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

(11) EP 0 870 678 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.10.1998 Bulletin 1998/42

(51) Int Cl.[6]: **B65B 9/06**, B65B 25/14, B65B 57/16

(21) Application number: **98201040.7**

(22) Date of filing: **02.04.1998**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **07.04.1997 NL 1005750**

(71) Applicant: **Buhrs-Zaandam B.V.**
NL-1505 HH Zaandam (NL)

(72) Inventors:
- **Timmerman, Ronald**
  1507 TX Zaandam (NL)
- **Hendriks, Johan**
  1625 BC Hoorn (NL)

(74) Representative:
Smulders, Theodorus A.H.J., Ir. et al
Vereenigde Octrooibureaux
Nieuwe Parklaan 97
2587 BN 's-Gravenhage (NL)

(54) Apparatus for packaging articles of different thickness

(57) A packing apparatus for packing mail items, magazines, books, CDs and like products composed of one or more layers, comprising a product-assembling path (1), a product-positioning station (10), a folding station (2), the product-positioning station comprising an upper and a lower speed-influencing element (12) intended for engaging a bottom side and a top side respectively of the product to be packed, wherein upstream of the product-positioning station (10), a sensor (13) is provided by means of which the height of a product is determined, the product-positioning station (10) comprising an actuator (14) by means of which the mutual distance between the upper and the lower speed-influencing element (11,12) is continuously settable, a control being provided to which the sensor (13) and the actuator (14) are connected, the control being arranged so that the distance between the upper and the lower speed-influencing element always corresponds to the height of the product to be packed when this product to be packed arrives at the product-positioning station (10).

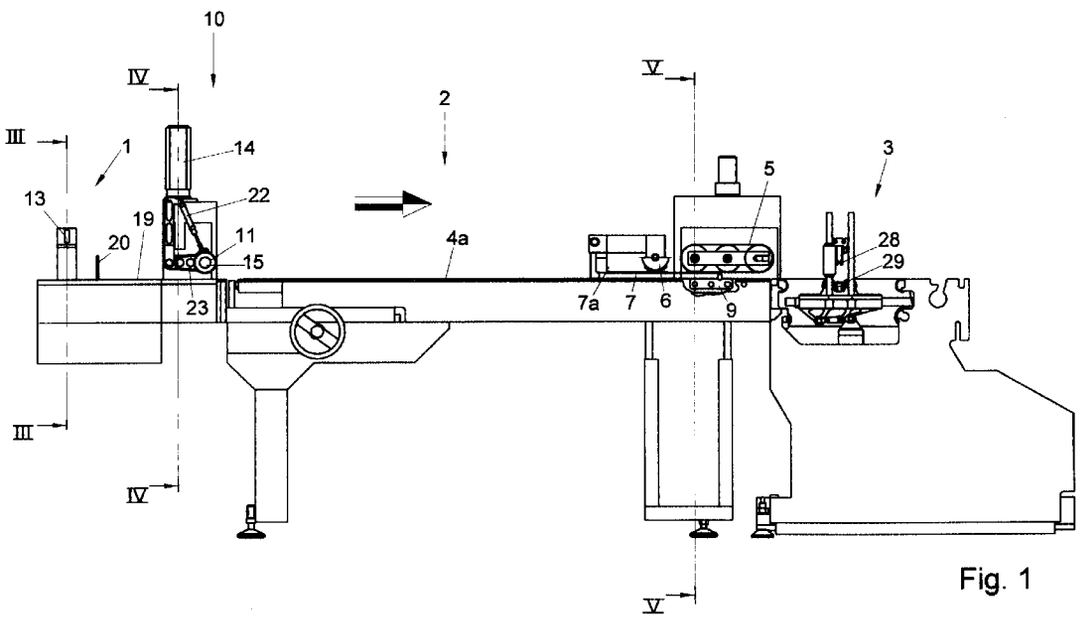

Fig. 1

EP 0 870 678 A1

Description

The invention relates to a packing apparatus for packing mail items, magazines, books, CDs and like products composed of one or more layers, comprising a product-assembling path in which products to be packed are assembled, a product-positioning station by means of which the assembled products are positioned in a controlled manner on a continuous packing material web of film or paper, a folding station comprising folding means by means of which the longitudinal edges of the continuous packing material web are folded around the products to be packed to form a continuous packing tube with products included therein, and a separating station by means of which the packing tube is divided in transverse direction between the products into loose, packed end products, the product-positioning station comprising an upper and a lower speed-influencing element, intended for engaging a bottom side and a top side respectively of the product to be packed, the speed of the upper speed-influencing element always corresponding to the speed of the lower speed-influencing element, while the speeds of the two speed-influencing elements can be controlled continuously.

