-------|-----------------------|
| 34 | extraction devices |
| 35 | pusher |
| 36 | linear electric motor |
| 37 | upper part |
| 5 38 | lower part |
| 39 | channels |
| 40 | sensors |
| 41 | sensor |
| S1 | feeding station |
| 10 S2 | transfer station |
| S3 | transfer station |
| S4 | transfer station |
| S5 | feeding station |
| S6 | transfer station |
| 15 S7 | feeding station |

Claims

- 20 1. A method for controlling a packing machine (8) manufacturing packets (1) of smoking articles, each containing two distinct inner wraps (3) each realized by folding a wrapper (5) around a group (4) of smoking articles; the packing machine (8) comprises:
- 25 a forming unit (9), where the groups (4) of smoking articles are formed in succession and which comprises a hopper (30), which is provided with at least four output mouths (31), each used to extract a group (4) of smoking articles by means of a corresponding extraction device (34); and a first wrapping unit (10), wherein each wrapper (5) is folded around each group (4) of smoking articles so as to form a corresponding inner wrap (3);
- 30 a coupling unit (11), wherein the inner wraps (3) are coupled so as to form the content of the packets (1) of smoking articles;
- 35 a second wrapping unit (12), wherein a blank (6) is folded around each pair of inner wraps (3) so as to form an outer container (2); and a plurality of wrapping drums (13, 20, 26) which are part of the two wrapping units (10, 12) and each of which has a plurality of wrapping heads (15, 22, 28), which are suitable to receive the groups (4) of smoking articles together with corresponding wrapping materials (5, 6, 7);
- 40 wherein each output mouth (31) has an associated output mouth (31), so that two output mouths (31) are associated with each another when the two output mouths (31) are used to extract two corresponding groups (4) of smoking articles which will be coupled to one another so as to be part of the same packet (1) of smoking articles;
- 45 the control method comprises the steps of:
- 50
- 55

detecting the correct operation of each out-

put mouth (31) of the hopper (30), so as to identify a possibly faulty output mouth (31); using, for the formation of the groups (4) of smoking articles and in the absence of faulty output mouths (31), all the output mouths (31), always extracting from each output mouth (31) a corresponding group (4) of smoking articles; and

using, to manufacture the packets (1) of smoking articles and in the absence of faulty output mouths (31), all the wrapping heads (15, 22, 28), always supplying all the wrapping heads (15, 22, 28) with the corresponding wrapping materials (5, 6, 7);

the control method is **characterised in that** it comprises the further steps of:

avoiding using, for the formation of the groups (4) of smoking articles and in the presence of a faulty output mouth (31), the faulty output mouth (31) as well as the output mouth (31) associated with the faulty output mouth (31), thus avoiding extracting the corresponding groups (4) of smoking articles from the two output mouths (31);

avoiding using, to manufacture the packets (1) of smoking articles and in the presence of a faulty output mouth (31), the wrapping heads (15, 22, 28) that are supposed to receive the groups (4) of smoking articles from the faulty output mouth (31) and from the output mouth (31) associated therewith; and

avoiding supplying the corresponding wrapping materials (5, 6, 7) to the wrapping heads (15, 22, 28) that are supposed to receive the groups (4) of smoking articles from the faulty output mouth (31) and from the output mouth (31) associated therewith.

2. The control method according to Claim 1, wherein the faulty output mouth (31) and the output mouth (31) associated therewith are prevented from being used by disabling the corresponding extraction devices (34).

3. The control method according to Claim 1 or 2, wherein:

each output mouth (31) of the hopper (30) is associated with a plurality of walls defining small channels where the smoking articles are arranged in substantially vertical piles; and each output mouth (31) of the hopper (30) is provided with at least one sensor (40), which is suitable to detect the presence of smoking articles along the corresponding small channels.

4. The control method according to Claim 3 and comprising the further step of identifying an output mouth (31) as faulty when at least one of the corresponding small channels has no smoking articles.

5. The control method according to one of the Claims 1 to 4 and comprising the further steps of:

checking whether the groups (4) of smoking articles are complete downstream of the output mouths (31); and

identifying an output mouth (31) as faulty when one or more groups (4) of smoking articles extracted from the output mouth (31) are incomplete.

