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(54) Benævnelse: **Indretning til automatisk lastning af en lastbærer med lastenheder, som danner en laststabel og fremgangsmåde til samme**

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Description

[0001] The invention relates to a device for the automated loading of a load carrier with loading units forming a load stack, wherein the device has a conveyor conveying the load carrier in at least one planar direction and one vertical axis direction thereto and the device has a positioning conveyor with at least two conveyor belts conveying the loading unit in the direction of the load carrier, which is to be displaced relative to the load carrier in the longitudinal direction and in the transverse direction and the device has a transfer conveyor conveying the loading unit onto the positioning conveyor, according to the preamble of claim 1.

[0002] The loading units may be units which are required in the picking of products for retail or branch businesses. A branch pallet required for the respective business is made up of numerous different products here.

[0003] These units or loading units are compiled on a load carrier in the form, for example, of a pallet, the units being compiled on the pallet to form stacks of products, that is to say often in the form of a predetermined sequence which is specified by the branch business.

[0004] Examples of such loading units which have to be handled with special care during picking are stackable containers of piece goods, including fruit and vegetable products.

[0005] The loading units may therefore be disposable containers in the form, for example, of boxes or else as reusable containers which are made of plastic or cardboard, or else as folding boxes, that is to say containers with side walls that fold in.

[0006] Fresh produce is often dispatched by the wholesaler in the form of said containers which have to be stacked on load carriers in the form of pallets or roll containers appropriately for the branch concerned. When stacking, an important role is played by the sequence already mentioned above, this being ensured by operating staff when the load is manually stacked on the load carrier and being specified by a control device in the form, for example, of a master computer when the load carrier is loaded automatically.

[0007] Manually stacking containers that are often up to 20 kg in weight on the load carrier is very laborious and time-consuming. In fresh produce stores containing fruit and vegetable products, container sizes are often standardised in terms of their dimensions and usually have a base area of 600 by 400 mm with different heights or a base area of 300 by 400 mm likewise with different heights.

[0008] Containers are mostly designed here to be open at the top and cannot be handled with conventional automated devices for palletising in the form of robots with gripping arms since the products in the container are pressure-sensitive and the robots often have pincer-like grips which apply compressive force on the side faces of the container and thereby damage the sensitive products.

[0009] In addition, the known multiple grippers, as are usually used in order picking in the retail sector, are disadvantageous in terms of the achievable hourly output, which is in turn problematic for the sensitive and perishable products mentioned above.

[0010] EP 0 799 780 A2 discloses a palletising device for packaged stacks of paper sheets or the like which has a height-adjustable pallet table on which a pallet to be loaded is kept ready. A feed conveyor is provided, the discharging end of which is to be displaced back and forth in the conveying direction over the pallet table. The feed conveyor is to also be displaced transversely to its conveying direction and transversely to the pallet. The feed conveyor is fed via a stationary feeding device and an intermediate conveyor which changes its conveying direction depending on the transverse position of the feed conveyor.

[0011] EP 1 462 394 B1 discloses a loading device for a load carrier. This has a loading tongue for receiving a loading unit and a scraper that strips the loading unit from the loading tongue onto the load carrier.

[0012] EP 2 592 027 A1 discloses a device for the controlled placement and arrangement of objects on a load carrier. This known device has what is referred to as a bull nose belt with which loading units are conveyed towards a loading belt from which loading units are placed on a pallet.

[0013] Finally, EP 2 247 517 B2 discloses an order picking system and method for loading a load carrier, in which a loading unit is fed via a feed device to an alignment device, by which the loading unit is aligned relative to a positioning conveyor and delivered to the latter. The positioning conveyor has two conveyor belts which are arranged at an adjustable spacing from each other and is to be extended in the direction of the discharge location of the loading unit on the load carrier. The spacing between the two conveyor belts of the positioning conveyor is determined here with regard to a conveying property of the stacking unit to be loaded and/or depending on a gap width of a stacking gap in a stacking position of the loading stack.

[0014] Based hereon, the object of the present invention is to provide a device for the automated loading of a load carrier with loading units forming a load stack, which is significantly simpler in

construction and at the same time has a significantly better palletising performance than known devices. A method for the automated loading of a load carrier with loading units forming a load stack is also to be provided.

[0015] To achieve this object, the invention has the features specified in claim 1 with regard to the device. Advantageous embodiments thereof are described in the further claims.

[0016] Furthermore, with regard to the method, the invention has the features specified in claim 13, with advantageous embodiments of the method being described in the further claims.

[0017] The invention provides a device for the automated loading of a load carrier with loading units forming a load stack, wherein the device has a conveyor conveying the load carrier in at least one planar direction and one vertical axis direction thereto and the device has a positioning conveyor with at least two conveyor belts conveying the loading unit in the direction of the load carrier which is to be displaced relative to the load carrier in the longitudinal direction and in the transverse direction and the device has a transfer conveyor conveying the loading unit onto the positioning conveyor, wherein the positioning conveyor has a fixed relative lateral spacing provided between the conveyor belts independently of the loading unit and the transfer conveyor has a push plate that receives the loading unit and a pusher which is provided for conveying the loading unit on the push plate in the direction of the conveyor belts of the positioning conveyor.

[0018] The device according to the invention is intended for the automated loading of a load carrier. For this purpose, a control device, described in more detail below, is to be provided which controls the device and, in addition, for example, also controls the loading of the positioning conveyor with loading units in the prescribed sequence.

[0019] This prescribed sequence is to be specified by the distributor, for example the operator of the device, or is to also be determined depending on the dimensions and weight of the individual loading units.

[0020] The device is to have a conveyor which is provided for transporting empty load carriers to the device according to the invention and is also provided, for example, for transporting the load carriers filled with loading units away again and exchanging them for an empty load carrier.

[0021] In addition, the device according to the invention also has a positioning conveyor which is provided for conveying and positioning the loading units at the predetermined or calculated location for stacking and for this purpose has at least two conveyor belts conveying the loading

unit in the direction of the load carrier, which is to be displaced relative to the load carrier in the longitudinal direction and in the transverse direction so that the loading unit is to be discharged on the load carrier at the predetermined location.

[0022] In addition, the device according to the invention also has a transfer conveyor which positions the loading unit onto the positioning conveyor so that the latter takes over the loading unit and then conveys it to form stacks on the load carrier.

[0023] According to the invention, the positioning conveyor is characterised in that there is a predetermined lateral spacing between the conveyor belts which is not changed depending on the loading unit to be conveyed. The width of a conveyor strap of a conveyor belt is to be selected depending on the width of the loading unit to be transported, so that the corresponding loading unit is to rest completely on the conveyor strap.

[0024] If such a loading unit is to be palletised, then only one conveyor belt needs to be operated in the conveying direction to deposit the loading unit on the load carrier. If instead a wider loading unit is to be palletised, it is placed by the transfer conveyor before being transferred to then two conveyor belts on a push plate provided according to the invention in such a way that the loading unit rests at least largely centrally or centred when it passes from the push plate to the two conveyor belts, so that the loading unit rests fully on the conveyor straps during the entire dwell time on the positioning conveyor during transportation by the two conveyor straps of the two conveyor belts.

[0025] The design of the positioning conveyor according to the invention with at least two conveyor belts which, however, are always at the same spacing from one another regardless of any property of the loading unit, ensures that a costly unit for adjusting the spacing between the conveyor belts is not necessary and thus the associated control effort for the controlled or regulated adjustment of the clear lateral spacing between the conveyor belts is also not necessary. This avoids, on the one hand, the effort required to manufacture and install such an adjustment unit and, on the other, also the maintenance effort required for this adjustment unit. In addition, the effort required to integrate the functionality of the adjustment unit into a control device or a master computer for the device is also eliminated, resulting in technical simplification and a reduction in the complexity of the system and in the maintenance effort in terms of both hardware and software.

[0026] The inventive design of the transfer conveyor with a push plate that receives the loading unit also ensures that the device is significantly simplified compared to known devices. A push plate has the advantage that it is to be operated without a conveyor strap, does not require its own

drive and also does not require its own control system for the drive, which in turn simplifies the device according to the invention compared to the known device and reduces the installation and maintenance costs for the hardware and software, and, furthermore, due to the elimination of a drive for a conveyor belt, the energy costs when operating the device according to the invention is to also be reduced compared to the known device.

[0027] Because it is provided according to the invention that the transfer conveyor has a pusher which is intended to convey the loading unit on the push plate in the direction of the conveyor belts of the positioning conveyor, it is achieved that a transition from one belt to another is avoided, this being problematic due to unavoidable contamination of the belts when operating such a device since each belt transition is to lead to lateral displacements of the loading unit or rotational movements of the loading unit on the belt. If such a rotational movement of the loading unit were to occur, this would lead to a disruption in the automated loading of the load carrier since such a twisted loading unit could collide with a loading unit already arranged on the load carrier and thus a system malfunction would occur.

[0028] However, since the pusher provided according to the invention not only conveys the loading unit on the push plate, but also aligns it relative to the conveyor belt or conveyor belts, and the loading unit aligned in this way is delivered from the push plate directly onto the conveyor belt or conveyor belts and is still held aligned by the pusher during the delivery process, the risk of the loading unit shifting sideways relative to the conveyor belt or conveyor belts is avoided, and the risk of the loading unit rotating when transferring to the conveyor belt or conveyor belts is also avoided since the loading unit cannot twist while it is resting on the push plate and being guided by the pusher.

[0029] According to a refinement of the invention, it is provided that the pusher is designed as a corner turn pusher with an abutment surface and a pushing surface and is designed for positioning relative to the push plate depending on the position of the loading unit, which position is to be predetermined on the load carrier.

[0030] This ensures that the loading unit to be manipulated or displaced by the pusher is transported by a conveyor system (not described in more detail) in the direction of the pusher until the loading unit comes to rest on the abutment surface of the pusher and is already aligned there, for example, relative to the conveyor belt or conveyor belts of the positioning conveyor.

[0031] The pusher is to already be positioned on the push plate relative to the predetermined position of the loading unit on the load carrier before it receives the loading unit from the conveyor system so that a transverse movement of the loading unit on the push plate is no longer required, but the loading unit is positioned in the corner area of the abutment surface and pushing surface, which are arranged, for example, at a 90 degree angle to each other, and thus an exact alignment of the loading unit relative to the conveyor belt or conveyor belts is achieved before the loading unit is moved from the pusher to the conveyor belt or conveyor belts.

[0032] According to a refinement of the invention, it is provided that the pusher and the conveyor belts is to be positioned independently of one another in the direction transverse to the conveying direction of the conveyor belts depending on the predetermined position of the loading unit on the load carrier. This ensures that the pusher is to be positioned or displaced transversely to the conveying direction of the conveyor belts again immediately after it has pushed the loading unit onto the conveyor belt(s) and the conveyor belt(s) have carried out the further transportation of the loading unit onto the load carrier, in order to be aligned according to the predetermined position of the next loading unit to be positioned on the load carrier. This also includes the advantage that if a loading unit is only on one of the conveyor belts for further transportation in the direction of the load carrier, the pusher is to already push the next loading unit to be positioned onto the other conveyor belt, which is to then convey this loading unit further in the direction of the load carrier, while the other loading unit is still on the conveyor belt previously fed by the pusher. This makes it possible to improve the performance of the device according to the invention, that is to say the number of loading units palletised per hour.

[0033] According to a refinement of the invention, it is also provided that the conveyor belts is to be controlled independently of one another in the conveying direction towards the load carrier. This means, for example, that one conveyor belt is to be driven in the conveying direction while the other conveyor belt remains stationary. This also includes one of the conveyor belts being extended or moved or displaced in the direction of the load carrier, that is to say in the longitudinal direction, while the other conveyor belt does not undergo any extension movement in the direction of the load carrier, which is advantageous, for example, if there is currently a loading unit to be transported to the load carrier only on one of the conveyor belts and this conveyor belt is extended in the direction of the load carrier. An adjacent conveyor belt is ready to receive a next loading unit as it is located adjacent to the push plate.

[0034] According to a refinement of the invention, it is therefore provided that the conveyor belts is to be extended independently of one another in the direction of the load carrier and in the process

always have a constant relative spacing from one another in the transverse direction, so the spacing between the conveyor belts does not change and the spacing is therefore also not changed, for example, depending on the dimensions or another loading unit property.

[0035] According to a refinement of the invention, it is also provided that the latter has an apparatus for receiving respective lateral bearing surfaces of a load carrier in the form of a roll container, wherein the apparatus is designed to align the bearing surfaces largely parallel to one another.

[0036] The device according to the invention is therefore intended for the automated loading of a load carrier, which may be a pallet, a Euro pallet, a roll container or another load carrier. It has been shown that pallets and roll containers are often used for the picking of fresh produce, the device according to the invention being intended and designed for the automated loading of both pallets and roll containers.

[0037] In the case of roll containers which have a rollable platform on whose transverse sides there are lateral bearing surfaces in the form of, for example, side gratings, it has been found that these side gratings have a lateral inclination in the direction of the longitudinal central axis of the rollable platform after a relatively long period of operation of the roll container, for example, so that the receiving space between the lateral bearing surfaces of the roll container tapers from the platform along the vertical axis of the lateral bearing surfaces, that is to say the receiving space becomes smaller when viewed upwards from the platform.

[0038] This decreasing receiving space of the roll container is enlarged when the operator manually loads the roll container by pulling, pushing or pressing the lateral bearing surfaces outwards in order to be able to load the roll container with loading units layer by layer in an upward direction, starting from the platform.

[0039] The device according to the invention now has an apparatus for receiving respective lateral bearing surfaces of a load carrier in the form of a roll container and it is designed in such a way that it is to align the lateral bearing surfaces largely parallel to one another, thus eliminating the problem of the receiving space of the roll container tapering from the platform.

[0040] According to a refinement of the invention, it is provided that the apparatus is in the form of a wedge surface and has a bearing surface which is associated with a respective bearing surface and which, in a plan view from above, has a configuration that widens in the conveying direction towards the load carrier, and/or the apparatus has a rotatably arranged roller associated with a

respective bearing surface, the outer circumferential surface of which roller is wedge-shaped when viewed from above onto a cross-section through the roller.

[0041] Both configurations, that is to say the wedge-shaped device and the roller with a wedge-shaped outer peripheral surface when viewed from above onto a cross-section through the roller, serve to ensure that the arrangement of the roll container on the wedge surface and/or the roller ensures that the lateral bearing surfaces, that is to say for example the side gratings, come into contact with the wedge surface or come into contact with the roller and this physical contact between the side gratings and the wedge surface or the roller ensures that the side gratings are pressed or displaced outwards, that is to say to accommodate a configuration in which the side gratings are aligned largely parallel to one another and thus a collision of loading units conveyed into the receiving space of the roll container with the lateral bearing surfaces is avoided.

[0042] According to a refinement of the invention, it is also provided that the conveyor belts each have a tight side and a slack side and have a configuration between the tight side and the slack side that tapers in the direction of the load carrier in the vertical axis direction.

[0043] The conveyor belts is to have a deflection roller and/or a drive roller in the end region adjacent to the push plate and also have a deflection roller and/or a drive roller in the end region adjacent to the load carrier.

[0044] This tapering configuration is to be achieved by having the deflection roller and/or drive roller in the end region associated with the load carrier have a smaller diameter than the deflection roller and/or drive roller in the end region associated with the push plate.

[0045] Through this tapering of the belt thickness, the loading unit is to be discharged with a small difference in height between the top edge of the belt and the top edge of the already discharged or palletised loading unit. The conveyor belts are retracted when the loading unit to be palletised is located adjacent to the predetermined discharge position. The retraction speed of the conveyor belts is slightly lower than the belt speed in the conveying direction to the load carrier here so that the loading unit is always moved in the direction of the discharge position. This makes it possible to close a gap or a space between an already discharged or palletised loading unit or a stop surface in the area of or on the load carrier. At the same time, the conveyor belts is to be displaced together in the transverse direction here so that a gap or space with respect to the adjacent loading unit is also closed. The transverse movement of the conveyor belts takes place in such a way here that they always have a constant lateral spacing from each other.

[0046] Since the invention also includes the fact that only one conveyor belt of two or more conveyor belts is extended in the conveying direction to the load carrier, a narrow gap on the load carrier with a palletised or stacked loading unit is to be closed in this way even with only one extended conveyor belt. The loading units or containers are arranged on the conveyor belt or conveyor belts throughout the transportation process until they are discharged on the load carrier so that they receive planar support from below and in this way even damp or soft loading units is to be gently depalletised automatically.

[0047] According to a refinement of the invention, it is also provided that the pusher is designed to move in the direction of the conveyor belts at a speed corresponding to the conveying speed of the conveyor belts. This means that when the loading unit enters the coverage area of the conveyor belt or conveyor belts, it is supported by the pusher from the rear at a conveying speed corresponding to the conveying speed of the conveyor belt or conveyor belts, thus preventing twisting or angular displacement of the loading unit during the transition from the pusher plate to the conveyor belt or conveyor belts.

[0048] According to a refinement of the invention, it is also provided that the conveyor belts are designed to be displaced in the direction transverse to the conveying direction of the conveyor belts. The conveyor belts are always moved or displaced together in the transverse direction to the conveying direction so that changing the lateral spacing between the conveyor belts is not provided for and accordingly a device for changing the lateral spacing between the conveyor belts is not required either. The transverse movement of the conveyor belts is to reduce or close gaps or spaces between the individual loading units on the load carrier.

[0049] According to a refinement of the invention, it is also provided that the positioning conveyor has three conveyor belts which is to be operated independently of each other and is to be displaced together transversely to the conveying direction.

[0050] This increases the conveying capacity of the conveyor belts and significantly increases the hourly output of the device according to the invention compared to the known device.

[0051] According to a refinement of the invention, it is also provided that the device has a control device which is designed to actuate the pusher by means of a drive in the direction of the conveyor belts at a translation speed corresponding to the conveying speed of the conveyor belts in the conveying direction towards the load carrier. The device according to the invention is to therefore prevent the loading unit from twisting during the transition from the push plate to the conveyor belt

or conveyor belts. This also prevents a loading unit from being compressed when transitioning from the push plate to the conveyor belt or conveyor belts. Such compression of the loading unit could occur if the pusher were to be moved at a higher translation speed in the direction of the conveying direction of the conveyor belts since a compressive force would then be exerted by the pusher on the back of the loading unit, which is already partially resting on the conveyor belt and, in the case of a damp container or a damp loading unit, for example, this would result in the loading unit being compressed, which would also result in products in the loading unit being pressed, crushed or squeezed.

[0052] Such damage to the products contained in the loading unit must be avoided, particularly in the case of fresh produce such as fruit and/or vegetables, as this would lead to pressure marks on the product.

[0053] The device according to the invention is also characterised in that the control device is designed to actuate a conveyor belt by means of a drive in the direction transverse to the conveying direction of the conveyor belt while maintaining a fixed relative lateral spacing between the conveyor belts. The lateral spacing between the conveyor belts therefore always remains the same.

[0054] According to the invention, a method is also provided for the automated loading of a load carrier with loading units forming a load stack, in which a load carrier is conveyed in at least one planar direction and one vertical axis direction thereto and the loading unit is conveyed in the direction of the load carrier by means of a positioning conveyor with at least two conveyor belts, wherein the conveyor belts is to be displaced relative to the load carrier in the longitudinal direction and in the transverse direction, and the loading unit is conveyed onto the positioning conveyor by means of a transfer conveyor, wherein, according to the method, the loading unit is conveyed by means of a pusher from a push plate onto the conveyor belts of the positioning conveyor and during a movement in the longitudinal direction and in the transverse direction the conveyor belts have a fixed relative spacing provided between the conveyor belts.

[0055] Since the conveyor belts of the positioning conveyor have a fixed lateral spacing provided between each other, independent of the loading unit, and this spacing is not changed, that is to say is not even changed depending on the loading unit or its dimensions or its position relative to the push plate and/or relative to the load carrier, there is also no need for a unit for adjusting the spacing and/or a control device which is provided for controlling the change in the spacing. This achieves a significant reduction in the complexity of the device and also of the method for operating the device and also reduces the energy required to operate the device.

[0056] Because the transfer conveyor does not have a conveyor belt, but rather a push plate on which the loading unit to be palletised lies in the area of the transfer conveyor and the loading unit is then conveyed by means of a simple pusher in the direction of the conveyor belts of the positioning conveyor, the conveyor belt is eliminated and a drive for the conveyor belt and also a control system for operating the conveyor belt are eliminated. This also reduces the complexity of the system and achieves a corresponding cost advantage with regard to installation, maintenance and operation of the device too.

[0057] According to a refinement of the method according to the invention, it is also provided that in order to reduce a spacing between loading units arranged on the load carrier, before or after the loading unit reaches a predetermined position, a transverse movement of the conveyor belts is carried out in the longitudinal direction relative to the load carrier, before the loading unit is discharged on the load carrier or another loading unit, wherein the conveyor belts are moved transversely as a single unit during the transverse movement.

[0058] This means that the spacing between adjacent loading units on the load carrier is to be reduced or that adjacent loading units is to be arranged next to one another on the load carrier and the loading units is to therefore also support one another on the load carrier and, in addition, the best possible use is made of the space available on the load carrier.

[0059] According to a refinement of the method according to the invention, it is also provided that, before the loading unit is discharged, the conveyor belts are retracted counter to the conveying direction of the belts at a retraction speed which is lower than the conveying speed of the straps of the conveyor belts and the conveyor belts are displaced in the transverse direction largely simultaneously with the retraction movement. In this way, the time required for discharging the loading units on the load carrier is to be reduced and the efficiency of the device according to the invention and the method according to the invention is to be increased and the discharging performance of the device in loading units per unit of time is to be increased compared to the known device.

[0060] Finally, the method according to the invention also provides for lateral stop surfaces of a load carrier to be aligned largely parallel to one another by changing the clear spacing between the stop surfaces using wedge surfaces and/or rollers in contact with the stop surfaces.

[0061] In this way, the clear spacing between the stop surfaces of the load carrier, which may be, for example, a roll container with lateral side gratings, is to be changed in such a way that the stop

surfaces are automatically aligned largely parallel to one another using the apparatus provided on the device according to the invention and thus preventing the loading unit, which is automatically conveyed onto the load carrier in the form of, for example, said roll container, colliding with the side gratings.

[0062] The roll container is to be conveyed to the predetermined discharge location for the load carrier by means of the conveyor, which conveys the load carrier in a planar direction and a vertical axis direction, and is to be lifted there to a first level for discharging a first layer of loading units on the load carrier. After a first layer of loading units has been positioned on the load carrier, the roll container is to be lowered slightly by means of the conveyor until the upper level of the already palletised loading units then corresponds to the vertical level for the arrangement of the next loading units. During the process of lowering the roll container, the side gratings of the roll container is to remain in contact with the apparatus provided on the device, so that the side gratings are kept at a spacing largely parallel to each other, so that the discharging or palletising of further loading units on the already palletised level of loading units is to immediately continue.

[0063] The invention is explained in more detail below with reference to the drawing, in which:

Fig. 1 shows a perspective representation of a device for the automated loading of a load carrier, with a roll container as load carrier and also a Euro pallet as load carrier;

Fig. 2 shows a representation similar to that of Fig. 1 with a plurality of loading units which are already ready for loading on the represented Euro pallet and are shown schematically;

Fig. 3 shows a representation similar to that of Fig. 2, showing the Euro pallet in the raised position and positioned to receive loading units;

Figs. 4-8 show perspective representations of the device to explain the process of automated loading of the load carrier with two loading units in sequential representation;

Figs. 9-11 show perspective representations of the device to explain the process of automated loading of the load carrier with another loading unit in sequential representation;

Figs. 12-15 show perspective representations of the device to explain the process of automated loading of the load carrier with another loading unit;

Figs. 16-18 show perspective representations of the device to explain the process of automated loading of the load carrier with a smaller loading unit;

Figs. 19-21 show perspective representations of the device to explain the automated loading of the load carrier with another smaller loading unit;

Figs. 22-23 show perspective representations of the device to explain the positioning of a loading unit in the form of a roll container;

Figs. 24-25 show two representations to explain the largely parallel alignment of the side gratings of the roll container by means of the device according to the invention;

Figs. 26-28 show perspective representations to explain the automated loading of a roll container with a loading unit;

Figs. 29-31 show perspective representations to explain the automated loading of a roll container with another loading unit;

Figs. 32-34 show perspective representations to explain the automated loading of a roll container with another loading unit;

Figs. 35-37 show perspective representations to explain the automated loading of a roll container with another loading unit;

Figs. 38-40 show perspective representations to explain the automated loading of a roll container with a smaller loading unit;

Figs. 41-44 show perspective representations to explain the automated loading of a roll container with another smaller loading unit;

Figs. 45-47 show schematic representations in a view from above to explain a modified embodiment of the device during the automated loading of a roll container; and

Fig. 48 shows a schematic representation in a view from above to explain the device according to the invention during the automated loading of a load carrier in the form of a Euro pallet.

[0064] Fig. 1 of the drawing shows a perspective representation of a device 1 for the automated loading of a load carrier 2, with a roll container 3 as load carrier and also a Euro pallet 4 as load carrier.

[0065] The device according to the invention is therefore intended and suitable for automatically loading different load carriers 2 with loading units, wherein the load carrier may be, for example, a pallet, a Euro pallet or even a roll container.

[0066] The loading units 5, which is to be seen in more detail, for example, in Fig. 2 of the drawing, are provided via a suitable conveyor system to a feed device 6 and, for example, are provided by this conveyor system on a push plate 7.

[0067] Adjacent to the push plate 7 is provided a pusher 8 which in the embodiment shown is a corner turn pusher having a pushing surface 9 and an abutment surface 10, wherein the two surfaces 9, 10 are at a 90 degree angle in the embodiment shown of the corner turn pusher 8.

