(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 174 687**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **85201366.3**

(22) Date of filing: **30.08.85**

(51) Int. Cl.⁴: **B 65 H 29/32**

(30) Priority: **01.09.84 NL 8402674**

(43) Date of publication of application:
19.03.86 Bulletin 86/12

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) **Device for stacking sheet-shaped objects.**

(57) Device for stacking sheet-shaped objects provided with a frame, with a conveyor belt (10) arranged at least substantially horizontally in the frame and with a stacking table arranged so as to be vertically adjustable in the frame, whereby means have been provided to transport a sheet-shaped object, spending at the bottom side of the lower part of the conveyor belt by means of sucking action, and to release the sucking action when the sheet-shaped object has arrived at the stacking table, whereby the conveyor belt is formed by several adjacent air permeable belts (11), the lower parts of which extend under a bottom wall (12), provided with openings (14) to let air pass, of a case (9) in which a vacuum can be generated, while between the belts up-and-down movable push off elements (22) are movable, which are coupled with closing elements (15) in the case for closing the air passage openings in the bottom wall of the case.

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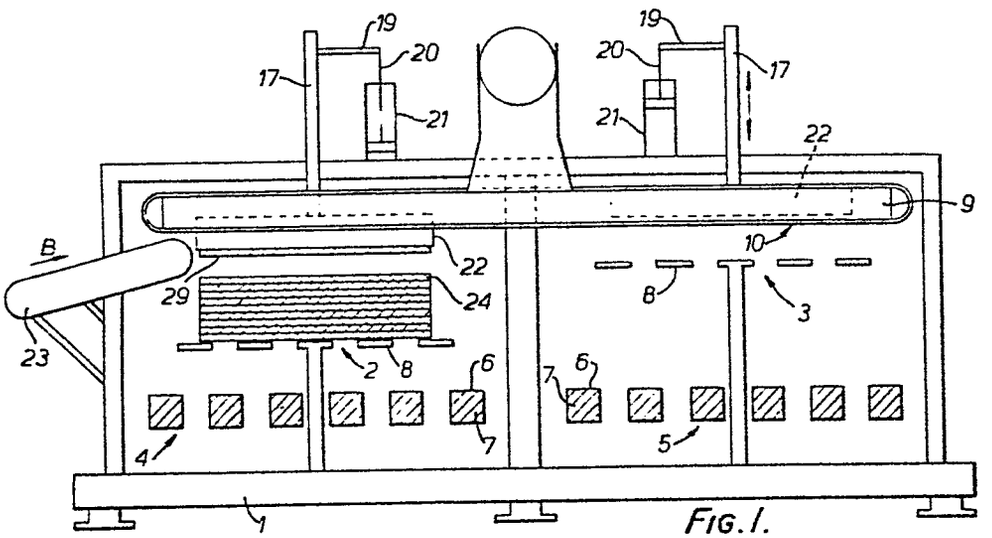

FIG. 1.

Device for stacking sheet-shaped objects.

The invention relates to a device for stacking sheet-shaped objects provided with a frame, with a conveyor belt arranged at least substantially horizontally in the frame and with a stacking table arranged vertically adjustable in the frame, whereby means have been provided to transport a sheet-shaped object, suspended at the bottom side of the lower part of the conveyor belt by means of sucking action, and to release the sucking action when the sheet-shaped object has arrived at the stacking table.

Such a device is known from the Dutch patent application No. 7103309. Any indication with regard to the construction of the means for generating resp. releasing the sucking action, however, is not given in this application.

The invention aims to obtain a device of the above kind, whereby the sucking action can be released at the desired moment in a simple way and at the same time the very light object can be delivered positively to the stacking table.

According to the invention this can be achieved because the conveyor belt is formed by several adjacent air permeable belts, the lower parts of which extend under a bottom wall, provided with openings to let air pass, of a case in which a vacuum is to be generated, whilst between the belts up-and-down movable push off elements are movable, which are coupled with closing elements in the case for closing the air passage openings in the bottom wall of the case.

In using the device according to the invention the sucking

action can be released at the desired moment by closing the air passage openings in the case, while at the same time, with the aid of the push off elements the sheet-shaped object will be released from the conveyor belt, so that there will be no risk of the sheet-shaped object remaining stuck to the conveyor belt, in spite of the sucking action having been released, and thus not being delivered to the stacking table correctly.

The invention will be further explained with reference to an embodiment of a device according to the invention, shown diagrammatically in the enclosed figures.

Fig. 1 shows diagrammatically, partly in view and partly in cross-section, a device according to the invention.

Fig. 2 shows, on a larger scale, a part of the vacuum case and associated parts.

The device shown in fig. 1 comprises a frame 1 in which a pair of stacking tables 2 and 3 are accommodated movable up-and-down.