Patentansprüche

1. Verfahren zum Steuern einer Verpackungsmaschine (8), die Packungen (1) von Rauchartikeln herstellt, wovon jede zwei gesonderte Innenhüllen (3) enthält, die jeweils durch Falten einer Hülle (5) um eine Gruppe (4) von Rauchartikeln realisiert werden; wobei die Verpackungsmaschine (8) umfasst:

eine Formungseinheit (9), bei der die Gruppen (4) von Rauchartikeln nacheinander geformt werden, und die einen Trichter (30) umfasst, der mit wenigstens vier Ausgabeöffnungen (31) versehen ist, wovon jede verwendet wird, um eine Gruppe (4) von Rauchartikeln mittels einer entsprechenden Extraktionsvorrichtung (34) zu extrahieren; und

eine erste Einwickleinheit (10), bei der jede Hülle (5) um die jeweilige Gruppe (4) von Rauchartikeln gefaltet wird, um eine entsprechende Innenhülle (3) zu bilden;

eine Kopplungseinheit (11), bei der die Innenhüllen (3) gekoppelt werden, um den Inhalt der Packungen (1) von Rauchartikeln zu bilden;

eine zweite Einwickleinheit (12), bei der ein Zugschnitt (6) um jedes Paar Innenhüllen (3) gefaltet wird, um einen Außenbehälter (2) zu bilden; und mehrere Einwickeltrommeln (13, 20, 26), die einen Teil der zwei Einwickleinheiten (10, 12) bilden und wovon jede mehrere Einwickelköpfe (15, 22, 28) aufweist, die geeignet sind, die Gruppen (4) von Rauchartikeln zusammen mit den entsprechenden Einwickelmaterialien (5, 6, 7) aufzunehmen;

wobei jede Ausgabeöffnung (31) eine zugeordnete Ausgabeöffnung (31) hat, so dass zwei Ausgabeöffnungen (31) einander zugeordnet sind, wenn die zwei Ausgabeöffnungen (31) verwendet werden, um zwei entsprechende Gruppen (4) von Rauchartikeln zu extrahieren, die miteinander gekoppelt werden, um einen Teil

derselben Packung (1) von Rauchartikeln zu bilden;

wobei das Steuerverfahren die Schritte umfasst:

5 Detektieren des korrekten Betriebs jeder Ausgabeöffnung (31) des Trichters (30), um eine möglicherweise fehlerhafte Ausgabeöffnung (31) zu identifizieren;

10 Verwenden aller Ausgabeöffnungen (31) für das Bilden der Gruppen (4) von Rauchartikeln und beim Nichtvorhandensein von fehlerhaften Ausgabeöffnungen (31), wobei immer aus jeder Ausgabeöffnung (31) eine entsprechende Gruppe (4) von Rauchartikeln extrahiert wird; und

15 Verwenden aller Einwickelköpfe (15, 22, 28) zum Herstellen der Packungen (1) von Rauchartikeln und beim Nichtvorhandensein von fehlerhaften Ausgabeöffnungen (31), wobei immer alle Einwickelköpfe (15, 22, 28) mit den entsprechenden Einwickelmaterialien (5, 6, 7) versorgt werden; wobei das Steuerverfahren **dadurch gekennzeichnet ist, dass** es die weiteren

20 Schritte umfasst:

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Vermeiden der Verwendung der fehlerhaften Ausgabeöffnung (31) sowie der Ausgabeöffnung (31), die der fehlerhaften Ausgabeöffnung (31) zugeordnet ist, bei der Formung der Gruppen (4) von Rauchartikeln und beim Vorhandensein einer fehlerhaften Ausgabeöffnung (31), so dass das Extrahieren der entsprechenden Gruppen (4) von Rauchartikeln aus den zwei Ausgabeöffnungen (31) vermieden wird;

30 Vermeiden der Verwendung der Einwickelköpfe (15, 22, 28), die dazu bestimmt sind, die Gruppen (4) von Rauchartikeln von der fehlerhaften Ausgabeöffnung (31) und von der Ausgabeöffnung (31), die dieser zugeordnet ist, zu empfangen, bei der Herstellung der Packungen (1) von Rauchartikeln und beim Vorhandensein einer fehlerhaften Ausgabeöffnung (31); und

35 Vermeiden der Zufuhr der entsprechenden Einwickelmaterialien (5, 6, 7) zu den Einwickelköpfen (15, 22, 28), die dazu bestimmt sind, die Gruppen (4) von Rauchartikeln von der fehlerhaften Ausgabeöffnung (31) und von der Ausgabeöffnung (31), die dieser zugeordnet ist, zu empfangen.

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2. Steuerverfahren nach Anspruch 1, wobei verhindert wird, dass die fehlerhafte Ausgabeöffnung (31) und die Ausgabeöffnung (31), die dieser zugeordnet ist, verwendet werden, durch Ausschalten der entsprechenden Extraktionsvorrichtungen (34).

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3. Steuerverfahren nach Anspruch 1 oder 2, wobei:

jeder Ausgabeöffnung (31) des Trichters (30) mehrere Wände zugeordnet sind, die kleine Kanäle definieren, in denen die Rauchartikel im Wesentlichen in vertikalen Stapeln angeordnet sind; und

jede Ausgabeöffnung (31) des Trichters (30) mit wenigstens einem Sensor (40) versehen ist, der geeignet ist, das Vorhandensein von Rauchartikeln längs der entsprechenden kleinen Kanäle zu detektieren.