[0068] The pusher or corner turn pusher 8 is arranged to be movable in a controlled or regulated manner both in the transverse direction Z and in the longitudinal direction X by means of a schematically represented drive 11, so that a loading unit 5 arranged on the push plate 7 is to be conveyed by the pusher or corner turn pusher 8 from the push plate 7 onto a conveyor belt 12 or 13 or onto both conveyor belts 12, 13, as will be explained in more detail below.

[0069] The device 1 according to the invention is to be controlled by means of a control device 14, as will be explained in more detail below.

[0070] The loading unit 2 in the form of, for example, the roll container 3 and the Euro pallet 4 is to be lifted in the direction of the vertical axis direction Y by means of a conveyor 15 in the form of, for example, a combination conveyor lift 16 in order to be arranged adjacent to the respective outlet end of the two conveyor belts 12, 13, as is to be seen from Fig. 1 of the drawing.

[0071] Load carriers 2 intended for loading are fed to the combination conveyor lift 16 via a combination conveyor 17, as is to be seen from Fig. 1 of the drawing.

[0072] The combination conveyor lift 16 then conveys the roll container 3 or the Euro pallet 4 to the height suitable for loading with the loading units 5 in the vertical axis direction Y.

[0073] The positioning conveyor 18 provided according to the invention comprises the two conveyor belts 12, 13 and the transfer conveyor 19 is designed in the form of the pusher or corner turn pusher 8.

[0074] The two conveyor belts 12, 13 or also a third conveyor belt 20 as are to be seen in Fig. 45 thus form elements of the positioning conveyor 18 and are each to be moved individually in the longitudinal direction X according to the coordinate system according to Fig. 1 by means of a respective linear conveyor unit 21 in order to discharge loading units 5 on the load carrier 2.

[0075] By means of a linear unit or linear conveyor unit 22 which is to be seen in Fig. 1 of the drawing, the conveyor belts 12, 13, 20 are each displaced together in the transverse direction to the load carrier 2, meaning that the conveyor belts 12, 13 have a lateral spacing from one another, as is to be seen from Fig. 1 of the drawing, for example, which is always constant, that is to say is not changed, and in particular is not changed depending on a property of the loading unit 5.

[0076] Such a change is also not provided for because the loading unit 5 is positioned on only one conveyor belt 12 or 13 or 20 or is also to be positioned on two conveyor belts 12, 13 or 13, 20 or, for example, also on three conveyor belts 12, 13, 20, that is to say by means of the corner turn pusher or pusher 8, so that there is no need for a change in the lateral spacing 23 between the conveyor belts 12, 13, 20, as is to also be seen, for example, from Fig. 46 of the drawing.

[0077] Since the lateral spacing 23 between the belts 12, 13, 20 does not have to be changed, it is also unnecessary to have to make provision in terms of equipment for a unit for adjusting or changing the lateral spacing 23, and a control unit which changes the lateral spacing 23, for example depending on a conveying property of the loading unit 5, is also unnecessary, so the device according to the invention is characterised by a correspondingly high cost advantage over a device which provides for an adjustment of the lateral spacing between the conveyor belts.

[0078] Since the pusher or corner turn pusher 8 is to be displaced both in the transverse direction Z and in the longitudinal direction X by means of the drive 11 as is to be seen, for example, in Fig. 1 of the drawing, the pusher 8 is to be positioned in the transverse direction Z in a position

corresponding to the loaded position of the loading unit 5 on the load carrier 2 even before a loading unit 5 is received on the push plate 7, this being controlled, for example, by means of the control device 14.

[0079] As soon as the loading unit 5 to be positioned on the load carrier 2 is therefore transferred to the push plate 7, the pusher or corner turn pusher 8 already has a position in the transverse direction Z that corresponds to the later loading position in the direction of the transverse axis Z on the load carrier 2, so that a corresponding speed advantage is to be achieved compared to a situation in which the loading unit 5 to be positioned must first be aligned or positioned in the Z direction on the push plate 7 before the corner turn pusher or pusher 8 positions the loading unit 5 on one of the conveyor belts or on the conveyor belts, only one movement of the pusher or corner turn pusher 8 in the longitudinal axis direction X according to Fig. 1 being carried out for this purpose.

[0080] A stop 24, which is to be seen, for example, in Fig. 1 of the drawing, serves as an end stop for the positioning of the loading units 5 in the longitudinal direction X, as is to be seen from the figures, for example from Fig. 5 of the drawing. In addition, the device 1 also has a side stop 25, which is to be seen, for example, from Fig. 2 of the drawing and serves to align or position the loading units 5 of a Euro pallet 4 that is open on all sides, as is to also be seen, for example, from Fig. 5 of the drawing.

[0081] In general, the invention provides that, when the loading unit 5 has been moved by the pusher or corner turn pusher 8 onto a single conveyor belt 12, 13, 20 or onto two or three conveyor belts 12, 13, 20, and the loading unit 5 has thus left the coverage area of the push plate 7, the pusher or corner turn pusher 8 is moved in the X and Z directions back into the receiving position, which is to be seen, for example, in Fig. 1 of the drawing, so that the push plate 7 is ready to receive a loading unit 5 and the pusher or corner turn pusher 8 is already positioned according to the position Z in the transverse direction, which corresponds to the receiving position in the transverse direction Z on the load carrier 2 to be loaded.

[0082] Fig. 2 of the drawing shows an initial situation in which a loading unit 5 designated A is arranged in front of the push plate 7 and is to be conveyed onto the push plate 7 by a conveyor device (not shown in more detail) until it rests against the abutment surface 10. It is moved here relative to the corner turn pusher 8 in such a way that it is aligned between the abutment surface 10 and the pushing surface 9 and is exactly aligned in terms of angular position to the loading position on the Euro pallet 4, which has not yet been raised in the Y direction in the position in Fig. 2. Fig. 2 of the drawing also shows that a roll container 3 is already arranged in a waiting position on the

combination conveyor 17 and is intended as the next load carrier 2 for loading with loading units 5.

[0083] In the position that is to be seen in Fig. 3 of the drawing, the Euro pallet 4 has already been moved in the vertical axis direction Y into a position in which it is positioned to receive loading units 5 in a first stacking layer. The side stop 25 and the stop 24 or the stop surface 24 have already been arranged on the Euro pallet 4 as a load carrier 2 in such a way that they are flush with the respective rear and left-hand end surfaces of the Euro pallet 4. The loading unit 5 has already been arranged on the push plate 7, as already explained above.

[0084] Fig. 4 of the drawing shows a next step in the sequence of automated loading of the loading unit 5 on the load carrier 2.

[0085] The loading unit 5 is represented schematically and may, for example, represent a container with fruit and vegetable products that is open at the top.

[0086] The loading unit 5 or the container 5 has already been transferred to both conveyor belts 12, 13 by means of the pusher 8, the straps 26, 27 of the conveyor belts 12, 13 for this purpose having a synchronised rotation speed, that is to say rotating at the same speed. When positioning the loading unit 5 on the conveyor belts 12, 13, the corner turn pusher 8 conveys the loading unit 5 at a speed corresponding to the speed of the conveyor belts 12, 13 in the conveying direction (X direction) of the conveyor belts, so that damage to the loading unit 5 due to excessive pressure exerted by the pushing surface 9 on the back of the container 5 is to be avoided. In this way, the formation of pressure marks on fruit and vegetable products in the container 5 is avoided.

[0087] In a next loading step, which is to be seen in Fig. 5 of the drawing, the two conveyor belts 12, 13 have been extended in the X direction in the direction of the load carrier 2 and the loading unit 5 is ready to be discharged on the load carrier 2. For this purpose, the conveyor belts 12, 13 are controlled in such a way that they are moved back in the X direction again counter to the conveying direction, that is to say counter to the forward direction, at a constant rotational speed in the direction of the starting position as is to be seen in Fig. 1, while the straps 26, 27 are still driven in the conveying direction.

[0088] This ensures that the container 5 resting on the bearing surface 24 is discharged exactly in the corner area between the bearing surface 24 and the side stop 25 on the load carrier 4 in the first stack layer or stack position.

[0089] While the first container 5 is still being positioned on the Euro pallet 4, the next loading unit 5, designated B, is moved onto the push plate 7 by the conveyor system (not shown in detail), that is to say in such a way that it comes to rest on the abutment surface 10 of the corner turn pusher 8 and is aligned with the loading position on the load carrier 2 shown in Fig. 8 of the drawing. During the process of loading the loading unit 5 onto the push plate 7, the two conveyor belts 12, 13 are moved back in the direction of the starting position as is to be seen in Fig. 1 of the drawing. This continues until the end regions 28 of the conveyor belts 12, 13 assigned to the Euro pallet 4 are located at the later transfer position on the load carrier 2.

[0090] Fig. 7 of the drawing shows that the loading unit 5 has already been transferred from the corner turn pusher 8 to the conveyor belts 12, 13, which then convey the loading unit 5 in the direction of the later loading position on the load carrier 2 according to Fig. 8, as is to be seen from Fig. 8 of the drawing.

[0091] While the load carrier 2 is still being loaded with the loading unit 5, which is designated B in Fig. 8 of the drawing, a next loading unit 5 (loading unit C) is positioned on the push plate 7 and received by the corner turn pusher 8.

[0092] Even before the loading unit C is received by the corner turn pusher 8, the corner turn pusher 8 is moved in the transverse direction Z relative to the push plate 7 into the position corresponding to the later position of the loading unit C on the load carrier 2 according to Fig. 10 of the drawing and is then received in the Z direction by the two conveyor belts 12, 13 and, as is to be seen in Fig. 11 of the drawing, conveyed in the direction of the later loading position of the loading unit C adjacent to the loading unit A onto the Euro pallet 4. The two conveyor belts 12, 13 are moved together here in the direction or direction Z1 according to Fig. 11, that is to say without changing a lateral spacing between the two conveyor belts 12, 13, so that a gap maintained between the loading unit C and the loading units A, B when loading the loading unit C on the load carrier 4 adjacent to the two already positioned loading units A, B is preferably reduced to zero, so that the loading units A, C are arranged next to one another on the load carrier 4. It is of course also possible within the scope of the invention for the joint movement of the conveyor belts 12, 13 in the direction of direction Z1 to be controlled by the control device 14 in such a way that a gap is maintained between the two containers A, C. This is to be advantageous, for example, if the containers or loading units A, C contain fruit and vegetable products that are to be kept at a spacing from one another.

[0093] While the loading unit C is still being arranged on the Euro pallet 4, the loading unit D is made available on the push plate 7, as is to be seen from Fig. 12 of the drawing, that is to say resting on the abutment surface 10 of the corner turn pusher 8, which has already been positioned in the transverse direction Z of the later discharge position of the loading unit D on the Euro pallet 4 before the loading unit D is made available, so that a subsequent movement of the corner turn pusher 8 in the longitudinal direction X results in the loading unit D being able to be delivered to the two conveyor belts 12, 13. These two conveyor belts 12, 13 then convey the loading unit D in the direction of the specified discharge position on the product pallet 4. By means of a retraction movement of the two conveyor belts 12, 13 counter to the conveying direction of the circulating straps 26, 27 while simultaneously maintaining the conveying movement of the two straps 26, 27, the loading unit D is discharged on the Euro pallet 4 adjacent to the already positioned loading units A, B, C at the predetermined discharge position of the Euro pallet 4. The individual steps of discharging the loading unit D on the Euro pallet 4 is to be seen in Figs. 12, 13 and 14 as well as 15.

[0094] While the two conveyor belts 12, 13 are still discharging the loading unit D on the Euro pallet 4, the corner turn pusher 8 moves relative to the push plate 7 to the position corresponding to the transverse direction Z of the next loading unit E on the Euro pallet 4, as is to be seen from Fig. 16 of the drawing. The loading unit E has already been positioned on the abutment surface 10 of the corner turn pusher 8 and a subsequent movement of the corner turn pusher 8 in the direction of the longitudinal direction X according to Fig. 1 of the drawing results in the loading unit E resting on the push plate 7, which is aligned with the abutment surface 10 and the pushing surface 9 of the corner turn pusher 8, being conveyed onto the conveyor belt 12, while the conveyor belt 13 remains empty, since the loading unit E is only half as wide as the loading units A, B, C, D previously positioned on the Euro pallet 4.

[0095] A subsequent movement, with which the conveyor belt 12 loaded with the loading unit E is extended in the direction of the discharge position on the loading unit A already placed on the Euro pallet 4, that is to say is extended in the direction X, leads - as is to be seen from the further Figures 17, 18 and 19 of the drawing - to the loading unit E being discharged on top of the loading unit A and loading units are therefore stacked on the Euro pallet 4.

[0096] As is to be seen from Figures 16 to 19 of the drawing, the stop 24 and the side surface 25 have been moved in the vertical axis direction Y to the corresponding plane in the vertical axis direction for positioning the loading unit E, so that the loading unit E comes to rest on the stop surface of the stop 24 and, via a transverse movement of the two conveyor belts 12, 13 together in

the transverse direction Z, comes to rest on the side stop 25 or the side stop surface of the side stop 25 and thus an exact alignment of the loading unit E on the upper surface 29 (Fig. 16) of the already positioned loading unit A takes place.

[0097] While the loading unit E is still being discharged on the upper surface 29 of the loading unit A, the next loading unit F is conveyed onto the push plate 7, as is to be seen from Fig. 19 of the drawing, and then, as is to be seen from Fig. 20 of the drawing, moved by the corner turn pusher 8 onto the conveyor belt 12, that is to say in a manner precisely aligned with the longitudinal direction of the conveyor belt 12 by the pushing surface 9 and the abutment surface 10. This avoids the risk of the loading unit F becoming twisted when arranged on the conveyor belt by the exact positioning of the loading unit by means of the pushing surface 9 and the abutment surface 10 of the corner turn pusher 8. The corner turn pusher 8 pushes the loading unit F onto the conveyor belt 12 here at a speed corresponding to the conveying speed of the conveyor belt 12, as already explained above, so that on the one hand the risk of twisting of the loading unit and damage to the loading unit F is safely avoided.

[0098] As is to be seen from Fig. 21 of the drawing, the loading unit F is discharged directly onto the front side 30 of the already positioned loading units G on the surface or upper side 31 of the already positioned loading unit B. Any lateral spacing of the loading unit F relative to the bearing surface 32 of the side stop 25 is reduced to zero by a transverse movement of the two conveyor belts 12, 13 in the transverse direction Z. Such a lateral spacing is to be achieved, for example, by the two conveyor belts 12, 13 being kept at a spacing from the bearing surface 32 in a controlled manner during the movement of the loading unit F to be positioned in the longitudinal direction X, meaning that a collision of the front side of the loading unit F with the bearing surface 32 is to be avoided. Due to the subsequent transverse movement of the two conveyor belts 12, 13 in the transverse direction Z, this intentionally induced lateral spacing is reduced to zero, so that maximum utilization of the discharge area provided by the Euro pallet 4 is achieved and, moreover, the stacks of loading units formed on the Euro pallet 4 are aligned exactly one above the other.

[0099] By repeating the sequence of operations described with reference to the present explanation during the automatic loading of the load carrier 4, further levels of loading units placed on the Euro pallet 4 is to be provided, so that stacks of loading units are automatically formed on the load carrier using the device according to the invention.

[0100] The loading of a load carrier in the form of a roll container 3 with loading units will be explained below with reference to Figures 22 to 44.

[0101] Fig. 22 of the drawing shows that the roll container 3 has already been placed on a lifting platform 33, that is to say by means of the combination conveyor 17, which already has a Euro pallet 4 ready as the next load carrier.

[0102] In a next step, the roll container 3 is raised in the vertical axis direction Y via the combination conveyor lift 16, which is to convey both Euro pallets 4 and roll containers 3 in the vertical axis direction Y, that is to say to a height at which the receiving surface 34 of the roll container 3 in the vertical axis direction Y largely coincides with the corresponding discharge level height of the conveyor belts 12, 13 in the vertical axis direction Y.

[0103] The stop 24 is still arranged at a clear spacing from the side gratings 35, 36 of the roll container 3. It has been shown that the side gratings 35, 36 of roll containers 3 which have already been in use tend to shift in the direction of the longitudinal centre axis 40 of the receiving surface 34 shown in Fig. 24 of the drawing. This displacement movement of the side gratings 35, 36 would result in a loading unit to be placed on the receiving surface 34 by the device 1 according to the invention colliding with one of the side gratings 35, 36 or both side gratings 35, 36 during the displacement movement in longitudinal direction X.

[0104] In order to avoid such a collision, the device 1 according to the invention has an apparatus 37 which is designed to receive respective lateral bearing surfaces of a roll container 3, that is to say, for example, serves to receive the side gratings 35, 36 of the roll container 3.

[0105] As is readily to be seen from Fig. 24 of the drawing, the apparatus 37 has wedge-shaped receptacles 38, 39 which engage with the side gratings 35, 36 while the stop 24 is advanced in the X direction onto the side gratings 35, 36. Such a displacement movement of the stop 24 leads to the side gratings 35, 36 being spread apart so that the side gratings 35, 36 are largely aligned parallel to one another and a risk of collision of a loading unit to be placed with the side gratings 35, 36 is now avoided.

[0106] During a lowering movement of the roll container 3 in the vertical axis direction Y, which is carried out when, for example, a first layer of loading units has been placed on the receiving surface 34, the wedge-shaped receptacles 38, 39 remain resting on the side gratings 35, 36, so that a tilting movement of the side gratings 35, 36 in the direction of the longitudinal centre axis 40 (Fig. 24) is avoided.

[0107] Alternatively, the invention also provides that the receptacles 38, 39 are disengaged from the side gratings 35, 36 during the lowering movement of the roll container 3, that is to say by a

corresponding retraction movement of the stop 24 relative to the roll container 3 and, after the lowering movement of the roll container 3 has been carried out, the receptacles 38, 39 are brought back into engagement with the side gratings 35, 36 and the side gratings are thus again largely aligned parallel to one another.

[0108] Fig. 26 of the drawing shows the roll container 3 in a position ready to receive a first loading unit A.

[0109] As is to also be seen from Fig. 26, a first loading unit A has already been positioned on the push plate 7, that is to say in such a way that the corner turn pusher 8 is already in a position in the transverse direction Z corresponding to the later discharge position of the loading unit A in the transverse direction Z on the roll container 3.

[0110] By means of a pushing movement of the corner turn pusher 8 on the loading unit A, the latter is conveyed onto the two conveyor belts 12, 13, as is to be seen from Fig. 27 of the drawing. The two conveyor belts 27 take the loading unit A in an aligned orientation relative to the discharge position on the receiving surface 34 of the roll container 3 due to being extended in the longitudinal direction X in the direction of the receiving surface 34 while maintaining a circular movement of the conveyor belts 12, 13 in the conveying direction X, as is to be seen from Fig. 28 of the drawing. The loading unit A comes to rest on the abutment surface of the stop 24 at the predetermined discharge position and at the same time the two conveyor belts 12, 13 are retracted counter to the conveying direction X so that the loading unit A is gently discharged on the receiving surface 34. In a similar way, the loading units are gently discharged on the respective discharge surface of a Euro pallet 4.

[0111] The gentle discharging of the respective loading units 5 on the load carrier 2 is to be brought about by the respective conveyor belts 12, 13, 20 having a smaller wrap diameter in the respective discharging end region 41 (Fig. 3) than in the opposite end region, resulting in a wedge-shaped configuration 42 (Fig. 3) of the conveyor belts 12, 13 in the conveying direction X. This prevents the loading units from being placed on the respective receiving surface of the roll containers 3 or Euro pallets 4 or a stack of loading units already formed thereon via a falling movement of the loading units, that is to say they do not fall down onto the receiving surfaces or stacks of loading units already formed, but are gently discharged thereon.

[0112] Fig. 28 of the drawing also shows that the corner turn pusher 8 is already in a position aligned in the transverse direction Z during the discharge of the loading unit 8 on the roll container

3, which corresponds to the later position of the loading unit B on the roll container 3 in the Z direction.

[0113] This loading unit B is now conveyed onto the push plate 7 by means of a conveyor device (not shown in more detail) and comes into contact there with the abutment surface 10 of the corner turn pusher 8 and is to be transported back onto the two conveyor belts 12, 13 by the corner turn pusher 8, as is to be seen from Fig. 29 of the drawing. These are extended in direction X towards the roll container 3 until the discharge position of the loading unit B on the roll container 3 has been reached and the loading unit B is to be gently placed on the roll container 3.

[0114] The procedure just described for discharging the loading unit B on the roll container 3 is to be seen in individual steps in Figures 29, 30 and 31 of the drawing. While the loading unit B is still being placed on the roll container 3 by the two conveyor belts 12, 13, the corner turn pusher 8 is already being retracted in the X direction in the direction of the push plate 7 and is ready to receive a next loading unit C, as is to be seen from Fig. 31 of the drawing.

[0115] Fig. 32 of the drawing shows that the next loading unit C has already been placed on the push plate 7 and is then, as explained in Fig. 33 of the drawing, moved by means of the corner turn pusher 8 onto the two conveyor belts 12, 13 and is then discharged by these, as is to be seen from Fig. 34 of the drawing, at the predetermined discharge location on the surface of the loading unit A already placed on the roll container 3. Fig. 33 of the drawing also shows that the roll container 3 has already been lowered by the combination conveyor lift 16 by one stacking level in the vertical axis direction Y before the loading unit C is conveyed by the automated device for loading the load carrier in the direction of the receiving space located between the two side gratings 35, 36 of the roll container 3.

[0116] Fig. 34 of the drawing also shows that the corner turn pusher 8 has been moved back in the longitudinal direction X to the push plate 7 during the conveying movement of the loading unit C onto the roll container 3 and is ready to receive a next loading unit D to be placed, which is then made available on the push plate 7, as is to be seen from Fig. 35 of the drawing.

[0117] Fig. 36 of the drawing shows a position in which the loading unit D has already been moved by the corner turn pusher 8 onto the two conveyor belts 12, 13 and these are in the extension movement in the longitudinal direction X so that the loading unit D is to be conveyed between the two side gratings 35, 36 in order to be discharged by the conveyor belts 12, 13 on the upper side of the loading unit B already placed there and in this way loading units are stacked on the load carrier,

as is to be seen from Fig. 37 of the drawing.

[0118] Figures 38 to 41 of the drawing show the automated loading of the load carrier with a loading unit E, which is only half the width of the previously placed loading units A, B, C, D.

[0119] Fig. 38 shows that the loading unit E has already been provided on the push plate 7, that is to say resting on the abutment surface 10 of the corner turn pusher 8, which then conveys the loading unit E in the direction of the conveyor belt 12 according to Fig. 39 of the drawing, and pushes it onto the conveyor belt 12, as is to be seen from Fig. 40 of the drawing. By means of an extending movement of the conveyor belt 12 with the loading unit E placed thereon and a circulating movement of the conveyor strap 26 of the conveyor belt 12, the loading unit E is discharged on top of the already placed loading unit C, as is to be seen in Fig. 41 of the drawing. The loading unit E is thereby brought up to the bearing surface of the stop 25 and the two conveyor belts 12, 13 are moved together in the direction of the side grating 36 in the transverse direction Z in order to close a gap between a side surface of the loading unit E and the side grating 36, so that stacks of loading units arranged exactly one on top of the other are formed on the roll container 3.

[0120] Fig. 41 of the drawing also shows that during this time a next loading unit F is already being conveyed in the direction of the push plate 7 or the corner turn pusher 8 arranged thereon, while the loading unit E is being discharged on the top of the already stacked loading unit C, so that the process of placing the loading unit E and conveying the loading unit F onto the push plate 7 takes place simultaneously.

[0121] Also, as is to be seen from Figs. 42 and 43 of the drawing, the next loading unit F is already to be moved by the corner turn pusher 8 in the direction of the other of the two conveyor belts 12, 13, that is to say the conveyor belt 13, during the loading of the load carrier with the loading unit E, so that the loading of the load carrier with two loading units is to be carried out largely simultaneously by controlling the two conveyor belts 12, 13 in direct succession to one another independently of one another, whilst any transverse movement of the two conveyor belts 12, 13 in the transverse direction Z always takes place together.

[0122] Finally, Fig. 44 of the drawing shows that the corner turn pusher 8 has already moved the loading unit F onto the conveyor belt 13 and that the latter is then extended in the longitudinal direction X to discharge the loading unit F on top of the already discharged loading unit C, while the conveyor belt 12 is already in a retracted position.

[0123] Fig. 45 of the drawing shows a schematic representation of a modified embodiment of the device according to the present invention, in which the positioning conveyor 18 has three conveyor belts 12, 13, 20, wherein the lateral spacing 23 between the conveyor belts may be different from conveyor belt to conveyor belt, but this respective lateral spacing is static, that is to say is not changed, for example, depending on a conveying property of a loading unit or another property of the loading unit.

[0124] In the illustration designated with the additional designation 1, the corner turn pusher 8 is arranged on the push plate 7 in a position which is aligned for transferring the loading unit 5 to the left-hand conveyor belt 12 and the middle conveyor belt 13.

[0125] According to the representation designated with the additional designation 2, the loading unit 5, which is so wide that it rests flat on two conveyor belts 12, 13 and is thus supported from below during the entire conveying process from the push plate 7 to the roll container 3 and thus a bending of the loading unit 5 is avoided, has already been discharged onto the two conveyor belts by the corner turn pusher 8. The loading unit 5 is conveyed by the conveyor belts 12, 13 in the direction of the roll container 3 and is thereby brought into an extended position, as is to be seen from the representation designated with the additional designation 3.

[0126] The representation designated with the additional designation 3 also shows that the two conveyor belts 12, 13 is to be extended together in the direction of the load carrier 3 for discharging the loading unit 5, while the lateral spacing 23 between the respective conveyor belts does not change.

