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(54) **FILLING STATION AND METHOD OF FILLING AN ENVELOPE**

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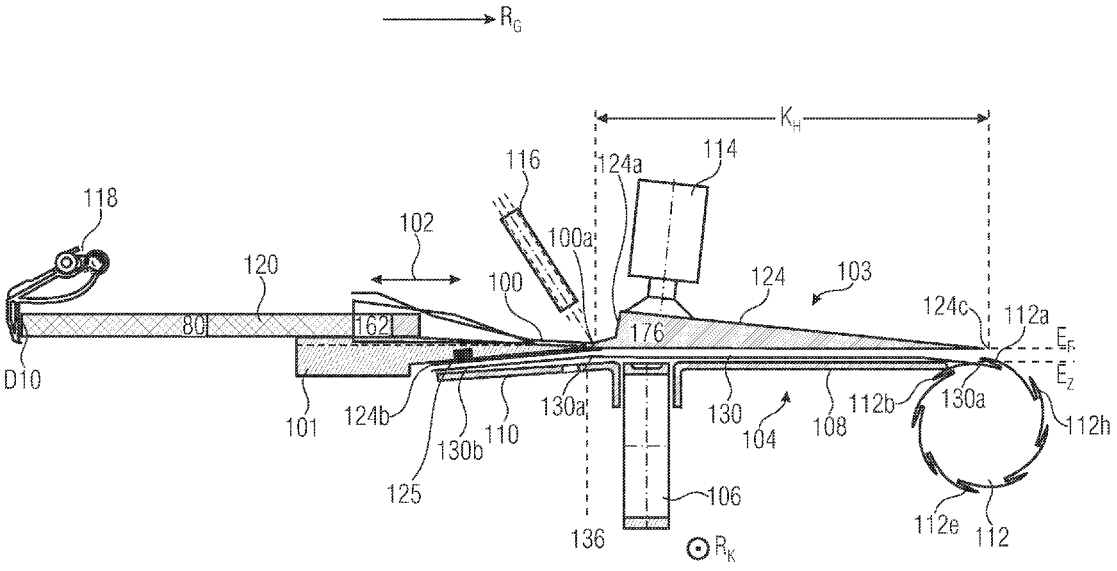
(57) **ABSTRACT**

A filling station for filling an envelope with a filling material includes a filling area, a holder configured to hold an envelope to be filled in the filling area while it is being filled and to release the filled envelope once it has been filled, at least one opener configured to open the envelope to be filled, an inserter configured to insert a filling material into the opened envelope to be filled, and a transport unit configured to move a subsequent envelope into the filling area while the envelope to be filled is being filled, the opener being configured to open the subsequent envelope before the filled envelope has completely left the filling area.



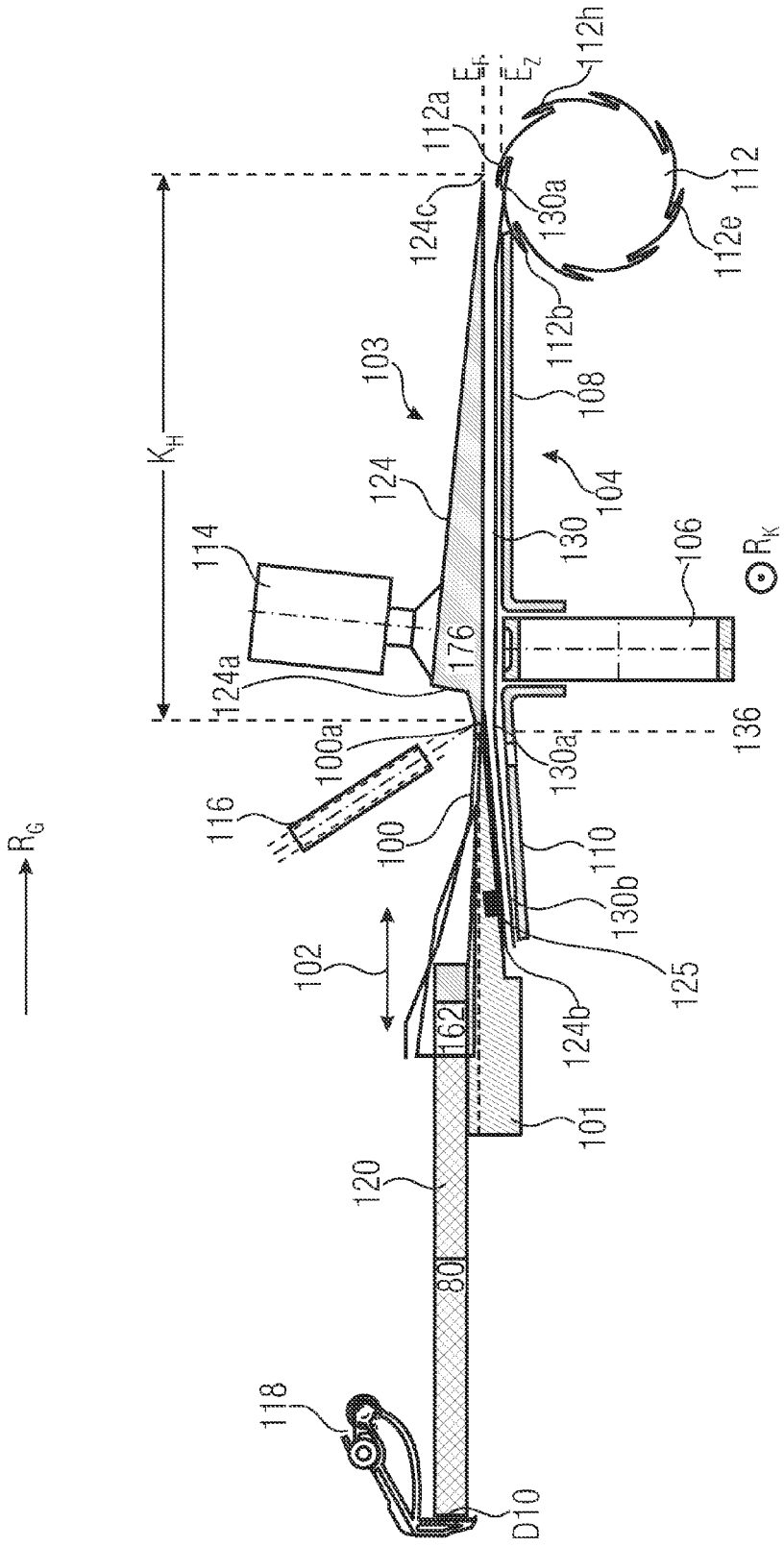

R_G
K_H
E_F
E_Z
R_K
112h
112a
112
124c
130a
112e
112b
103
108
124
104
130
106
114
176
124a
136
100a
130a
116
100
110
130b
102
125
162
124b
101
120
80
118
D10

FIGURE 1

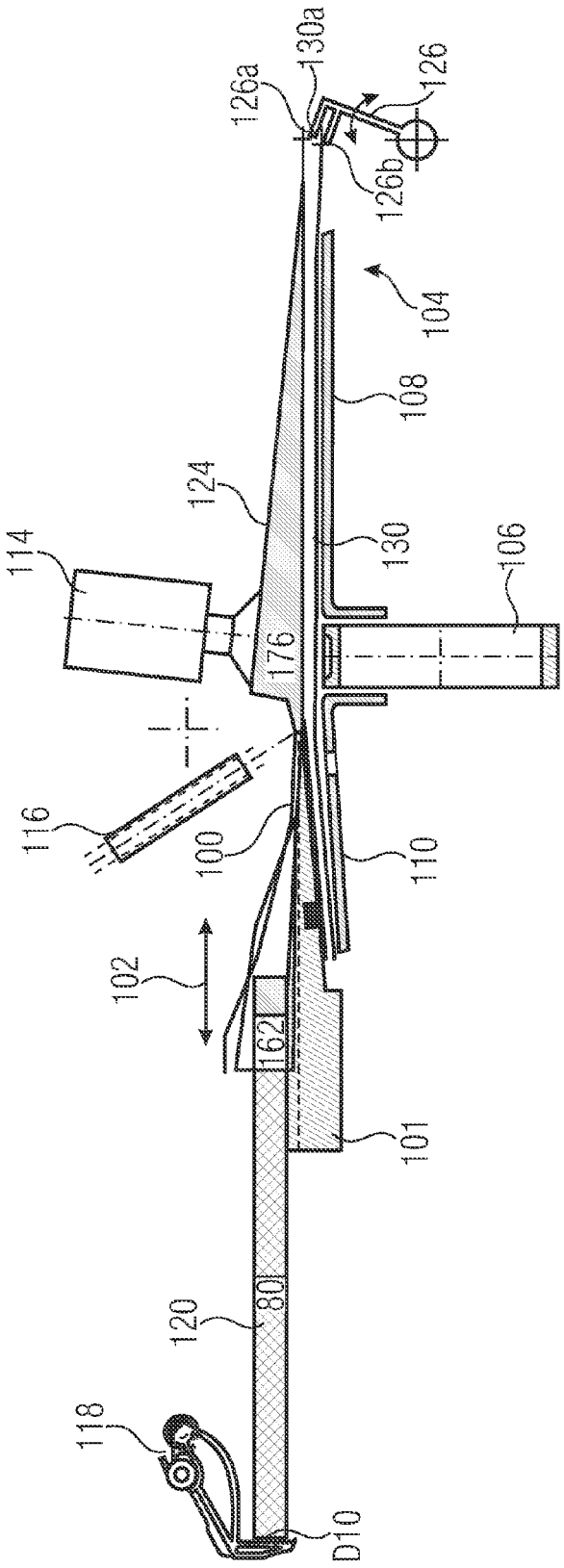

130a
126a
126
126b
104
108
124
130
106
114
176
116
100
110
102
162
101
120
80
118
D10