4. Steuerverfahren nach Anspruch 3 und umfassend den weiteren Schritt des Identifizierens einer Ausgabeöffnung (31) als fehlerhaft, wenn wenigstens einer der entsprechenden kleinen Kanäle keine Rauchartikel aufweist.

5. Steuerverfahren nach einem der Ansprüche 1 bis 4 und umfassend die weiteren Schritte:

Prüfen, ob die Gruppen (4) von Rauchartikeln stromabwärts der Ausgabeöffnungen (31) vollständig sind; und

Identifizieren einer Ausgabeöffnung (31) als fehlerhaft, wenn eine oder mehrere Gruppen (4) von Rauchartikeln, die aus der Ausgabeöffnung (31) extrahiert werden, unvollständig sind.

30 Revendications

1. Procédé pour commander une machine d'emballage (8) pour la fabrication de paquets (1) d'articles à fumer, chacun contenant deux emballages internes distincts (3), chacun réalisé en pliant un papier d'emballage (5) autour d'un groupe (4) d'articles à fumer ; la machine d'emballage (8) comprend :

une unité de formage (9) dans laquelle les groupes (4) d'articles à fumer sont formés en succession et qui comprend une trémie (30) qui est prévue avec au moins quatre bouches de sortie (31), chacune utilisée pour extraire un groupe (4) d'articles à fumer au moyen d'un dispositif d'extraction (34) correspondant ; et

une première unité d'emballage (10), dans laquelle chaque papier d'emballage (5) est plié autour de chaque groupe (4) d'articles à fumer afin de former un emballage interne (3) correspondant ;

une unité de couplage (11), dans laquelle les emballages internes (3) sont couplés afin de former le contenu des paquets (1) d'articles à fumer ;

une seconde unité d'emballage (12), dans laquelle une découpe (6) est pliée autour de chaque paire d'emballages internes (3) afin de former un contenant externe (2) ; et

une pluralité de tambours d'emballage (13, 20, 26) qui font partie des deux unités d'emballage (10, 12) et dont chacun a une pluralité de têtes d'emballage (15, 22, 28) qui sont appropriées pour recevoir les groupes (4) d'articles à fumer conjointement avec des matériaux d'emballage (5, 6, 7) correspondants ; dans lequel chaque bouche de sortie (31) a une bouche de sortie (31) associée, de sorte que deux bouches de sortie (31) sont associées entre elles lorsque les deux bouches de sortie (31) sont utilisées pour extraire deux groupes (4) correspondants d'articles à fumer qui sont couplés entre eux afin de faire partie du même paquet (1) d'articles à fumer ; le procédé de commande comprend les étapes suivantes :

détecter le fonctionnement correct de chaque bouche de sortie (31) de la trémie (30) afin d'identifier une bouche de sortie (31) éventuellement défectueuse ; utiliser, pour la formation des groupes (4) d'articles à fumer et en l'absence de bouches de sortie (31) défectueuses, toutes les bouches de sortie (31), extraire toujours de chaque bouche de sortie (31), un groupe (4) correspondant d'articles à fumer ; et utiliser, pour fabriquer les paquets (1) d'articles à fumer et en l'absence de bouches de sortie (31) défectueuses, toutes les têtes d'emballage (15, 22, 28), alimenter toujours toutes les têtes d'emballage (15, 22, 28) avec les matériaux d'emballage (5, 6, 7) correspondants ; le procédé de commande est **caractérisé en ce qu'**il comprend les étapes supplémentaires suivantes :

éviter d'utiliser, pour la formation des groupes (4) d'articles à fumer et en présence d'une bouche de sortie (31) défectueuse, la bouche de sortie (31) défectueuse ainsi que la bouche de sortie (31) associée à la bouche de sortie (31) défectueuse, éviter ainsi d'extraire les groupes (4) correspondants d'articles à fumer des deux bouches de sortie (31) ; éviter d'utiliser, pour fabriquer les paquets (1) d'articles à fumer et en présence d'une bouche de sortie (31) défectueuse, les têtes d'emballage (15, 22, 28) qui sont supposées recevoir les groupes (4) d'articles à fumer de la bouche de sortie (31) défectueuse et de la bouche de sortie (31) associée à cette dernière ; et éviter d'amener les matériaux d'emballage (5, 6, 7) correspondants aux têtes d'emballage (15, 22, 28) qui sont supposés recevoir les groupes (4) d'articles à fumer de la bouche de sortie (31)

défectueuse et de la bouche de sortie (31) associée à cette dernière.