Such apparatus is known from European patent application EP-A-0 685 417.

A drawback of the known apparatus is that it can only pack products whose mutual thicknesses substantially correspond. However, from the nature of the packing apparatus, it follows that the products to be packed do not all have the same thickness. Indeed, in the product-assembling path, some products have more enclosures added thereto than other products. An enclosure can for instance be formed by a CD box added to a magazine and only intended for specific subscribers. It is true that in the known apparatus, the distance between the speed-influencing elements is settable, but this distance is changed only occasionally for a series of products to be packed. In the known apparatus, it is not possible to randomly process products having mutually different thicknesses.

The object of the invention is to provide a packing apparatus whereby products of different thicknesses can be processed in random order.

To this end, according to the invention, the packing apparatus of the type described in the opening paragraph is characterized in that upstream of the product-positioning station, a sensor is provided by means of which the height of a product is determined, the product-positioning station comprising an actuator by means of which the mutual distance between the upper and the lower speed-influencing element is continuously settable, a control being provided to which the sensor and the actuator are connected, the control being arranged so that the distance between the upper and the lower speed-influencing element always corresponds to the height of the product to be packed when this product to be packed arrives at the product-positioning station.

With an apparatus of such design, by means of the sensor, the thickness of each product fed to the product-positioning station is determined. Next, by means of the actuator, the distance between the speed-influencing elements is adapted to the thickness of the product to be positioned before, or at least when this product to be positioned arrives at the positioning station. Hence, with an apparatus of such design, products of mutually different thicknesses can be processed in random order.

According to a further elaboration of the invention, it is particularly favorable when the sensor is a laser displacement sensor, arranged above the product-assembling path and measuring the distance to the top side of the product, with the control being arranged for deriving from this distance the thickness of the product. Such sensor is of standard commercial availability and can determine a distance with great precision.

It is clear that sometimes, the thickness of a product to be packed varies over the length thereof. This may for instance be the case when an enclosure has an A5-size, whereas the product itself has an A4-size. To prevent the situation that the distance between the speed-influencing elements still changes while a product is located between these elements, according to a further elaboration of the invention, it is particularly favorable if the control is of such design that the sensor measures the maximum thickness of a product to be packed, that the distance between the speed-influencing elements corresponds to this maximum thickness when this product to be packed arrives at the product-positioning station and that this distance is maintained during a period to be set.

Further elaborations of the invention are described in the subclaims and will be specified on the basis of an exemplary embodiment, with reference to the accompanying drawings. In these drawings:

Fig. 1 is a side elevational view of an exemplary embodiment of the apparatus;
Fig. 2 is a top plan view of the exemplary embodiment shown in Fig. 1;
Fig. 3 is a sectional view taken on the line III-III in Fig. 1;
Fig. 4 is a sectional view taken on the line IV-IV in Fig. 1; and
Fig. 5 is a sectional view taken on the line V-V in Fig. 1.

Fig. 1 schematically shows, in side elevational view, a portion of an exemplary embodiment of a packing apparatus for packing mail items, magazines, books, CDs and like products composed of one of more layers. Such packing apparatus comprises a product-assembling path 1, whose final portion is shown in Fig. 1 and in which products to be packed are assembled in that feeder stations feed enclosures and the like to a conveying path 19. On this conveying path 19, a thus assembled product is advanced by means of projections 20 con-

nected to an endless chain 21 that is driven. Arranged at the end of the product-assembling path 1 is a product-positioning station 10 by means of which the assembled products are positioned in a controlled manner on a continuous packing material web of film or paper. This packing material web is brought into the product-conveying path downstream of the product-assembling path 1, at the inlet of the folding station 2. In applicant's packing apparatus, the packing material web is passed from the lower side of the product-conveying path over a so-called folding block into the product-conveying path. Such folding block is described in EP-A-0 686 555. After the products have been positioned on the packing material web by the product-positioning station 10, the longitudinal edges of the continuous packing material web are folded around the products to be packed to form a continuous packing tube with products included therein. To this end, the folding station 2 comprises folding means, which in applicant's packing apparatuses comprise, inter alia, the above-mentioned folding block and a so-called pulling element 5 in the form of a pulling belt 5. To guarantee the further transport of the packing material web with the products located thereon, the folding station 2 comprises a first conveyor belt 4 on which at least a part of the packing material web is located which extends under the products to be packed. The pulling element 5 mentioned is disposed above the first conveyor belt 4 and engages parts of the packing material web located at the top side of the products to be packed. The folding station further comprises connecting means 6 by means of which the longitudinal edges of the packing material web are interconnected.