FIGURE 2

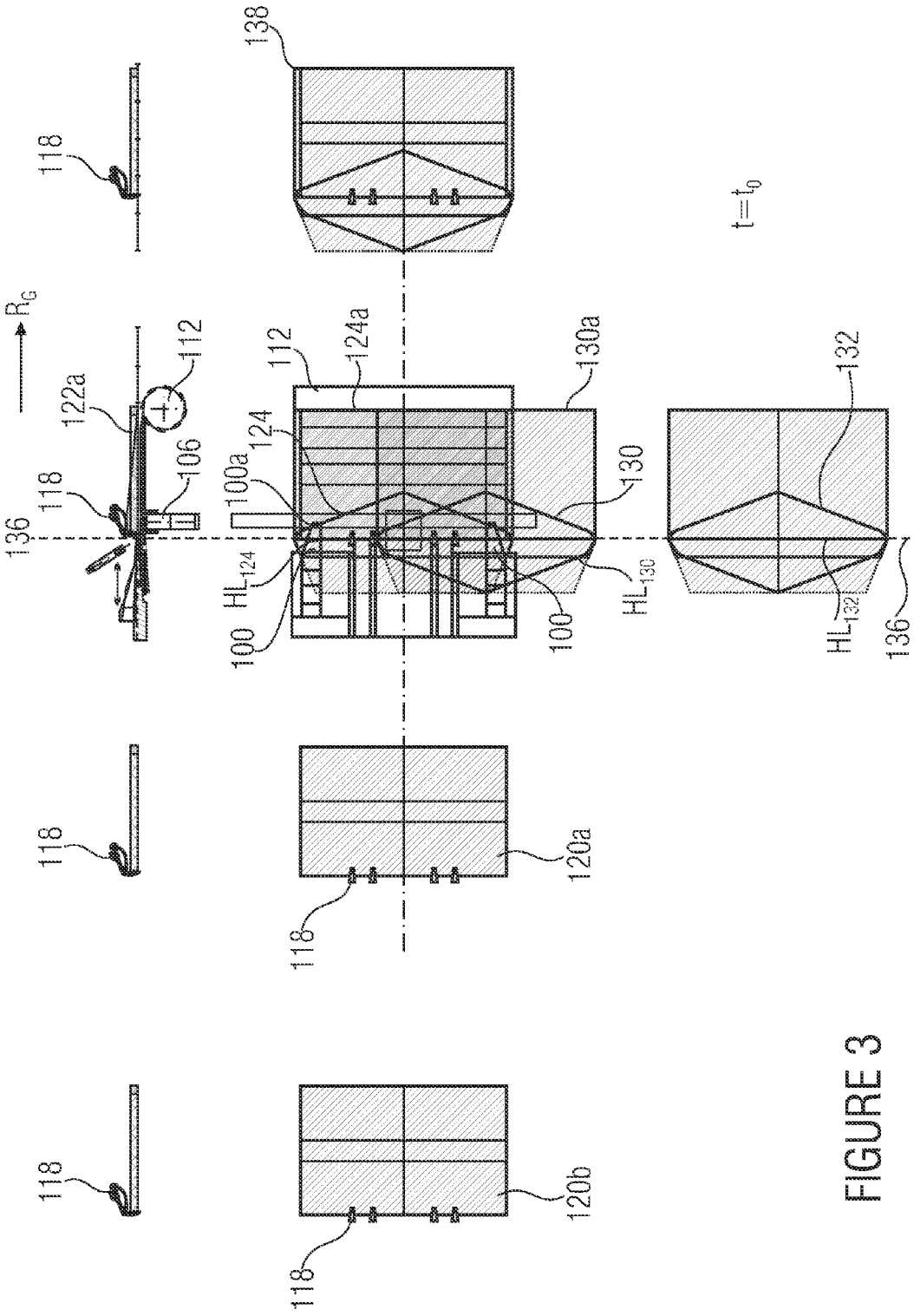

138
118
R_G
112
122a
106
118
136
100a
124
112
124a
130a
132
130
100
HL_{124}
HL_{130}
HL_{132}
136
$t=t_0$
118
120a
118
118
120b
118

FIGURE 3

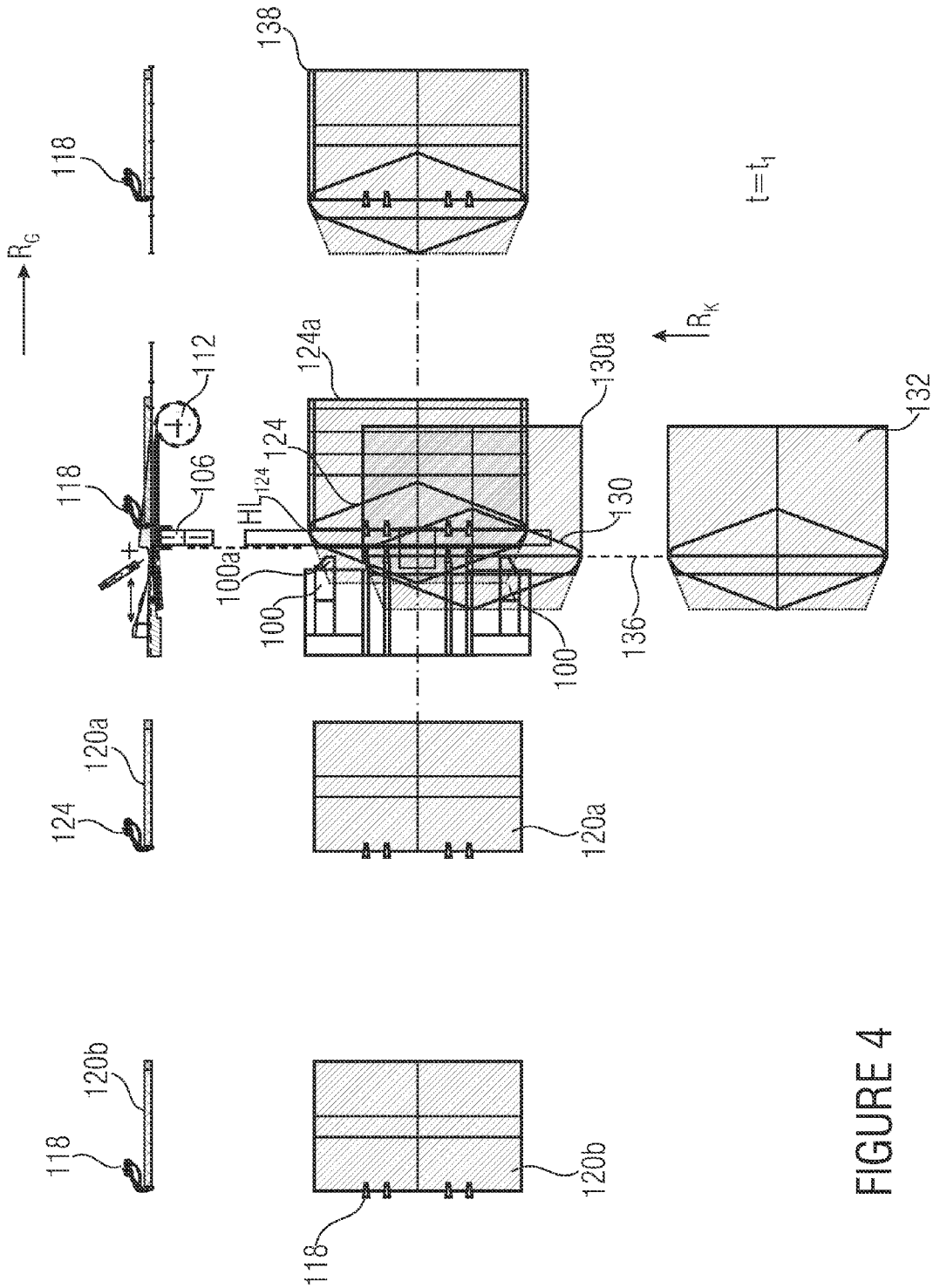

138
118
R_G
112
124a
130a
R_K
$t=t_1$
132
118
106
H_{L124}
124
130
100a
100
100
136
120a
124
120a
120b
118
120b
118

FIGURE 4

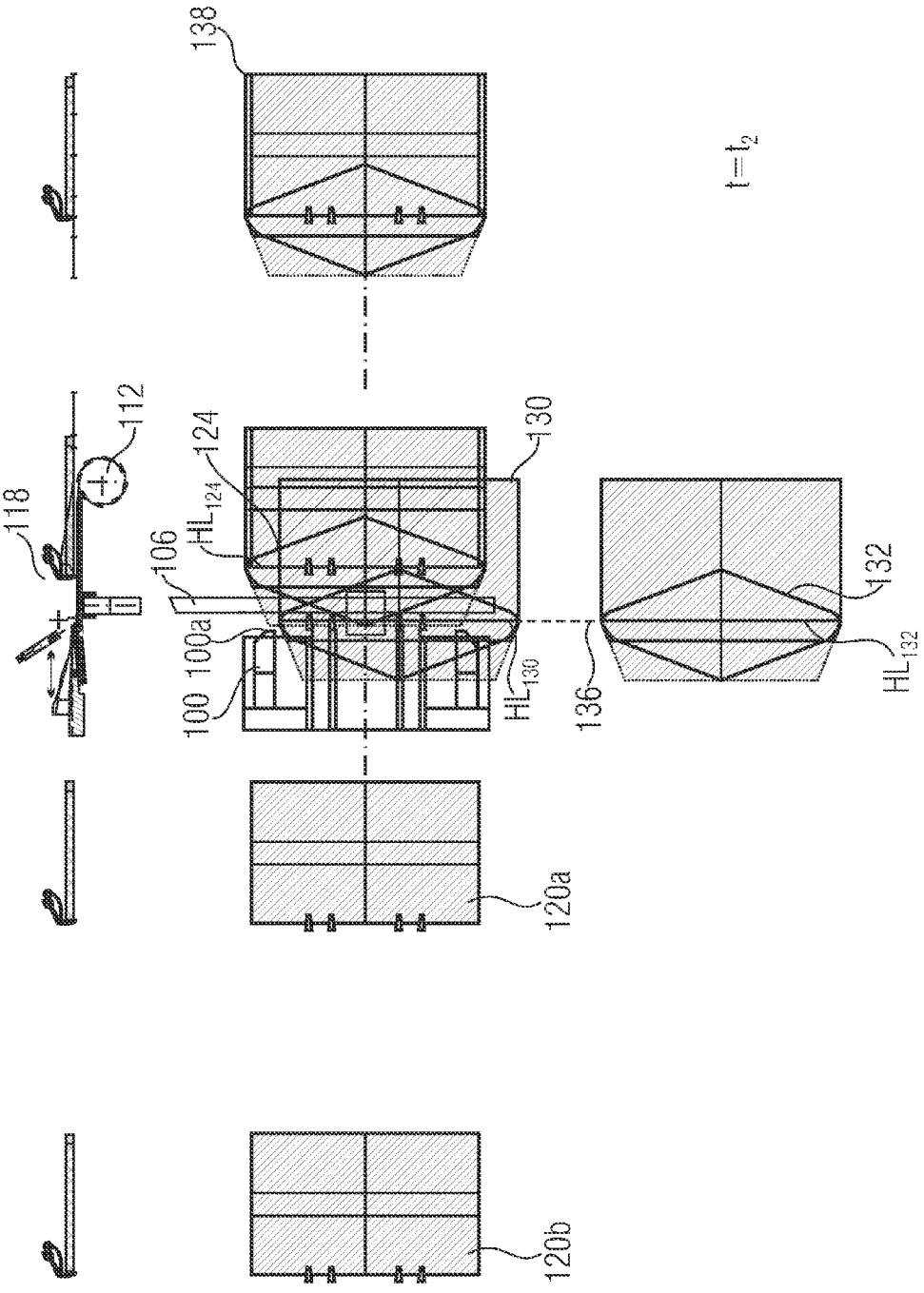

138
$t=t_2$
112
118
124
HL_{124}
106
130
100a
100
HL_{130}
136
132
HL_{132}
120a
120b