2. Procédé de commande selon la revendication 1, dans lequel on empêche l'utilisation de la bouche de sortie (31) défectueuse et de la bouche de sortie (31) associée à cette dernière en désactivant les dispositifs d'extraction (34) correspondants.
3. Procédé de commande selon la revendication 1 ou 2, dans lequel :
 - chaque bouche de sortie (31) de la trémie (30) est associée à une pluralité de parois définissant de petits canaux où les articles à fumer sont agencés en piles sensiblement verticales ; et chaque bouche de sortie (31) de la trémie (30) est prévue avec au moins un capteur (40), qui est approprié pour détecter la présence d'articles à fumer le long des petits canaux correspondants.
4. Procédé de commande selon la revendication 3 et comprenant l'étape supplémentaire pour identifier une bouche de sortie (31) comme étant défectueuse lorsqu'au moins l'un des petits canaux ne comporte pas d'articles à fumer.
5. Procédé de commande selon l'une des revendications 1 à 4, et comprenant les étapes supplémentaires suivantes :
 - vérifier si les groupes (4) d'articles à fumer sont complets en aval des bouches de sortie (31) ; et identifier une bouche de sortie (31) comme étant défectueuse lorsqu'un ou plusieurs groupes (4) d'articles à fumer extraits de la bouche de sortie (31) sont incomplets.