Disposed downstream of the folding station 2 is a separating station 3 by means of which the packing tube formed in the folding station 2 is divided, in transverse direction between the products, into loose, packed end products. Such cutting station for instance comprises a cutting knife for cutting through, in transverse direction, a packing material web composed of paper, or a sealing beam 28 with counterpressure beam 29, as shown in the present exemplary embodiment, for sealing up and at the same time separating loose, packed end products of the packing tube.

The product-positioning station 10 comprises an upper and a lower speed-influencing element 11 and 12 respectively, intended for engaging a bottom side and a top side respectively of the product to be packed. The speed of the upper speed-influencing element 11 always corresponds to the speed of the lower speed-influencing element 12. Moreover, the speeds of the two speed-influencing elements 11, 12 can be controlled continuously. Positioning is effected in that, at the start of the engagement of a product, the speed-influencing elements 11, 12 have a peripheral speed which corresponds to the conveying speed of a product as it enters. Next, the speed of the speed-influencing elements 11, 12 is varied during the engagement of the product such that the product is placed at a desired position on the packing material web. As is clearly visible in Figs. 1 and 2, upstream of the product-positioning station 10, a sensor 13 is provided by means of which the height of a product is determined. The positioning station 10 comprises an actuator 14 by means of which the mutual distance between the upper and the lower speed-influencing element 11 and 12 respectively is continuously settable. The packing apparatus further comprises a control to which the sensor 13 and the actuator 14 are connected. The control is arranged so that the distance between the upper and the lower speed-influencing element 11, 12 always corresponds to the height of the product to be packed when this product to be packed arrives at the product-positioning station 10.

In the present exemplary embodiment, the sensor 13 is a laser displacement sensor, arranged above the product-assembling path 1 and measuring the distance to the top side of the product. The control is arranged for deriving from this distance the thickness of the product.

Preferably, the control is of such design that the sensor 13 measures the maximum thickness of a product to be processed. Next, the control provides that the distance between the speed-influencing elements 11, 12 corresponds to this maximum thickness when the product to be packed arrives at the product-positioning station and that this distance is maintained during a period to be set. This prevents the distance between the speed-influencing elements 11, 12 from varying each time during the engagement of a product, which would result in a highly irregular behavior and would moreover cause a very high load on the actuator 14.

In the present exemplary embodiment, the actuator 14 is designed as a servomotor 14. As is clearly demonstrated in Figs. 2 and 3, the speed-influencing elements 11, 12 are constructed as a number of top rollers 11 and a bottom roller 12. The rotary axis 15 of the top rollers 11 is bearing-mounted in a slide 16 which is bearing-mounted for sliding up and down in a guide 17. The servomotor 14 drives a spindle 18 which engages the slide 16 such that the vertical position of the top roller 11 is settable by means of the servomotor 14. In order to take up small differences in thickness without adjusting the top roller 11, it is particularly favorable if each top roller 11 is bearing-mounted so as to be spring-loaded in vertical direction. In the present exemplary embodiment, the spring is formed by a pneumatic telescope 22. The rotary axis 15 of the top rollers 11 is bearing-mounted in the slide 16 via a pivotable arm 23. The rotational drive of the top roller 11 and the bottom roller 12 takes place by means of a single drive motor having a continuously variable speed. For this purpose, the top roller 11 and the bottom roller 12 are drivably interconnected via a Schmidt-coupling, known per se, as described in EP-A-0 685 417.

In the present exemplary embodiment, the folding station 2 comprises a pressure plate 7 arranged above the first conveyor belt 4. In operation, the top side of this

pressure plate 7 is engaged by the pulling element 5, with the interposition of at least the longitudinal edges of the packing material web. The distance between the first conveyor belt 4 and the bottom side of the pressure plate 7 is such that products of different thicknesses can pass therebetween. Upstream of the pressure plate 7, the longitudinal edges of the packing material web do not yet lie on top of each other, while directly downstream of the vertical portion 7a of the pressure plate 7, these longitudinal edges lie on top of each other.