FIGURE 5

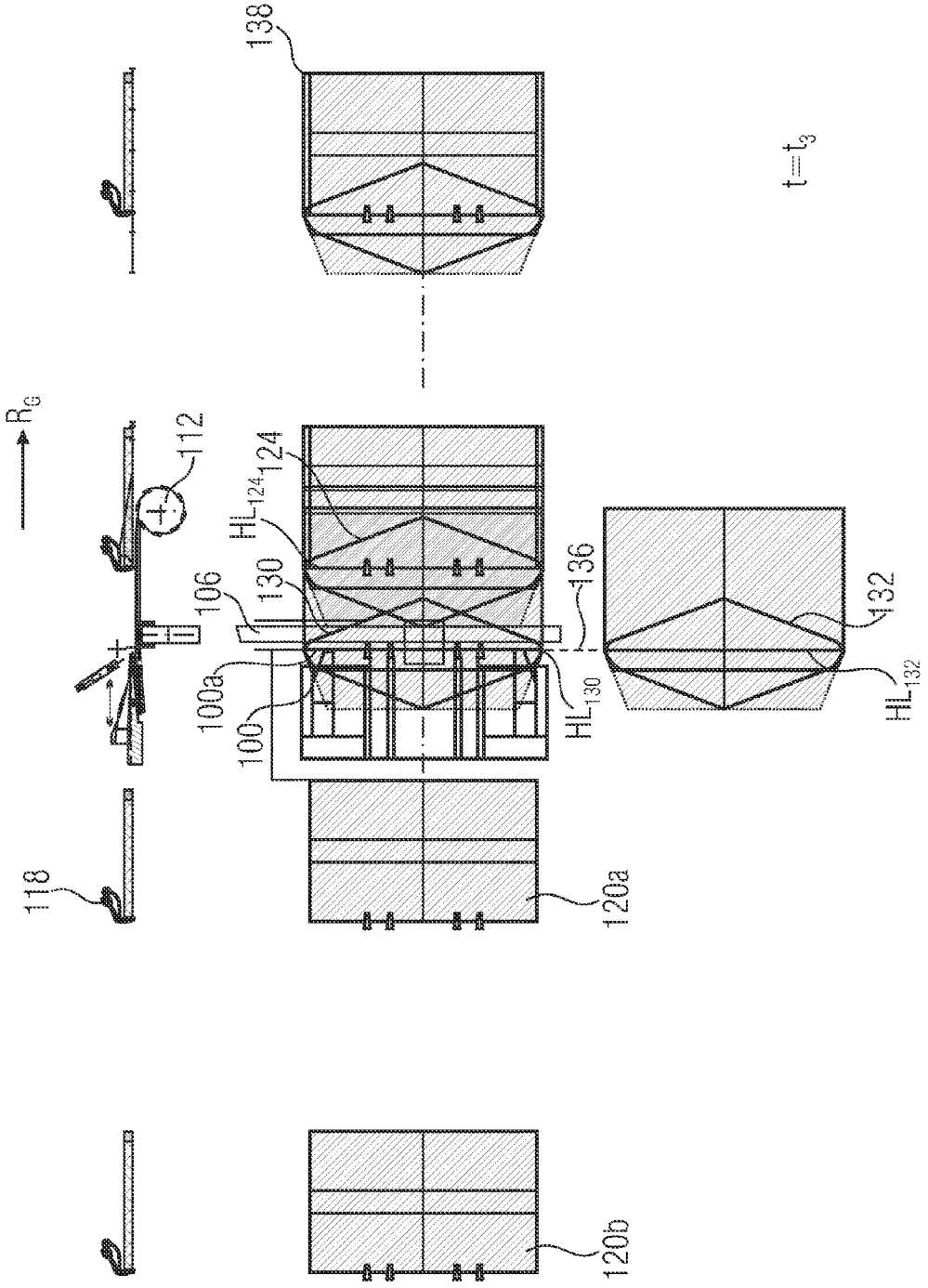

138
$t=t_3$
R_G
112
124
HL_{124}
106
130
136
132
100a
100
HL_{130}
HL_{132}
118
120a
120b

FIGURE 6

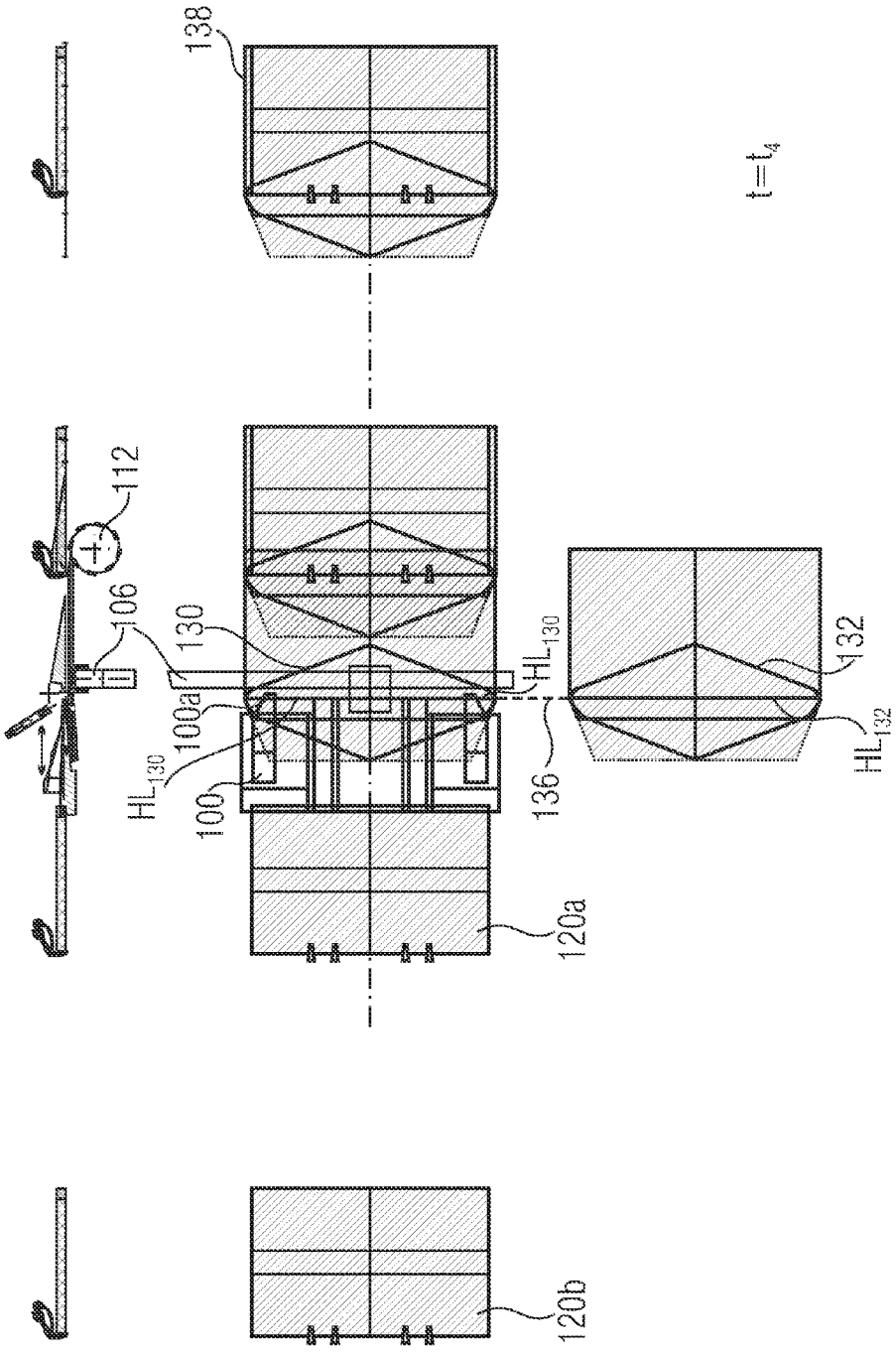

138
t=t4
112
106
130
100a
HL130
100
HL130
132
HL132
136
120a
120b

FIGURE 7

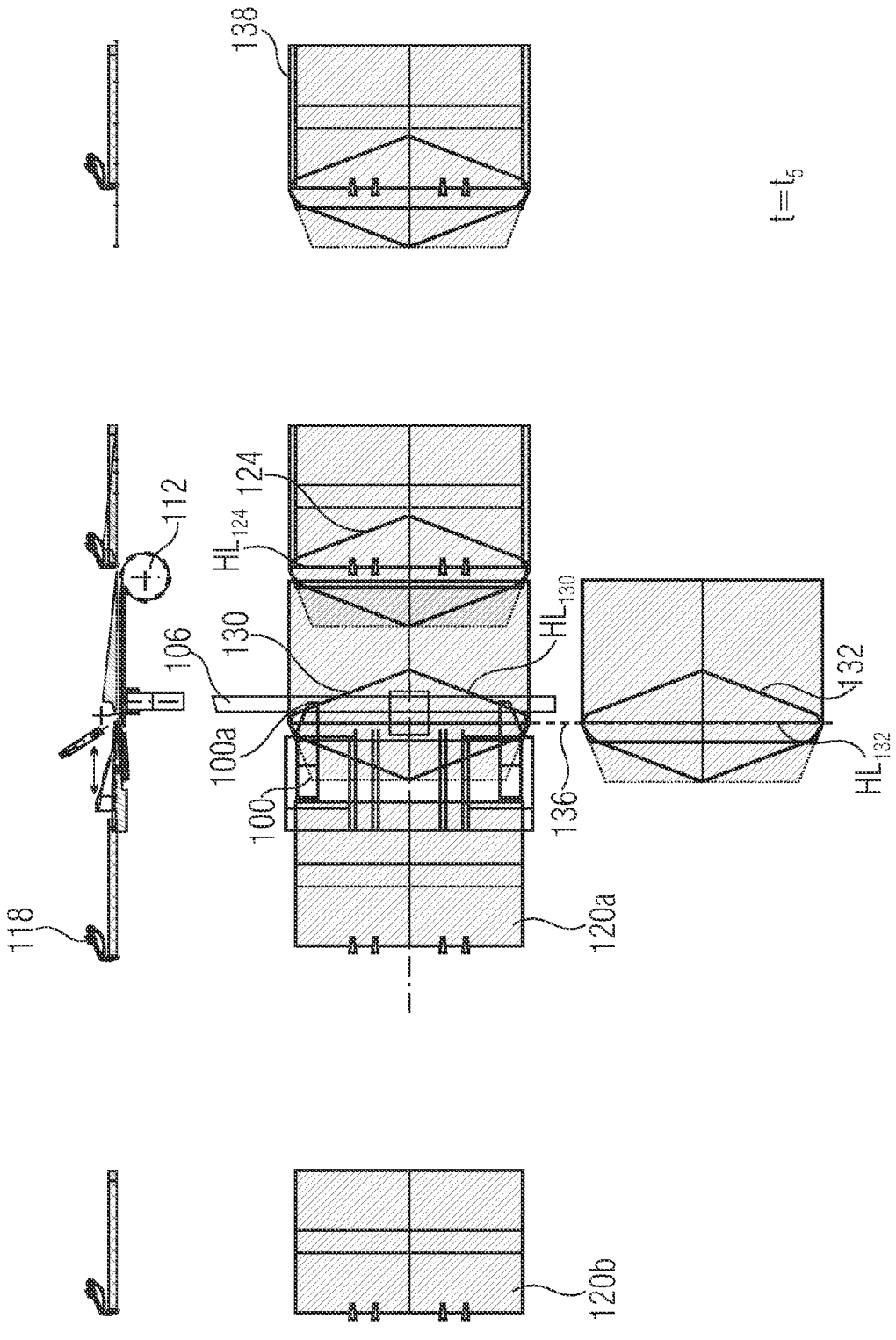

138
$t=t_5$
112
124
HL_{124}
130
106
HL_{130}
132
100a
100
136
HL_{132}
118
120a
120b