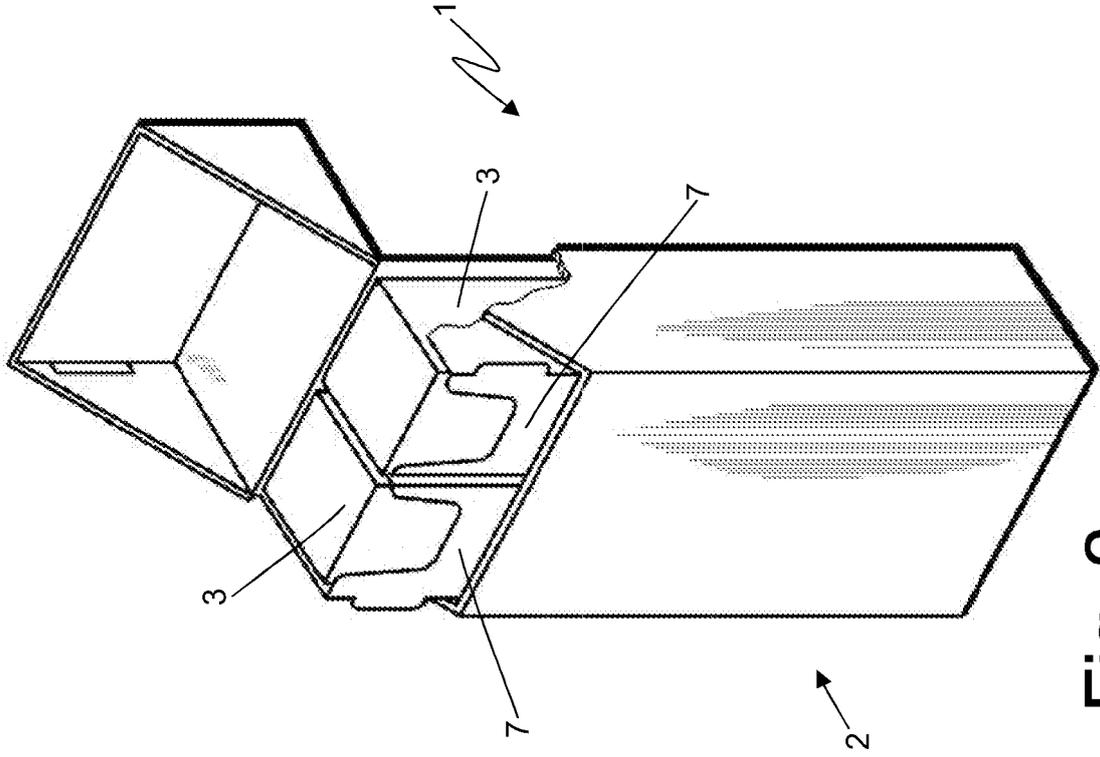


Fig. 2

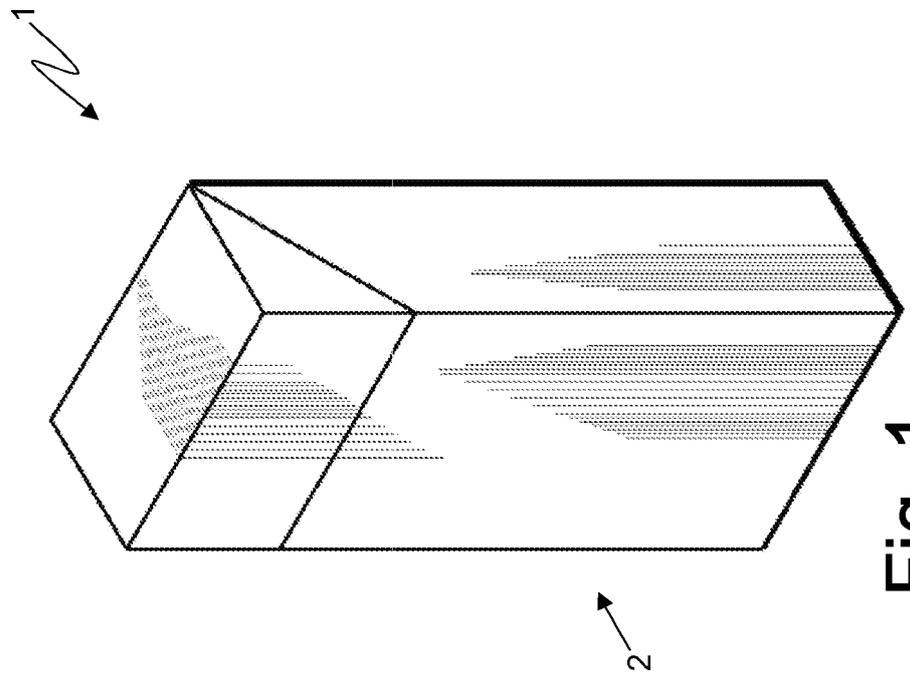


