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- (73) Patenthaver: **Bobst Lyon, 3 Rue Edison, 69500 Bron, Frankrig**
- (72) Opfinder: **CORREAD, Thibault, 12, rue Santos Dumont, 69008 Lyon, Frankrig**
BUSA, Denis, 73, rue Jean Moulin, 69300 Caluire-et-Cuire, Frankrig
CONVERT, Claude, 168, impasse des Charmes, 01700 Beynost, Frankrig
- (74) Fuldmægtig i Danmark: **Plougmann Vingtoft A/S, Strandvejen 70, 2900 Hellerup, Danmark**
- (54) Benævnelse: **STATION TIL MODTAGELSE AF PLADEFORMEDE ELEMENTER TIL EN MASKINE TIL EMBALLAGEFREMSTILLING, TILSVARENDE MASKINE TIL EMBALLAGEFREMSTILLING SAMT FREMGANGSMÅDE TIL MODTAGELSE AF PLADEFORMEDE ELEMENTER TIL EN MASKINE TIL EMBALLAGEFREMSTILLING**
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Description

The invention relates to a station for receiving sheet elements and for discharging bundles of sheet elements for a machine for manufacturing packaging. The invention also relates to a machine for manufacturing packaging from sheet elements, comprising a station for receiving, stacking and discharging bundles of sheet elements. The invention also relates to a method for receiving sheet elements for a packaging manufacturing machine.

A packaging manufacturing machine is commonly used in order to ensure making of boxes or cases made of cardboard from sheet elements, for example in the form of sheets of corrugated cardboard. The sheet elements are successively inserted into the machine, advance continuously from upstream to downstream in the longitudinal drive direction. They are automatically printed by flexography, cut and scored, so as to form case layups. At the outlet of the machine, the sheet elements are received and stacked, and the obtained bundles are discharged afterwards. A receiving station is responsible for receiving the sheet elements and for making bundles of sheet elements.

Prior art

Document EP 0666234 describes a station for stacking, separating and discharging bundles of sheet elements. The station comprises a vertically movable lifting table, receiving falling sheet elements to be stacked. The table descends progressively down to the level of an output conveyor, recovering and discharging a bundle of sheet elements after formation thereof. A separator moves vertically and horizontally. After the formation of a bundle, the separator overhangs the lifting table and is thus interposed to support the sheet elements of the next bundle. The lifting table then transfers the bundle that has just been formed, towards the output conveyor which discharges the bundle. Afterwards, the separator is retracted and the lifting table can then recover the sheet elements of the next bundle.

Such a station has drawbacks. First of all, the sheet element at the bottom of the bundle is quite often damaged when the separator is retracted. In addition, the separator has some inertia. Its movement during a cycle proves to be difficult to carry out at a speed compatible with the rates of stacking necessary for the sheet elements. Such a separator can also prove to be incompatible with some modes of transverse alignment of the sheet elements.

Document EP 0501213 describes a station for stacking, separating and discharging bundles of sheet elements. The station comprises sheet element supply means, retractable supports forming a temporary stacking storage, placed above a bundle discharging device.

5 Such a station has drawbacks. In particular, the first sheet element arriving in the stacking storage will be in contact with, and be damaged by, the retractable supports. In addition, because of the heightwise-fixed position of the retractable supports, the temporary stacking storage will be more rapidly saturated with sheet elements arriving at high rate, which limits the overall productivity of the printing or transformation line.

10 Other documents of the prior art include EP3378811, JP4774350, JP2006069034 and US5613673.

Document EP3378811 discloses an arrangement for stacking sheet configured to produce stacks having bundles of sheet arranged in a staggered manner. The arrangement comprises a vertically movable stacking platform.

15 JP4774350 discloses a machine for producing boxes made of corrugated cardboard. The machine comprises a lifting table designed to receive a stack of sheet elements. Once the stack is completed, a pusher device discharges the stack from the lifting table.

20 JP2006069034 discloses a machine arranged to produce boxes. The machine comprises a stacking device comprising a vertically movable lifting table and a temporary receiving element configured to transitionally receive the formed stack and lower it onto the lifting table.

25 Document US5613673 discloses an apparatus for stacking sheets configured to produce a continuous stack and comprising a stack separation element. The separation element being movable horizontally and adapted to separate the flow of sheets into separate stacks.

Disclosure of the invention

30 The invention aims to solve one or more of these drawbacks. A main objective of the present invention consists in developing a station for receiving sheet elements allowing avoiding falls of sheet elements and bundles. A second objective is to make a packaging manufacturing machine comprising a station for receiving sheet elements and discharging bundles of sheet elements, installed at the downstream outlet of the machine. A still another objective is to succeed in developing a method for receiving sheet elements for a packaging manufacturing machine.