Under stacking table 2 a conveyor 4 and under stacking table 3 a conveyor 5 has been arranged. Each conveyor has been constructed from a number of endless belts 6, extending parallel to each other, and horizontally and perpendicularly to the plane of fig. 1 and further guided around rolls 7 rotatable around horizontal axes of rotation.

As further appears from fig. 1 each stacking table is constructed from a number of laths 8 extending parallel to each other, all this in such a way, that in the lowest position of stacking table 2 and 3 resp., said laths 8 will be situated under the upper parts of belts 6 of conveyor 4 resp. 5 for delivering the objects lying on the stacking table to the relevant conveyor 4 or 5, so that next these objects can be transported perpendicularly to the plane of drawing 1.

Over the stacking table, a case 9 has been arranged in the frame, in which, with the aid of means not further shown, a vacuum can be generated. An endless conveyor 10, which is constructed from a number of belts 11, extending parallel to and at some distance from each other, has been arranged in such a way that the lower parts of the belts 11, while in operation, can move in the direction according to arrow A along the bottom side of bottom 12 of vacuum case 9.

As appears in particular from fig. 2 holes 13 and 14 resp. have been provided both in belt 11 and in bottom 12 of vacuum case 9.

In the vacuum case a closing plate 15 made of elastic material

such as rubber has been provided, which is joined to a support plate 16. Fixed to support plate 16 are upwardly extending rods 17, which are mutually coupled by a cross-rod 18. Cross-rod 18 is coupled to piston rod 20 of an adjusting cilinder 21 with the aid of an arm 19, in such a way that closing plate 15, from the position shown in fig. 2, in which said closing plate closes openings 14 in the bottom of the vacuum case, can be moved upwardly for exposing said openings.

Further plate-shaped push off elements 22 are coupled with the support plate 16, said plate-shaped elements 22 extending vertically and being movable up-and-down between belts 11 forming conveyor 10 between the position, in which said plate-shaped elements, as shown in fig. 2, extend with their lower most ends at some distance below the belts 11 and a position, in which the lower most edges of the plate-shaped elements are situated above the bottom sides of the belts 11.

Further the device is provided with a supply conveyor 23 near an end of the frame.

While in operation sheet-shaped objects 24 will be supplied in the direction according to arrow B with the aid of the supply conveyor. The movement of said sheet-shaped objects as well as the number of sheet-shaped objects can be controlled with the aid of sensors not further shown.

A sheet-shaped object supplied with the aid of conveyor 23 will be sucked against the bottom side of conveyor 10, because vacuum has been generated in vacuum case 9 and openings 14 in the bottom of the vacuum case have all been exposed.

When a sheet-shaped object has arrived over stacking table 2 and must be delivered to said stacking table, a signal will be given to adjusting cilinder 21 in such a way that said adjusting cilinder 21 will move closing plate 15 and push members 22 downward. Thereby openings 14 are closed, so that there is no longer a sucking action on the sheet-shaped object, whilst simutaneously the sheet-shaped object is pressed down positively with the aid of push off elements 11 in order to be delivered to stacking table 2. While forming a stack of sheet-shaped objects on stacking table 2 the latter will gradually move downward. When a sufficient number of sheet-shaped objects has been delivered to stacking table 2, the closing plate which is situated over stacking table 2 will no longer be moved downward but kept in its raised position, so that the sheet-shaped object can move further on into the direction of

stacking table 3. As soon as a sheet-shaped object has arrived at stacking table 3, it will be delivered to stacking table 3 in a similar way as described above. During said loading of stacking table 3 stacking table 2 can be moved further downward for delivering the sheet-shaped objects to conveyor 4 and, after discharging of the sheet-shaped objects with the aid of conveyor 4 the table 2 can be brought back to its starting position.

After a sufficient number of sheet-shaped objects has been placed on stacking table 3 the delivering of sheet-shaped objects to stacking table 2 will be resumed again, while in the meantime stacking table 3 will move further downward to deliver the objects to conveyor 5. After said objects have been discharged, with the aid of conveyor 5, stacking table 3 can be brought back into its starting position, after which the cycle described above can repeat itself again.

CLAIMS

1. Device for stacking sheet-shaped objects provided with a frame, with a conveyor belt arranged at least substantially horizontally in the frame and with a stacking table arranged so as to be vertically adjustable in the frame, whereby means have been provided to transport a sheet-shaped object, spending at the bottom side of the lower part of the conveyor belt by means of sucking action, and to release the sucking action when the sheet-shaped object has arrived at the stacking table, characterised in that the conveyor belt is formed by several adjacent air permeable belts, the lower parts of which extend under a bottom wall, provided with openings to let air pass, of a case in which a vacuum can be generated, while between the belts up-and-down movable push off elements are movable, which are coupled with closing elements in the case for closing the air passage openings in the bottom wall of the case.