Fig. 1

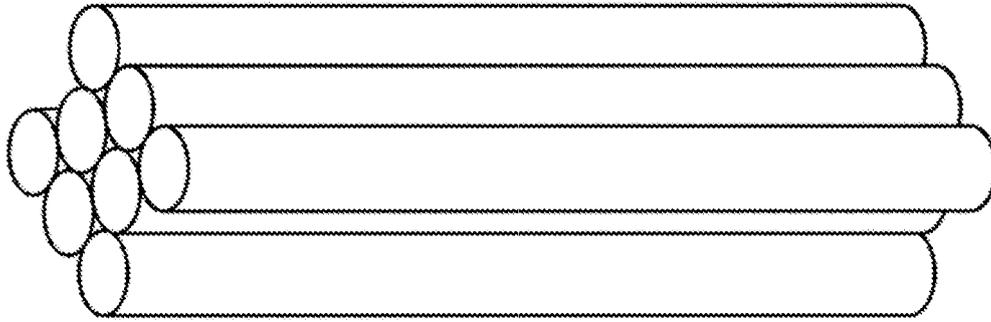


Fig. 4

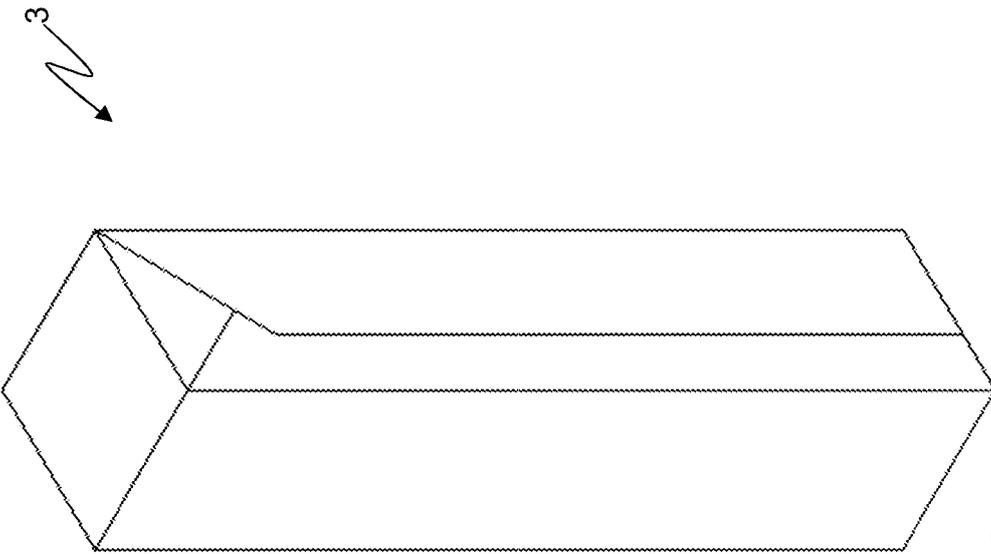