[0127] The representation designated with the additional designation 3 also shows that during the loading of the roll container 3 with the loading unit 5, the corner turn pusher 8 has already been moved back onto the push plate 7 and has also carried out a lateral or transverse movement, so that another loading unit, in this case a loading unit with half a width, is already ready on the push plate 8 for positioning on the conveyor belt 20.

[0128] The representation designated with the additional designation 4 shows that this loading unit has been delivered by the push plate 7 onto the conveyor belt 20 and is then transported by means of the conveyor belt 20 in the direction of the roll container 3.

[0129] The representation designated with the additional designation 5 shows that while the small loading unit is still being discharged on the roll container 3 by means of the conveyor belt 20, a loading unit that is twice as wide as the small loading unit conveyed by the conveyor belt 20 has

already been provided on the push plate 7 in the coverage area of and in contact with the corner turn pusher 8, that is to say while loading units are still being conveyed in the direction of the load carrier, other loading units are already to be provided on the push plate 7 and even while a loading unit is being conveyed by one conveyor belt, here for example by the conveyor belt 20, in the direction of the load carrier, it is to be moved to another conveyor belt or other conveyor belts, here for example the conveyor belts 12, 13, so that the conveying of loading units in the direction of the load carrier by different conveyor belts 12, 13, 20 is also to be carried out simultaneously, which contributes to a considerable increase in the performance of the device according to the invention compared to known devices.

[0130] The representations designated with the additional designations 6, 7, 8 show that the conveying of a loading unit 5 in the direction of the roll container 3 is to take place simultaneously with the provision of another loading unit on the push plate 7 and its conveying in the direction of the roll container or another load carrier.

[0131] Finally, the representations designated with the additional designations 9, 10, 11, 12 are schematic representations that show that, with the device according to the invention, a loading unit of three times the width is also to be conveyed compared to the loading unit shown on the push plate 7 in the representation designated with the additional designation 3. The embodiment of the device according to the invention with three conveyor belts 12, 13, 20 therefore has the advantage that loading units with a width that corresponds to the width of one of the conveyor belts 12, 13, 20 and loading units with a width which rest on two conveyor belts when viewed in the width direction of the conveyor belts are to be transported simultaneously in the direction of the load carrier, whereby the hourly output of the device according to the invention in loading units per hour is to be significantly increased compared to the known device and loading units are also to be conveyed in the direction of the load carrier which rest on all three conveyor belts 12, 13, 20 when viewed in the width direction of the loading unit.

[0132] Fig. 48 of the drawing shows that two to three different loading units is to also be arranged one behind the other on two conveyor belts at the same time, which contributes to a considerable increase in the hourly output of the device according to the invention, the conveyor belts being able to be moved together or individually in the X direction, while they are always moved simultaneously in the transverse direction Z. Compared with the known device, the hourly output of the device according to the invention in loading units per hour also increases significantly because there is no change in the lateral spacing between the conveyor belts, for example depending

on a property of the loading units, and thus such a respective adjustment of the spacing between the conveyor belts also leads to a time advantage in favour of the device according to the invention.

[0133] The device according to the invention and the method according to the invention are now characterised, inter alia, in that different and, in particular, differently dimensioned loading units is to be automatically assembled on the load carrier in the predetermined sequence to form stacks of loading units, the loading units being able to be in the form of containers of different sizes. For example, the device and the method is to be used for picking fruit and vegetable products or other fresh produce or other goods. For the sake of clarity only, such loading units or containers filled with fruit and vegetable products may have base dimensions of 600 by 400 mm or 300 by 400 mm. Since such containers are usually designed to be open at the top and the products they contain are also very sensitive to pressure, known automated palletising devices are unsuitable for the desired automated picking of such sensitive products.

[0134] The device according to the invention is also characterised in that the loading units or containers are always supported from below during the entire transportation process from the push plate to the positioning of the loading units on the load carrier, that is to say the loading units rest with their respective base surface fully on the push plate and also rest fully or almost fully on the conveyor belts of the positioning conveyor and in particular the situation does not arise that a wide loading unit or container rests on conveyor belts only with lateral areas of the base surface, as is the case with the known device. This also reduces the risk that a base area of the loading unit, which is inherently moist due to the products arranged in the loading unit in the container, will tend to bend or break. In contrast to the known device, in the device according to the invention the loading units to be handled in each case do not first have to be aligned relative to the positioning conveyor by means of an adjusting unit provided with conveyor belts either, resulting in a significant time advantage in the handling of the loading units and thus considerably increasing the hourly output of the device according to the invention.

[0135] Furthermore, in the device and the method according to the invention, only one respective belt transition takes place, that is to say when the loading unit is transferred from the push plate to the conveyor belt or conveyor belts of the positioning conveyor. At such a belt transition, there is a risk of the loading unit twisting relative to the conveyor belt or conveyor belts, particularly if the conveyor belt is dirty. This problem has also been eliminated by the device and the method according to the invention, since the respective loading unit is held aligned relative to the conveyor belt or conveyor belts by the cross pusher during this belt transition until the loading unit is fully positioned on the conveyor belt or conveyor belts, so that positioning of the loading unit on the

conveyor belt or conveyor belts in a twisted or rotated position relative to the longitudinal direction of the respective conveyor belt is avoided.

[0136] With regard to features of the invention that are not explained in more detail above, reference is expressly also made to the patent claims and the drawing.

List of reference numerals

[0137]

1. Device
2. Load carrier
3. Roll container
4. Euro pallet
5. Loading unit
6. Feed device
7. Push plate
8. Pusher, corner turn pusher
9. Pushing surface
10. Abutment surface
11. Drive
12. Conveyor belt
13. Conveyor belt
14. Control device
15. Conveyor
16. Combination conveyor lift
17. Combination conveyor
18. Positioning conveyor
19. Transfer conveyor
20. Conveyor belt
21. Lineal conveyor unit
22. Linear unit, linear conveyor unit
23. Lateral spacing
24. Stop
25. Side stop

26. Strap
27. Strap
28. End regions
29. Surface
30. Front side
31. Surface
32. Bearing surface
33. Lifting platform
34. Receiving surface
35. Side grating
36. Side grating
37. Apparatus
38. Receptacle
39. Receptacle
40. Longitudinal centre axis
41. Discharging end region
42. Wedge-shaped configuration

Krav:

1. Indretning (1), som er indrettet til automatiseret lastning af en lastbærer (2) med lastenheder (5), som danner en laststabel, hvorved indretningen (1) har et transportørmiddel (17), som er indrettet til at transportere lastbæreren (2) i mindst én plan retning (X-retning) og én lodret akseretning (Y-retning), og indretningen har en positioneringstransportørindretning (18) med mindst to transportbånd (12, 13, 20), som er indrettede til at transportere lastenheden (5) i retning af lastbæreren (2), hvorved transportbåndene (12, 13, 20) er indrettede til transportbevægelse i forhold til lastbæreren (2) i længderetningen (X-retning) og i tværretningen (Z-retning), og indretningen har en overføringstransportør (19), som er indrettet til at transportere lastenheden (5) over på positioneringstransportørindretningen (18), **kendetegnet ved at** positioneringstransportørindretningen (18) har én mellem transportbåndene (12, 13, 20) tilvejebragt tilsigtet fast sideafstand (23), som er uafhængig af lastenheden (5), og overføringstransportøren (19) har en skubbeplade (7), som modtager lastenheden (5), og en skubber (8), som er tilvejebragt til transport af lastenheden (5) på skubbepladen (7) i retning af positioneringstransportørindretningens (18) transportbånd (12, 13, 20).

2. Indretning ifølge krav 1, **kendetegnet ved at** skubberen (8) er udformet som en vinkeludskubber med en anlægsflade (10) og en skubbeflade (9), og er udformet til positionering i forhold til skubbepladen (7) afhængig af den på lastbæreren (2) forudbestemte position af lastenheden (5).

3. Indretning ifølge krav 1 eller 2, **kendetegnet ved at** skubberen (8) og transportbåndene (12, 13, 20) kan placeres uafhængigt af hinanden i retning på tværs af transportbåndenes (12, 13, 20) transportretning afhængigt af den på lastbæreren (2) forudbestemte position af lastenheden (5).

4. Indretning ifølge et af de foregående krav, **kendetegnet ved at** transportbåndene (12, 13, 20) er udformede, så de kan styres uafhængigt af hinanden i transportretningen mod lastbæreren (2).

5. Indretning ifølge et af de foregående krav, **kendetegnet ved at** transportbåndene (12, 13, 20) er udformede til at kunne skyde frem uafhængigt af hinanden i retning mod lastbæreren (2) og samtidigt altid har en uændret afstand (23) fra hinanden i tværretningen.

6. Indretning ifølge et af de foregående krav, **kendetegnet ved** en indretning (37) til at modtage respektive sideanlægsflader (35, 36) på en lastbærer (2), som er udformet som en rullecontainer (3), hvorved indretningen (37) er udformet til opretning af anlægsfladerne (35, 36) stort set parallelt med hinanden.

7. Indretning ifølge krav 6, **kendetegnet ved at** indretningen (37) er udformet med kilefladeform og har en til en respektive anlægsflade (35, 36) allokeret kontaktflade, og som set ovenfra har en konfiguration, som udvider sig i transportretningen mod lastbæreren (2), eller indretningen har en drejeligt arrangeret rulle, som er allokeret en respektive anlægsflade, og hvis ydre periferiske overflade er kileformet set fra oven i et tværsnit gennem rullen.

8. Indretning ifølge et af de foregående krav, **kendetegnet ved at** transportbåndene (12, 13, 20) hver har en bærende båndpart og en ikke-bærende båndpart, og har en, i retningen mod lastbæreren i lodret akseretning, tilspidsende konfiguration (42) mellem den bærende båndpart og den ikke-bærende båndpart.

9. Indretning ifølge et af de foregående krav, **kendetegnet ved at** skubberen (8) er udformet til bevægelse i transportbåndenes (12, 13, 20) retning med en hastighed svarende til transportbåndets transporthastighed.

10. Indretning ifølge et af de foregående krav, **kendetegnet ved at** transportbåndene (12, 13, 20) er udformede til en fælles forskydningsbevægelse i retning på tværs af transportbåndets (12, 13, 20) transportretning.

11. Indretning ifølge et af de foregående krav, **kendetegnet ved at** positioneringstransportørindretningen (18) har tre transportbånd (12, 13, 20), som kan være i drift uafhængigt af hinanden og sammen kan forskydes på tværs af transportretningen.

12. Indretning ifølge et af de foregående krav, **kendetegnet ved** en styreindretning (14), som
    - er udformet til, ved hjælp af et drev (11), at aktivere skubberen (8) i retningen mod transportbåndene (12, 13, 20) med en transporthastighed svarende til

transportbåndets (12, 13) transporthastighed (20) i transportretningen mod lastbæreren (2),

og/eller

- ved hjælp af et drev skal aktivere et transportbånd (12, 13, 20) i retning på tværs af transportbåndets (12, 13, 20) transportretning under bibeholdelse af en fast sideafstand til hinanden mellem transportbåndene (12, 13, 20).

13. Fremgangsmåde til automatiseret lastning af en lastbærer (2) med lastenheder (5), som danner en laststabel, hvori en lastbærer (2) dertil bliver transporteret i mindst én plan retning (X-retning) og én lodret akseretning (Y-retning), og lastenheden (5) bliver transporteret i retning mod lastbæreren (2) ved hjælp af en positioneringstransportørindretning (18) med mindst to transportbånd (12, 13, 20), hvorved transportbåndene (12, 13, 20) kan transportere i længderetningen (X-retning) og i tværretningen (Z-retning) i forhold til lastbæreren (2), og lastenheden (5) bliver transporteret ved hjælp af en overføringstransportør (19) på positioneringstransportørindretningen (18), **kendetegnet ved at** lastenheden (5) bliver transporteret ved hjælp af en skubber (8) over på positioneringstransportørindretningens (18) transportbånd (12, 13, 20) af en skubbeplade (7), og under en bevægelse i længderetningen (X-retningen) og i tværretningen (Z-retningen) har transportbåndene (12, 13, 20) en tilsigtet fast afstand (23) til hinanden mellem transportbåndene (12, 13, 20).

14. Fremgangsmåde ifølge krav 13, **kendetegnet ved at** der for at reducere en afstand mellem lastenheder (5), som er arrangerede på lastbæreren (2), før eller efter opnåelsen af en forudbestemt position af lastenheden (5) i længderetningen i forhold til lastbæreren (2), udføres en tværgående bevægelse af transportbåndene (12, 13, 20) til levering af lastenheden på lastbæreren (2) eller på en anden lastenhed (5), hvorved transportbåndene (12, 13, 20) bliver bevæget på tværs som en samlet strukturel enhed på grund af den tværgående bevægelse.

15. Fremgangsmåde ifølge krav 13 eller 14, **kendetegnet ved at**, til levering af lastenheden (5) bliver transportbåndene (12, 13, 20) trukket tilbage imod transportbåndenes (12, 13, 20) transportretning med en tilbagetrækningshastighed, som er lavere end transporthastigheden af transportbåndenes (12, 13, 20) bånd (26, 27), og transportbåndene (12, 13, 20) bliver forskudt i tværgående retning stort set samtidig med tilbagetrækningsbevægelsen.

16. Fremgangsmåde ifølge et af kravene 13 til 15, **kendetegnet ved at** en lastbærers (2) sideanslægsflader (35, 36) bliver oprettet stort set parallelt med hinanden ved at den indvendige afstand mellem anlægsfladerne (35, 36) bliver ændret ved hjælp af kileflader og/eller ruller, som befinder sig i kontakt med anlægsfladerne (35, 36).

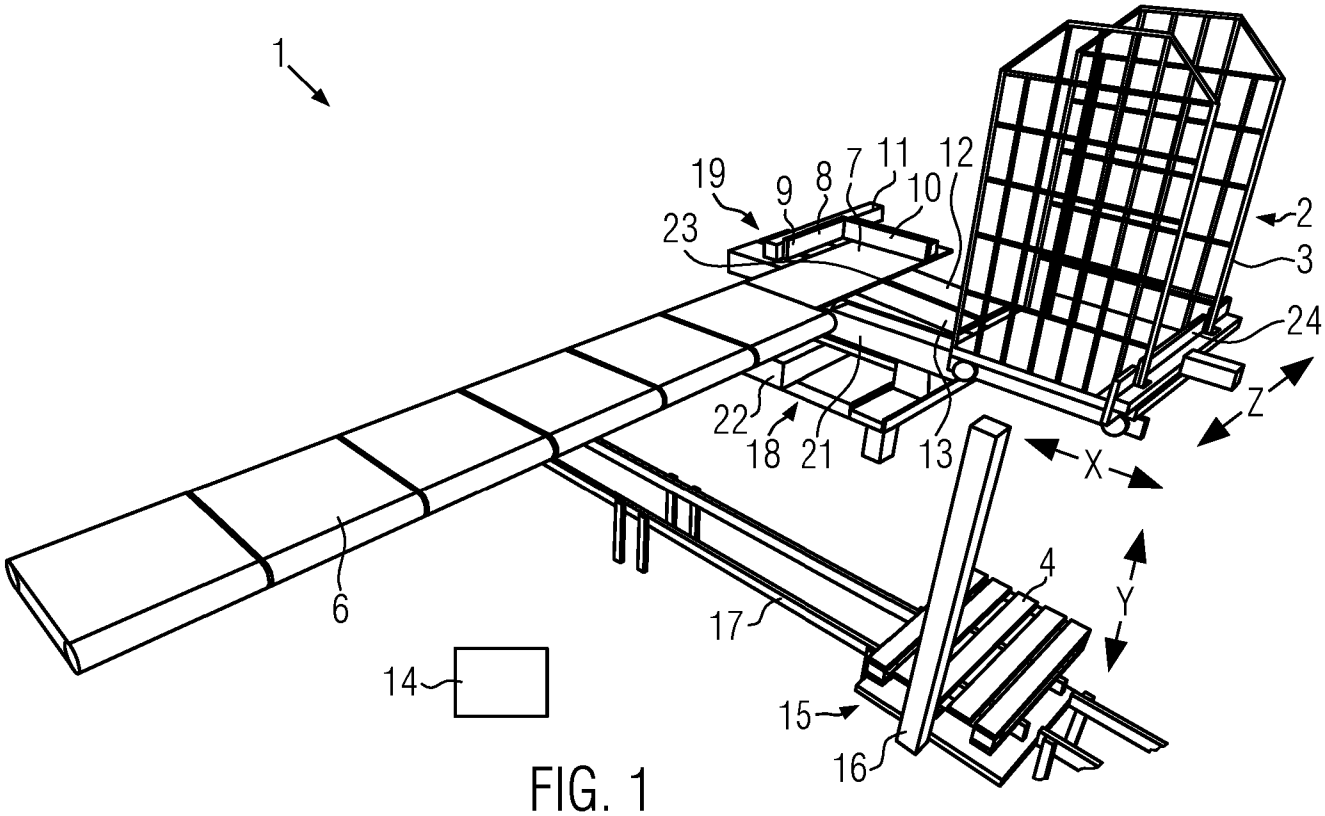

FIG. 1

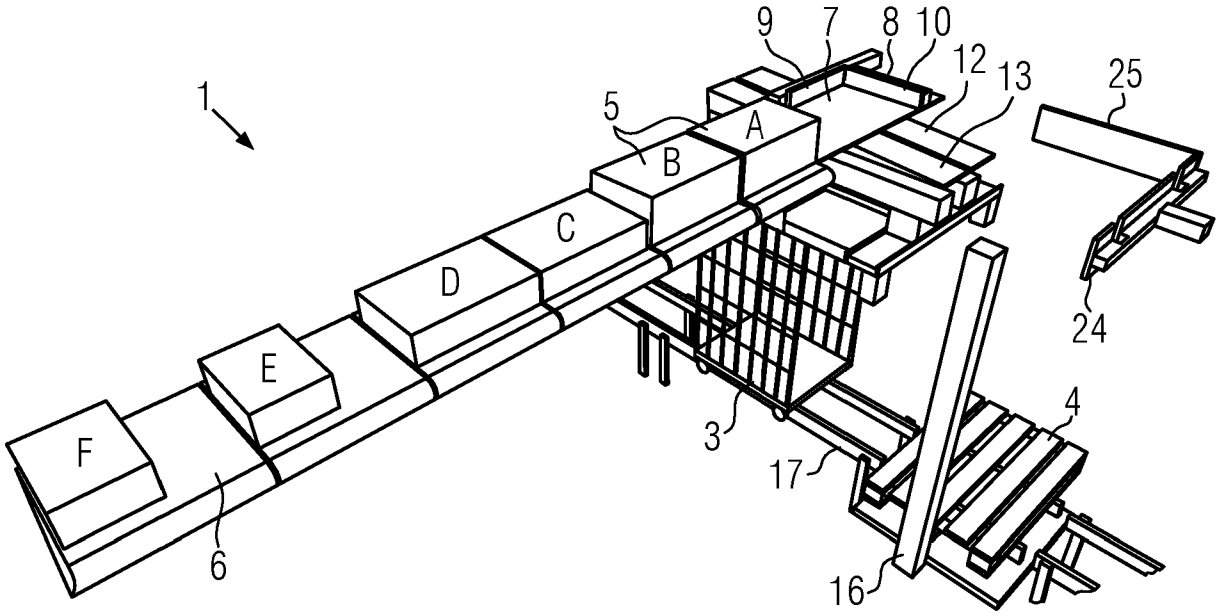
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FIG. 2

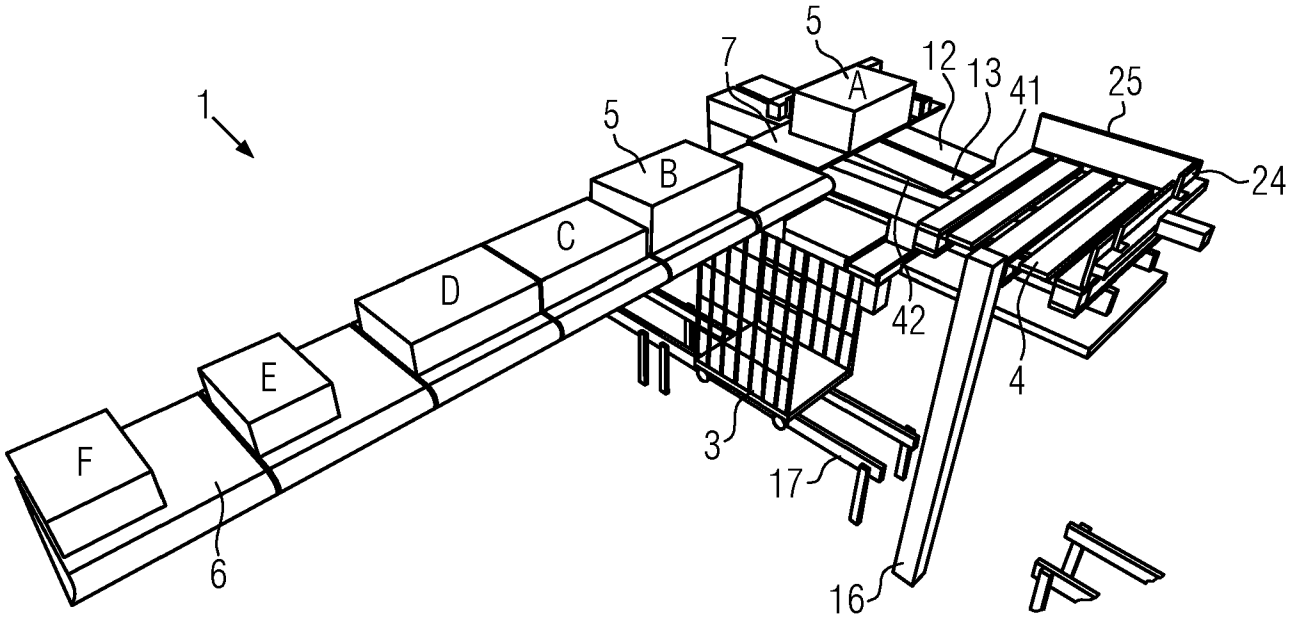
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FIG. 3

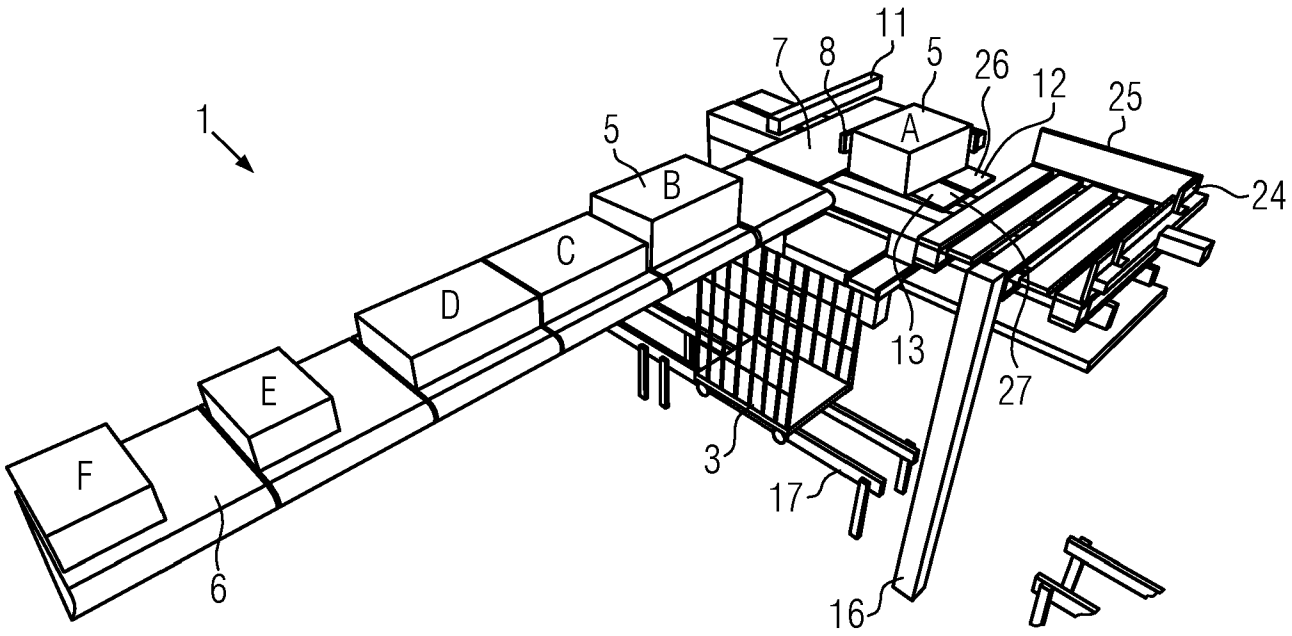
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FIG. 4