2. Device according to claim 1, characterised in that the push off elements are formed by plates or strips extending at least substantially vertically.

3. Device according to claim 1 or 2, characterised in that under the stacking table a discharge conveyor has been arranged to which the sheet-shaped object delivered to the stacking table can be delivered because the stacking table is movable unto under the upper plane of the discharge conveyor.

4. Device according to any of the previous claims, characterised in that seen in the direction of displacement of the conveyor at least two stacking tables have been arranged one behind the other, while for

every stacking table push off elements and a closing element have been provided, which can be operated independent of the push off elements and the closing element of the other stacking table.

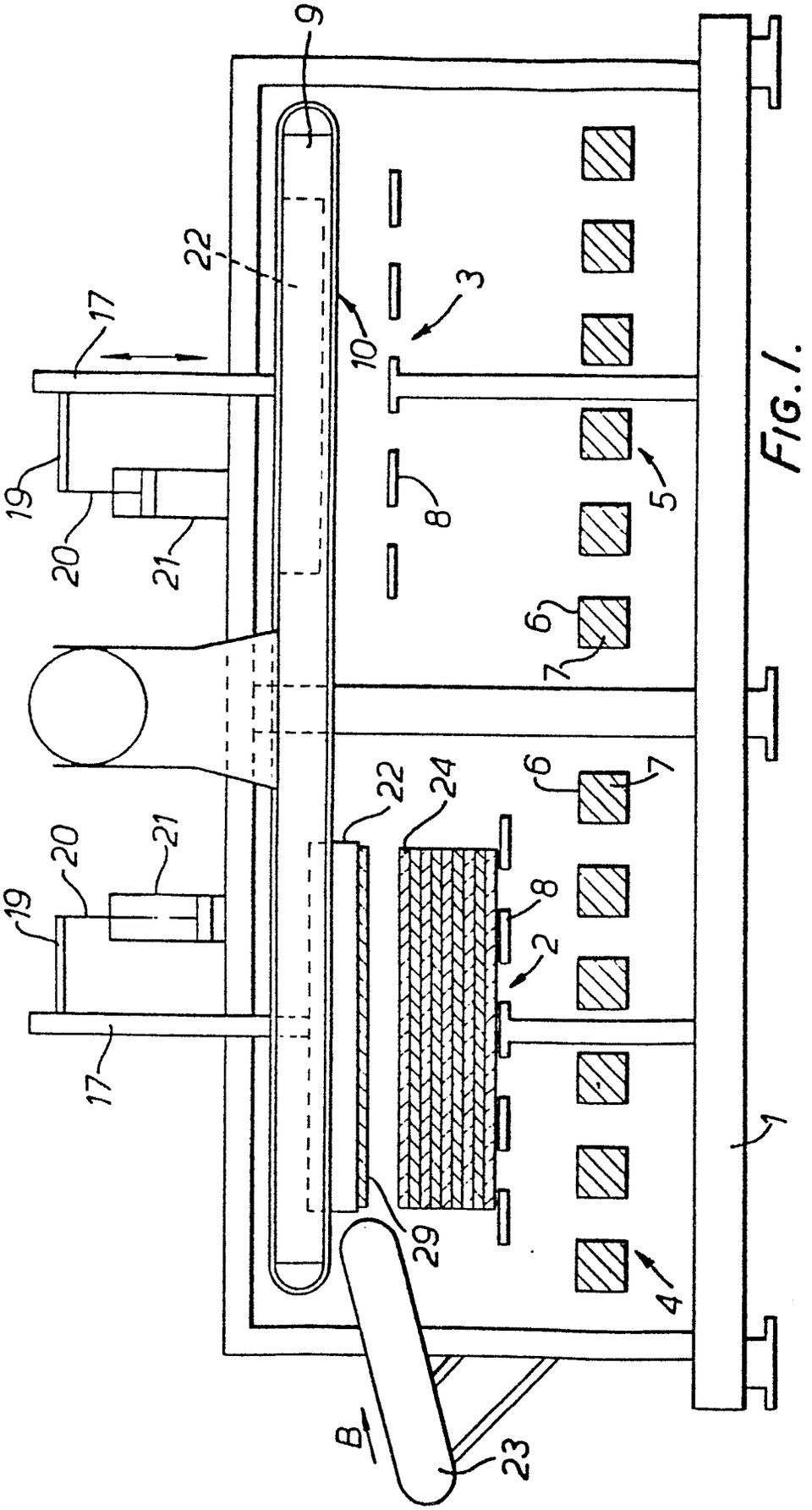

FIG. 1.