According to an aspect of the present invention, a station for receiving sheet elements and for discharging bundles of sheet elements for a machine for manufacturing packaging comprises:

- an arrangement for feeding sheet elements successively one after another,
- 5 - a lifting table, which is movable in a vertical direction, comprising a plurality of endless conveyor belts extending in a longitudinal horizontal direction, for receiving the sheet elements in bundle form,
- an output conveyor for discharging the sheet elements in bundle form,
- a separator, which is movable in the vertical direction, comprising a plurality of
- 10 receiving arms that open out in the longitudinal horizontal direction, for temporarily receiving the sheet elements in bundle form, the arms being disposed so as to be able to cross in the vertical direction without interacting with the endless conveyor belts of the lifting table.

In other words, with the separator, the bundle is transitionally received and

15 transferred without falling from the separator towards the lifting table thanks to their vertical crossing. The conveyor belts of the lifting table are arranged alternately, so as to be able to cross with the arms of the separator. The arms of the separator form a grid for receiving the bundle being formed, and are capable of passing between the conveyor belts of the lifting table. Thus, the bundle is transferred seamlessly and without falling

20 from the arms of the separator to the belts of the lifting table, thanks to their vertical crossing.

As a non-exhaustive example, a sheet element is defined as being made of a material such as paper, flat cardboard, corrugated cardboard, laminated corrugated cardboard, flexible plastic, or still other materials.

25 According to a particular feature, the arms of the separator may be able to move in the longitudinal horizontal direction, from downstream to upstream, so as to be able to position them above the lifting table, and from upstream to downstream, so as to be able to retract them out of the path of the lifting table.

According to a particular feature, the separator may preferably comprise:

- 30 - a support, the support being mounted so as to slide in a vertical direction,
- at least one arm, the arm(s) being mounted so as to be able to move in the longitudinal horizontal direction with respect to the support, the movement of the arm(s)

modifying the overhanging length of the arms with respect to the support on a first side in the longitudinal horizontal direction, and

- a drive system for moving the arm(s) in the longitudinal horizontal direction, the drive system being configured to simultaneously drive the arm for movement in the longitudinal horizontal direction and keep another of the arms retracted in its longitudinal position.

According to a particular feature, the separator thus comprises first of all a vertically movable support. And, the receiving arms of the separator are driven by a longitudinal horizontal translational movement, separately from the movement of the support.

According to a particular feature, and preferably, the lifting table may be movable between a high position under the arrangement for feeding the sheet elements and a low position in a plane similar to the plane of the output conveyor for discharging the bundle. Since the lifting table is located in its maximum height position directly under the arrangement for feeding the sheet elements, the sheet elements will arrive and descend directly onto the lifting table.

According to a particular feature, the belts of the lifting table may advantageously be capable of driving the bundle from upstream to downstream on the output conveyor.

According to a particular feature, and preferably, the output conveyor may comprise at least one belt capable of driving the bundle from upstream of the lifting table to downstream.

According to another aspect of the invention, a packaging manufacturing machine is characterized in that it comprises a station for receiving sheet elements and discharging bundles of sheet elements, installed at the downstream outlet of the machine, and having one or more technical feature(s) described and claimed hereinbelow.

According to still another aspect of the invention, a method for receiving sheet elements for a packaging manufacturing machine, is characterized in that it comprises the steps of:

- successively depositing sheet elements on a vertically movable lifting table, so as to form a first bundle of sheet elements;

- lowering the lifting table vertically with the sheet elements deposited successively to complete the formation of the first bundle of sheet elements;

- bringing in a vertically movable separator above the lifting table, said separator comprising a plurality of receiving arms extending in the longitudinal horizontal direction;

- successively depositing the sheet elements on the separator, so as to form a second bundle of sheet elements;

- horizontally discharging the first formed bundle from the lifting table;

5 - lowering the separator vertically with the sheet elements deposited successively to complete the formation of the second bundle of sheet elements;

- vertically raising the lifting table;

- crossing the vertically rising unloaded lifting table with the vertically lowering separator, the conveyor belts of the lifting table being arranged alternately, so as to cross with the receiving arms of the separator and so as to

10 recover the second bundle of sheet elements from the separator to the lifting table; and

- taking the separator out of the travel path of the lifting table.

Thanks to the dynamic operation of the vertically movable table and of the vertically movable separator, the bundle is thus transferred seamlessly from the vertically movable separator which descends down to the vertically movable table which rises.

15

According to a particular feature, the step consisting of bringing in the vertically movable separator may preferably be carried out in the longitudinal horizontal direction from downstream to upstream above the plane of circulation of the sheet elements, and then in the vertical direction from above the plane of circulation to below the plane of circulation.

20

According to a particular feature, the step consisting of taking out the vertically movable separator may preferably be carried out in the longitudinal horizontal direction from upstream to downstream.

25

Brief description of the drawings

Other features and advantages of the invention will appear clearly from the description that is made hereinafter, for indicative and non-limiting purposes, with reference to the appended drawings, wherein:

30

[Fig.1] shows a side view of the station for receiving sheet elements and discharging bundles mounted downstream;

[Fig.2] shows a detailed side view of the station of Figure 1;

[Fig.3] shows a view according to the longitudinal axis of the table and of the separator of the station; and

[Fig.4],
[Fig.5],
[Fig.6],
[Fig.7],
5 [Fig.8],
[Fig.9],
[Fig.10],
[Fig.11],
[Fig.12],
10 [Fig.13],
[Fig.14] and
[Fig. 15] show successive views illustrating the method for receiving sheet elements.