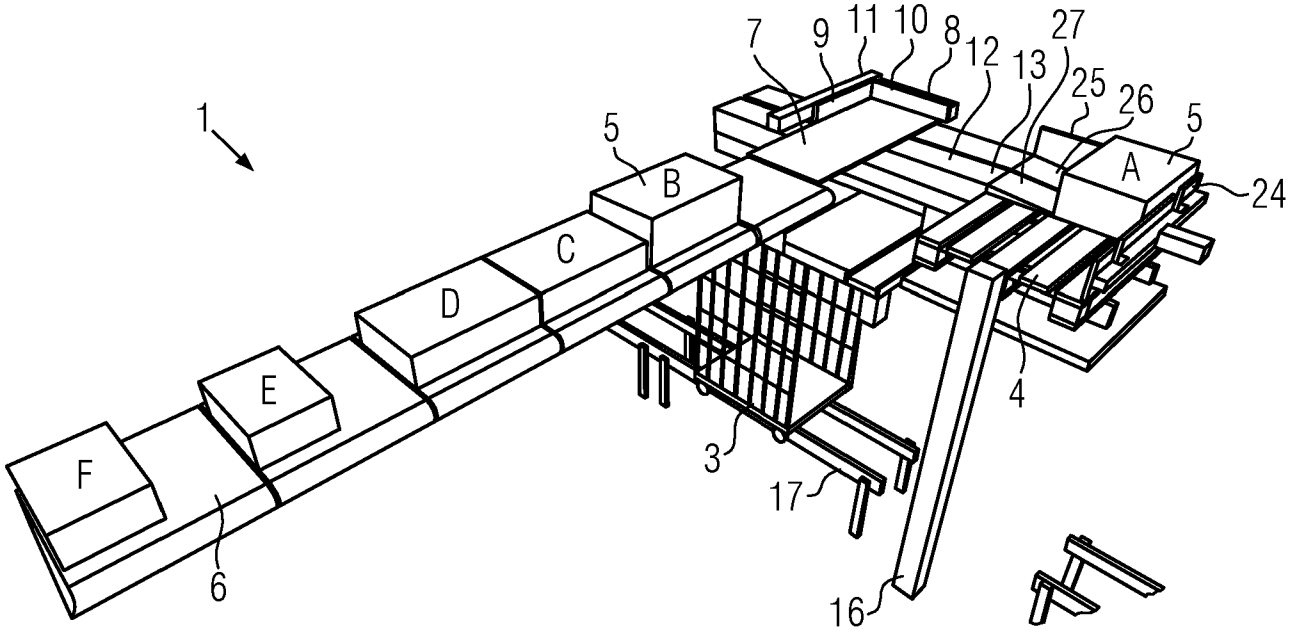
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FIG. 5

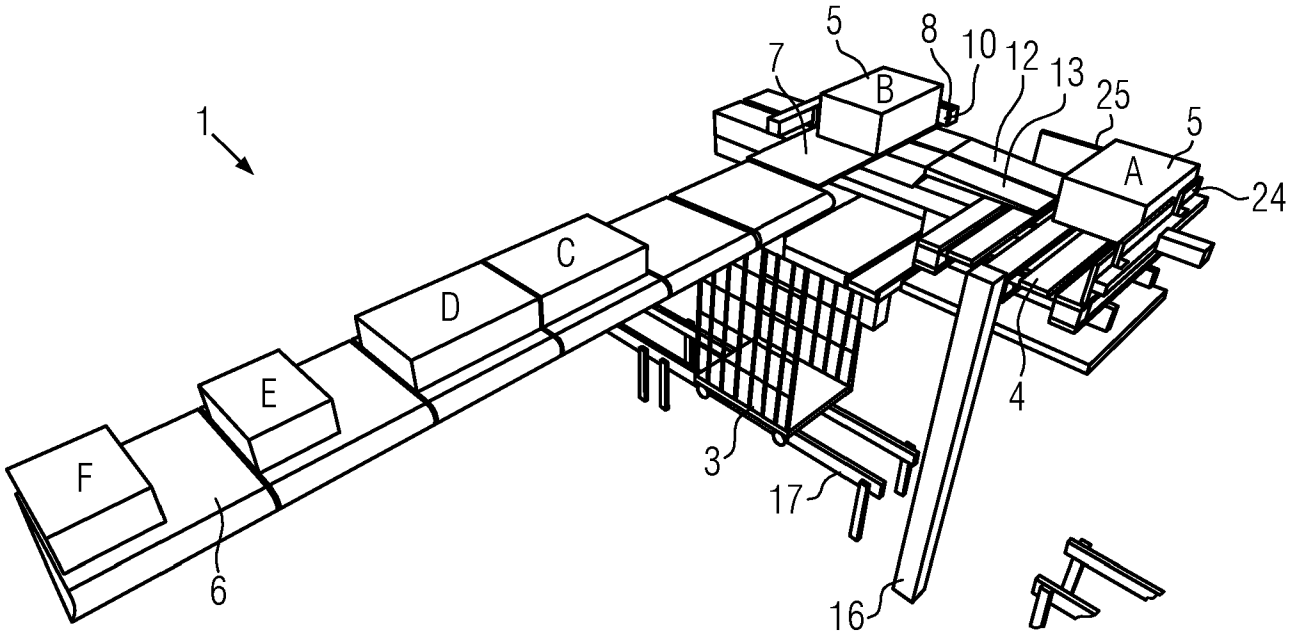
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FIG. 6

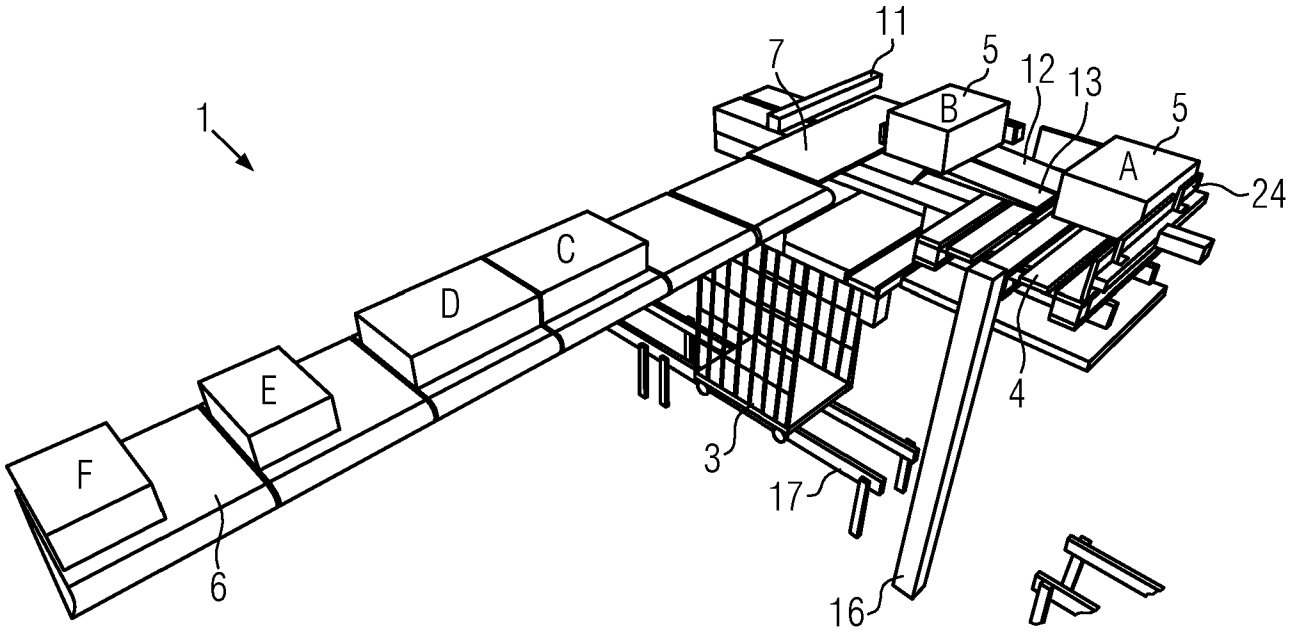
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FIG. 7

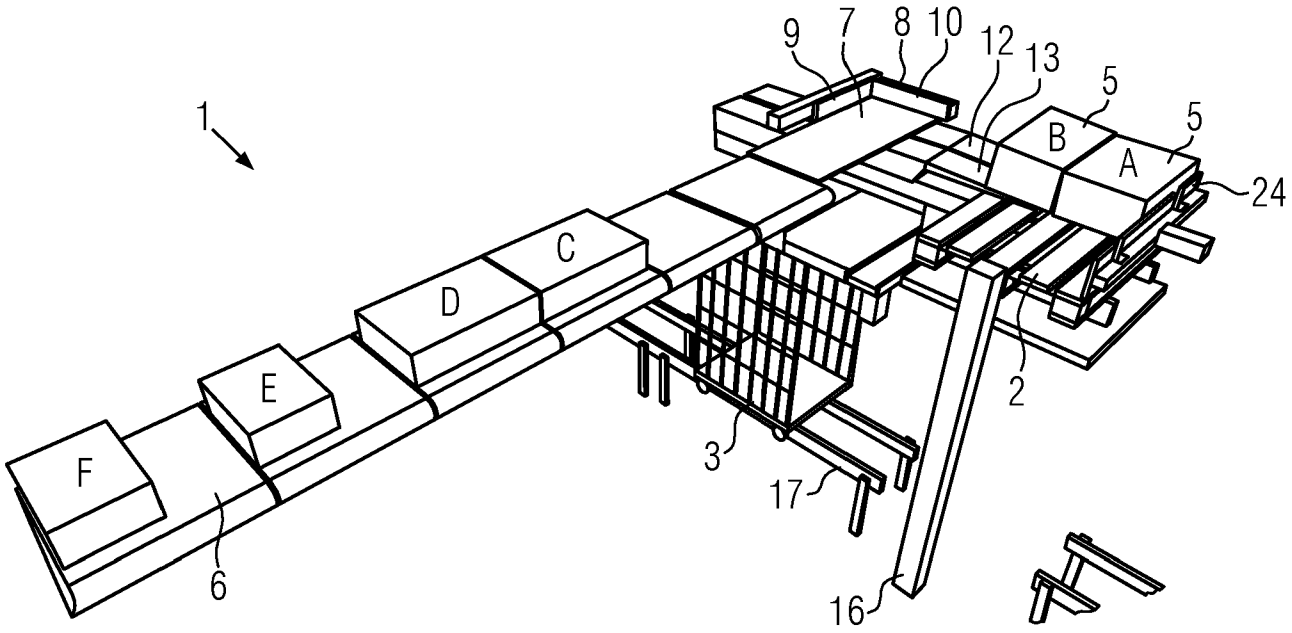
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FIG. 8

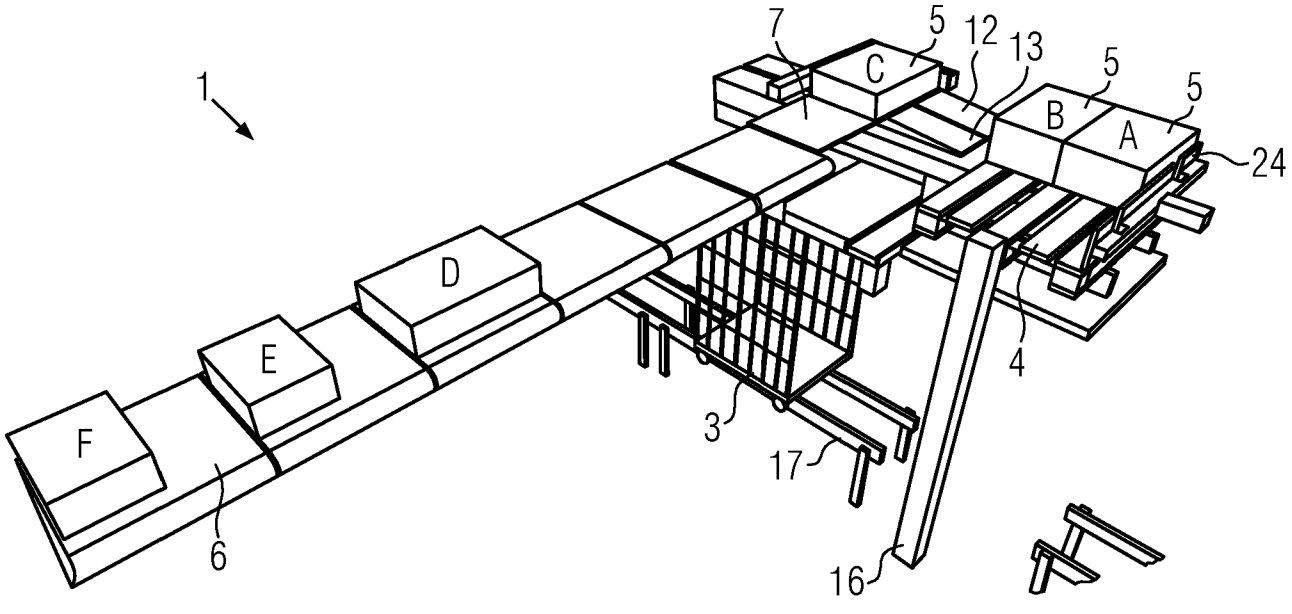
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FIG. 9

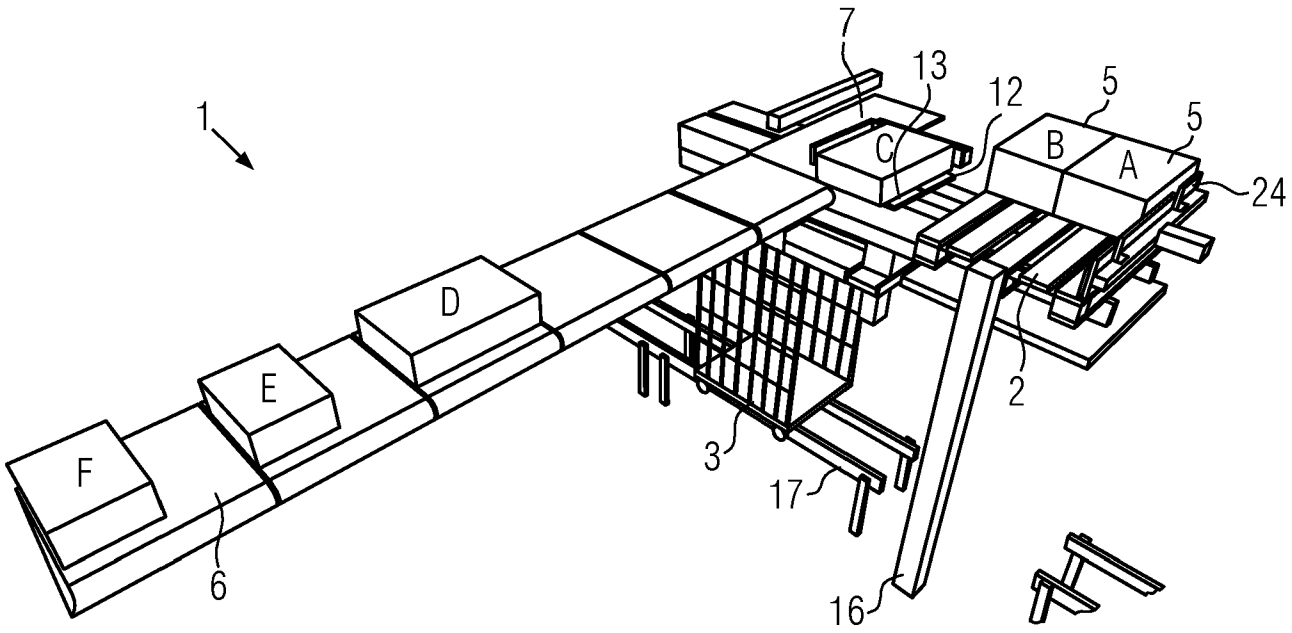
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FIG. 10

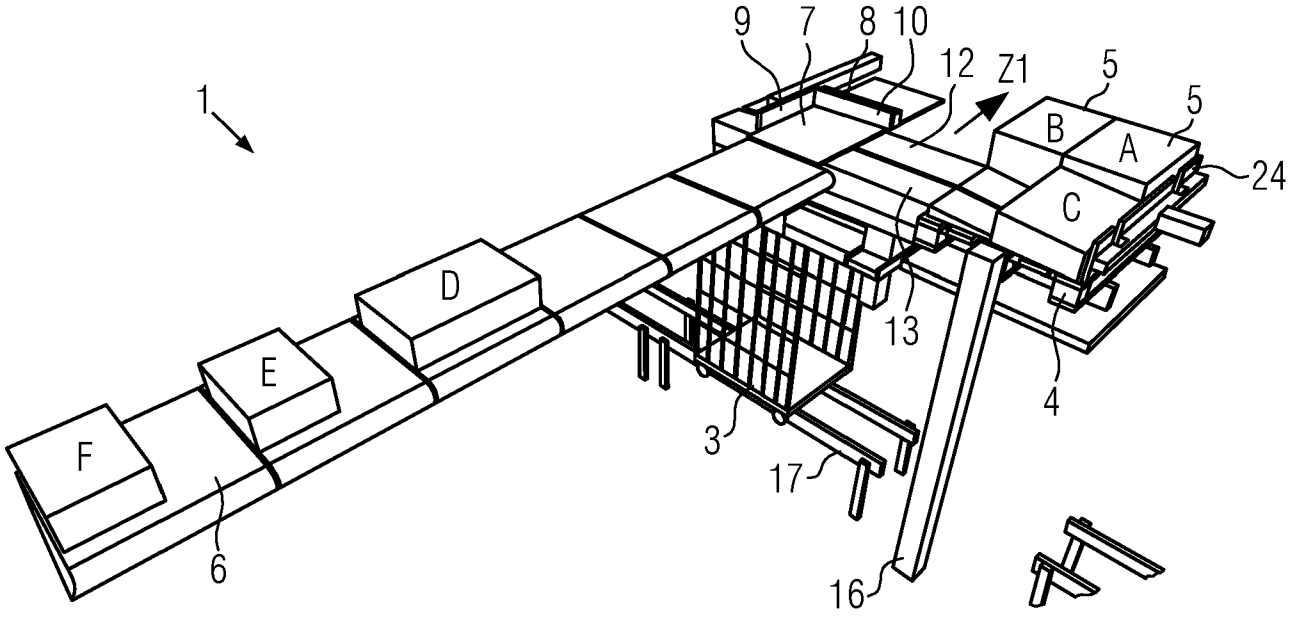
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FIG. 11

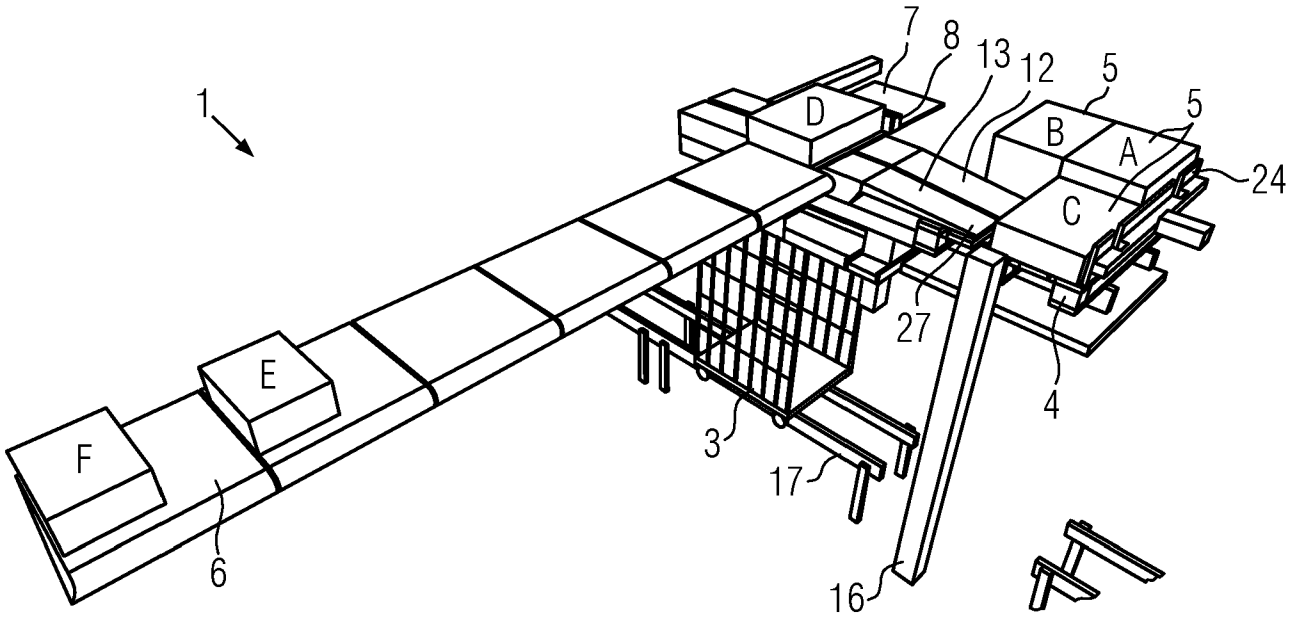
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FIG. 12

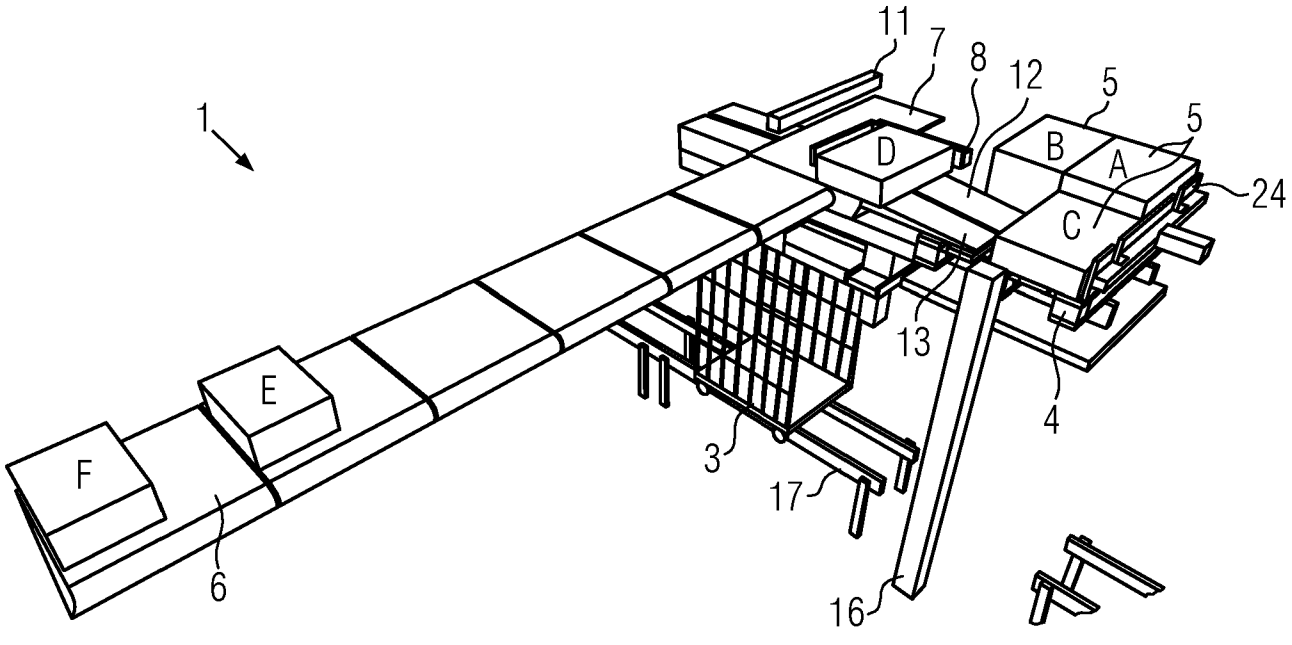
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FIG. 13

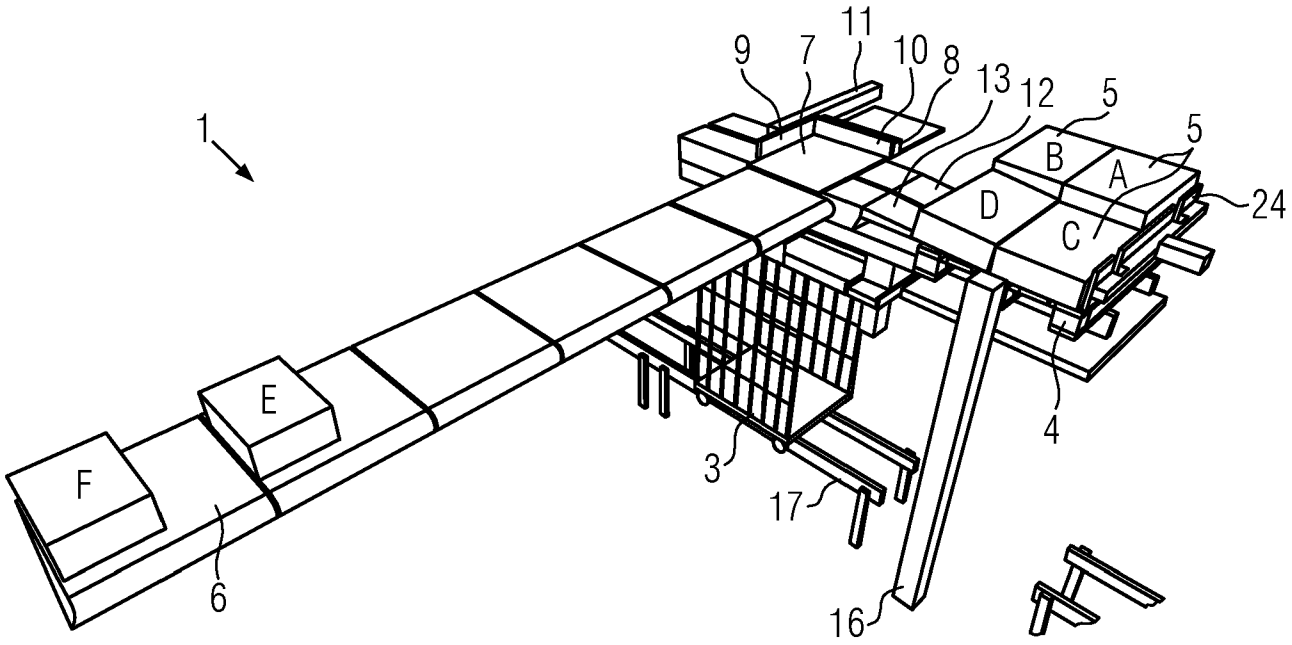
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FIG. 14