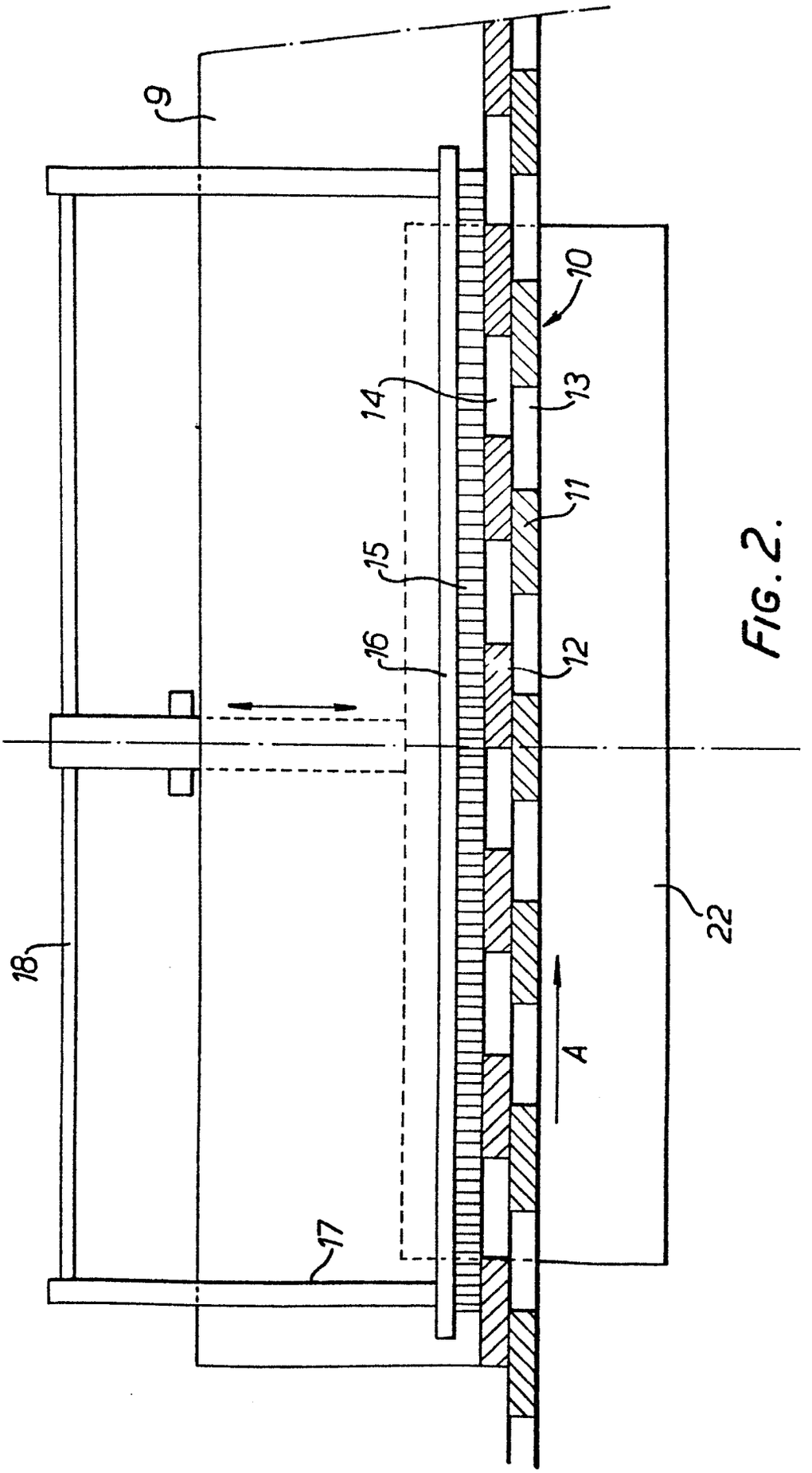

FIG. 2.

European Patent Office

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Application number:

EP 85 20 1366

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	DE-B-1 299 515 (STIEGLER) * Column 2, line 46 - column 4, line 36; figures 1,2 *	1	B 65 H 29/32
A		2-4	
Y	US-A-3 820 779 (DERITEND) * Column 1, line 42 - column 3, line 52; figures *	1	
A	NL-A- 245 944 (GAUBERT) * Page 6, line 10 - page 7, line 9; figures 2,5 *	1,2	
A	US-A-3 255 895 (KLINGLER) * Column 3, lines 60-68; figures 5-7 *	3	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	US-A-3 490 764 (MUELLER) * Column 6, lines 39-49; figure 4 *	4	B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29-11-1985	LONCKE J.W.

CATEGORY OF CITED DOCUMENTS

- : particularly relevant if taken alone
- : particularly relevant if combined with another document of the same category
- : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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