FIGURE 8

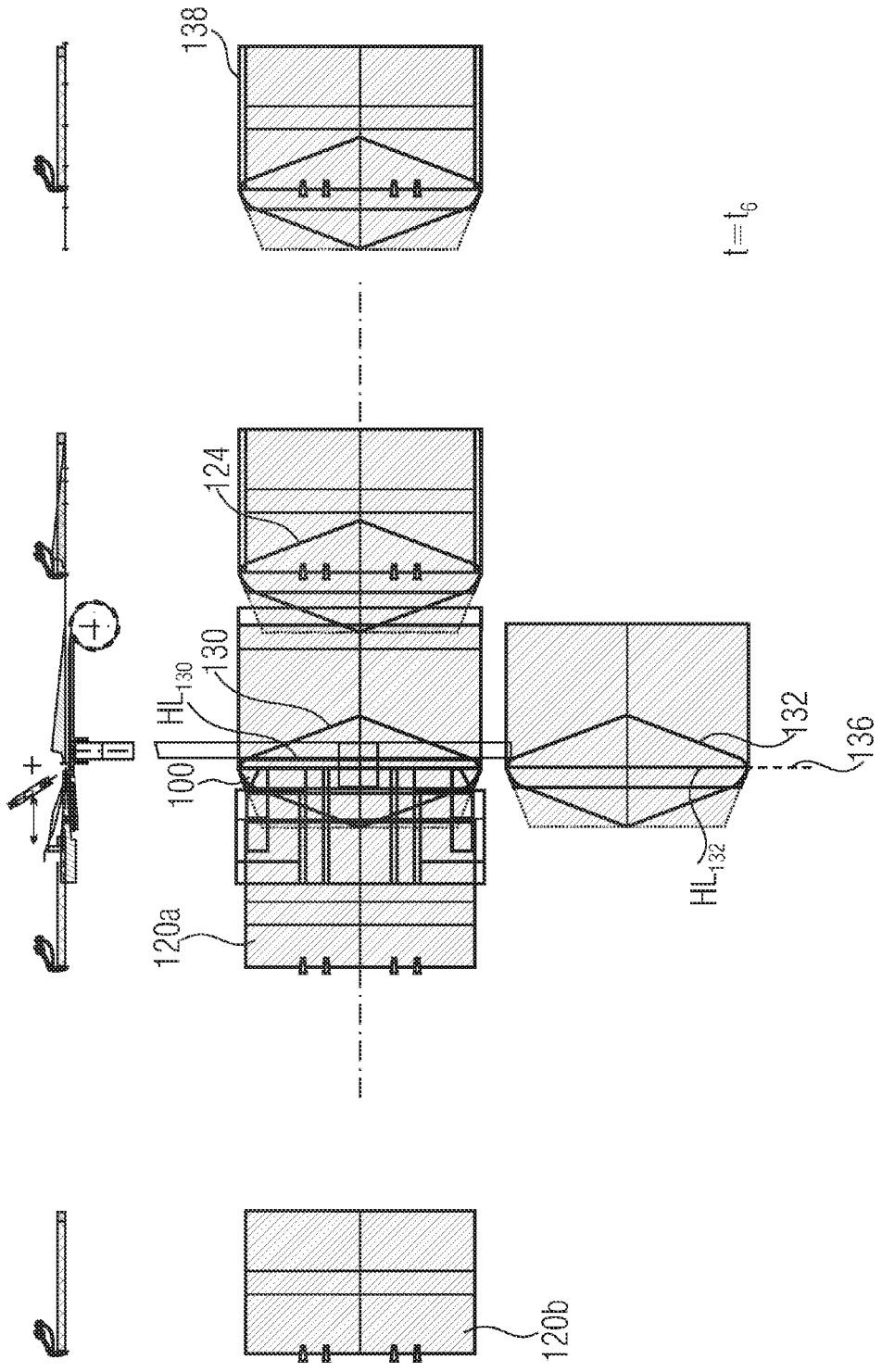


FIGURE 9

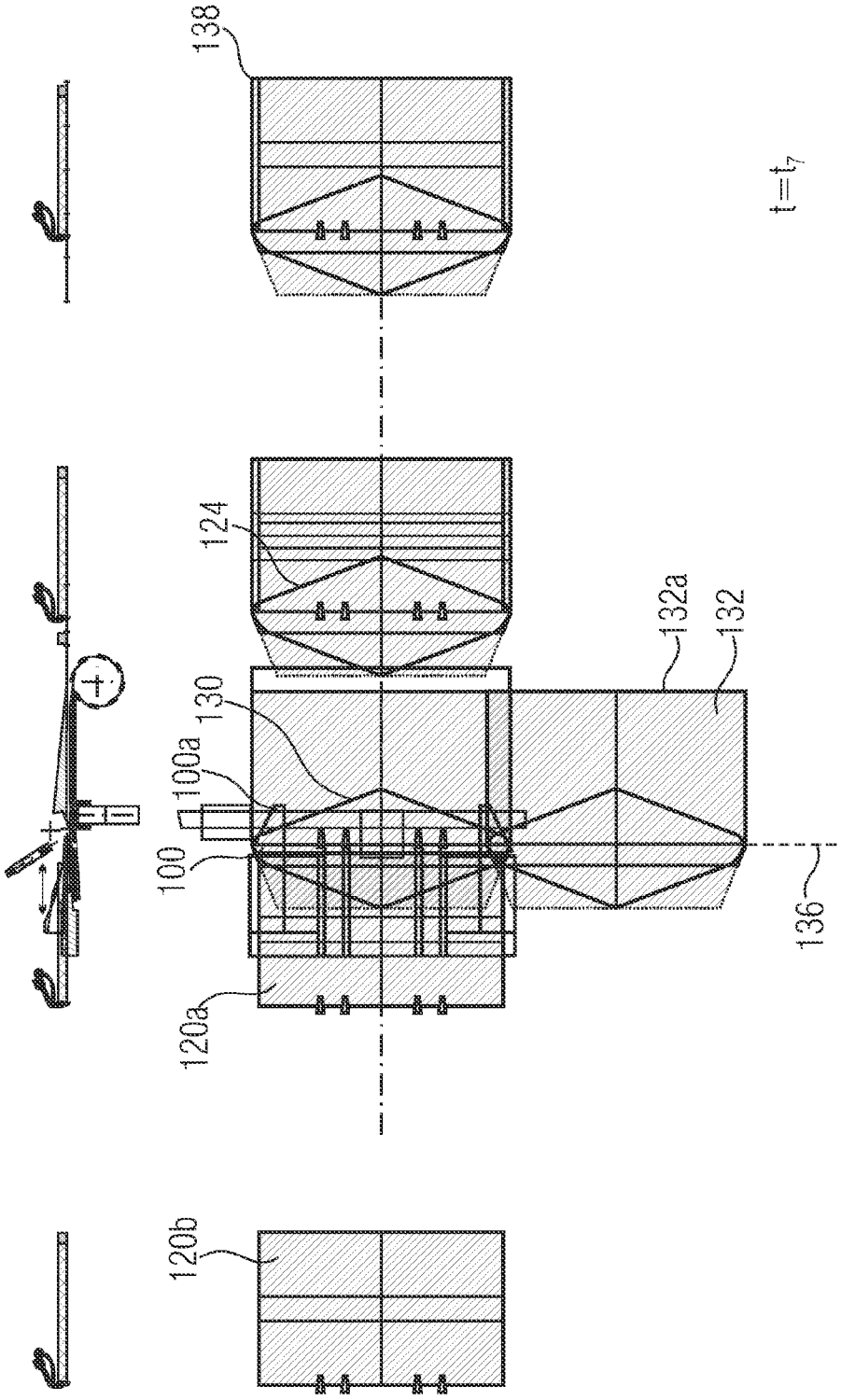


FIGURE 10

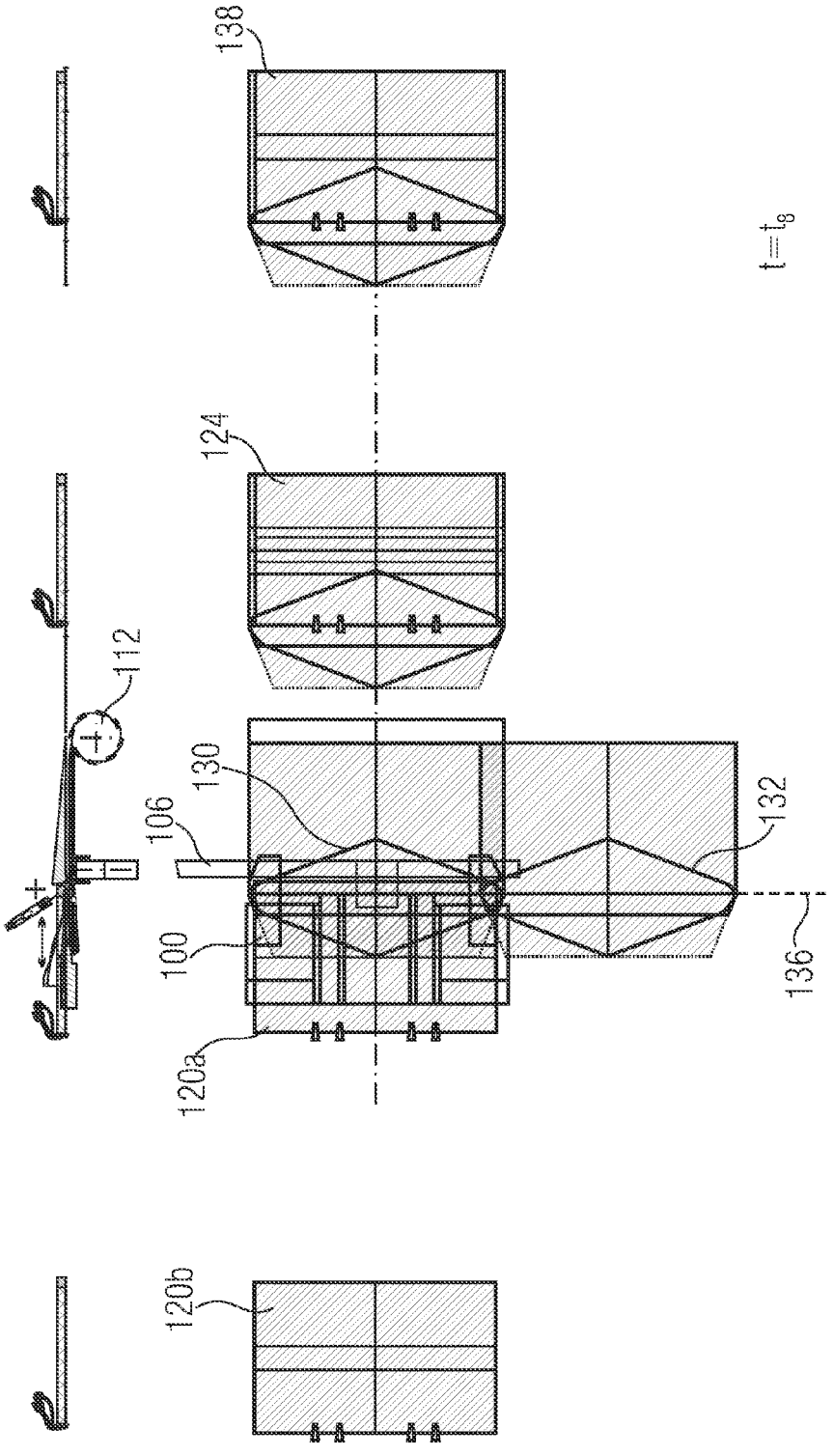


FIGURE 11

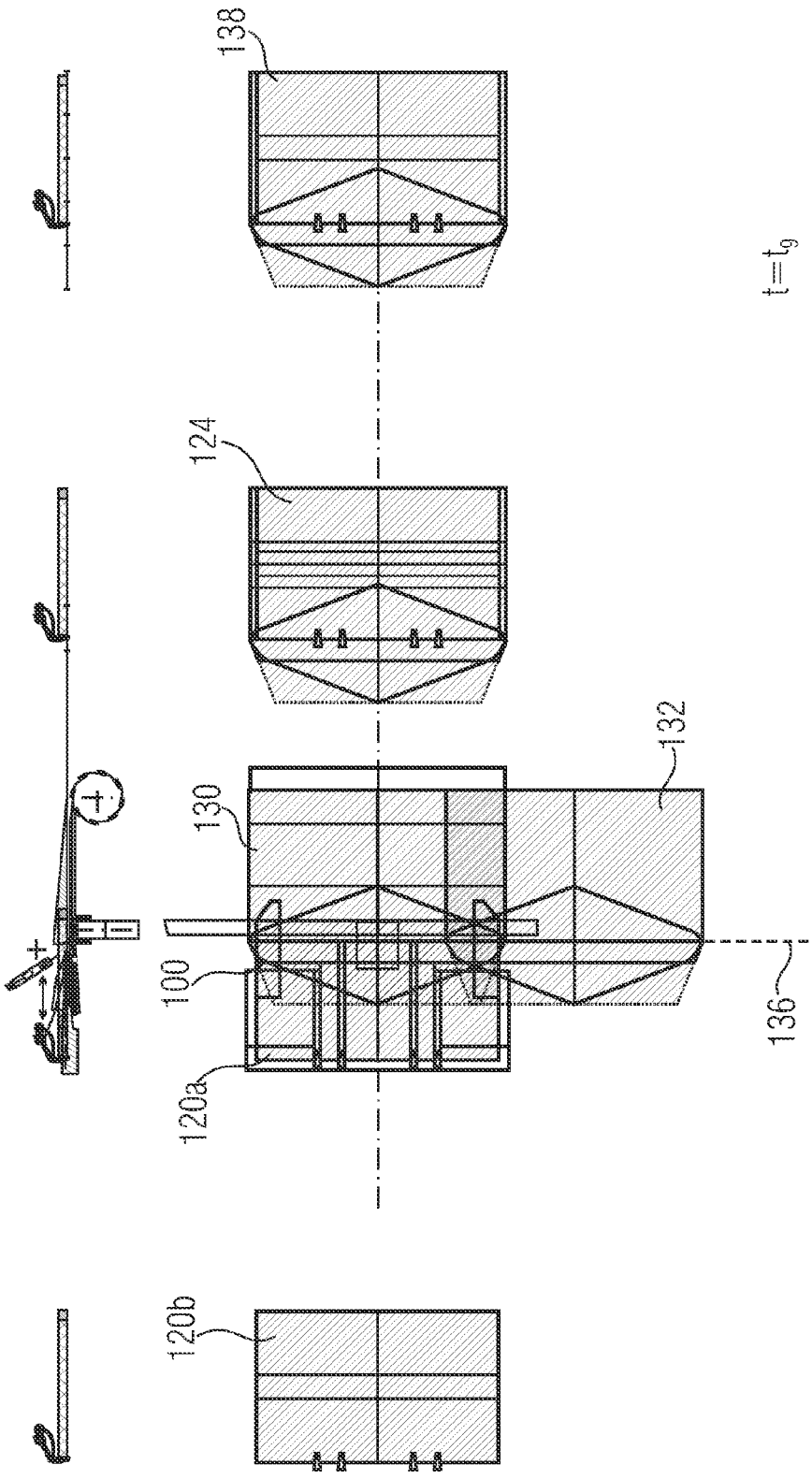


FIGURE 12

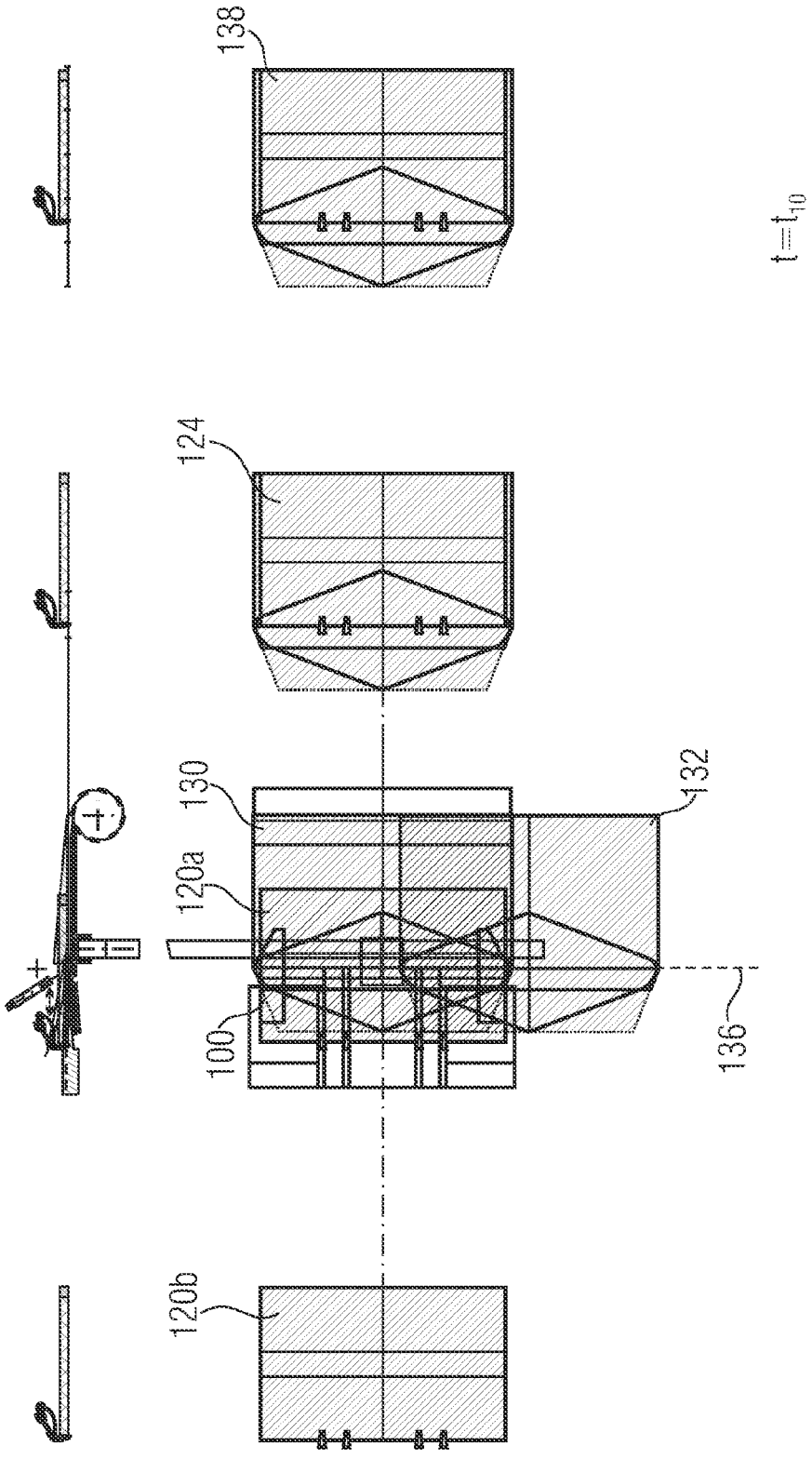


FIGURE 13

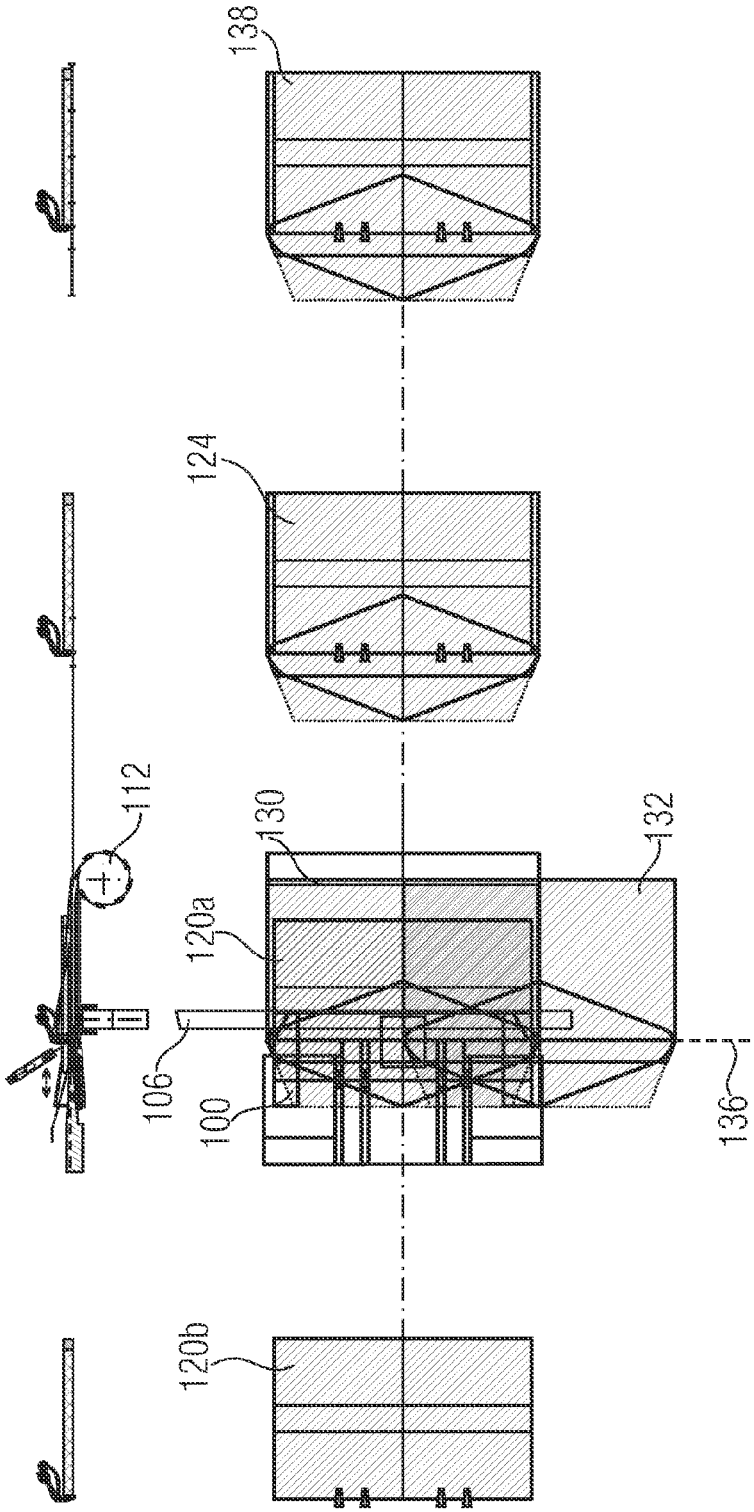


FIGURE 14

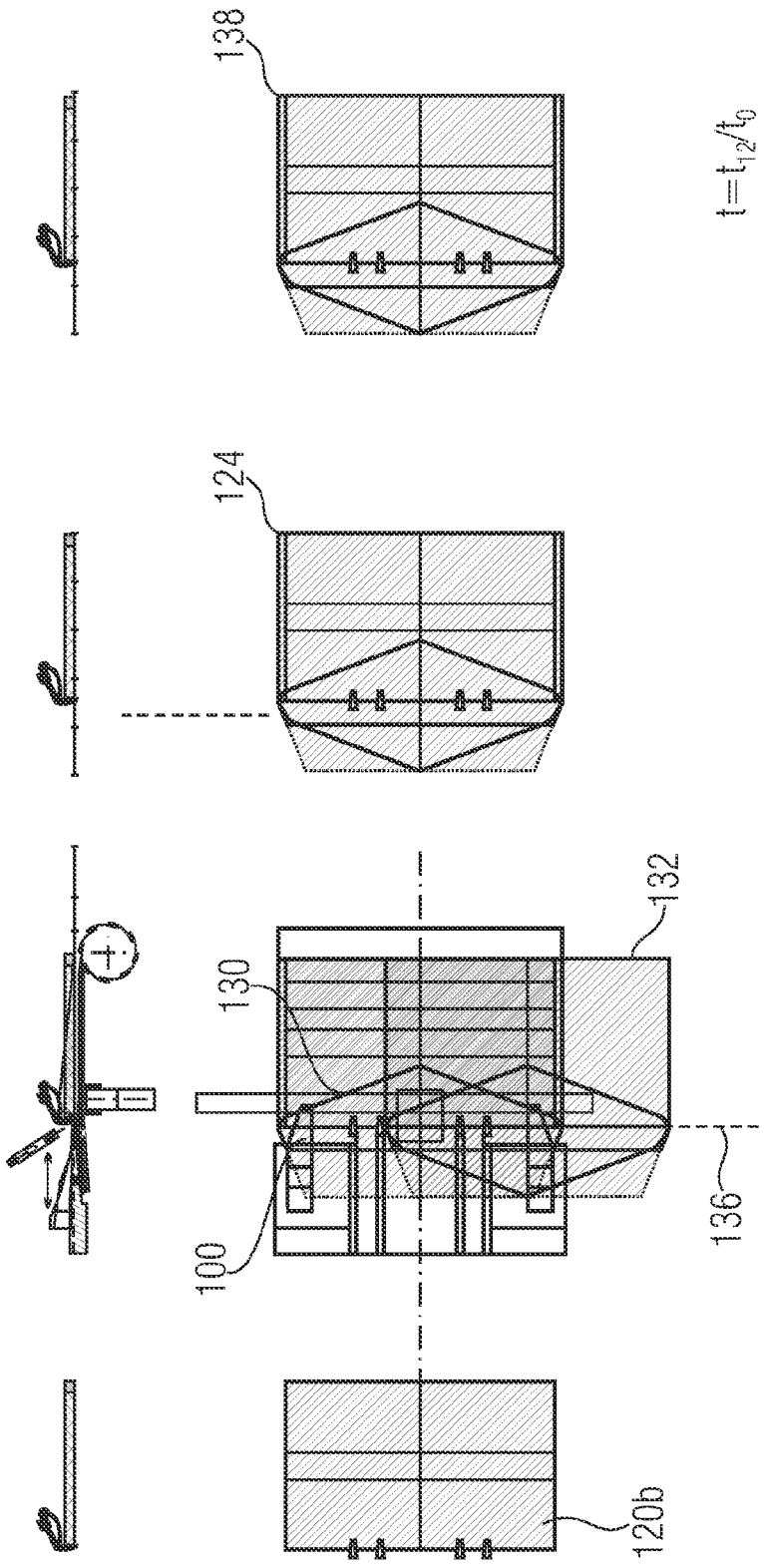


FIGURE 15

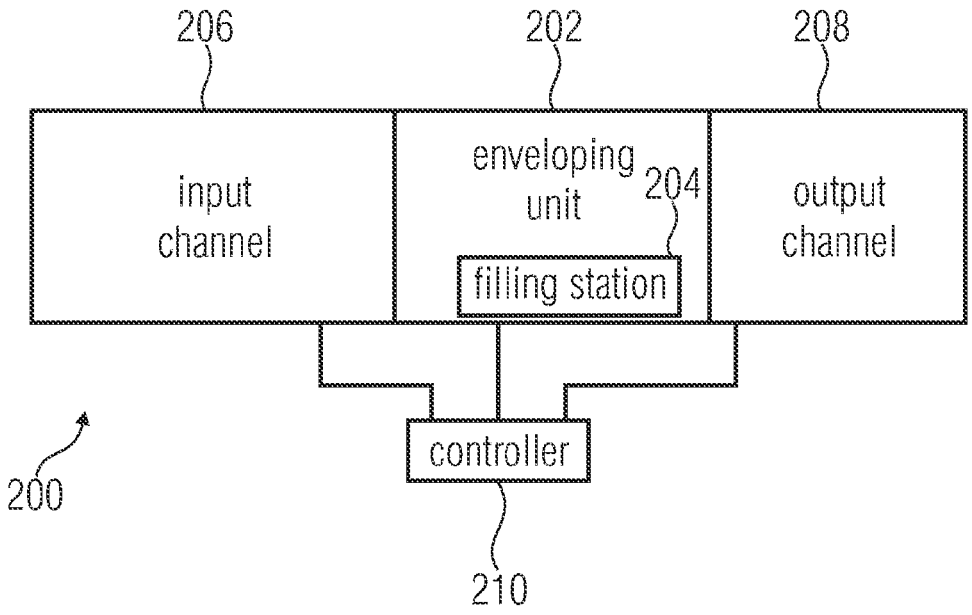

206
202
208
input channel
enveloping unit
204
filling station
output channel
controller
200
210

FIGURE 16

FILLING STATION AND METHOD OF FILLING AN ENVELOPE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of copending International Application No. PCT/EP2011/074316, filed Dec. 30, 2011, which is incorporated herein by reference in its entirety, and additionally claims priority from German Application No. 102011004346.2, filed Feb. 17, 2011, which is also incorporated herein by reference in its entirety.

[0002] The present invention relates to the field of paper handling, in particular to a filling station for filling an envelope, to a paper handling system, and to a method of filling an envelope in a filling station.

BACKGROUND OF THE INVENTION

[0003] Various enveloping principles are known from conventional technology. U.S. Pat. No. 7,475,522 B2 shows a filling station with direct feeding of the envelopes from above. Coming from the envelope leader, an envelope moves against a stop, is received by two worm wheels, is separated and is vertically inserted into the filling plane. Once the envelope has been opened and filled, the stop is opened and the envelope is transported out of the filling station. EP 1 275 523 A describes an approach to inserting a material into an envelope, the envelopes being fed from above, separated by worm wheels and fed to the filling station by means of the movement of the worm wheels. EP 1 473 173 A describes an enveloping machine wherein the envelopes are fed to the filling station from below. Feeding is performed by means of worm wheels, which are enabled for envelope output subsequent envelope filling.

[0004] The above-described filling stations for enveloping machines have short travel paths in the feeding of the envelopes to the filling station. In order to transport a subsequent envelope into the filling station, it is useful to bridge a movement path, which essentially corresponds to the thickness of the envelope and/or to the spacing of a screw channel. While the filled envelope is removed, the next envelope is already available for envelope opening. Avoidance of long travel paths and of the long dead times resulting therefrom enables that feeding of the envelopes to the filling need not be performed at high speeds; rather, low speeds may be used. Therefore, said approaches are suitable for large cycle outputs. U.S. Pat. No. 7,475,522 B2 relates to an embodiment of a filling station wherein the cycle output may amount to 30,000 envelopes/h. The short travel paths and the low speeds also enable compact design of the system.

[0005] However, the above-described known approaches or solutions are disadvantageous in that two of the three known solutions, namely the approaches described in U.S. Pat. No. 7,475,522 B2 and in EP 1 275 523 B1, disclose feeding of the envelopes from above. This is disadvantageous since in case of feeding being performed from above, a subsequent envelope can get caught in the window of the preceding envelope.

[0006] In addition, the three above-described approaches, wherein envelope filling is performed into an envelope with the flap located at the top and the throat opening located at the bottom, involve increased effort for preventing a collision of the material being introduced at the throat opening, and thereby significantly restrict format and shape flexibility. In addition, all of the above-described solutions provide a approaches without any lateral guide and/or without the envelope being spread open in the filling process, which considerably reduces process reliability and lowers the filling limit. Moreover, design and operation are expensive due to the worm wheels used.

[0007] According to the three solutions described above, opening the envelope as well as keeping it open are performed exclusively by means of blow air. However, this is reliable to a limited extent only, since, on the one hand, already minor adhesions on the inside of the envelope make it significantly more difficult to open the envelope by means of blow air only, and, on the other hand, keeping the envelope open by means of blow air only may result in that the filling material is partly or even completely "blown out" of the envelope.