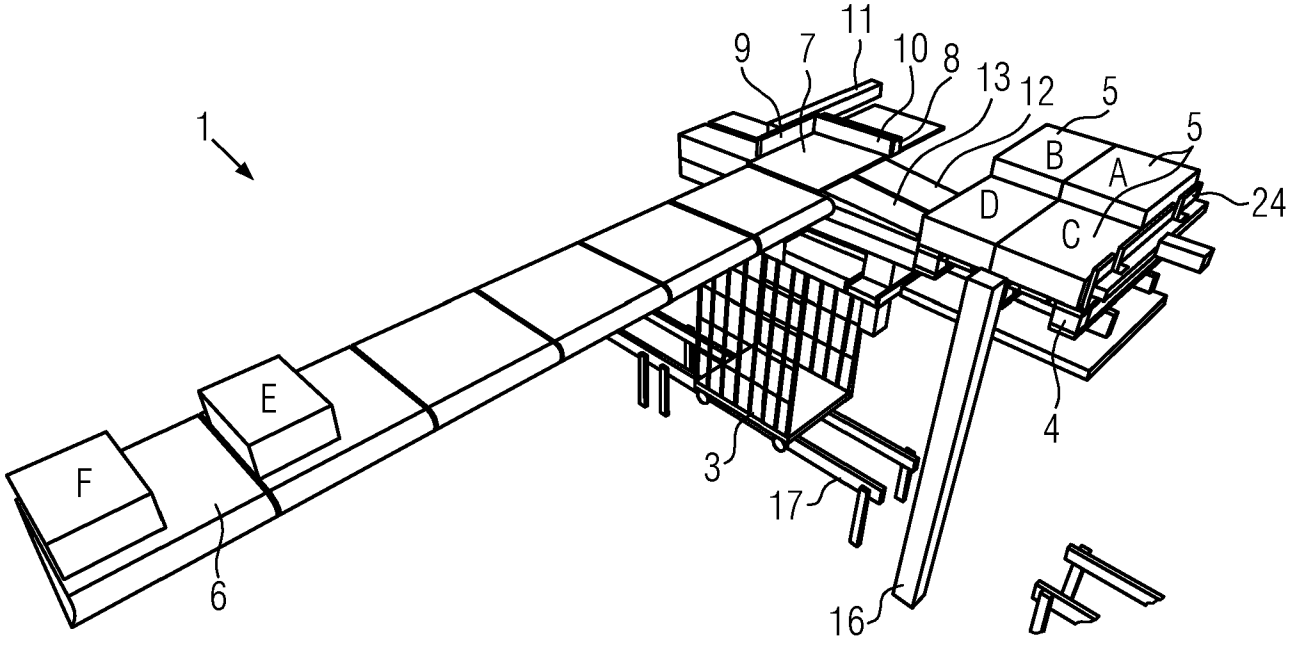
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FIG. 15

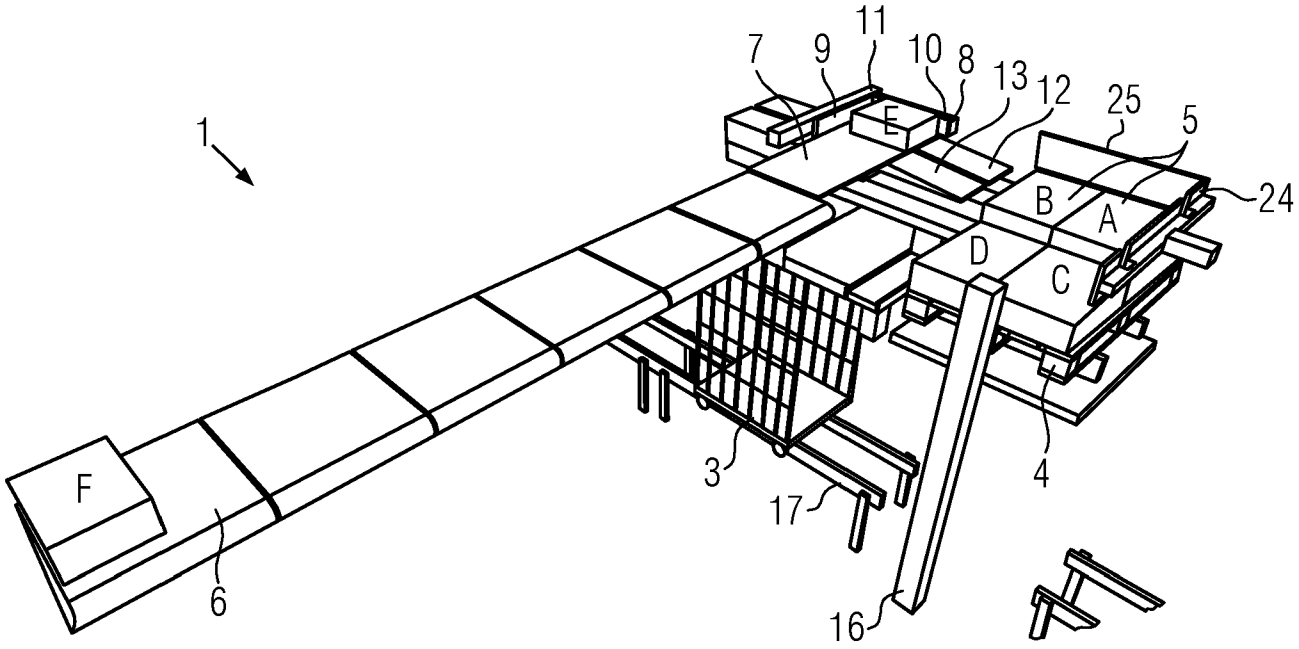
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FIG. 16

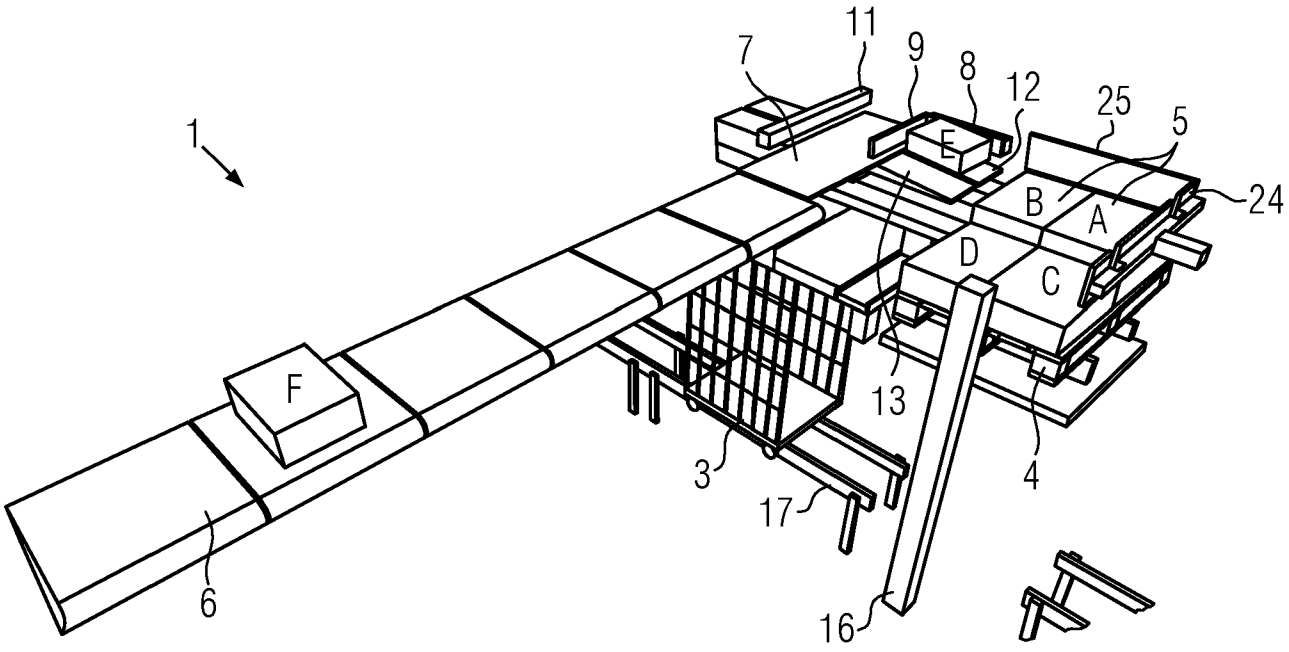
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FIG. 17

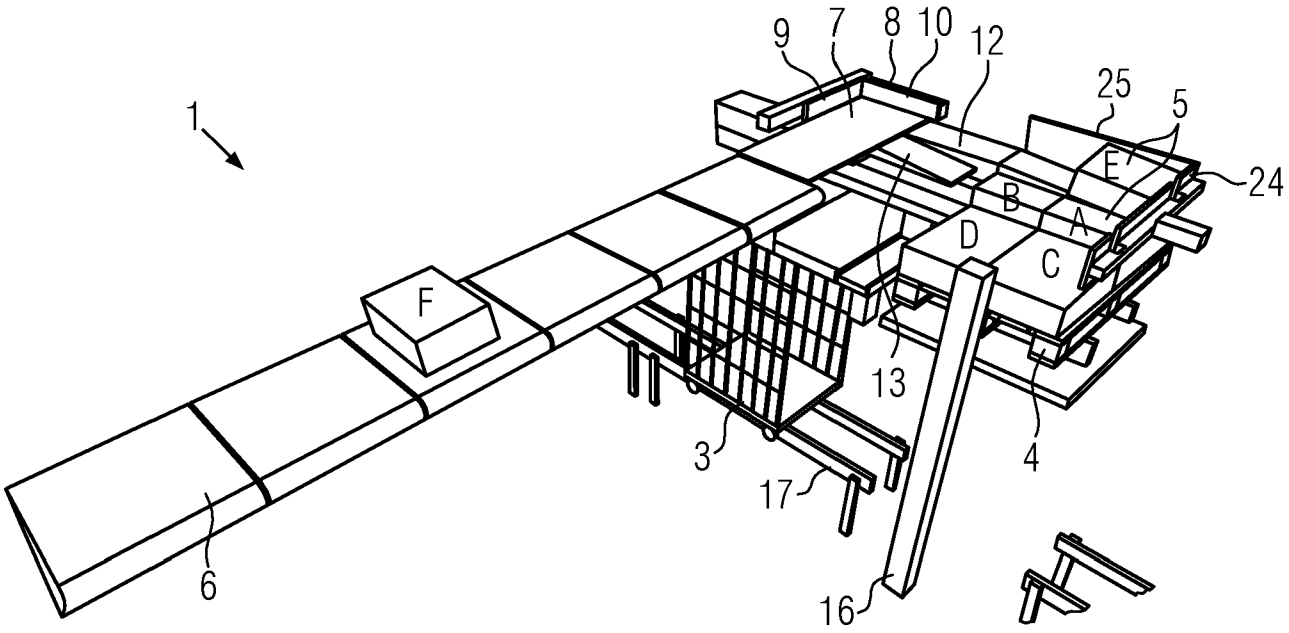
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FIG. 18

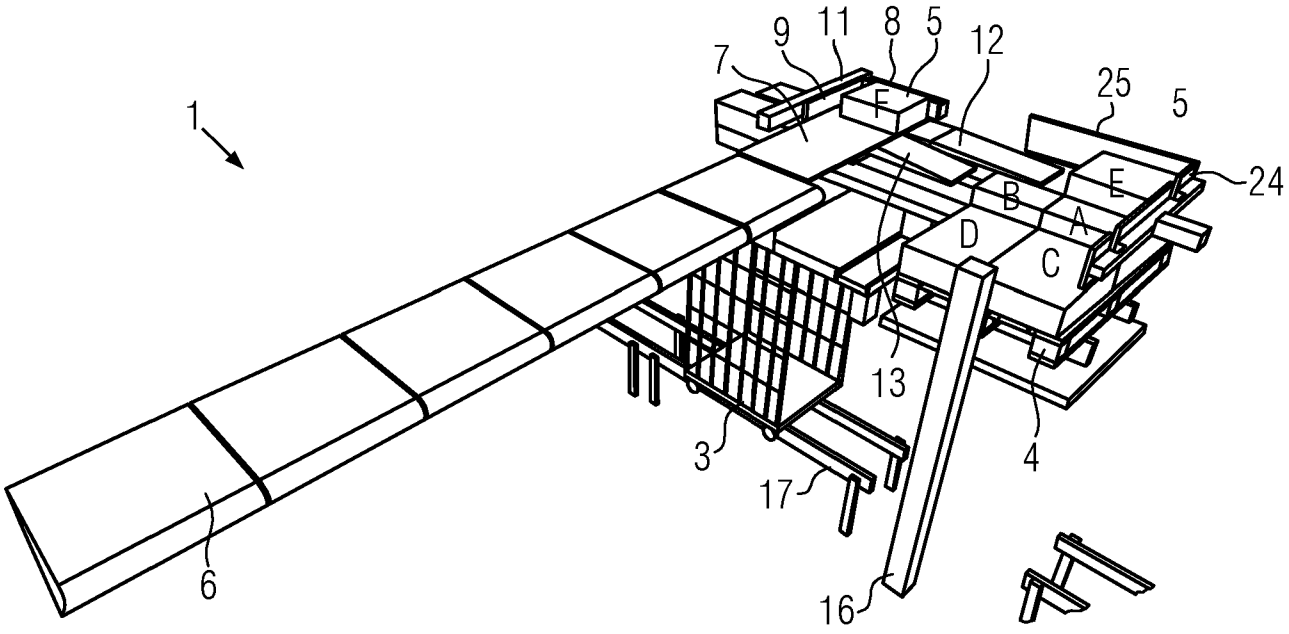
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FIG. 19

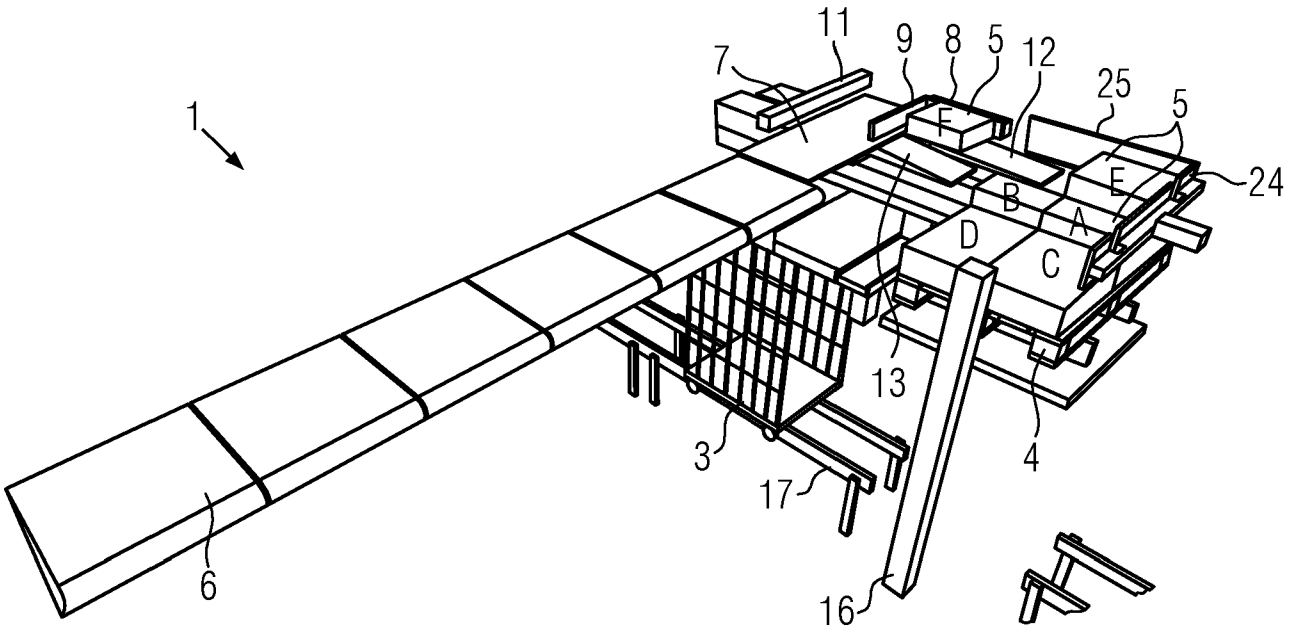
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FIG. 20

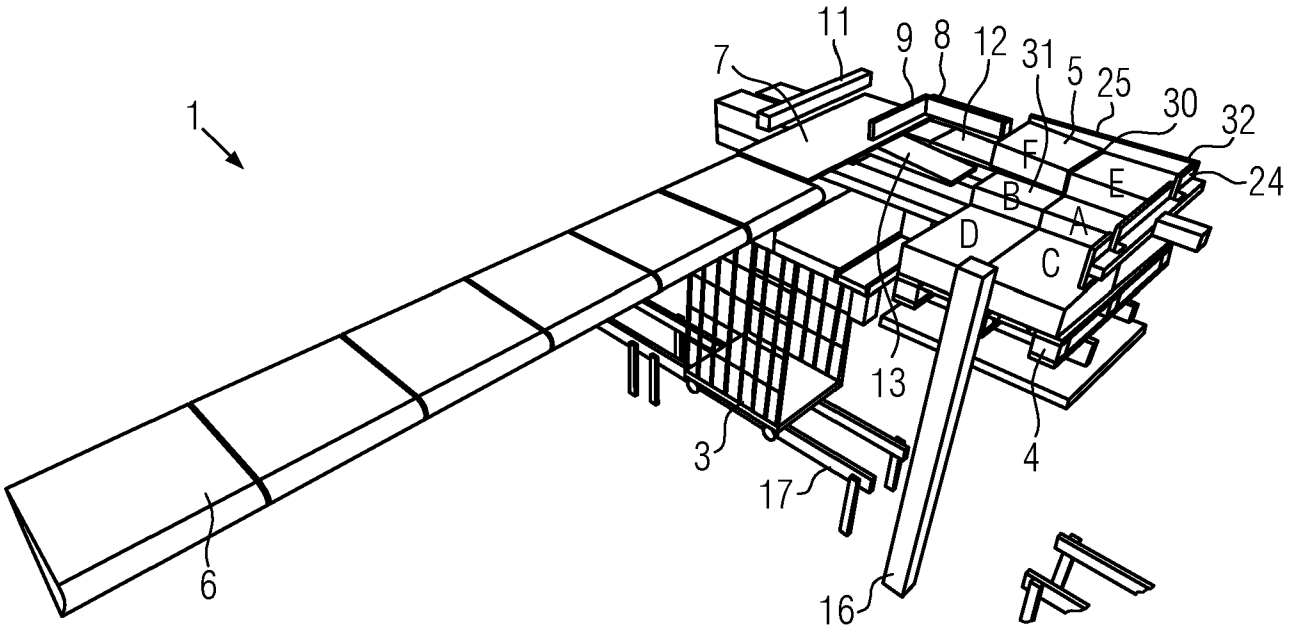
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FIG. 21

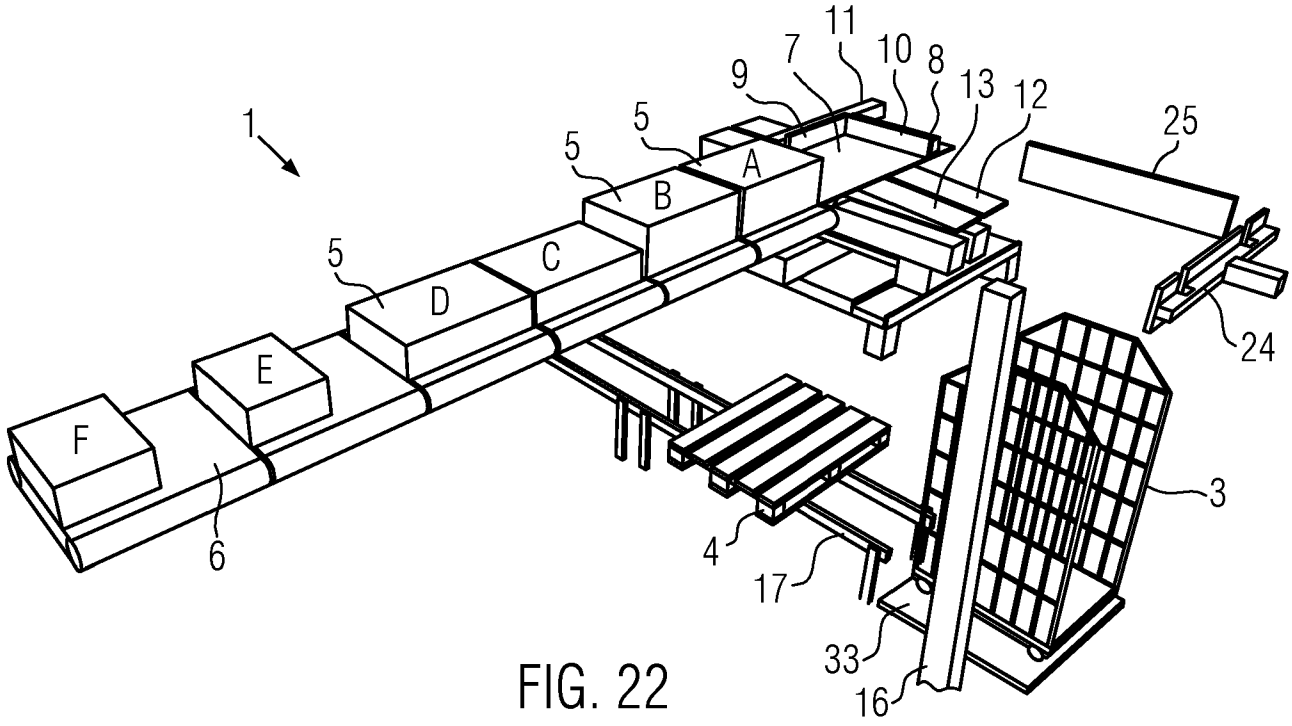
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FIG. 22

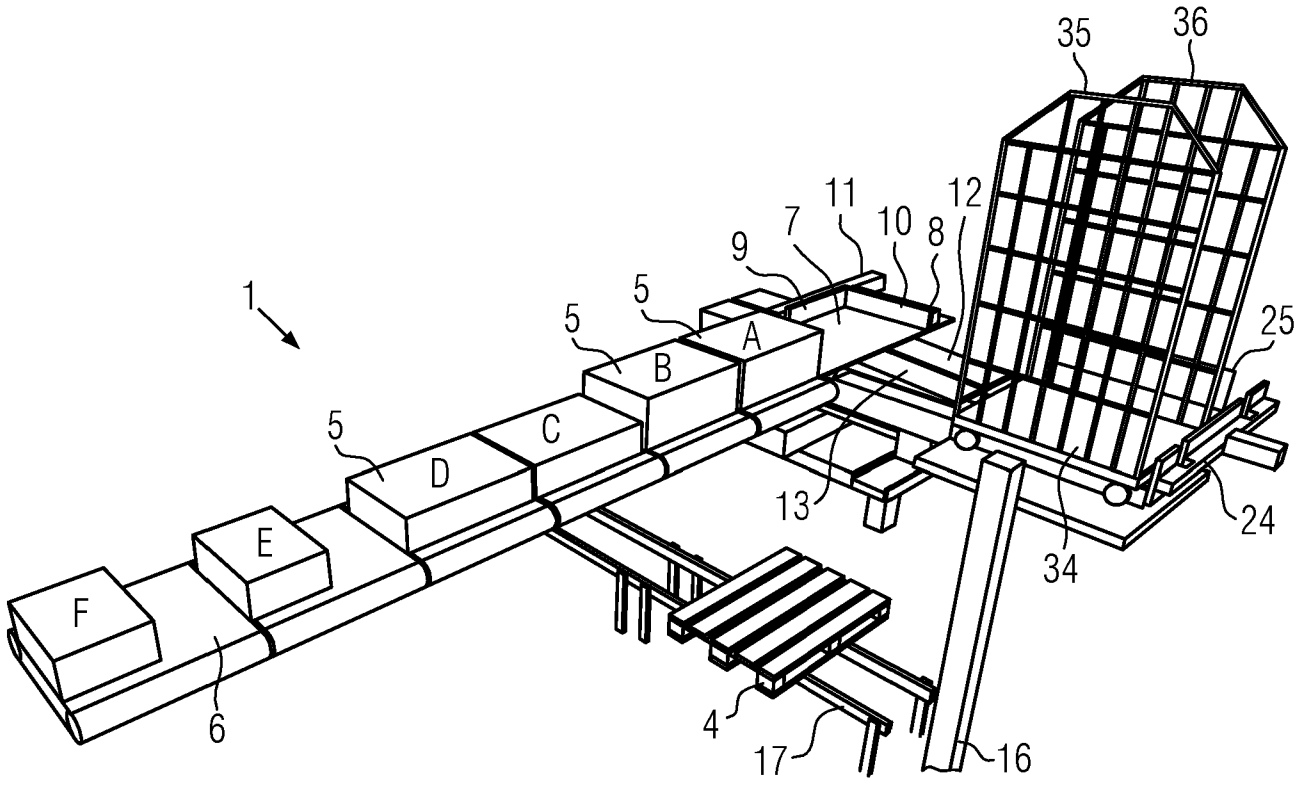
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FIG. 23