The longitudinal direction is defined with reference to the running or drive direction
15 of the sheet elements in the packaging manufacturing machine, in the station for receiving
sheet elements, according to their median longitudinal axis. The transverse direction is
defined as being the direction in a horizontal plane perpendicular to the running direction
of the sheet elements. The upstream and downstream directions are defined with
reference to the direction of movement of the sheet elements, according to the
20 longitudinal direction throughout the packaging manufacturing machine, from the input
of the machine up to the machine output and the station for receiving the sheet elements.

Detailed disclosure of preferred embodiments

As illustrated in Fig. 1, a packaging manufacturing machine, such as a flexography
printing machine 1 for corrugated cardboard sheets 2, comprises a station for receiving
25 sheet elements and for discharging bundles 23, 24 of sheet elements 3. All of the
flexography printing portion, in particular with the different printer units 4, is partially
shown by dashed lines. The receiving station 3 is mounted downstream of the last printer
unit of the machine 1.

The station 3 comprises a frame 6 with vertical side posts 7. The station 3 comprises
30 an arrangement for feeding the sheets 8, mounted at the upper portion of the frame 6. In
particular, the arrangement 8 includes a suction to create a vacuum 9. The arrangement
8 further comprises conveyor belts 11 and a grid provided with longitudinal bars, the
upper face of the sheets 2 being in contact with the conveyor belts 11. The sheets 2 that

are printed arrive one after another from upstream to downstream in a plane of circulation by being driven upstream of the station 3 by rolls and a vacuum suction (not visible), so-called ceiling-mounted, and then they are released at the level of the arrangement 8.

5 The arrangement 8 comprises a sheet folder device 12 mounted on the grid to separate the sheets 2 from the conveyor belts 11 and make them drop (cf. Fig. 2). For example, the sheet folder device 12 comprises a crank-connecting rod type mechanism 13 actuated sequentially according to the arrival of the sheets 2.

10 The station 3 comprises an output conveyor 14 in the form of a belt or of several conveyor belts 15, transporting the final bundle 23, 24 from upstream the station 3 towards the downstream output.

15 The station 3 comprises a lifting table 16 movable according to the vertical direction. The table 16 comprises several endless conveyor belts 17 extending according to a longitudinal horizontal direction. The belts 17 are driven by a suitable motor and transport the final bundle 23, 24 from upstream towards the output conveyor 14. The table 16 rises and descends by being driven thanks to a motor and chains 19.

20 The station 3 comprises a separator 21, which comprises several receiving arms 22 deployable according to the longitudinal horizontal direction. The arms 22 are longitudinally movable from upstream to downstream and vice versa. Some arms 22 may remain in a retracted position in the downstream position, this depending for example on the dimension of the sheets 2 making up the bundle 23, 24. The separator 21 rises and descends according to the vertical direction by being driven using a motor and toothed belts.

25 According to the invention, when the table 16 crosses the separator 21, the reception arms 22 are fit between the belts 17, without any interaction between the arms 22 and the belts 17 (cf. Fig. 3).

 The method for receiving sheet elements 2 and for discharging bundles 23, 24 of sheet elements 3 for the packaging manufacturing machine is illustrated in Figs. 4 to 15.

30 In a first step of the method (Figs. 4 and 5), sheet elements, in the form of sheets 2, arriving successively (arrow F in Fig. 5) from the flexography printing portion 4 of the flexography printing machine 1, are deposited successively over the vertically movable table 16, so as to form a first bundle of sheets 23.

In a second step of the method (Figs. 5 and 6), the table 16 with the successively deposited sheets is lowered vertically (arrow DT in Fig. 5), to end the formation of the first bundle of sheets 23.

5 In a third step of the method (Figs. 5 and 6), the vertically movable separator 21 is brought in (arrow ES in Fig. 5), with several ones of its arms 22 being inserted above the table 16. In its starting standby position (cf. Fig. 5), the separator 21 with its arms 22 is positioned above the arrangement for feeding the sheets 8 and the sheet folder device 12. In its arrival functional position (cf. Fig. 6), the separator 21 with its arms 22 is positioned above the first bundle of sheets 23 under the arrangement for feeding the
10 sheets 8 and the sheet folder device 12.

In a fourth step of the method (Figs. 6 to 14), the sheets 2 arriving successively (arrow F in Figs. 6 and 7) from the flexography printing portion 4 of the flexography printing machine 1 are deposited successively over the separator 21, and more specifically over its arms 22, so as to form a second bundle of sheets 24.

15 In a fifth step of the method (Figs. 6 to 12), the first bundle formed 23 is discharged horizontally (arrows O in Figs. 6 to 12) out of the table 16. The endless conveyor belts 17 of the table 16 are driven from upstream to downstream. The belt or the conveyor belts 15 of the output conveyor 14 are driven simultaneously from upstream to downstream.