In order to exert a pulling force also on the parts of the packing material web located below the products to be packed, the first conveyor belt 4 in the present exemplary embodiment is provided with passage openings 8. Arranged below the first conveyor belt 4 is a vacuum chamber 9, which vacuum chamber 9 is provided with at least one suction opening 9' abutting against the bottom surface of a top part 4a of the first conveyor belt 4. By means of this vacuum chamber 9, a vacuum is created, so that, via the passage openings 8, the packing material web is fixed onto the first conveyor belt 4 through suction.

For processing a plastic film web as packing material web, the connecting means 6 by means of which the longitudinal edges of the packing material web are interconnected, may be designed as a sealing element 6 arranged upstream of the pulling element 5. In operation, the sealing element 6 presses on the top side of the pressure plate 7, with the interposition of at least the longitudinal edges of the plastic film web.

For processing a paper as packing material web, the connecting means by means of which the longitudinal edges of the packing material web are interconnected, may be designed as at least one glue gun which is arranged upstream of the pulling element 5 and which is designed for applying adhesive to at least one of the longitudinal edges of the paper web. In general, this glue gun, not shown in the present exemplary embodiment, will be located upstream of the vertical part 7a of the pressure plate, because at that location, the longitudinal edges of the packing material web do not yet lie on top of each other. The pressure required for effecting the adhesive connection is provided by the pulling element 5 pressing on the pressure plate 7.

Preferably, the distance between the pressure plate 7 and the conveyor belt 4 is settable in that the pressure plate 7 is arranged so as to be displaceable in vertical direction. In that case, the pulling element 5 and the sealing element 6, if present, should of course likewise be arranged so as to be displaceable in vertical direction.

In the present exemplary embodiment, the pulling element 5 is designed as an endless second conveyor belt 5. The conveying speed of the second conveyor belt 5 corresponds to the conveying speed of the first conveyor belt 4. In this manner, a uniform transport of both the bottom side and the top side of the packing tube is effected without the products having to be clamped between the two conveyor belts.

As is clearly demonstrated in Fig. 5, for the purpose of its vertical adjustment, the pulling element 5 is suspended in a vertically adjustable frameplate 24 which is bearing-mounted on a vertical guide 25. The frameplate 24 is engaged by a screw spindle 26 which is connected to an adjusting knob 27 so as to be restrained from rotation. Due to the presence of the pressure plate 7, the variation in thickness within a series of products to be packed may increase to about 80 mm. When the products to be packed have a thickness of about 160 mm, the height of the pulling element 5 above the top part 4a of the conveyor 4 should be set at about 200 mm by means of the adjusting knob 27, so that products having a thickness of 200 mm as well as products having a thickness of 120 mm can be processed. Hence, the adjusting knob 27 serves for the setting per series of products to be processed. Within this series of products to be processed, a considerable variation in thickness may occur without this causing problems during the packing process.

It is readily understood that the invention is not limited to the exemplary embodiment described, but that various modifications are possible within the framework of the invention.

Claims

1. A packing apparatus for packing mail items, magazines, books, CDs and like products composed of one or more layers, comprising a product-assembling path (1), in which products to be packed are assembled, a product-positioning station (10) by means of which the assembled products are positioned in a controlled manner on a continuous packing material web of film or paper, a folding station (2) comprising folding means by means of which the longitudinal edges of the continuous packing material web are folded around the products to be packed to form a continuous packing tube with products included therein, and a separating station (3) by means of which the packing tube is divided in transverse direction between the products into loose, packed end products, the product-positioning station (10) comprising an upper and a lower speed-influencing element (11, 12), intended for engaging a bottom side and a top side respectively of the product to be packed, the speed of the upper speed-influencing element (11) always corresponding to the speed of the lower speed-influencing element (12), while the speeds of the two speed-influencing elements (11, 12) can be controlled continuously, **characterized in that** upstream of the product-positioning station (10), a sensor (13) is provided by means of which the height of a product is determined, the product-positioning station (10) comprising an actuator (14) by means of which the

mutual distance between the upper and the lower speed-influencing element (11 and 12 respectively) is continuously settable, a control being provided to which the sensor (13) and the actuator (14) are connected, the control being arranged so that the distance between the upper and the lower speed-influencing element always corresponds to the height of the product to be packed when said product to be packed arrives at the product-positioning station (10).