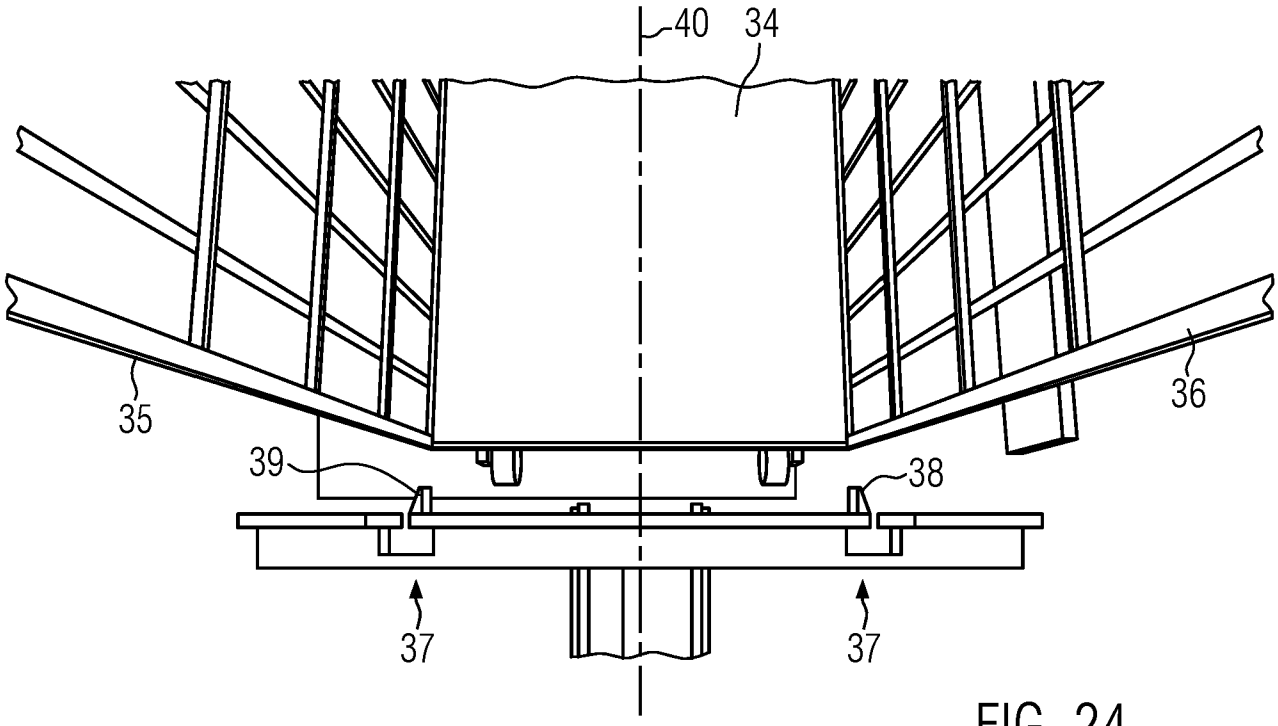

FIG. 24

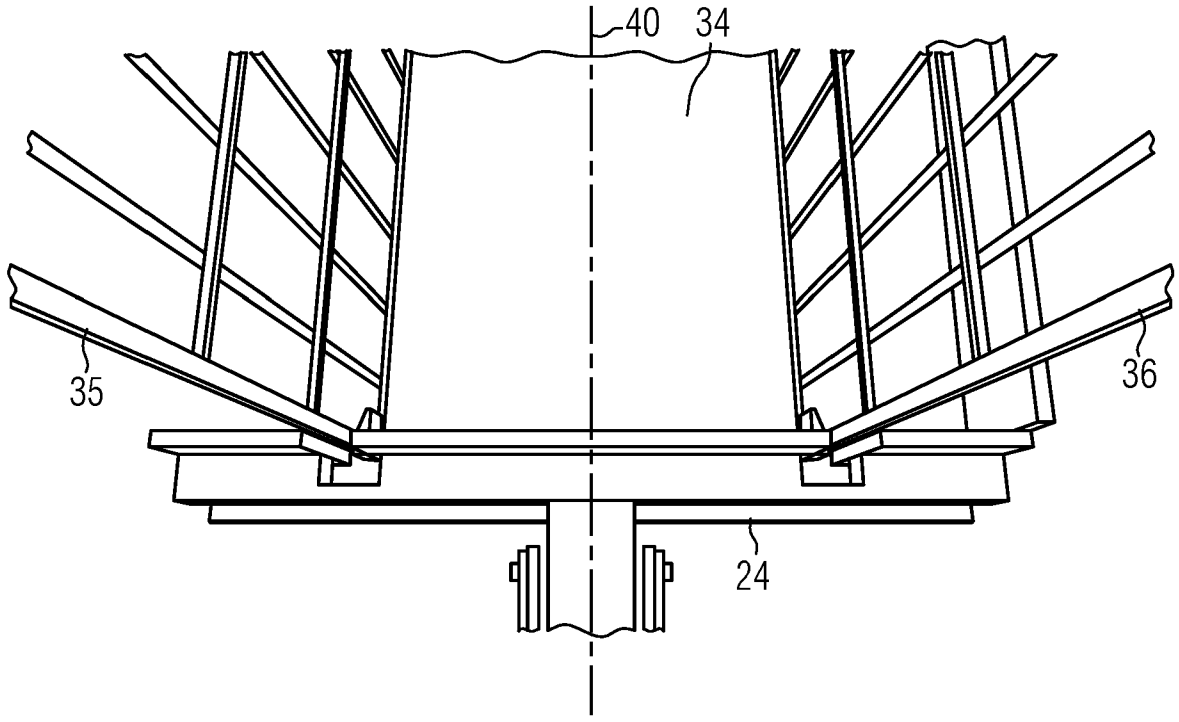

FIG. 25

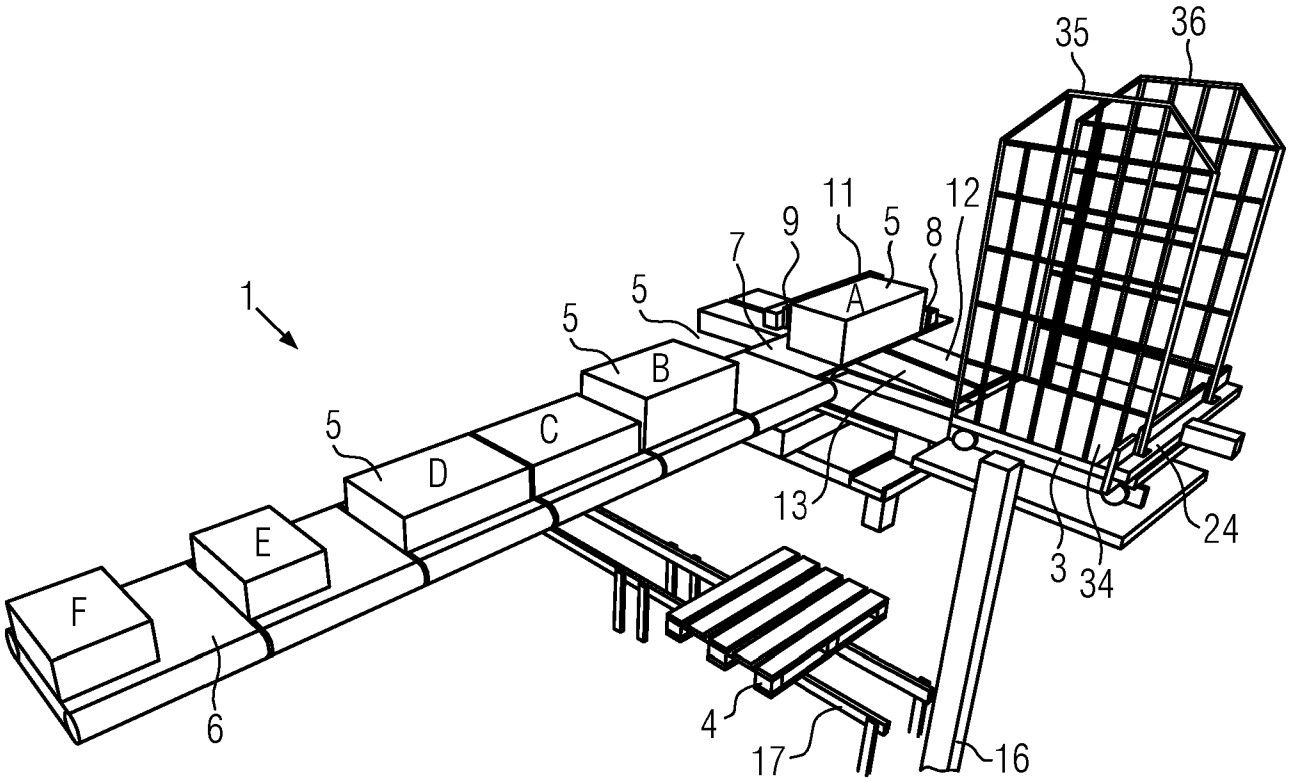
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FIG. 26

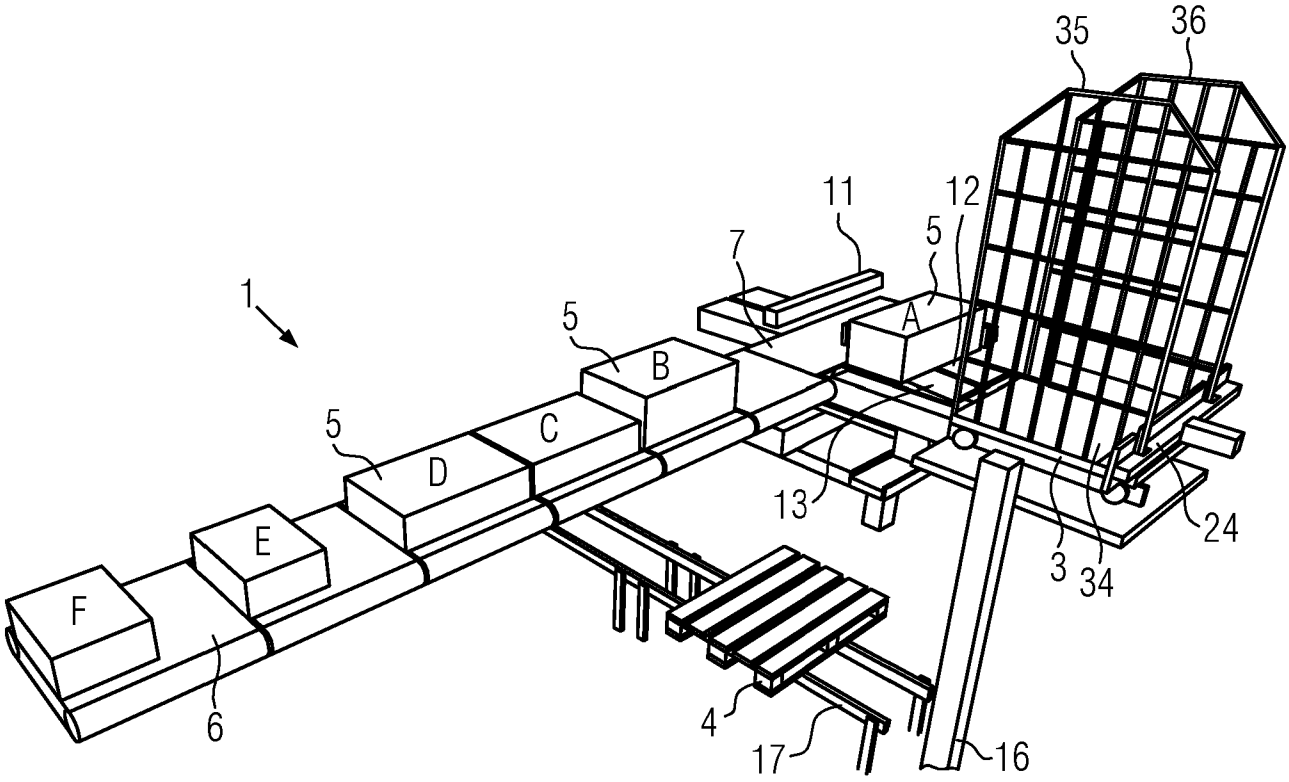
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FIG. 27

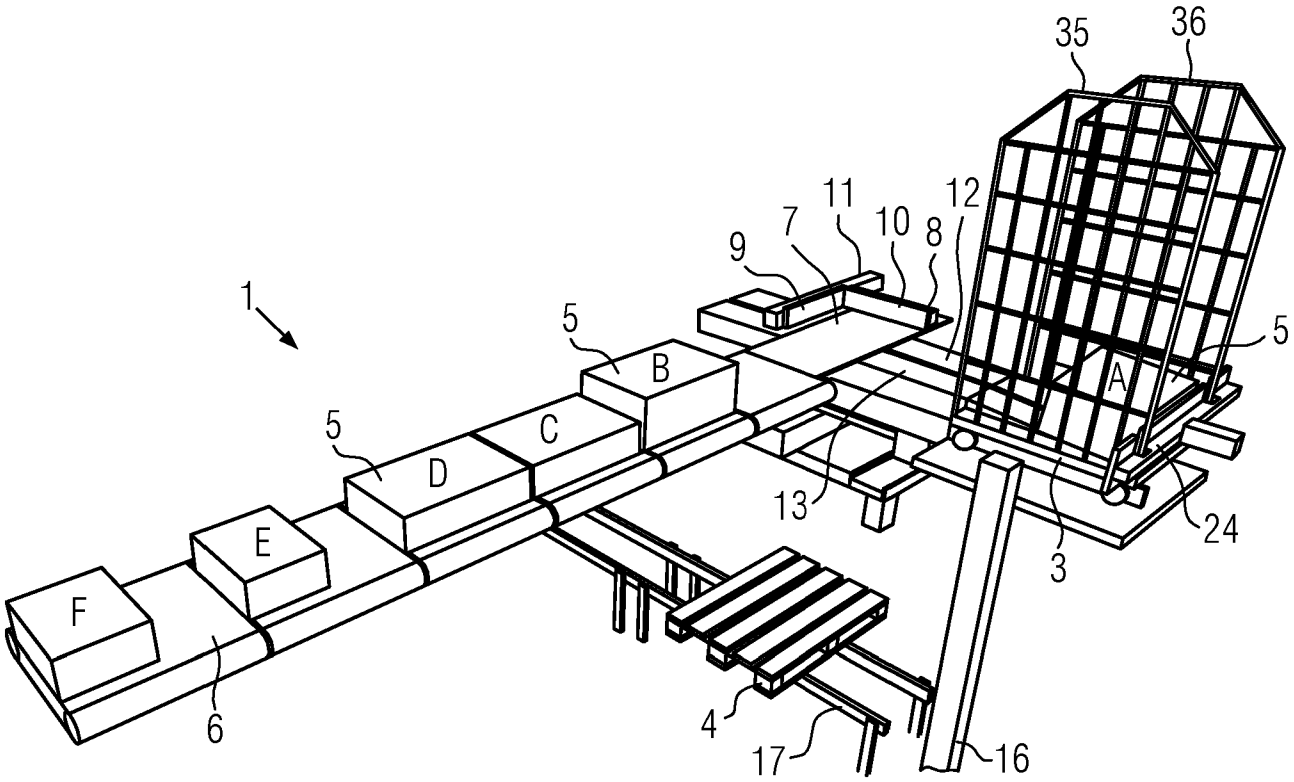
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FIG. 28

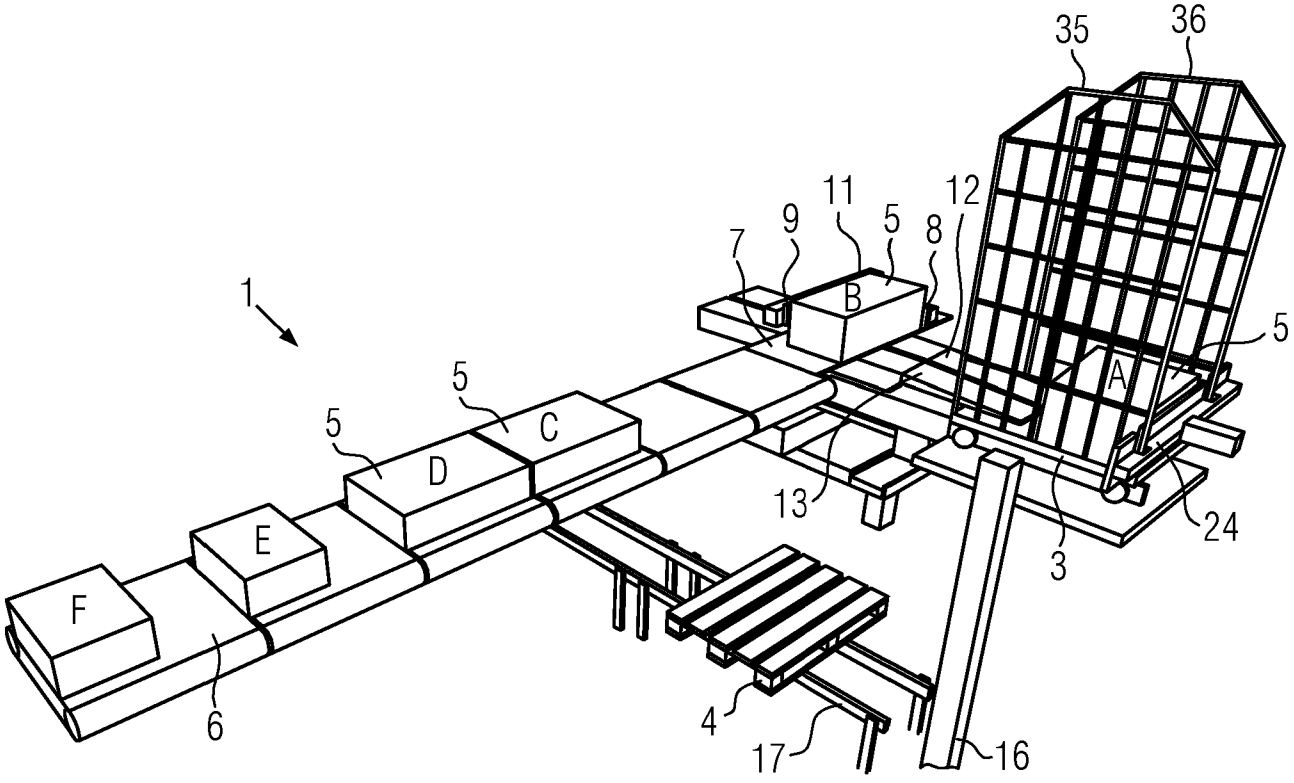
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FIG. 29

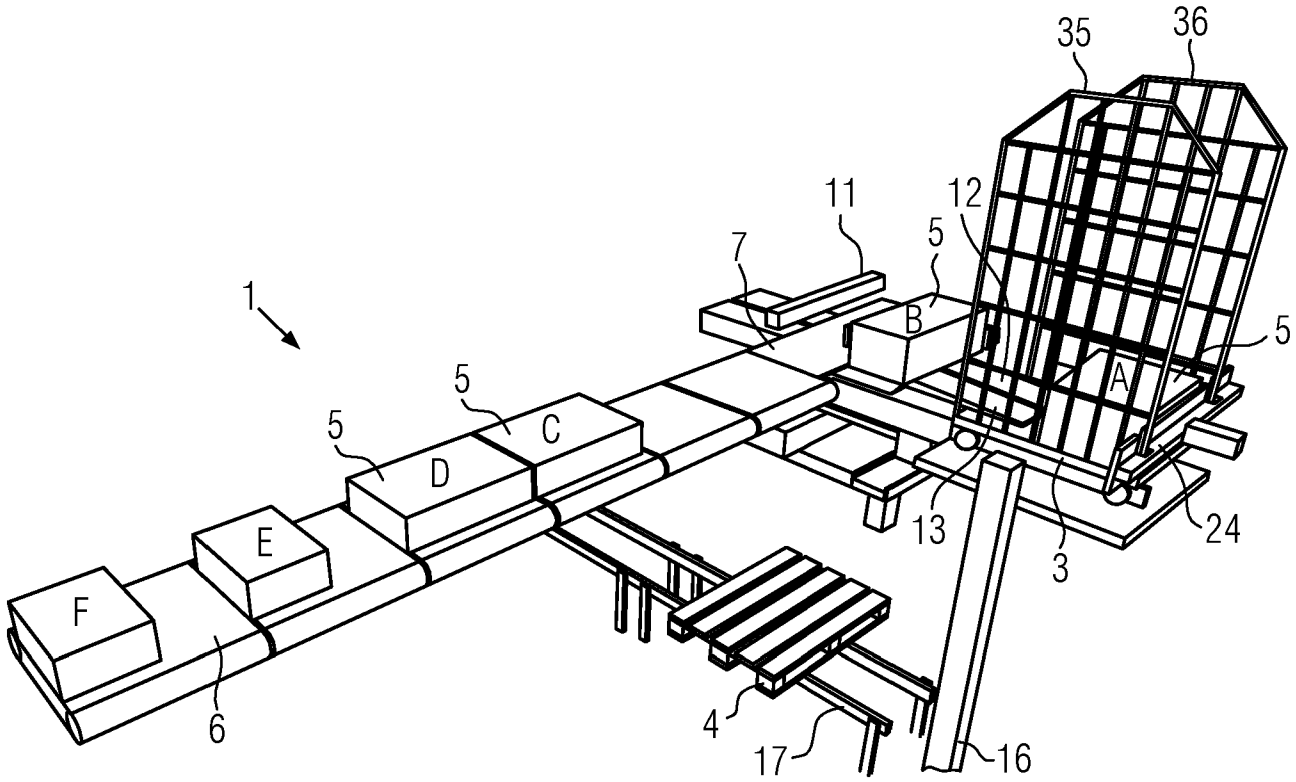
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FIG. 30

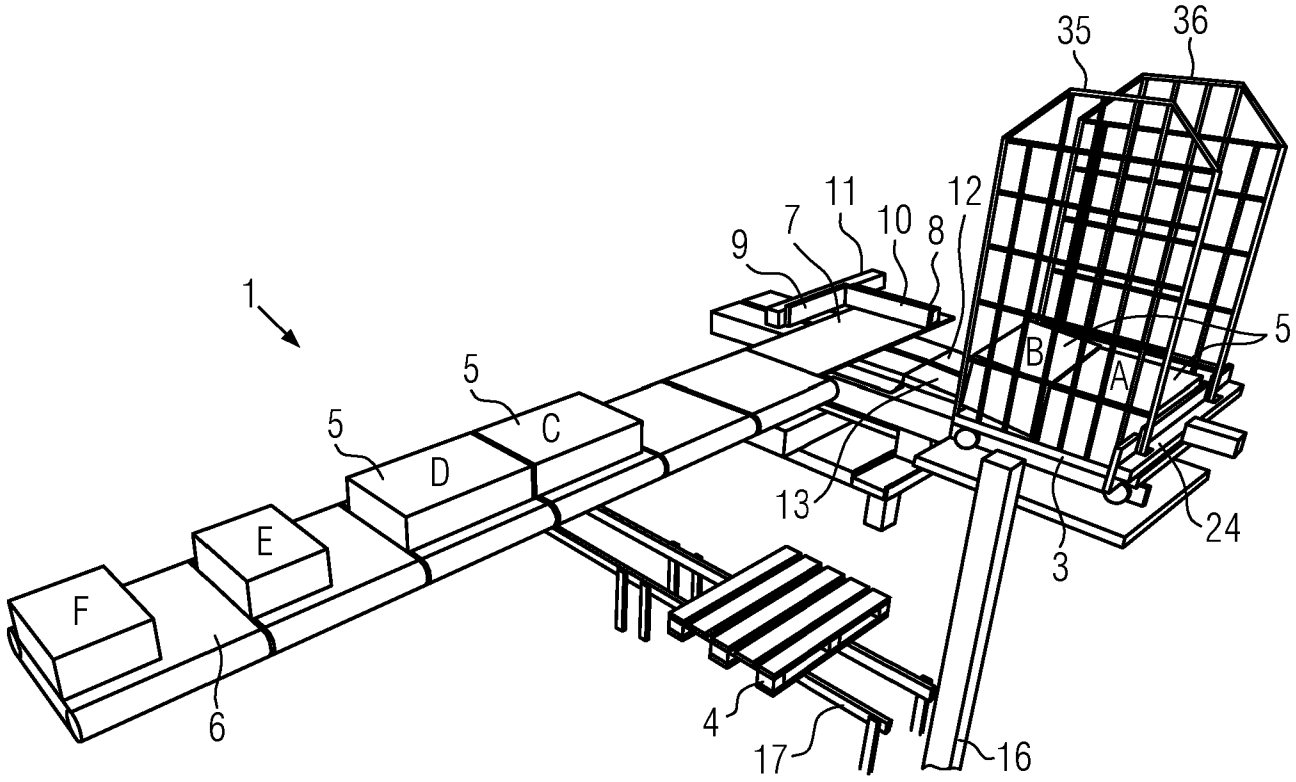
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FIG. 31