Fig. 3



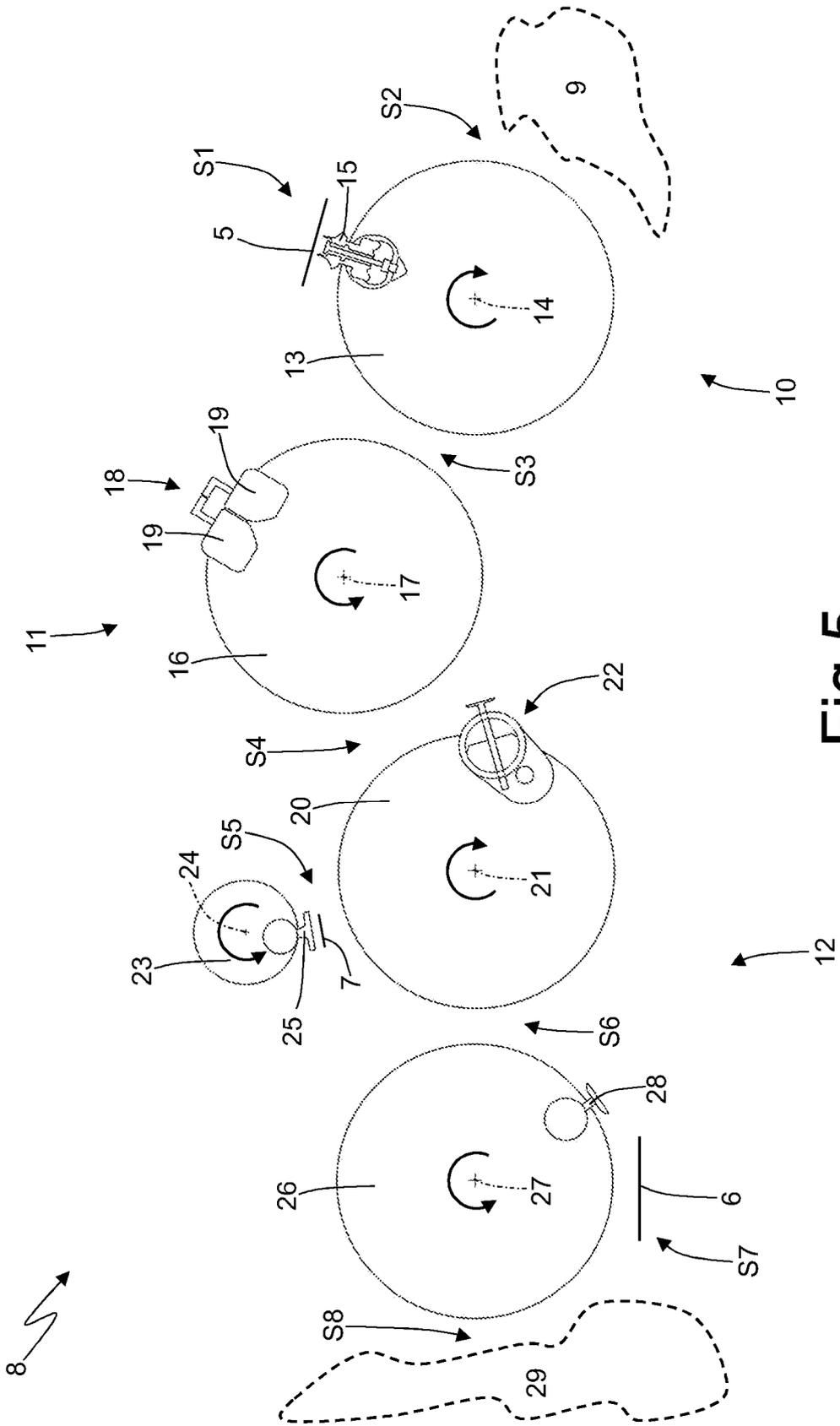
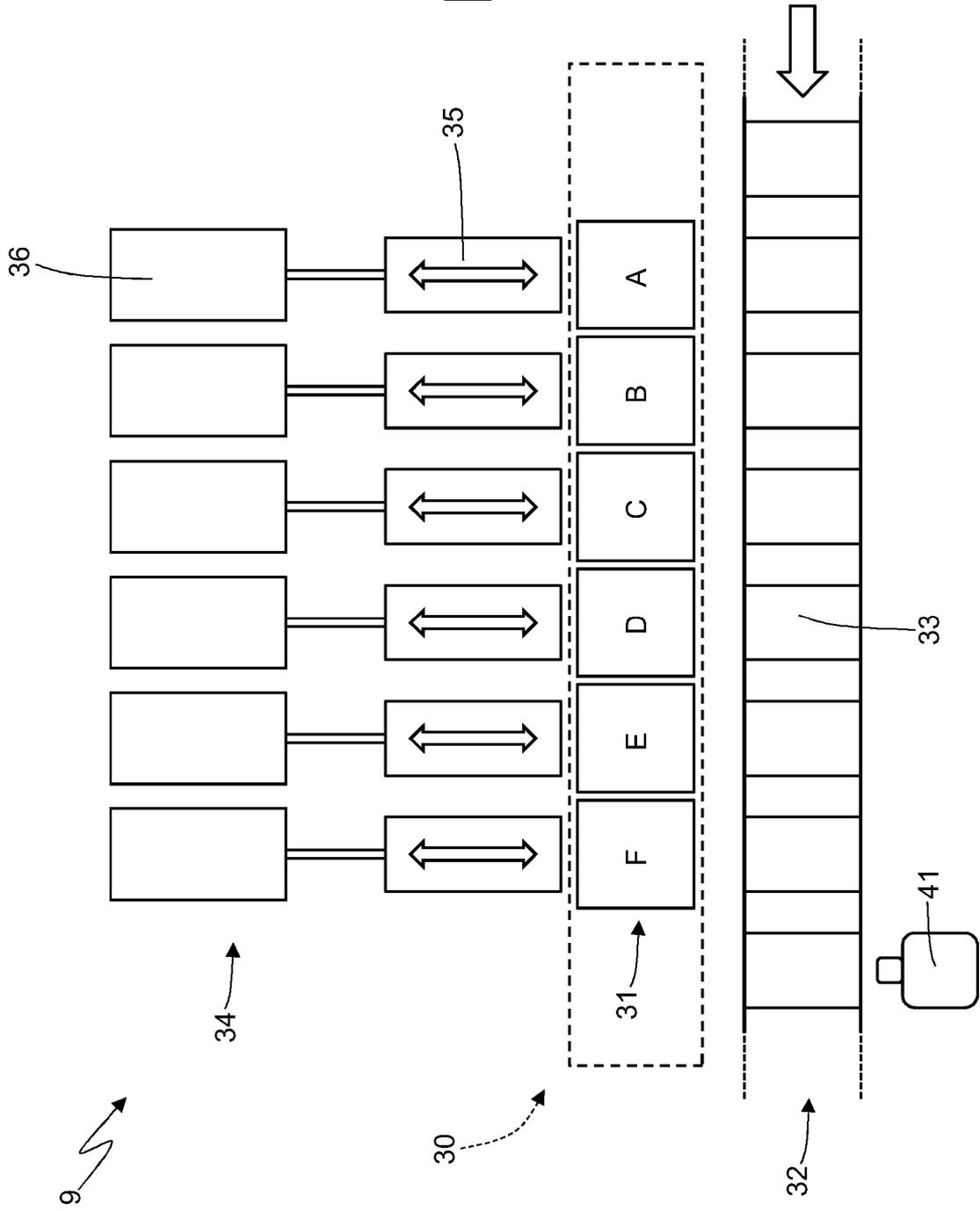