In a sixth step of the method (Figs. 7 to 9), the separator 21 with the successively
20 deposited sheets is lowered vertically (arrow DS in Figs. 7 to 9) to end the formation of the second bundle of sheets 24.

In a seventh step of the method (Fig. 9), the table 16 is raised vertically (arrow UT in Fig. 9). The table 16 is empty and no longer carries any bundle.

25 In an eighth step of the method (Fig. 10), the empty table 16 (UT) vertically rising is crossed with the separator 21 (DS) vertically descending. This crossing movement of the endless conveyor belts 17 of the table 16 with the arms 22 of the separator 21 allows recovering the second bundle of sheets 24 from the separator 21 towards the table 16.

30 In a ninth step of the method (Figs. 11 and 12), the separator 21 is taken out (arrow OS in Fig. 11) of the travel path of the table 16. The arms 22 of the separator 21 are moved horizontally from their upstream position crossed at the level of the table 16 (Fig. 10) towards a downstream position located substantially above the output conveyor 14 (Fig. 12).

In another step of the method (Fig. 13), the separator 21 is raised vertically (arrow US in Fig. 13) up to the horizontal level of the arrangement for feeding the sheets 8 and of the sheet folder device 12.

5 In a last step of the method (Figs. 14 and 15), the separator 21 with its arms 22 is repositioned above the arrangement for feeding the sheets 8 and the sheet folder device 12. The arms 22 of the separator 21 are moved (arrow IS in Fig. 14) horizontally from their upstream position located substantially above the output conveyor 14 (Figs. 12 to 14) towards a standby upstream position located substantially above the arrangement for feeding the sheets 8 and the sheet folder device 12 (Fig. 15). The standby upstream
10 position (Fig. 15) is substantially similar to the starting position (Figs. 4 and 5).

Thus, the cycle could start again.

Patentkrav

- 1.** Station til modtagelse af pladeformede elementer og udlevering af bundter af pladeformede elementer (3) til en maskine til emballagefremstilling, omfattende:
- 5 - en indretning til at tilføre de pladeformede elementer successivt efter hinanden (8),
- et i en lodret retning bevægeligt løftebord (16), omfattende flere endeløse transportbånd (17), der strækker sig i en vandret længderetning, til at modtage de pladeformede elementer i bundter og
- 10 - en udgangstransportør (14) til at udlevere de pladeformede elementer i bundter, **kendetegnet ved, at** den desuden omfatter:
- en i den lodrette retning bevægelig skilleindretning (21), omfattende flere modtagearme (22), der strækker sig frem i den vandrette længderetning, til midlertidigt at modtage de pladeformede elementer i bundter, idet armene (22) er
- 15 anbragt således, at de kan krydse hinanden i den lodrette retning uden at vekselvirke med båndene (17) på løftebordet (16).
- 2.** Station ifølge krav 1, **kendetegnet ved, at** armene (22) i skilleindretningen (21) er egnede til at bevæges i den vandrette længderetning fra nedstrøms mod
- 20 opstrøms for at placeres over løftebordet (16), og fra opstrøms mod nedstrøms for at fjerne dem fra løftebordets (16) bane.
- 3.** Station ifølge krav 1 eller 2, **kendetegnet ved, at** skilleindretningen (21) omfatter:
- 25 - en bærer, der er monteret forskydeligt i en lodret retning,
- mindst en arm, der er monteret således, at den er egnet til at bevæges i den vandrette længderetning i forhold til bæreren, idet bevægelsen af armen ændrer dens fremspringende længde i forhold til bæreren på en første side i den vandrette længderetning, og
- 30 - et drivsystem til at bevæge armen i den vandrette længderetning, der er udformet til samtidig at drive armen til bevægelse i den vandrette længderetning og holde en anden af armene tilbagetrukket i dens stilling i længderetningen.
- 4.** Station ifølge et af de foregående krav, **kendetegnet ved, at** løftebordet (16)
- 35 kan bevæges mellem en høj stilling under tilførselsindretningen (8) og en lav

stilling i et plan svarende til udgangstransportørens (14) plan.

5. Station ifølge et af de foregående krav, **kendetegnet ved, at** båndene (17) på løftebordet (16) er egnede til at drive bundtet fra opstrøms mod nedstrøms på udgangstransportøren (14).

6. Station ifølge et af de foregående krav, **kendetegnet ved, at** udgangstransportøren (14) omfatter mindst et bånd, der er egnet til at drive bundtet fra opstrøms for bordet (16) mod nedstrøms.

10

7. Maskine til emballagefremstilling, **kendetegnet ved, at** den omfatter en station til modtagelse af pladeformede elementer og udlevering af bundter af pladeformede elementer (3) ifølge et af de foregående krav, der er installeret ved udgangen nedstrøms for maskinen (1).