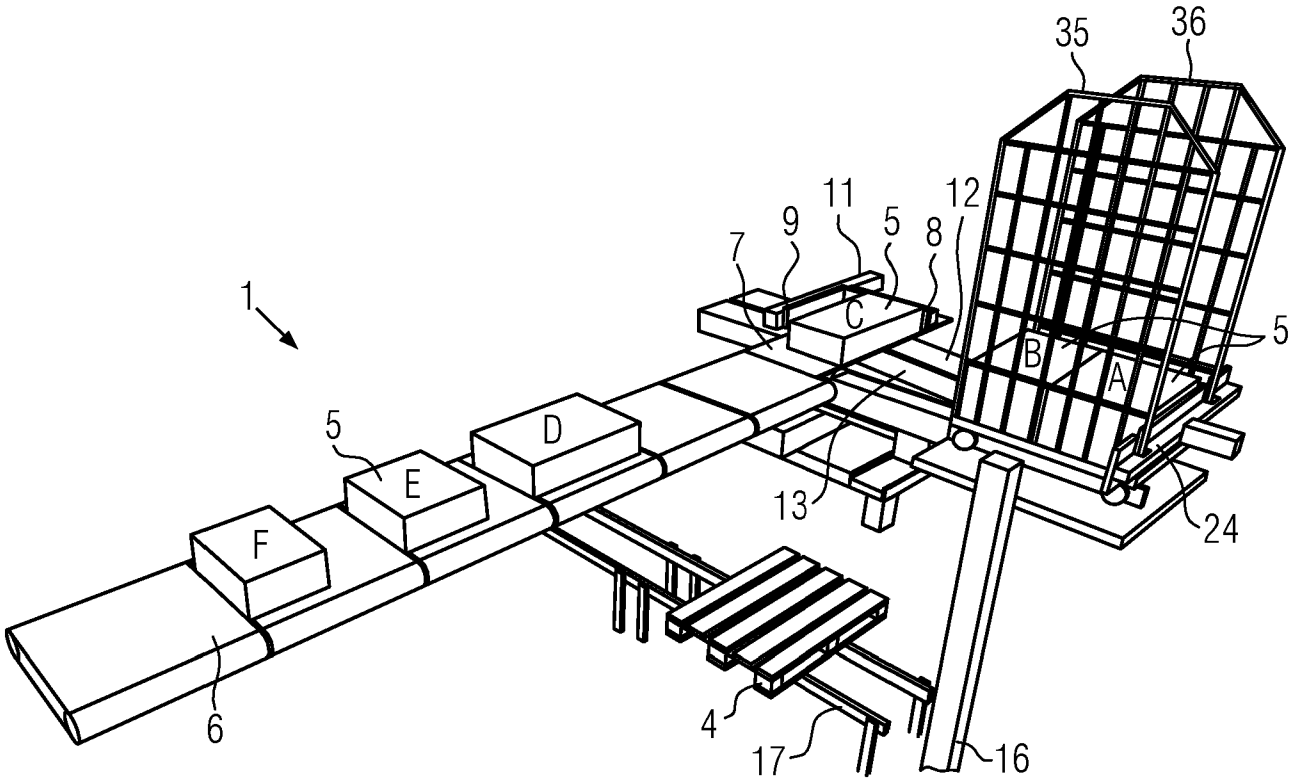
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FIG. 32

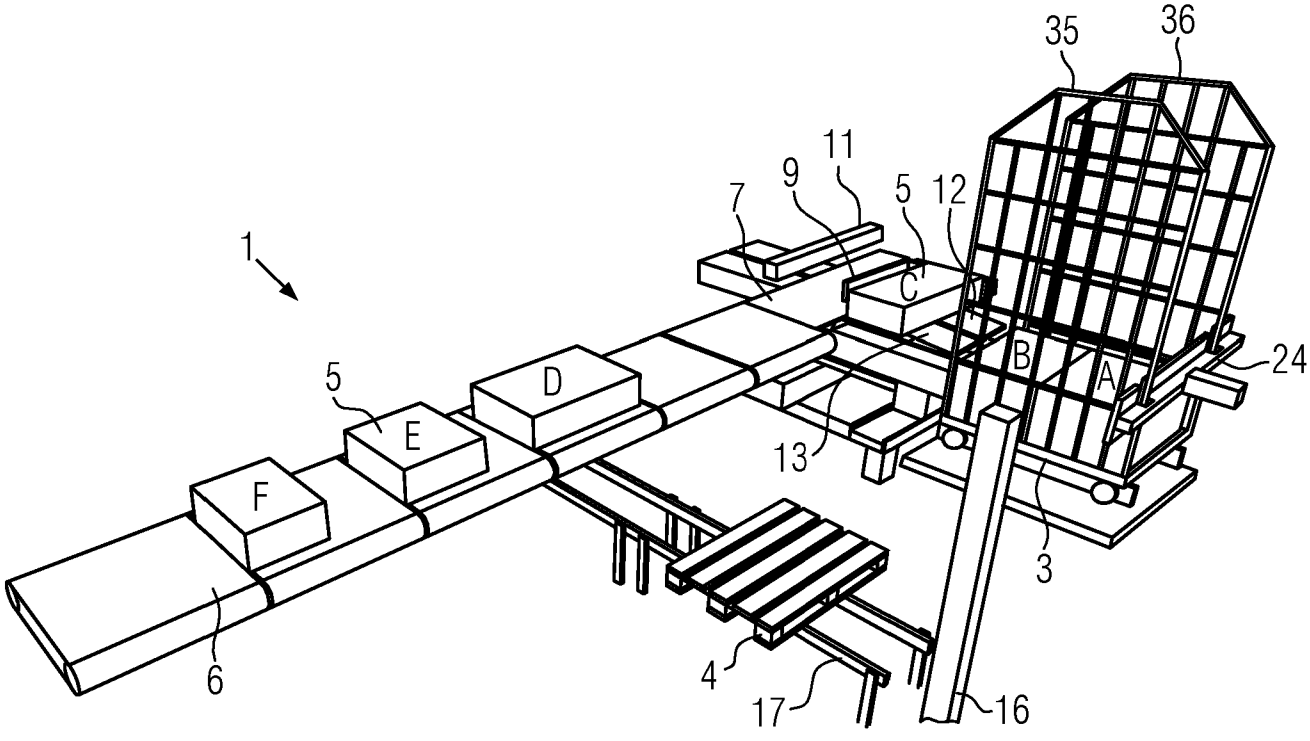
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FIG. 33

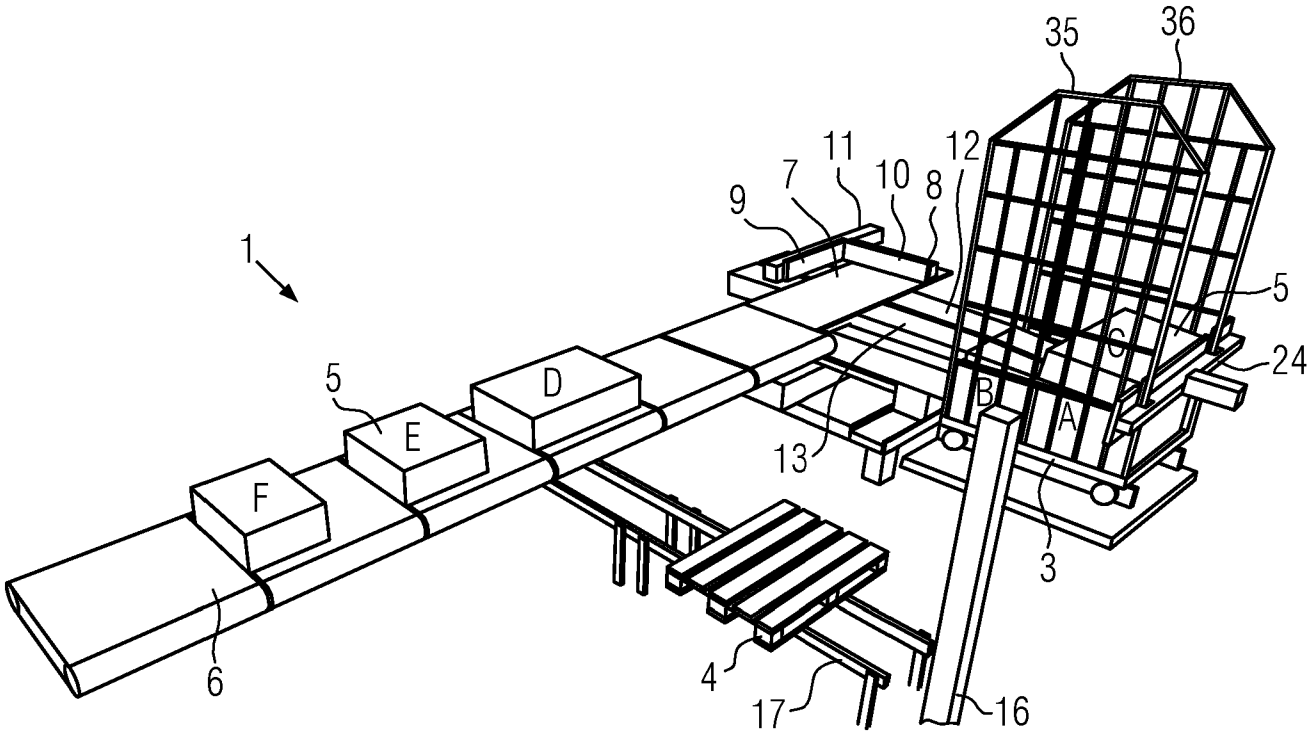
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FIG. 34

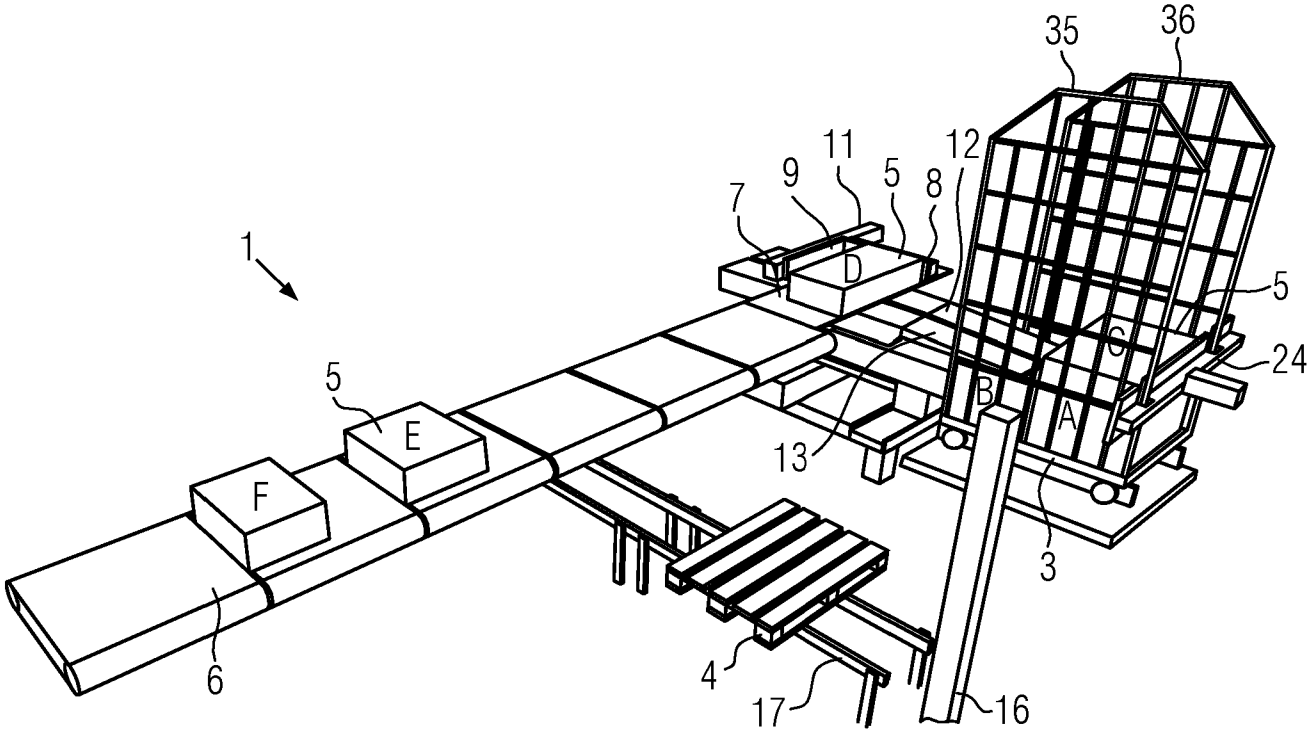
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FIG. 35

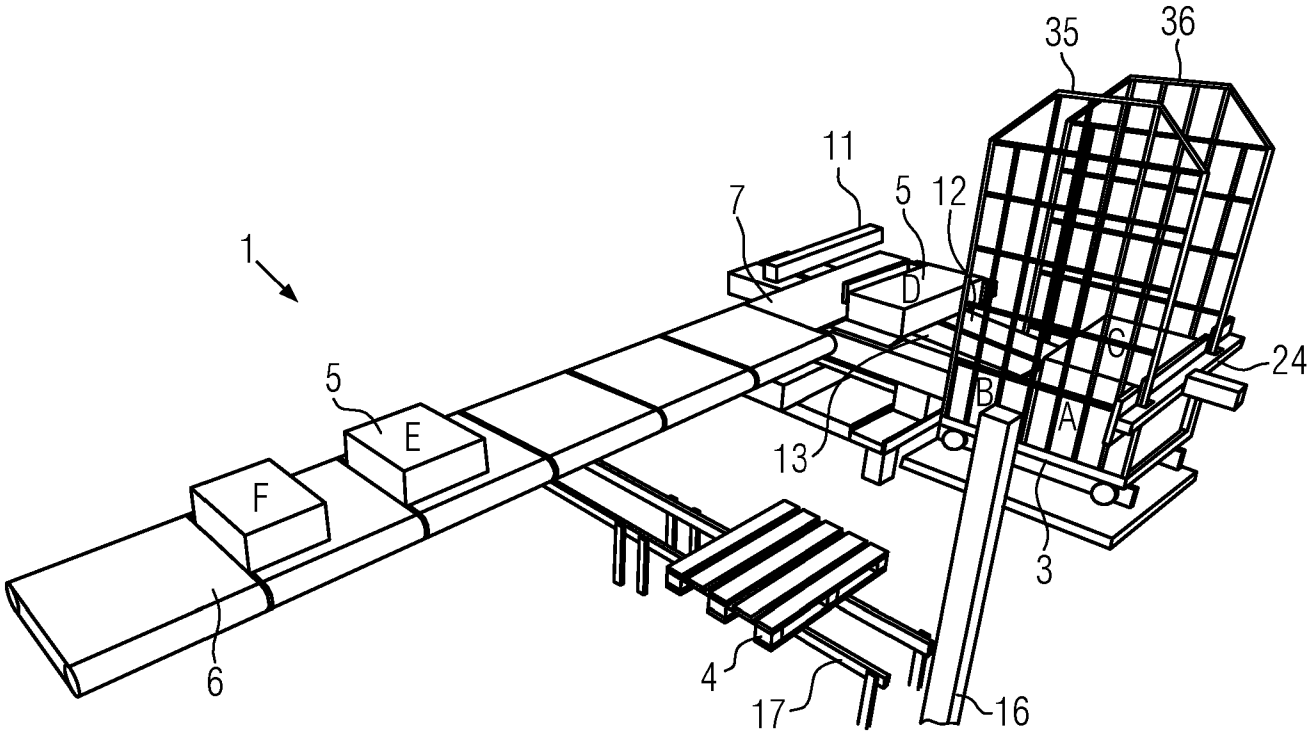
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FIG. 36

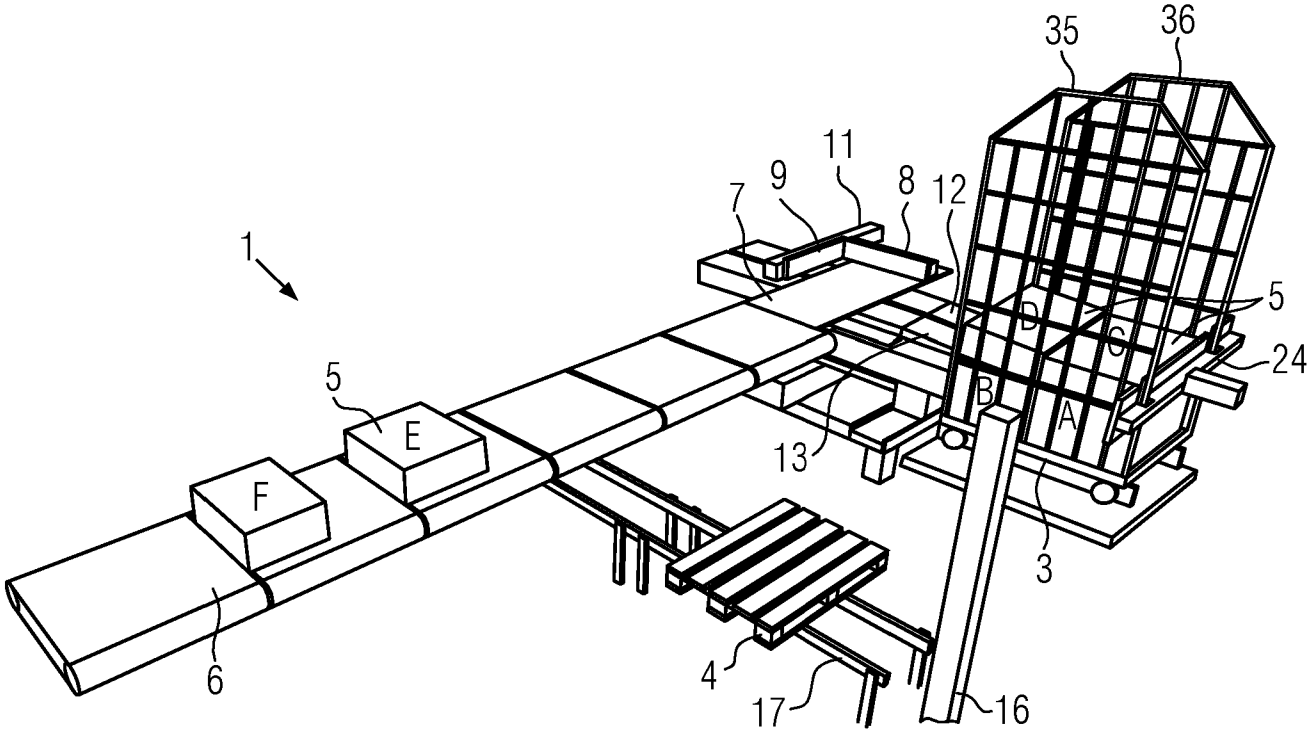
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FIG. 37

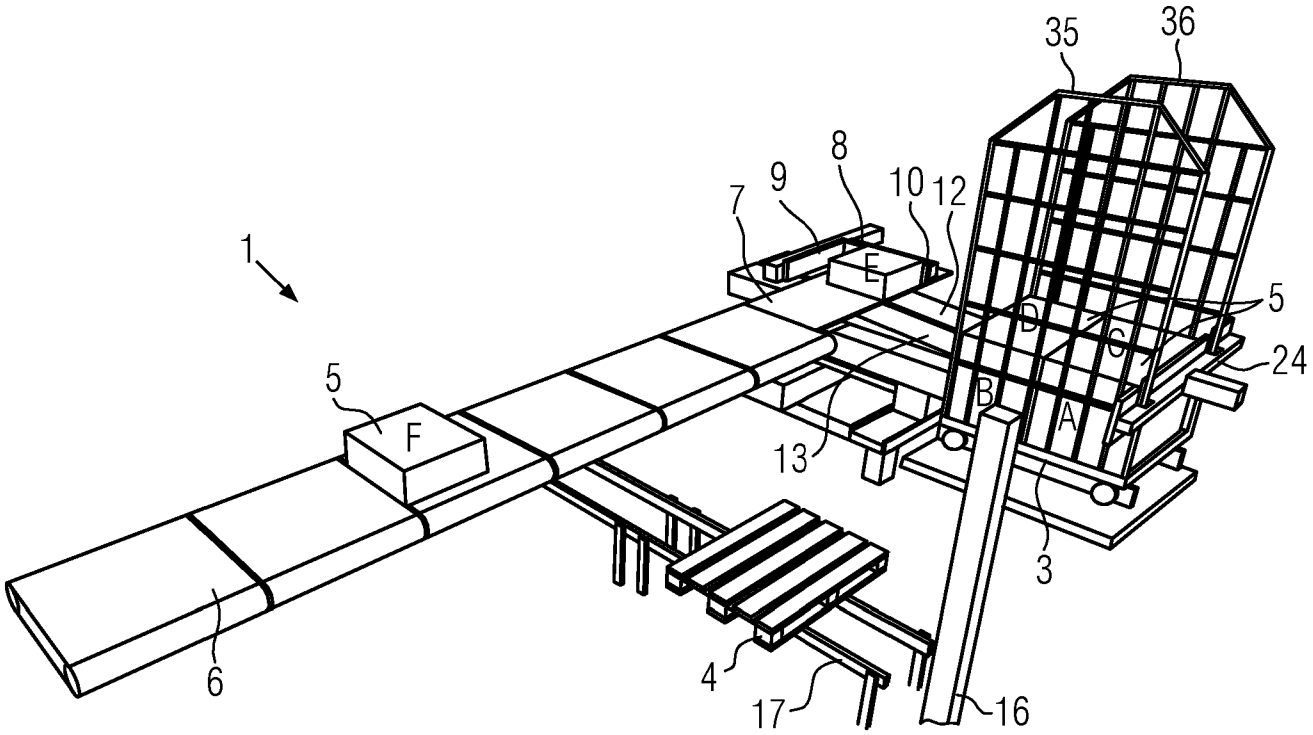
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FIG. 38

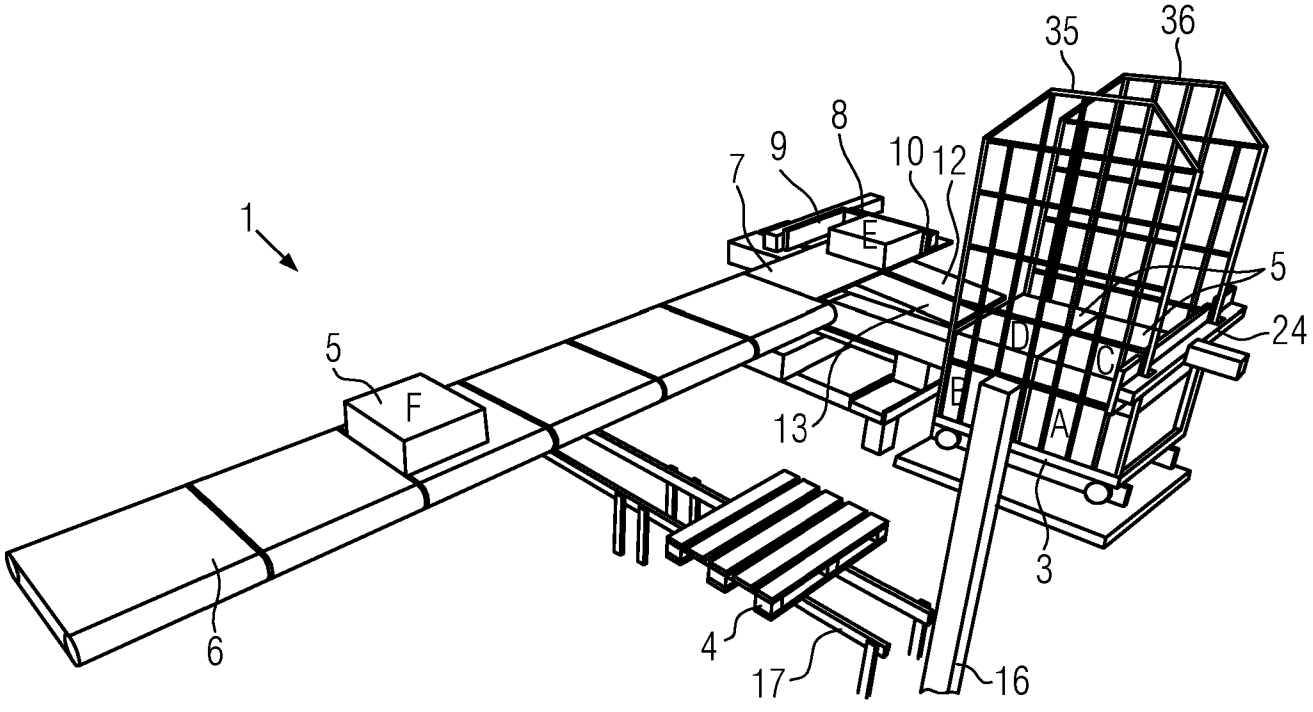
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FIG. 39

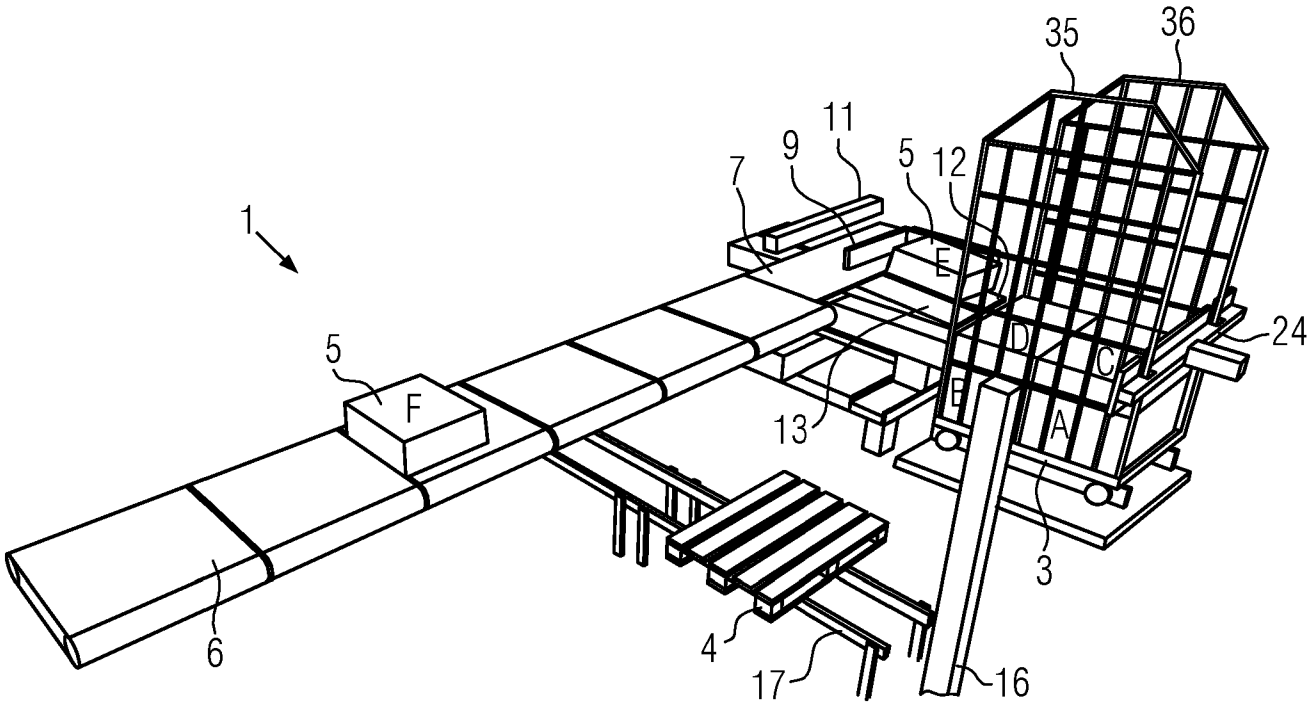
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FIG. 40