[0008] In addition, the known solutions may use a stop in the form of a separate element in the US patent, and in the form of worm wheels in the EP patent applications. This stop is extremely disadvantageous. The envelope rests at this stop while being filled, so that it is useful to control the stop synchronously with the slide so as to ensure reliable filling of the envelope and reliable removal at the same time. The approaches described therefore involve a large amount of expenditure in terms of control in order to correctly control the stop for releasing same.

SUMMARY

[0009] According to an embodiment, a filling station for filling an envelope including a filling material may have: a filling area, a holder configured to hold an envelope to be filled in the filling area in a stationary manner while it is being filled, and to release the filled envelope once it has been filled, at least one opener configured to open the envelope to be filled, an inserter configured to insert a filling material into the opened envelope to be filled, and a transport unit configured to move a subsequent envelope into the filling area while the envelope to be filled is being filled, and the opener being configured to open the subsequent envelope before the filled envelope has completely left the filling area.

[0010] According to another embodiment, a paper handling system may have: one or more paper handling components for providing a filling material; a filling station as claimed in claim **1**; and a controller effective to control the paper handling component and the filling station.

[0011] According to another embodiment, a method of filling an envelope with a filling material may have the steps of: holding, in a stationary manner, an envelope to be filled in a filling area, opening the envelope to be filled, introducing a filling material into the opened envelope to be filled, moving a subsequent envelope into the filling area while the envelope to be filled is being filled, releasing the filled envelope, and opening the subsequent envelope before the filled envelope has completely left the filling area.

[0012] The present invention further provides a paper handling system comprising one or more paper handling components, such as a cutter, a merger, a collating station, a folding unit and/or a gathering web having one or more insert leaders in order to provide a filling material, and comprising a filling station in accordance with embodiments of the invention, a controller being additionally provided which is operative to control the paper handling component and the filling station.

[0013] In accordance with an embodiment, the holder may comprise one or more segment rollers, one or more suction units acting upon the envelope flap from above or from below, one or more pliers, one or more lateral guide rails and/or a

suction unit which acts upon the envelope body from above and may be configured as a suction ledge or suction sheet.

[0014] In accordance with an embodiment, the holder is configured to hold an envelope at its envelope flap.

[0015] In accordance with an embodiment, the filling station includes a movable filling aid configured to be moved into the envelope to be filled, the transport means including an envelope feeder configured to feed the subsequent envelope so as to hold part of the subsequent envelope in a deflected manner in relation to the rest of the envelope and away from the envelope to be filled, and to release the deflected part of the envelope before filling of the envelope to be filled is completed. The holder is configured to hold the subsequent envelope in the filling area once the filled envelope has been released. The envelope feeder may be configured to hold an envelope bottom of the subsequent envelope in a downwardly deflected manner in relation to the rest of the subsequent envelope and to thereby hold it away or distant from the envelope to be filled. The filling aid may be configured to move into the subsequent envelope once filling of the preceding envelope has been completed and before removal of the filled envelope from the filling station is completed. In addition, the envelope feeder may be configured to receive the subsequent envelope below the filling area.