15

8. Fremgangsmåde til modtagelse af pladeformede elementer til en maskine til emballagefremstilling (1), **kendetegnet ved, at** den omfatter følgende trin:

- at sætte pladeformede elementer efter hinanden på et lodret bevægeligt løftebord (16), der omfatter flere endeløse transportbånd (17), der strækker sig i en vandret længderetning, for at danne et første bundt pladeformede elementer (23);
- at sænke løftebordet (16) lodret med de efter hinanden afsatte pladeformede elementer for at afslutte dannelsen af det første bundt pladeformede elementer (23);
- 25 - at bringe en lodret bevægelig skilleindretning (21) ind over løftebordet (16), hvilken skilleindretning omfatter flere modtagearme (22), der strækker sig frem i den vandrette længderetning;
- at sætte de pladeformede elementer efter hinanden på skilleindretningen (21) for at danne et andet bundt pladeformede elementer (24);
- 30 - at udlevere det første dannede bundt (23) vandret fra løftebordet (16);
- at sænke skilleindretningen (21) med de efter hinanden afsatte pladeformede elementer lodret for at afslutte dannelsen af det andet bundt pladeformede elementer (24);
- at hæve løftebordet (16) lodret;

- at krydse løftebordet (16), der hæves lodret, med skilleindretningen (21), der sænkes lodret, idet transportbåndene (17) på løftebordet (16) er anbragt skiftevis, for at krydses med skilleindretningens modtagearme (22) og for at genvinde det andet bundt pladeformede elementer (24) fra skilleindretningen (21)
- 5 mod løftebordet (16); og
- at føre skilleindretningen (21) ud af løftebordets (16) bevægelsesbane.

9. Fremgangsmåde ifølge krav 8, **kendetegnet ved, at** trinnet til indføring af skilleindretningen (21) foregår i den vandrette længderetning fra nedstrøms mod

10 opstrøms mod oversiden af de pladeformede elementers omløbsplan, og derpå i den lodrette retning fra oversiden af omløbsplanet mod undersiden af omløbsplanet.

10. Fremgangsmåde ifølge krav 8 eller 9, **kendetegnet ved, at** trinnet til at føre

15 skilleindretningen (21) ud foregår i den vandrette længderetning fra opstrøms mod nedstrøms.

FIG. 1

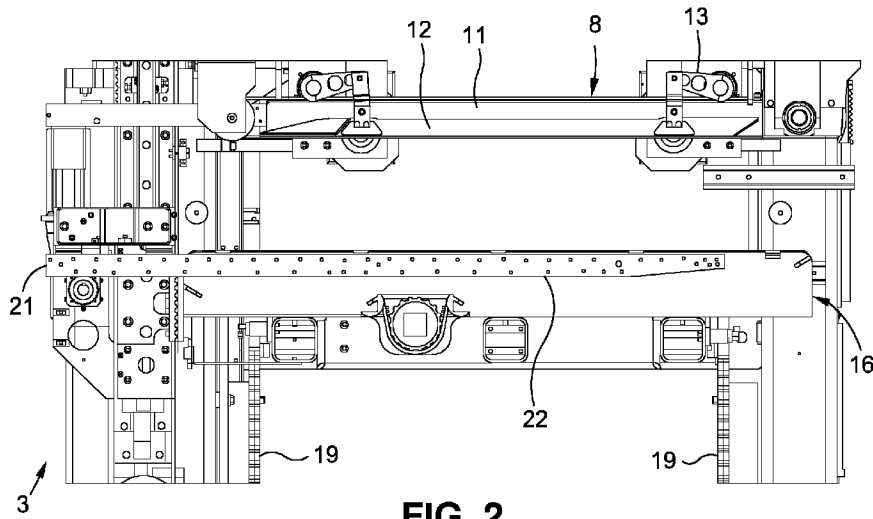
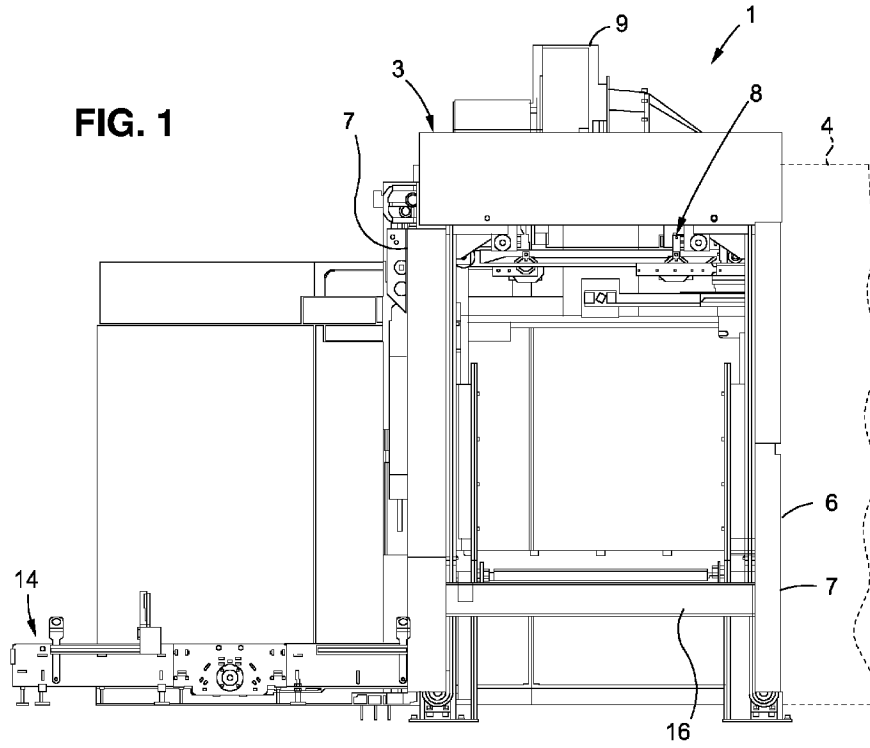