2. A packing apparatus according to claim 1, characterized in that the sensor (13) is a laser displacement sensor, arranged above the product-assembling path (1) and measuring the distance to the top side of the product, the control being arranged for deriving from said distance the thickness of the product.

3. A packing apparatus according to one of the preceding claims, characterized in that the control is arranged so that the sensor (13) measures the maximum thickness of a product to be processed, that the distance between the speed-influencing elements (11, 12) corresponds to said maximum thickness when said product to be packed arrives at the product-positioning station (10), and that said distance is maintained during a period to be set.

4. A packing apparatus according to any one of the preceding claims, characterized in that the actuator (14) is a servomotor (14), the upper and lower speed-influencing elements (11, 12) being constructed as at least one top roller and at least one bottom roller (11 and 12 respectively), a rotary axis (15) of the or each top roller (11) being bearing-mounted in a slide (16) which is bearing-mounted for sliding up and down in a guide (17), the servomotor (14) driving a spindle (18) which engages the slide (16) such that the vertical position of the top roller (11) is settable by means of the servomotor (14).

5. A packing apparatus according to any one of the preceding claims, characterized in that the or each top roller (11) is bearing-mounted so as to be spring-loaded in vertical direction.

6. A packing apparatus according to claim 4 or 5, characterized in that the drive of the top roller (11) and the bottom roller (12) takes place by means of a single drive motor having a continuously variable speed, the top roller (11) and the bottom roller (12) being drivably interconnected via a Schmidt-coupling.