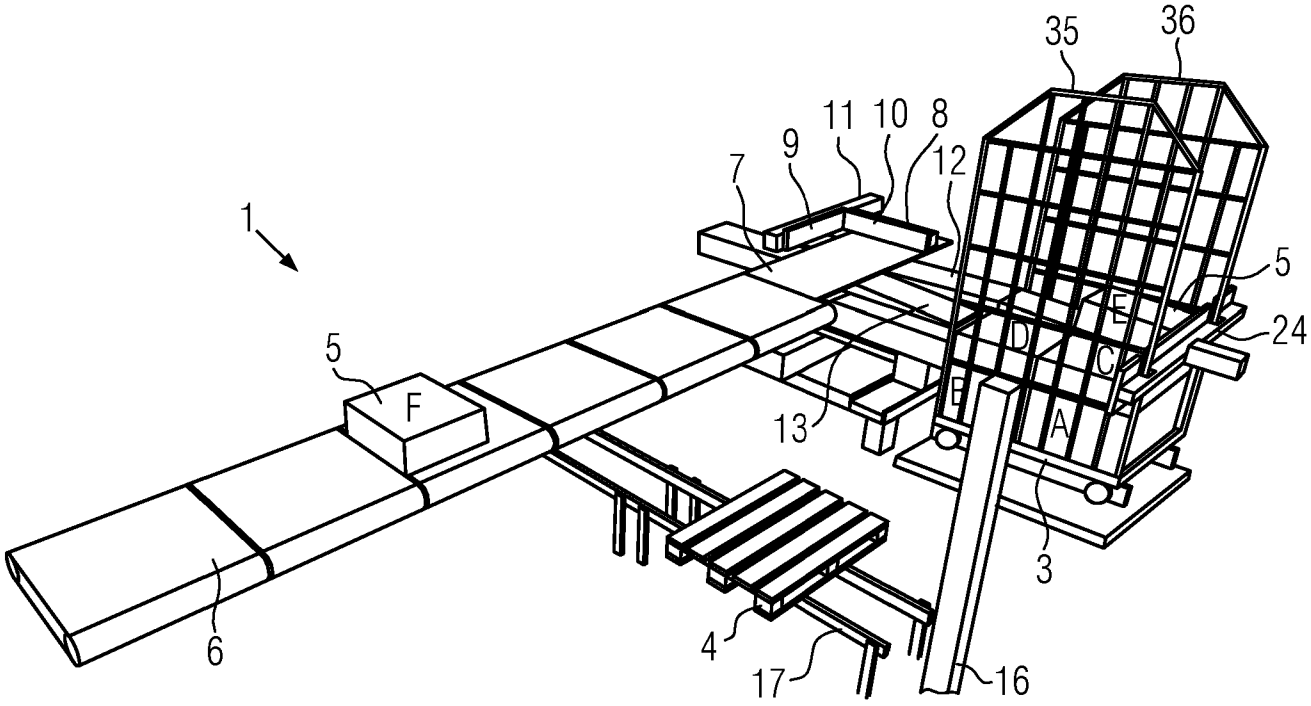
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FIG. 41

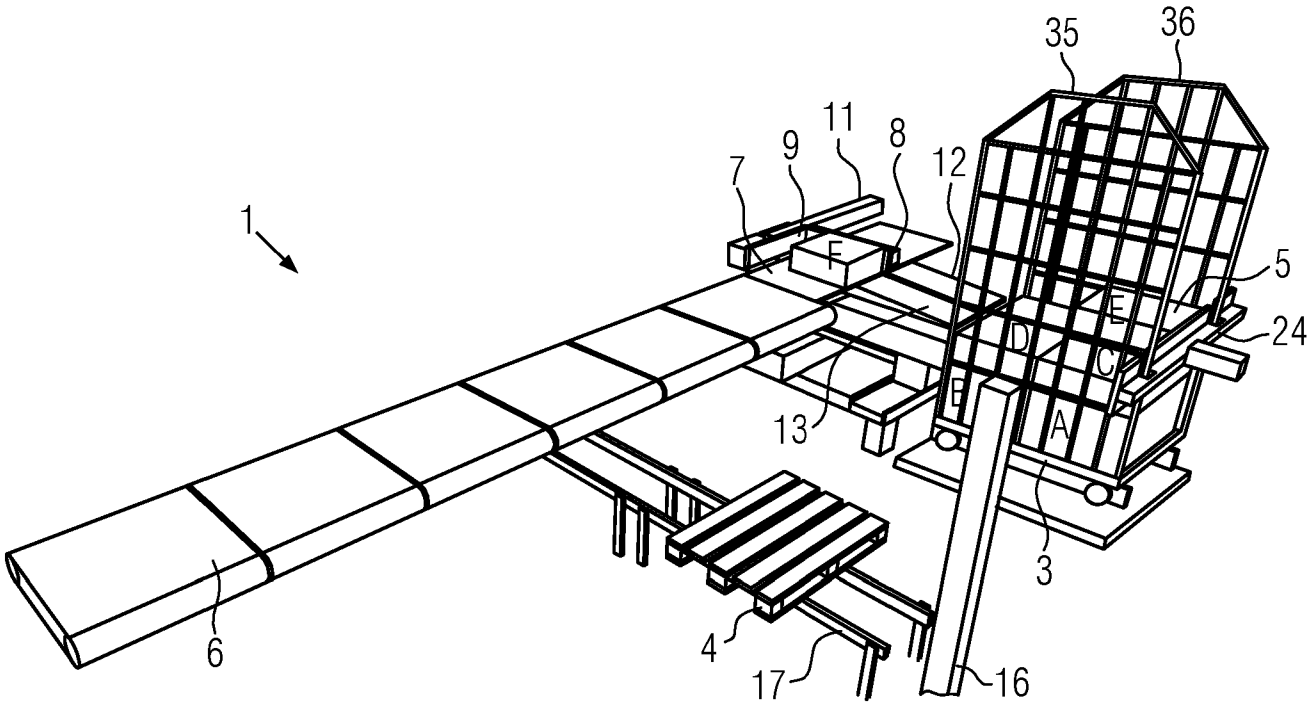
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FIG. 42

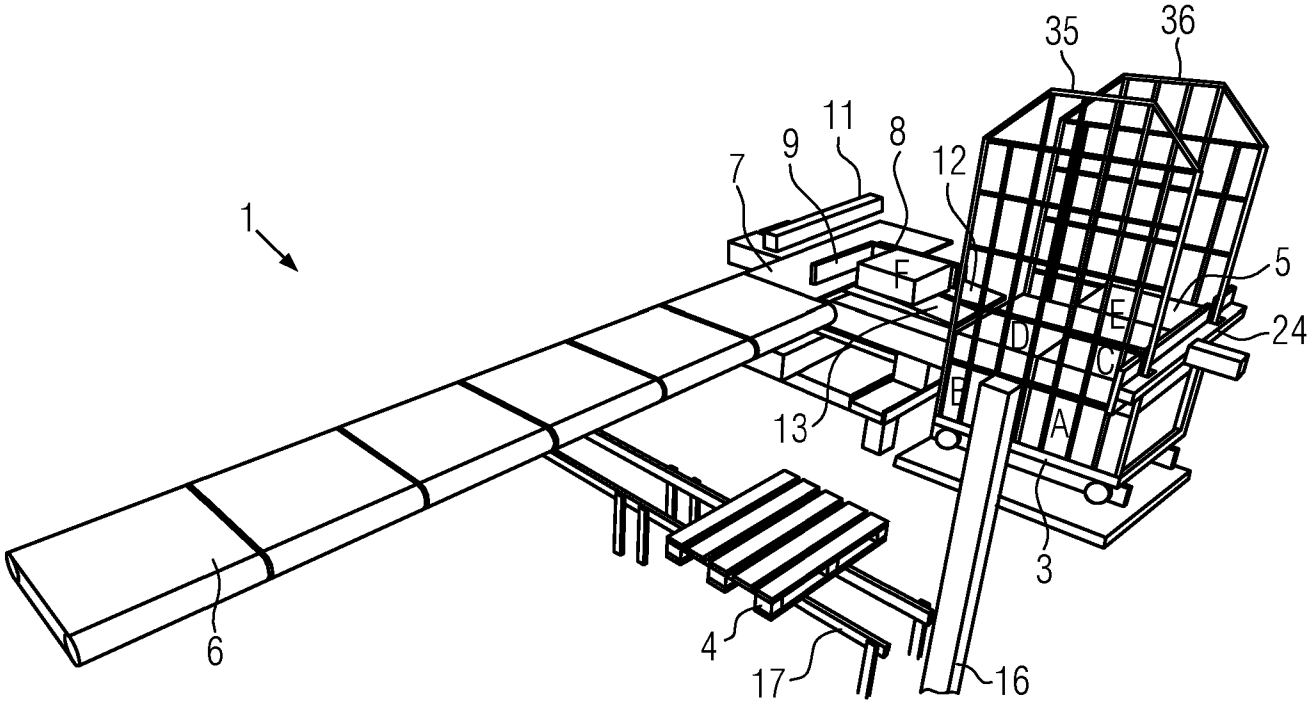
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FIG. 43

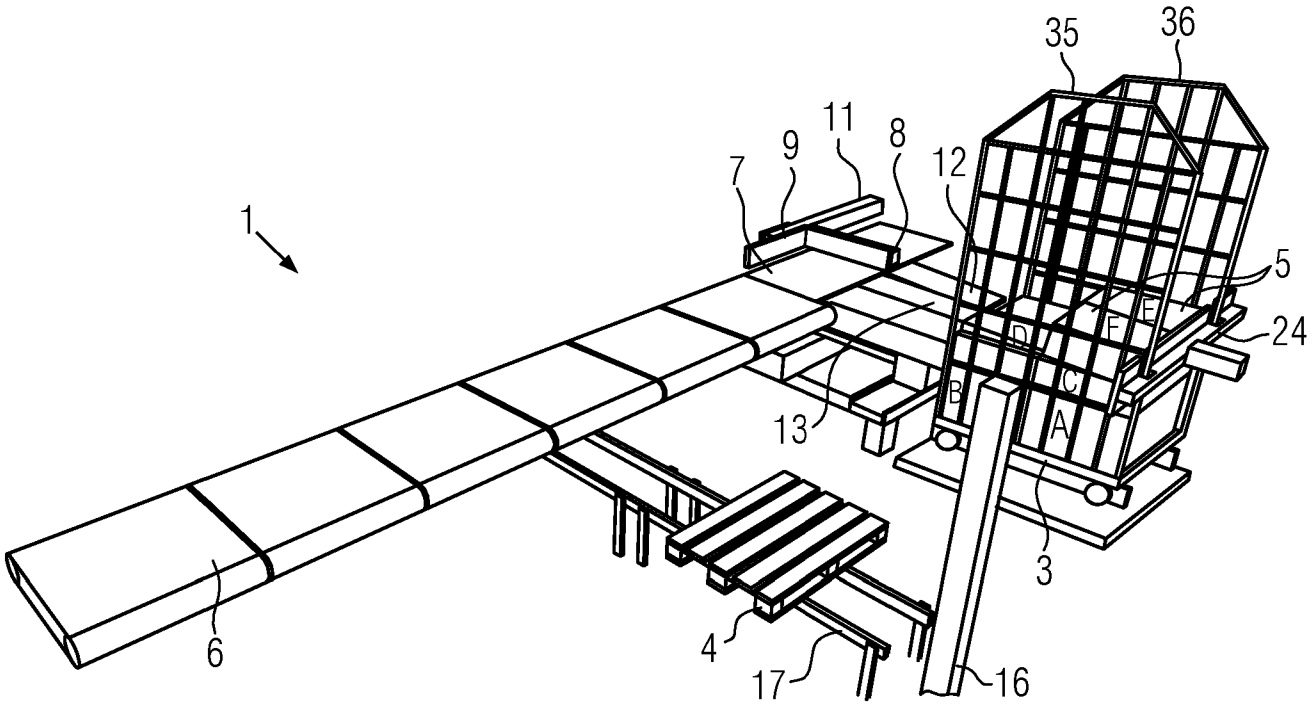

FIG. 44

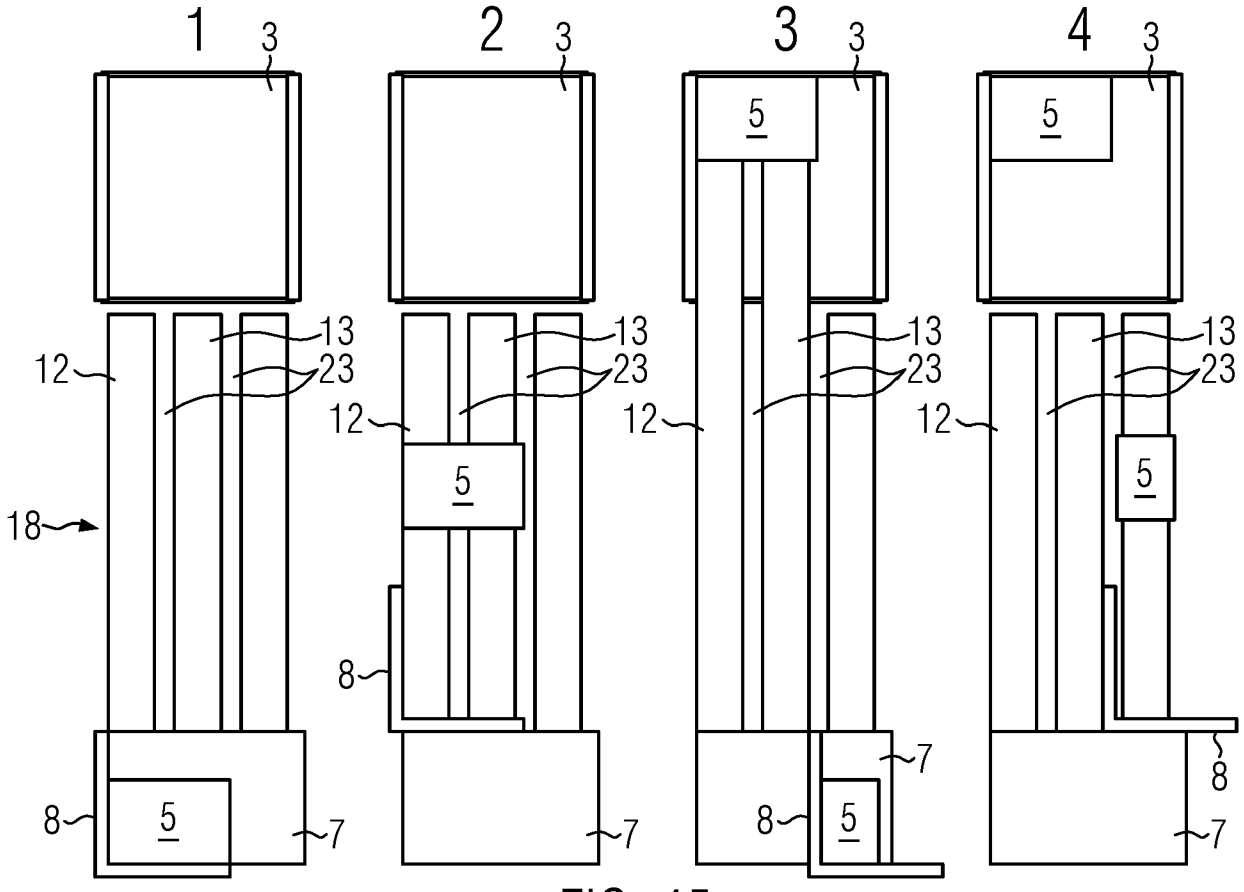

FIG. 45

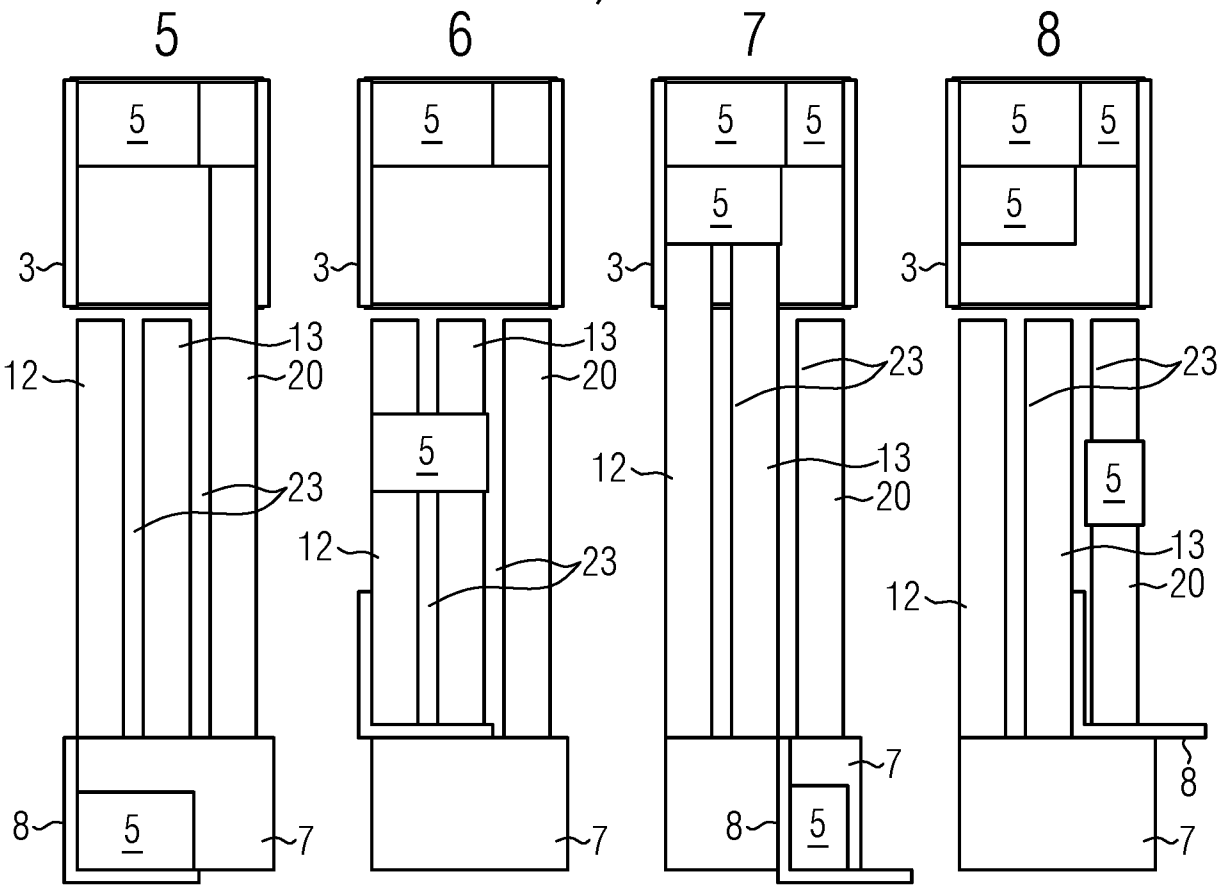

FIG. 46

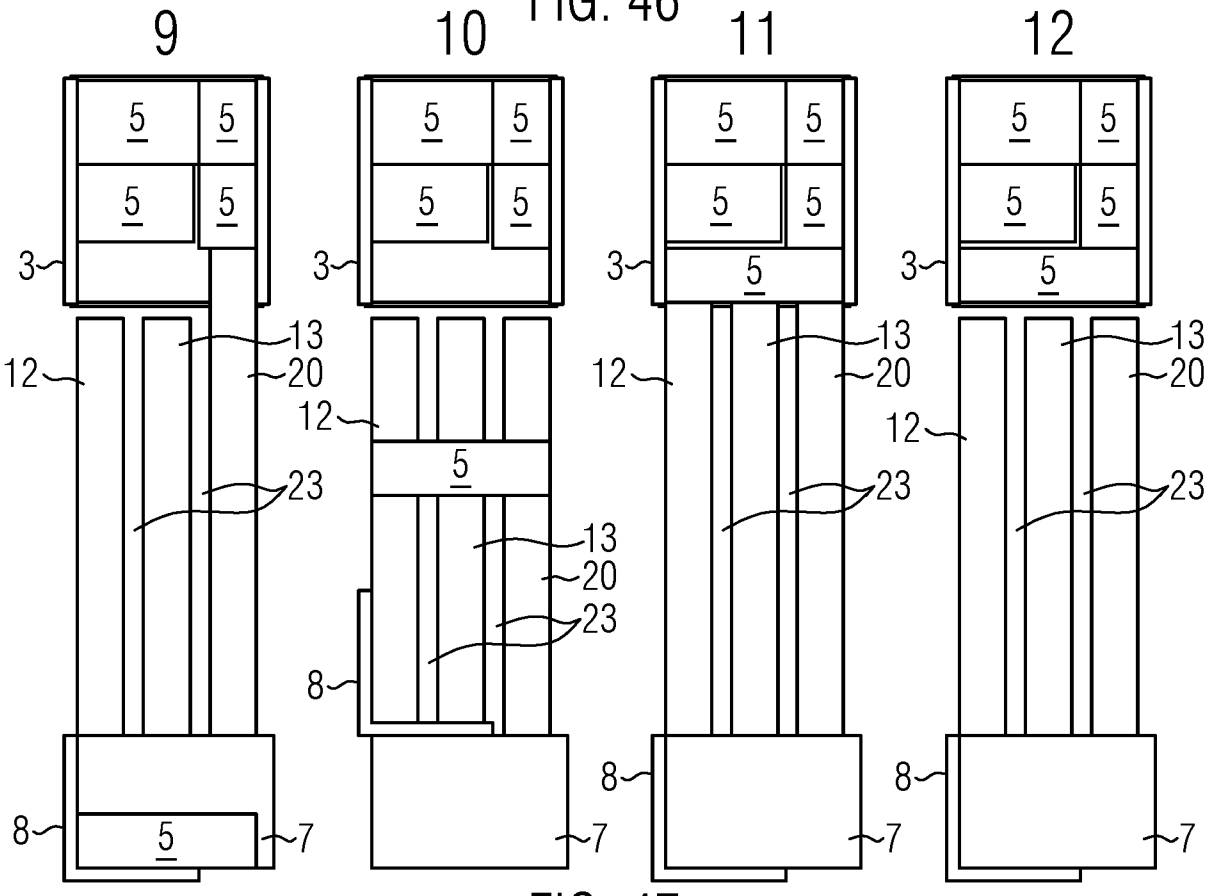

FIG. 47

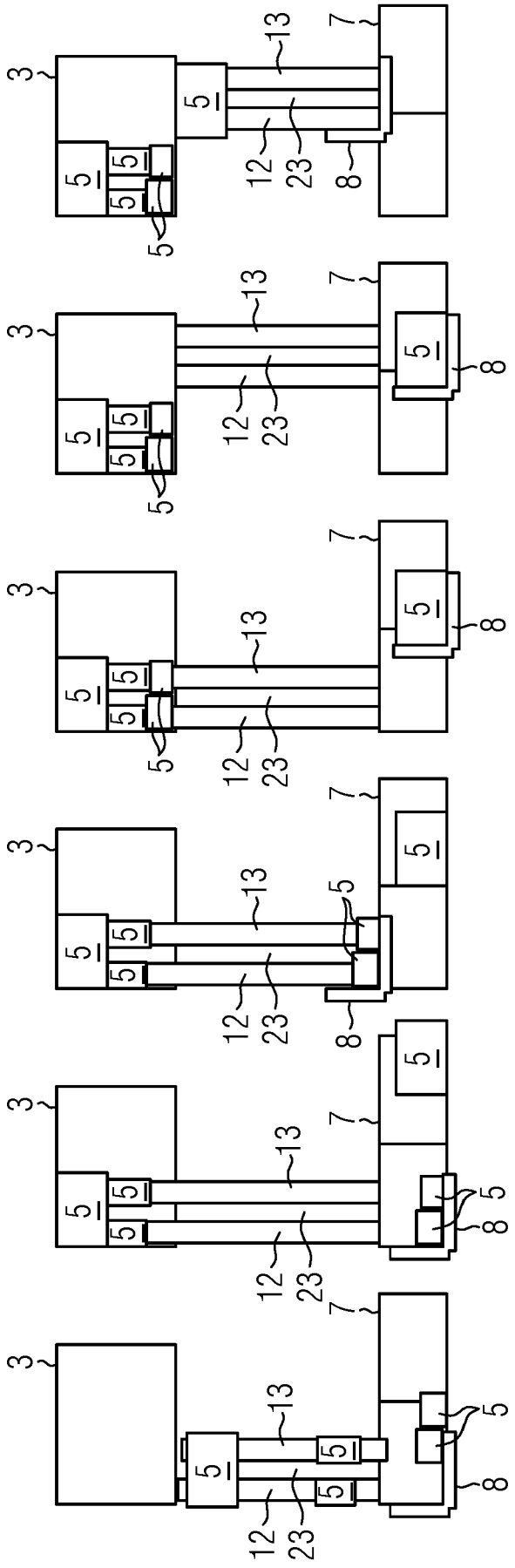

FIG. 48