FIG. 2

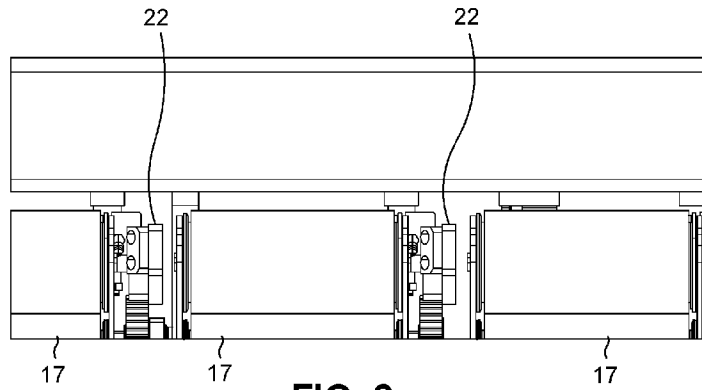


FIG. 3

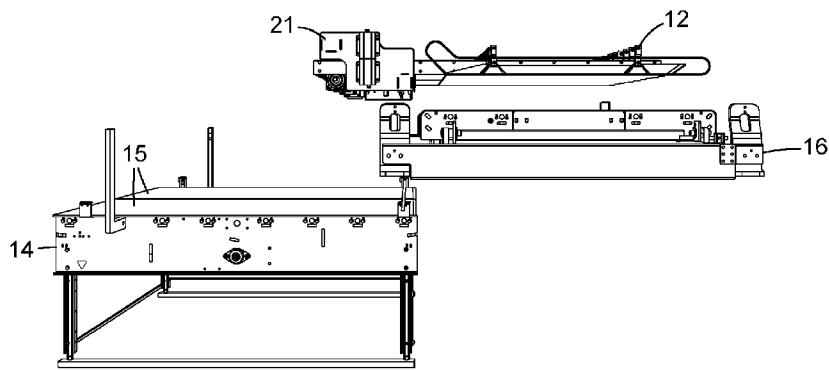


FIG. 4

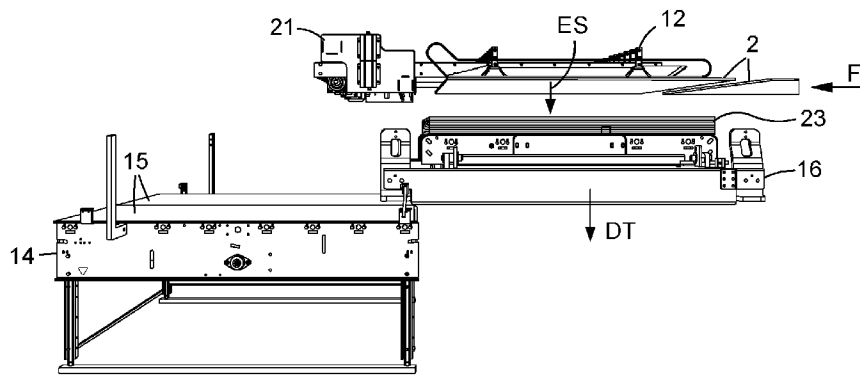


FIG. 5

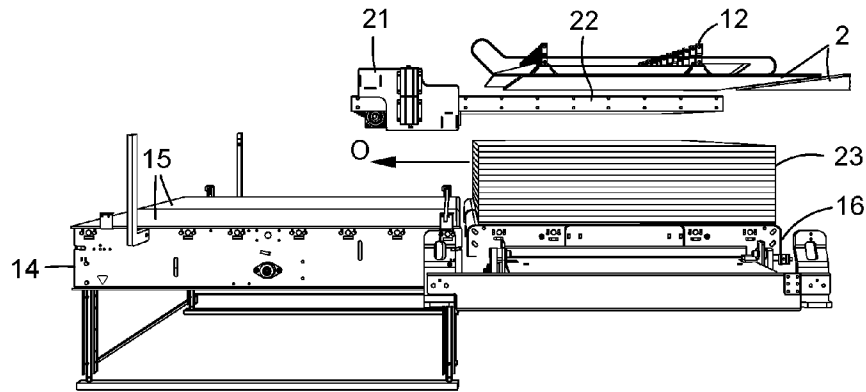


FIG. 6