[0016] In accordance with an embodiment, the envelope feeder may include a rotatable member or one or more movable pairs of fingers so as to hold part of the subsequent envelope in a deflected manner, e.g. downwardly deflected, in relation to the rest of the envelope and away from the envelope to be filled. The envelope bottom may be received in a bay, for example, so as to effect the deflection without the envelope bottom being fixed in place in the bay. In other embodiments, a clamping element may optionally be provided for fixing the envelope bottom in place. The envelope bottom is released before filling of the envelope is completed, so that it is no longer deflected. The rotatable member may be configured, for example, in the form of one or more rollers, one or more wheels, or a drum, first and second receptacles and possibly even one or more further receptacles being provided along a circumference of the rotatable member for receiving the envelope bottom.

[0017] In accordance with embodiments, the envelope feeder may further comprise a transport device so as to feed an envelope, it being possible for the transport device to be configured to feed an envelope in the material transport direction, counter to the material transport direction, or perpendicularly to the material transport direction. The transport device may further be configured to receive a plurality of envelopes in a shingled manner. In accordance with an embodiment, the further transport device includes a suction-belt transport device which is deactivated while the filling aid is moved into the envelope, and which Is activated while the envelope is being filled.

[0018] The filling station may further include a removal unit, which outputs a filled envelope and is active once the filling material has been inserted into the envelope. Moreover, the insertion means may comprise a filling slide provided to insert a filling material into the opened envelope. In accordance with a further embodiment, the filling slide may further be configured to output a filled envelope.

[0019] In accordance with embodiments of the invention, the filling aid includes a guide, one or more fingers, a sheet metal, or a packing bag.

[0020] Moreover, a further means may be provided in the filling station for opening the envelope disposed at the filling position, for example an air blast supply means, i.e. for separating the envelope bottom from the envelope top. Instead of the suction-belt transport device, the transport device may also include a segment transport device, a pliers transport device, a finger transport device, or a roller transport device. Moreover, a means may be provided in the filling station for avoiding interaction between an envelope being moved into the filling area and an envelope being filled or discharged (removed).

[0021] Embodiments of the invention thus provide a new approach to filling envelopes at a high cycle output within a wide format spectrum, the advantages of the known solutions having been retained, in particular, while their disadvantages have been eliminated. In accordance with embodiments of the invention, two envelopes are located one above the other in the filling area at the same time during operation, the envelope to be filled and the subsequent envelope. Filling aids are employed for ensuring the filling process. Active elements such as worms or transport wheels, which are used by the known solutions, are replaced by passive elements and/or alternative embodiments; for example, instead of the worms/transport wheels, a passive element is employed for separating the at least two envelopes located within the filling station, e.g. an element in the form of a slope, a holder or an edge or the like.

[0022] Embodiments of the invention are advantageous since no stop is required, so that the problems associated therewith, in particular the high control expenditure, are avoided.

[0023] In accordance with further embodiments of the invention, envelope feeding is performed such that a window of an envelope faces downward, so that guidance for the filling material, e.g. adaptation to the throat opening shape, is easier to implement. In addition, the envelopes to be filled are arranged to be positioned one below the other, which results in the next envelope being ready to be filled already once the filled envelope has been removed.