Fig.5

Fig.6



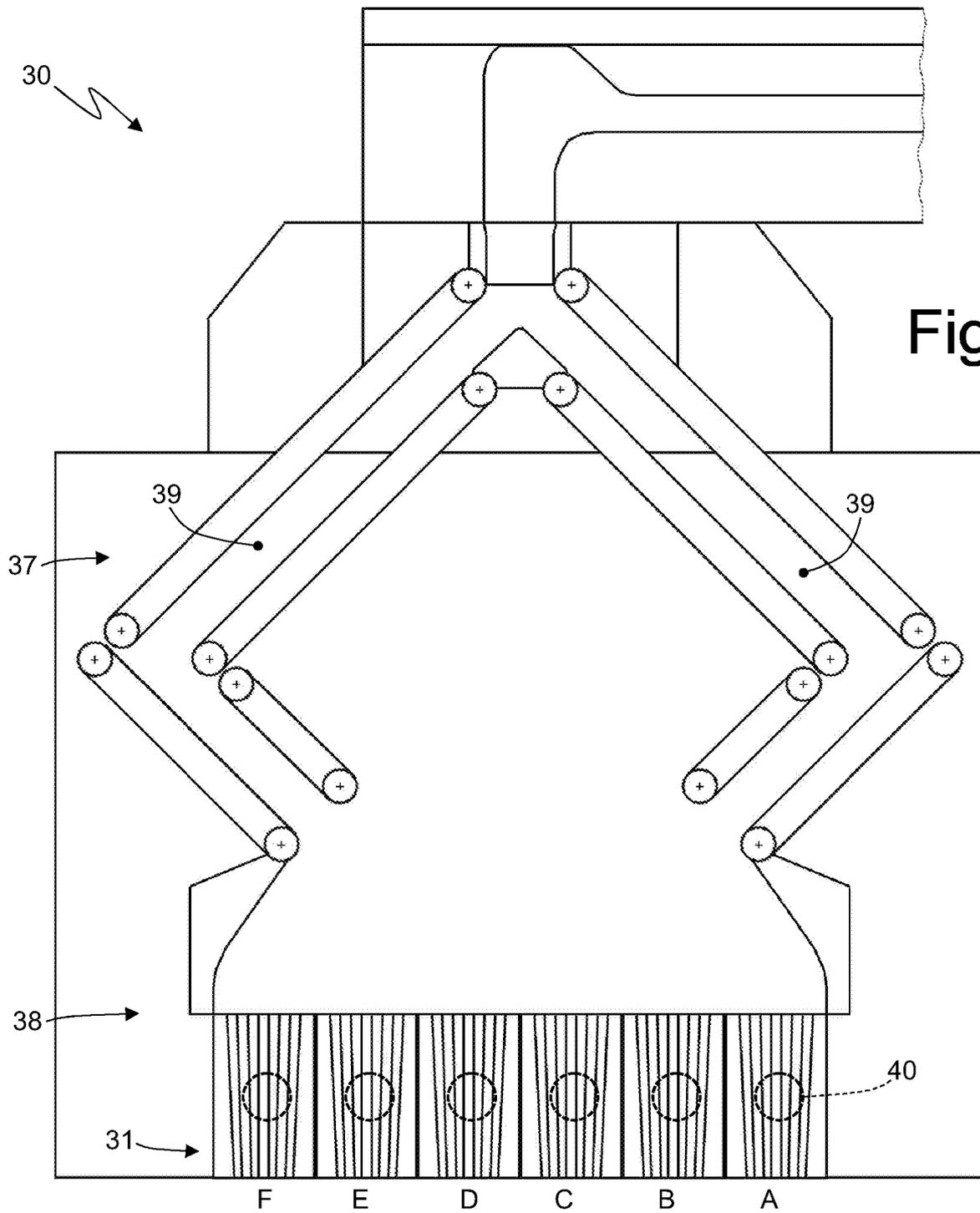
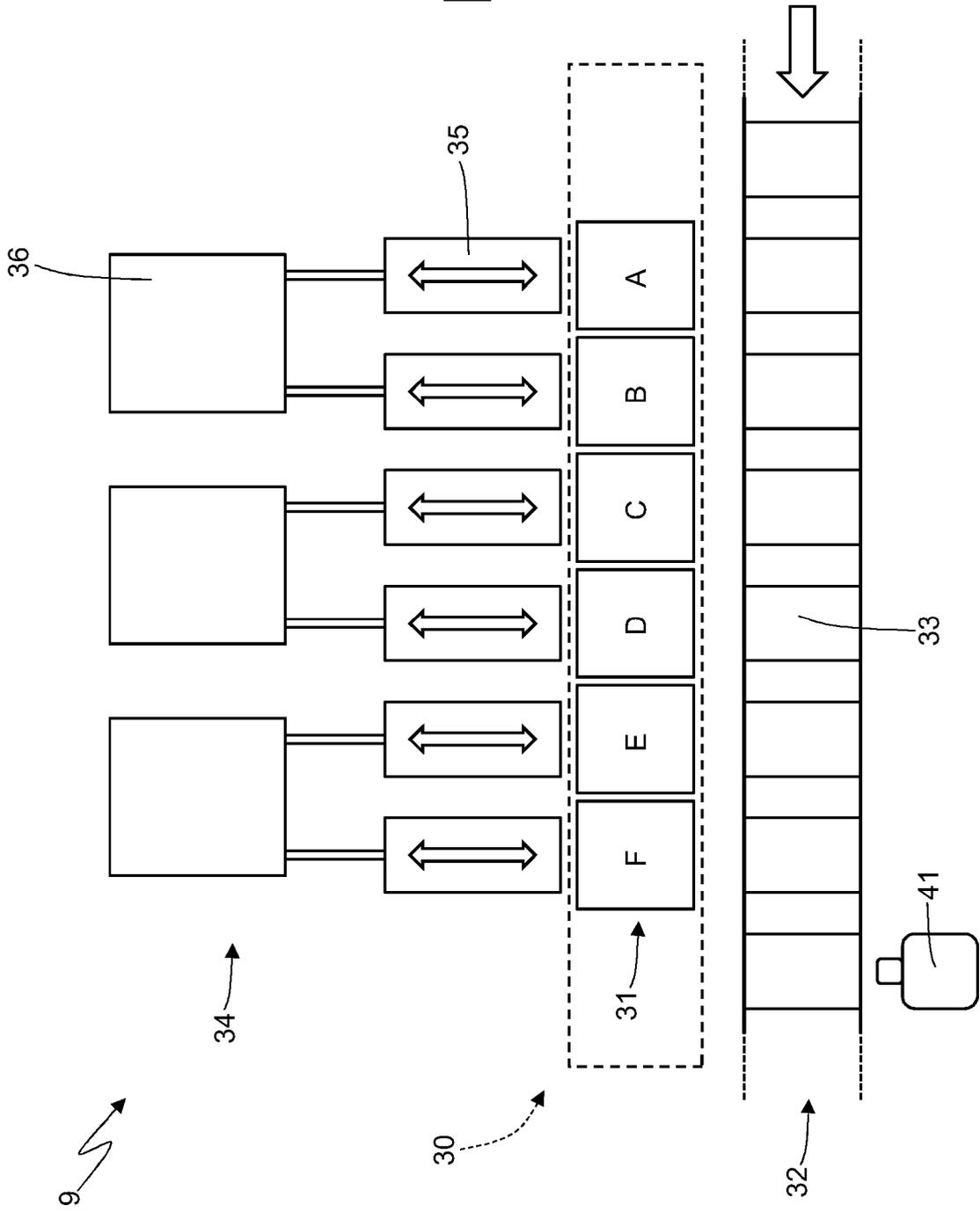


Fig.7

Fig.8



REFERENCES CITED IN THE DESCRIPTION

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