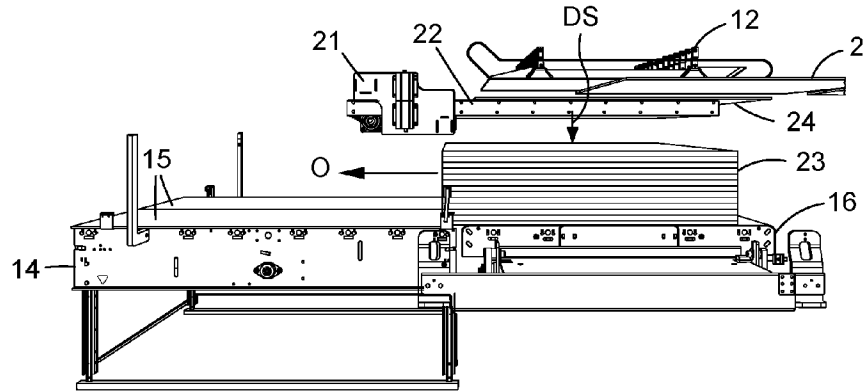


FIG. 7

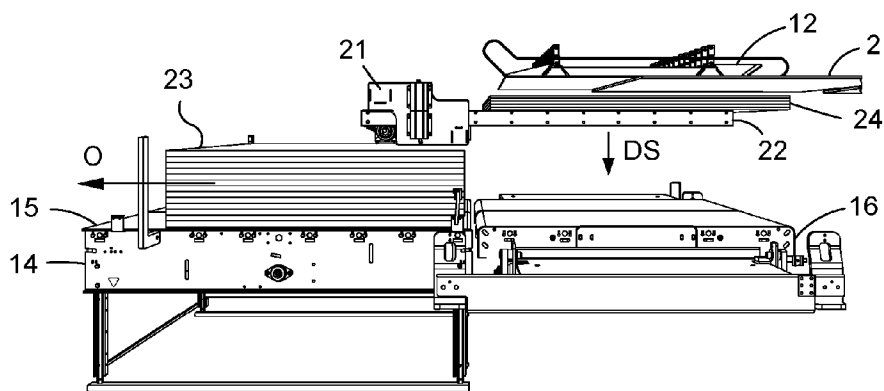


FIG. 8

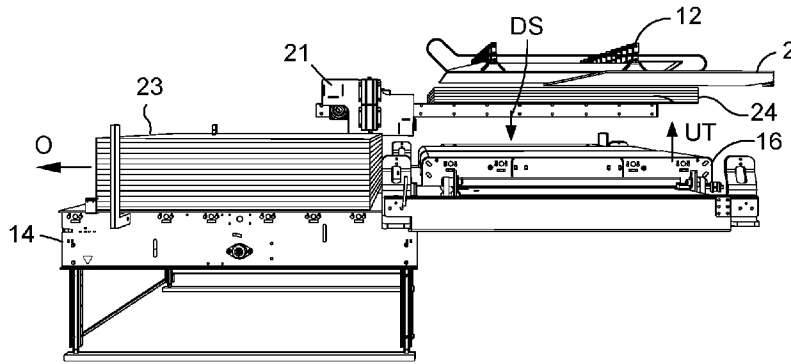


FIG. 9

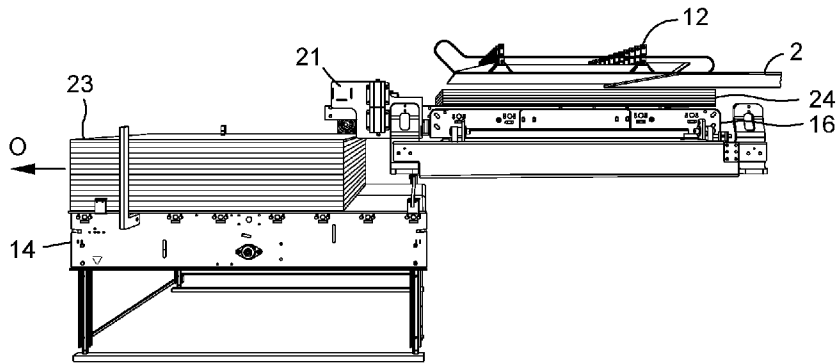


FIG. 10

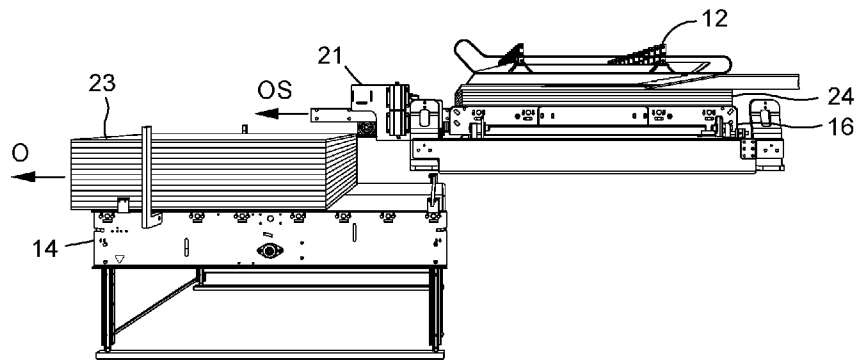