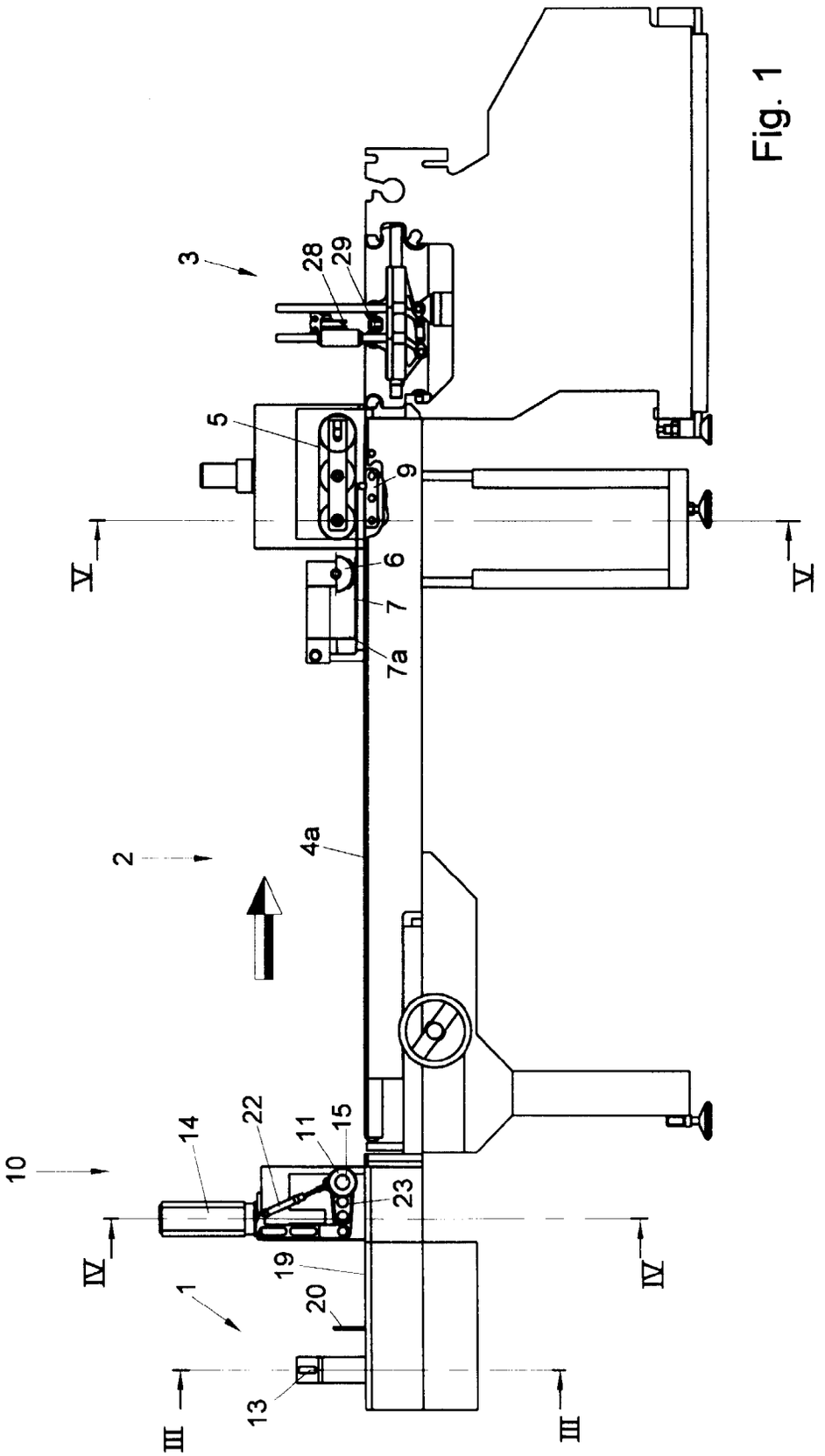

Fig. 1

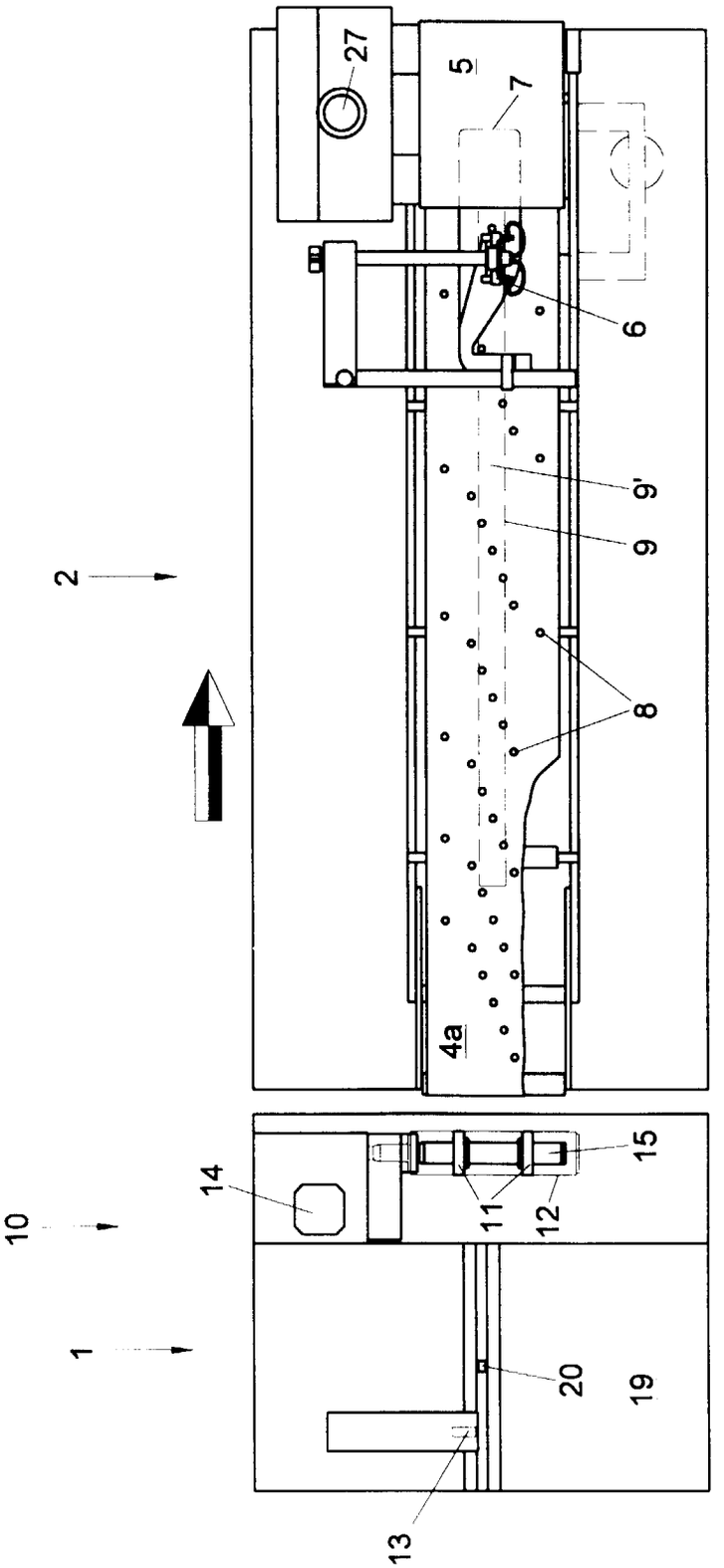

Fig. 2