[0024] One advantage of the inventive solution consists in that an enveloping machine is provided which has a high cycle output, can process a large format spectrum, comprises a low number of components and functional parts that may be used, comprises compact system space and/or little enclosed space, comprises short travel paths of envelopes and filling material, and shows no decrease in performance as the format height of the envelope increases.

[0025] One advantage of embodiments of the invention consists in that feeding of the envelopes may be effected with the windows and the flaps located at the bottom, compact dimensions of the system being achieved at the same time. In addition, one may operate with low filling rates, and the number of functional parts that may be used is low. The feeding performance is independent of the envelope height, i.e. of the distance between the envelope bottom and the envelope throat opening since the feeder is aligned to the hinge line (=edge where the flap of the envelope is attached to the envelope body). The performance potential may be increased since the envelope need not be transported counter to the filling direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Embodiments of the present invention will be detailed subsequently referring to the appended drawings, in which:

[0027] FIG. **1** shows a schematic, lateral sectional view of a filling station in accordance with an embodiment of the invention;

[0028] FIG. **2** shows a schematic, lateral sectional representation of a filling station in accordance with a second embodiment of the invention,

[0029] FIGS. **3** to **15** show representations of the process of envelopes being filled while using the inventive filling station by means of a representation of the condition of the filling station and the envelopes and materials located therein at different points in time between a starting position ($t=t_0$) and an end of the filling process ($t=t_{12}$); and

[0030] FIG. **16** shows a schematic representation of a paper handling system comprising an enveloping machine with a filling station in accordance with embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0031] In the following description of the embodiments, elements which are identical or have identical functions are provided with identical reference numerals.

[0032] FIG. **1** shows a first embodiment of a filling station. The filling station includes a movable filling aid **100**, the mobility of which is indicated by arrow **102**. The movable filling aid **100** includes, for example, a plurality of fingers which are arranged in parallel next to one another and may be at least partly moved into an envelope in that the filling aid **100** is moved, so that the filling aid **100** is arranged in a throat opening of the envelope. The filling aid **100** includes ends **100***a* which during movement toward an envelope are the first to come into contact with same. In the embodiment shown, the fingers **100** taper in the direction of the ends **100***a*. The filling aid **100** may be movably arranged on a material feeding sheet **101**, but may also be mounted independently thereof.

[0033] The filling aid **100** is arranged within a filling area **102** which starts from the filling aid **100** and extends along the material transport direction R_G by a distance which essentially corresponds to an envelope height K_H (=dimension of the envelope between the envelope bottom and the hinge line=edge where the flap of the envelope is attached to the envelope body) of an envelope pulled up onto the filling aid **100**. A filling plane E_F is defined essentially by a plane wherein the fingers of the filling aid **100** extend and/or wherein the top surface of the envelope pulled up (=side where the flap is arranged) is disposed.

[0034] Moreover, the filling station includes an envelope feeder **104** which feeds envelopes, which are transported by means of a suction-belt transport device **106** along a direction perpendicular to the material transport direction R_G, to the filling area. The envelope feeder **104** includes a receptacle **108**, upon which an envelope body of an envelope fed by means of the suction-belt transport device **106** rests. The receptacle **108** defines an envelope feeding plane E_Z, which is arranged below and in parallel with the filling plane E_F. The filling area extends vertically to the support and/or the plane E_Z. Depending on how a subsequent envelope is fed in, said envelope may be arranged to be offset in relation to the envelope currently being filled, so that the longitudinal and/or transverse sides of the envelopes are not aligned. That area wherein the envelopes are arranged to completely or partly overlap is considered to be the filling area.

[0035] Moreover, the envelope feeder **104** includes a portion **110** which is located upstream in the material feeding direction R_G and on which an envelope flap of an envelope fed by the suction-belt transport device **106** rests. The flap support **110** extends from the suction-belt transport device **106** counter to the material transport direction R_G and is arranged below the filling aid **100** and below the material feeding sheet **101**. A roller **112** is provided at a position which is arranged downstream from the suction-belt transport device **106** in the material feeding direction R_G. The roller **112** includes a plurality of receptacles or bays **112***a*-**112***h* arranged in a distributed manner along the circumference of the roller **112**. The receptacles **112***a*-**112***h* serve to receive an envelope bottom during transport into the filling area, so that the envelope bottom is downwardly deflected in relation to the rest of the envelope, as is illustrated by the receptacle **112***a*.

[0036] The filling station further includes one or more suction heads **114**, which cause an envelope throat to open. One or more blow air nozzles **116** are provided for assisting opening of the envelope.

[0037] The filling station further includes a filling slide **118** configured to move a filling material **120** in the material transport direction R_G and to insert it into an envelope provided at the filling station. In the embodiment shown in FIG. **1**, the filling slide **118** further serves to transport the filled envelope away, as is shown in the right-hand area of FIG. **1**. Moreover, the filling station includes a clamping element **125**, e.g. in the form of a suction unit in or at the sheet **101** which serves to fix in place a flap of an envelope during filling.

[0038] FIG. **1** depicts a situation wherein a first envelope **124** is waiting to be filled and is located, in the filling area **103**, at that filling position at which the filling aid **100** may be moved into the envelope **124** (the envelope throat **124***a*). The filling aid serves to guide the material during insertion and to laterally protect it in accordance with embodiments. While using a blow air blast supplied by the nozzle **118**, the envelope throat **124***a* was already opened, and the filling aid **100** is inserted. The suction unit **114** engages with the underside or rear side of the envelope **124** so as to open the envelope and keep it in the opened state. The flap **124***b* is arranged below the sheet **101** and is fixed in place, or held, by the suction unit **125**. The envelope bottom **124***c* is released, i.e. it is not downwardly deflected in relation to the rest of the envelope. By means of the slide **124**, the filling material is moved in the direction of the opened envelope **124**. In addition, a second, non-filled envelope **130** is shown which is or was moved into the filling area **103** to a position underneath the envelope **124** by means of the envelope feeder **104**. The throat opening **130***a* of the second envelope rests on the plate **108** and is located, with regard to the material transport direction R_G, at a position **136**, where also the throat **124***a* of the envelope **124** is arranged at the filling position. The envelope bottom **130***a* is arranged, in the bay **112***a*, such that it is downwardly deflected. In this manner, a movement of the envelope **130** in the material transport direction R_G, is prevented, and the upper envelope **124** may be discharged after the filling process without the lower envelope **130** being moved along with it. Immediately after discharge of the upper envelope **124** is started, the lower envelope is ready to be filled, and its throat is opened by the blow air aid and the suction unit, so that the filling aid may be inserted. The flap **130***b* rests upon the flap support **110** and is held by the suction unit **125** as soon as the

flap of the filled envelope **124** has released the suction unit. The envelope bottom **130***a* is downwardly deflected and is released once the suction unit **125** has been activated, so that moving of a subsequent envelope into the filling area can be started.

[0039] The functionality of the filling station described with regard to FIG. **1** is such that feeding of an envelope removed from an envelope leader is effected from the side, a window and an envelope flap being located at the bottom. The envelope is transported from the side by means of the envelope feeder, there is no movement in the material direction, and instead, the one or more filling aids are actively inserted into the envelope. The envelopes are transported into the filling station from below, for example via the suction belt **106**, with open flaps, and are positioned in the filling area. The envelope is held, while being transported into the filling station, in a guide, the rear edge separation, on the side of the bottom, in the example shown in FIG. **1**, in one of the receptacles **112***a*-**112***h* which is not located at the filling position. Lateral positioning may be effected, e.g., via stops, edges or traps or also directly via the suction-belt transport device. The envelope transported into the filling station in this manner is opened by means of an air blast supplied via the blow air tabs **116** once discharging of the preceding envelope has started, and is subsequently held open by the suction head and/or the plurality of suction heads **114**. In parallel herewith, the filling process is started, wherein lateral filling aids **100** are inserted into the opened envelope, span it open and protect the inflowing material **120** from hitting an envelope side or the envelope bottom and against envelope adhesion. The envelope may be fixed in place or held in different ways during the filling process, for example by fixing the envelope in place on the lateral filling aids by fixing the envelope flap in place on the underside of the envelope feeder via suction areas, or by a different, suitable configuration.

[0040] The filling material **120** is pushed into the opened envelope via the filling slides **124**, and in the embodiment shown in FIG. **1**, the rear edge separation is already detached, in that, in the embodiment shown, the roller **112** is made to latch one unit further on. In addition, envelope fixing is released, and the envelope is transported out of the filling station, for example by means of the filling slides.

[0041] Already while the envelope is being filled, the next envelope is laterally pushed, by means of the suction-belt transport device **106**, to a position below the envelope located in the filling station, the envelope bottom here being pushed into the next free bay of the rear edge separation depicted as a segment drum in FIG. **1**, here into bay **112***b*. In this manner, one ensures that the envelope which has been filled does not take along with it the underlying envelope when the former is being discharged.

[0042] Performing the above-described processes, namely filling/removing and feeding a new envelope, in parallel enables that a further envelope is available immediately after filling and prior to completion of removal of the filled envelope, whereby high performances are achieved. In contrast to known solutions, the inventive approach is advantageous since the envelope height has no influence on the feeding performance. The envelope height is that dimension of the envelope which extends from the envelope bottom to the edge where the flap of the envelope is attached to the envelope body, the so-called hinge line. This independence of the envelope height is achieved in that inward transport of the envelope is performed at the height of the hinge line.

[0043] FIG. **2** shows a further embodiment of the filling station, which differs from the embodiment described by means of FIG. **1** only in terms of the configuration of the rear edge separation, so that renewed description of those elements described by means of FIG. **1** which are only schematically shown in FIG. **2** will be dispensed with. As may be seen from FIG. **2**, the roller **112** shown in FIG. **1** is replaced by a reciprocating lever **126** which includes a pair of fingers **126***a*, **126***b*. The lever **126** may be pivoted between a first position closer to the suction-belt drive **106** and a second position further away from the suction-belt transport device, FIG. **2** showing the first position. The functionality is similar to that of the roller **112**; however, the lever **126** releases the envelope bottom once the envelope **124** has been positioned at the filling position, and is pivoted back to the first position so as to hold an envelope bottom **130***a* of a subsequent envelope **130**. Once the envelope **124** has been filled, it is removed, and the envelope bottom **130***a* of the subsequent envelope **130** arranged in the filling area is released by moving the lever **126** from the first position to the second position, and the lever **126** pivots back to the first position.

[0044] By means of the following figures, the function of the inventive filling station will be explained in more detail on the basis of a configuration of the filling station as was explained by means of FIG. **1**. The operational sequence will be explained in accordance with the following boundary conditions: feeding of the envelopes is performed from the side, said feeding of the envelopes being clocked and being effected at a predetermined distance between the envelopes. The windows in the envelopes are arranged at the bottom, and in the filling area of the filling station, two envelopes are arranged one below the other. A suction unit for opening the envelope has been dispensed with. The envelope is opened by means of blow air.

[0045] FIG. **3** shows the starting situation at a time $t=t_0$. In the top area of FIG. **3**, a lateral, schematic representation of the filling station of FIG. **1** is shown, and a top view is shown in the bottom area. The envelope **124** is arranged at the filling position, and the subsequent envelope **130** is already partly inserted into the filling area at a position below the envelope **124**. In addition, a subsequent envelope **132** is shown, which is ready for being inserted into the filling station, following the envelope **130**. The envelope **124** is located at that filling position at which its envelope section (hinge line HL_{124}) is located at the position **136**. In this position, the filling aids **100** may move into the throat opening of the envelope **124**. FIG. **3** shows that the filling aids **100** are already arranged inside the envelope and that a filling material **122***a* has already been inserted. The subsequent envelope **130** as well as the envelope **132** are fed in by means of the suction-belt transport device **126**, also at the position **136**, i.e. the hinge line HL_{130} and the hinge line HL_{132} of envelopes **130** and **132**, respectively, are arranged at the same position **136**—in the material transport direction R_G—at which a hinge line of the envelope to be filled, which is located in the filling position, is arranged. The envelope bottom **124***a* of the envelope **124** has already been released, and the envelope bottom **130***a* of the envelope **130** being fed is received in the bay **112***a* and held there. FIG. **3** further shows an envelope **138** which has already been filled and transported out of the filling station as well as further groups of filling materials **122***a* and **122***b*, which are moved to the filling station so as to be inserted there into the envelope **130** and/or the envelope **132**.