FIG. 11

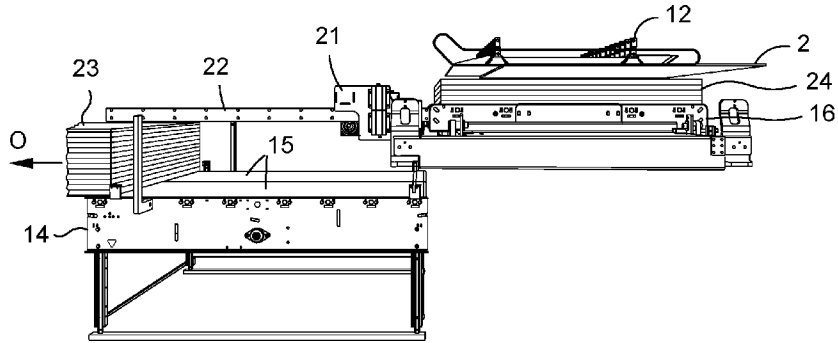


FIG. 12

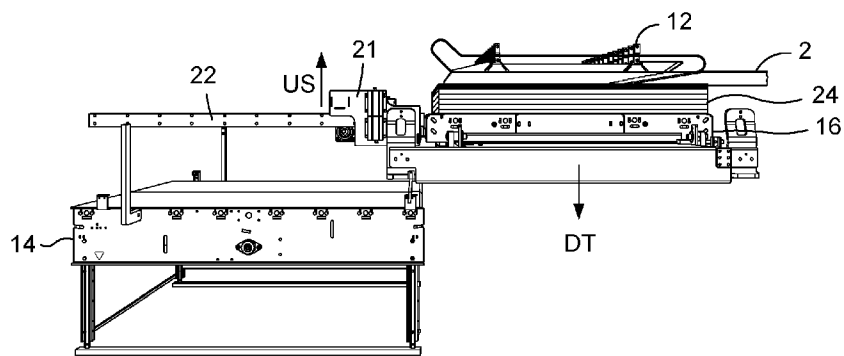


FIG. 13

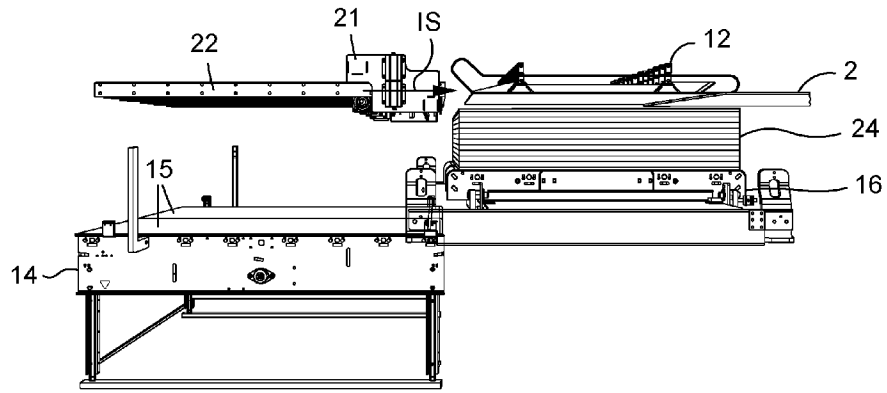


FIG. 14

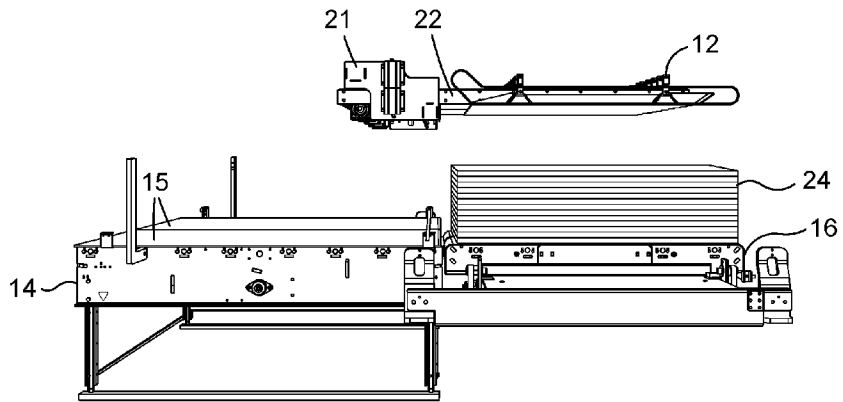


FIG. 15