[0046] One may further recognize in FIG. **3** that the filling aids **100** are arranged in a position in which they were moved in the direction of the material transport direction R_G starting from a rest position, so that their front portions **100***a* are arranged in the envelope **124**, more specifically at a position downstream along the material feeding direction R_G in relation to the hinge line HL_{124}. In terms of the elements of the filling station one may recognize that the front ends of the filling aids **100***a* extend, in a top view, across part of the suction belt **106**. In FIG. **3**, filling of the envelope **124** has already been completed, i.e. the filling material is inside the envelope, so that the latter may be closed by folding down the flap in a subsequent processing step. The filling aid(s) is/are already on its/their way back from the filling position to the rest position.

[0047] FIG. **4** shows the situation of a time period t_1 after the starting situation in FIG. **3**. The filled envelope **124** was moved in the material transport direction R_G, as may be seen from a comparison of FIGS. **3** and **4**; in FIG. **4** one can see that the hinge line HL_{124} of the envelope **124** has left the position **136** and is now arranged behind the belt transport device in the transport direction R_G. The filling aids **100** were returned to their rest positions, so that their tips **100***a* are arranged, in a top view, at a distance from the belt **106** (upstream from the position **136** in the material transport direction R_G), as may be seen, in a top view, by means of the distance between the front tip **100***a* and the belt **106**. The envelope **130** and the envelope **132** were moved further in the envelope feeding direction R_K, so that the overlapping area of the envelopes **124** and **130** is larger than that in FIG. **3**.

[0048] Movement of the envelopes **130** and **132** continues, as is shown by means of FIGS. **5** ($t=t_2$) and **6** ($t=t_3$), so that the situation shown after $t=t_3$ in FIG. **6** is achieved, wherein the envelope **130** has completely arrived in the filling station, more specifically in the filling area **103**. The filling aids **100**, too, are in their retracted positions, wherein the tips **100***a* of the filling aids are arranged, in relation to the elements of the suction-belt transport device **106**, at a distance from same, in a top view. As may further be seen from FIGS. **4** to **6**, the groups of filling materials **120***a* and **120***b* were moved in the material transport direction R_G, so that the group of materials **120***a* to be inserted into the envelope **130** is located directly in front of the filling station.

[0049] FIG. **7** shows the situation after $t=t_4$, once the wheel **112** was actuated so as to move it further by one bay so as to move the bay **112***a* shown in FIG. **1** to the position of the bay **112***h* shown in FIG. **1**. This results in that the envelope bottom **130***a* of the envelope **130** is released.

[0050] In FIG. **8**, the situation after $t=t_5$ is shown. The filling aids **100** were activated and moved from the rest position into that position wherein their tips **100***a* have been moved into the envelope **130**. The filling material **120***a* has already reached the filling station and was moved—between the lateral guides and by means of the filling aids **100**—in the direction of the envelope with the aid of the filling slide **118**. In FIG. **8**, the envelope **124** has already been completely discharged from the filling station.

[0051] FIGS. **9** to **14** show the introduction, performed in the time period from $t=t_6$ to $t=t_{11}$, of the filling material **120***a* into the envelope **130**, so that at the time $t=t_{12}/t_o$, the situation described by means of FIG. **3** arises. Starting from this situation, the next cycle of introducing the group of envelopes **120***b* into the envelope **132** starts. FIG. **10** shows the filling position wherein the filling aids **100** are completely inserted into the envelope. As can be seen in FIG. **10**, the front ends **100***a* are inserted into the envelope **130** and are located in a position which is downstream from the suction belt **106** in the material direction. The filling material **120***a* has its front edge, as seen in the envelope transport direction, at the hinge line HL_{130}. Envelope separation via the wheel **112** and/or the corresponding bay is no longer active, and the subsequent envelope already moves into the filling area. As may be seen from FIGS. **10** to **13**, the envelope **132** starts to move into the filling area of the filling station, an envelope bottom **132***a* of same (see FIG. **10**) being held in the bay **112***b* of the wheel **112**, which is now located in that position in which the bay **112***a* was in FIG. **1**. Once the material **120***a* has been moved beyond the filling aid in the transport direction, the filling aid is returned to the starting position.

[0052] In accordance with embodiments of the invention, the envelope flap is located at the position **110** shown in FIG. **1**, specifically, it is located below the paper travel sheet **101**. The filling aids **100** are advantageously displaceable in the format area. The envelope is positioned in the filling station by means of the suction-belt transport device **106**, the envelope possibly being opened, once it has been positioned, via blow air tabs **116** by means of pressurized air. The filling aids serve to move into the opened envelope so as to span it open.

[0053] In accordance with embodiments of the invention, a subsequent envelope is not inserted, in order to avoid movement overlap, until a preceding envelope is located in the filling position, and a filled transport is not output until the new envelope has been completely inserted.

[0054] FIG. **16** shows a schematic representation of a paper handling system **200** which includes an enveloping machine **202** comprising a filling station **204** in accordance with embodiments of the present invention. The paper handling system **200** may include one or more input channels, only one input channel **206** being shown by way of example in FIG. **15**. The input channel includes different paper handling components, such as a cutter, a merger, a collating station, a folding unit and/or a gathering web comprising one or more insert leaders. In addition, the system **200** includes at least one output channel **208** for further processing of the enveloped goods, for example a franking unit or a sorting unit. In addition, a controller **210** is provided which controls the components in the input channel **206**, in the output channel **208** and in the enveloping unit **202** as well as the filling station **204**. Even though FIG. **15** shows a central controller **210**, embodiments of the invention are not limited to such a configuration; rather, the controller may also be arranged within each of the components in a decentralized manner, and the corresponding control signals for the subsequent components are transmitted between the components.

[0055] Embodiments were described by means of a filling station which includes movable filling aids. It shall be noted at this point that the invention is not limited to such an implementation. Rather, the filling station may also operate without any filling aids.

[0056] Even though some aspects have been described within the context of a device, it is understood that said aspects also represent a description of the corresponding method, so that a block or a structural component of a device is also to be understood as a corresponding method step or as a feature of a method step. By analogy therewith, aspects that have been described in connection with or as a method step also represent a description of a corresponding block or detail or feature of a corresponding device. Some or all of the

method steps may be performed while using a hardware device, such as a microprocessor, a programmable computer or an electronic circuit. In some embodiments, some or several of the most important method steps may be performed by such a device.

[0057] While this invention has been described in terms of several embodiments, there are alterations, permutations, and equivalents which fall within the scope of this invention. It should also be noted that there are many alternative ways of implementing the methods and compositions of the present invention. It is therefore intended that the following appended claims be interpreted as including all such alterations, permutations and equivalents as fall within the true spirit and scope of the present invention.

1. A filling station for filling an envelope comprising a filling material, the filling station comprising:

a filling area,

a holder configured to hold an envelope to be filled in the filling area in a stationary manner while it is being filled, and to release the filled envelope once it has been filled,

at least one opener configured to open the envelope to be filled,

an inserter configured to insert a filling material into the opened envelope to be filled, and

a transport unit configured to move a subsequent envelope into the filling area while the envelope to be filled is being filled, and

the opener being configured to open the subsequent envelope before the filled envelope has completely left the filling area.

2. The filling station as claimed in claim **1**, wherein the holder is configured to hold an envelope at its envelope flap.

3. The filling station as claimed in claim **1**, comprising:

at least one movable filling aid configured to be moved into the envelope to be filled.

4. The filling station as claimed in claim **3**, wherein the filling aid is configured to guide the material in the filling process.

5. The filling station as claimed in claim **3**, wherein the filling aid is configured to be moved into the subsequent envelope once filling of the envelope has been completed and before removal of the filled envelope from the filling station is completed.

6. The filling station as claimed in claim **1**, wherein the transport unit comprises an envelope feeder configured to feed the subsequent envelope so as to hold part of the subsequent envelope in a downwardly deflected manner in relation to the rest of the envelope and away from the envelope to be filled, and to release the deflected part of the envelope before filling of the envelope to be filled is completed.

7. The filling station as claimed in claim **1**, wherein the holder is configured to hold the subsequent envelope in the filling area once the filled envelope has been released.

8. The filling station as claimed in claim **6**, wherein the envelope feeder is configured to hold an envelope bottom of the subsequent envelope in a downwardly deflected manner in relation to the rest of the subsequent envelope.

9. The filling station as claimed in claim **6**, wherein the envelope feeder is configured to receive the subsequent envelope below the filling area.

10. The filling station as claimed in claim **6**, wherein the envelope feeder comprises a rotatable member or one or more movable pairs of fingers so as to hold part of the subsequent envelope in a downwardly deflected manner in relation to the rest of the envelope and away from the envelope to be filled.

11. The filling station as claimed in claim **10**, wherein the rotatable member comprises one or more rollers, one or more wheels, or a drum, the envelope feeder comprising one or more receptacles arranged along the circumference of the rotatable member.

12. The filling station as claimed in claim **6**, wherein the envelope feeder comprises a transport device configured to feed the subsequent envelope.

13. The filling station as claimed in claim **12**, wherein the transport device is configured to feed the subsequent envelope in the material transport direction, counter to the material transport direction, or perpendicularly to the material transport direction.

14. The filling station as claimed in claim **12**, wherein the transport is configured to receive a plurality of envelopes in a shingled manner.

15. The filling station as claimed in claim **12**, wherein the transport comprises a suction-belt transport device.

16. The filling station as claimed in claim **1**, comprising a removal unit configured to discharge the filled envelope and to be activated once the filling material has been inserted into the envelope.

17. The filling station as claimed in claim **16**, wherein the removal unit comprises a suction drum arranged above the filling area.

18. The filling station as claimed in claim **1**, wherein the inserter comprises at least one filling slide configured to insert a filling material into the opened envelope.

19. The filling station as claimed in claim **18**, wherein the filling slide is further configured to discharge the filled envelope.

20. The filling station as claimed in claim **1**, which are effective to fill a plurality of envelopes such that

(a) the holder holds a first envelope in the filling area for receiving the filling material,

(b) the opener opens the first envelope, inserts a movable filling aid into the first envelope, and the first envelope is filled,

(c) an envelope feeder moves a subsequent envelope into the filling area while the first envelope is being filled, and holds part of the second envelope in a deflected manner in relation to the rest of the second envelope and away from the first envelope, and

(d) the holder releases the first envelope once it has been filled and holds, as soon as the first envelope has left the holder, the second envelope in the filling area, and the envelope feeder releases the deflected part of the second envelope,

wherein steps (b) to (d) for filling a plurality of envelopes are repeated, the opener opening the second envelope before the first envelope has completely left the filling area.

21. A paper handling system, comprising:

one or more paper handling components for providing a filling material;

a filling station as claimed in claim **1**; and

a controller effective to control the paper handling component and the filling station.

22. A method of filling an envelope with a filling material, comprising:

holding, in a stationary manner, an envelope to be filled in a filling area,

opening the envelope to be filled,
introducing a filling material into the opened envelope to be filled,
moving a subsequent envelope into the filling area while the envelope to be filled is being filled,
releasing the filled envelope, and
opening the subsequent envelope before the filled envelope has completely left the filling area.

23. The method as claimed in claim **19**, further comprising:
moving at least one movable filling aid into the envelope to be filled.

24. The method as claimed in claim **22**, further comprising:
feeding the subsequent envelope, part of the subsequent envelope being held in a deflected manner in relation to the rest of the envelope and away from the envelope to be filled, and being released before filling of the envelope to be filled has been completed.

25. The method as claimed in claim **22**, further comprising:
holding the subsequent envelope in the filling area once the filled envelope has been released.

26. The method as claimed in claim **24**, wherein an envelope bottom of the subsequent envelope is held in a downwardly deflected manner in relation to the rest of the subsequent envelope.

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