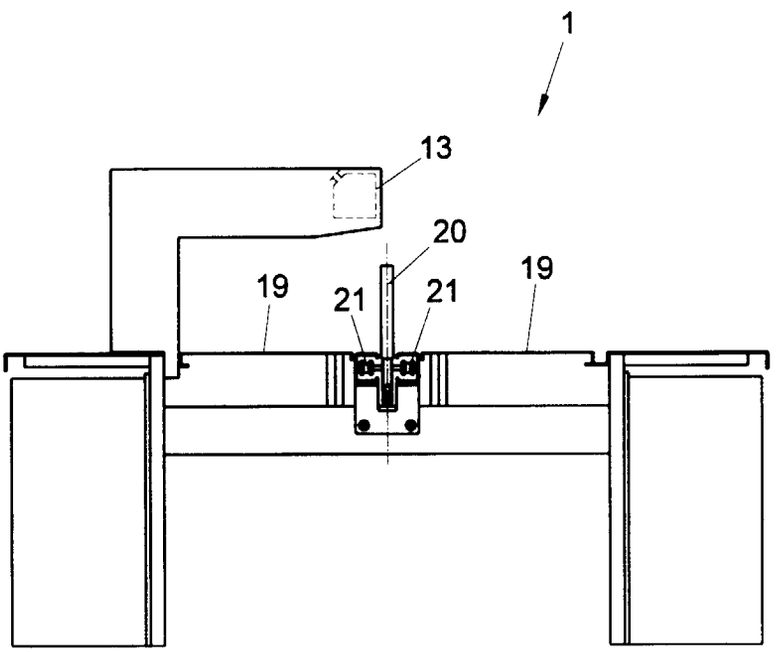

Fig. 3

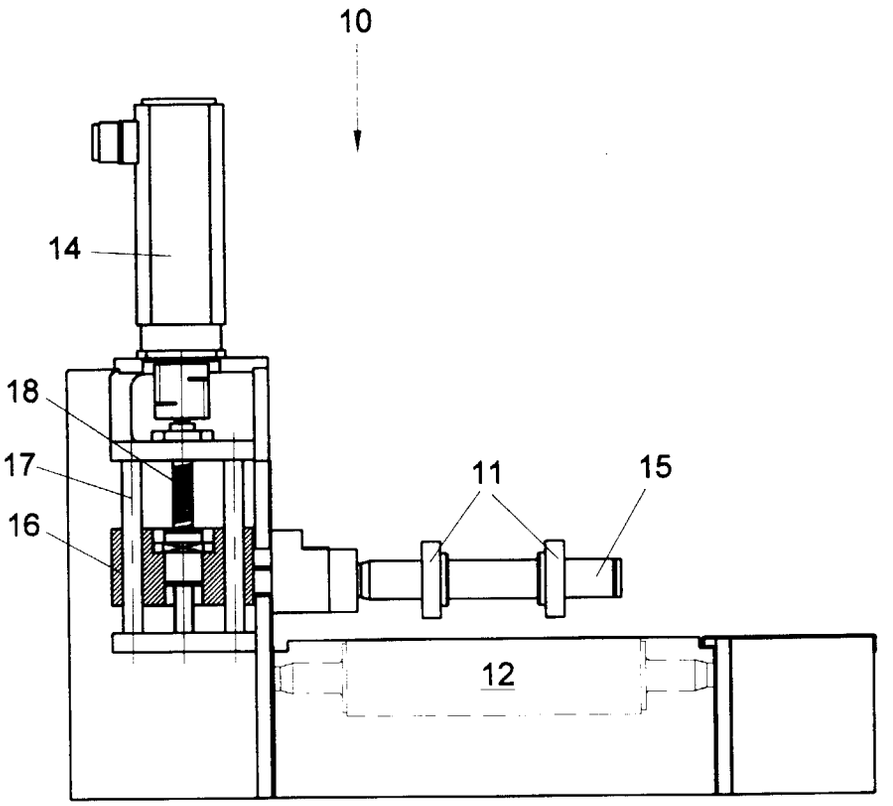

Fig. 4

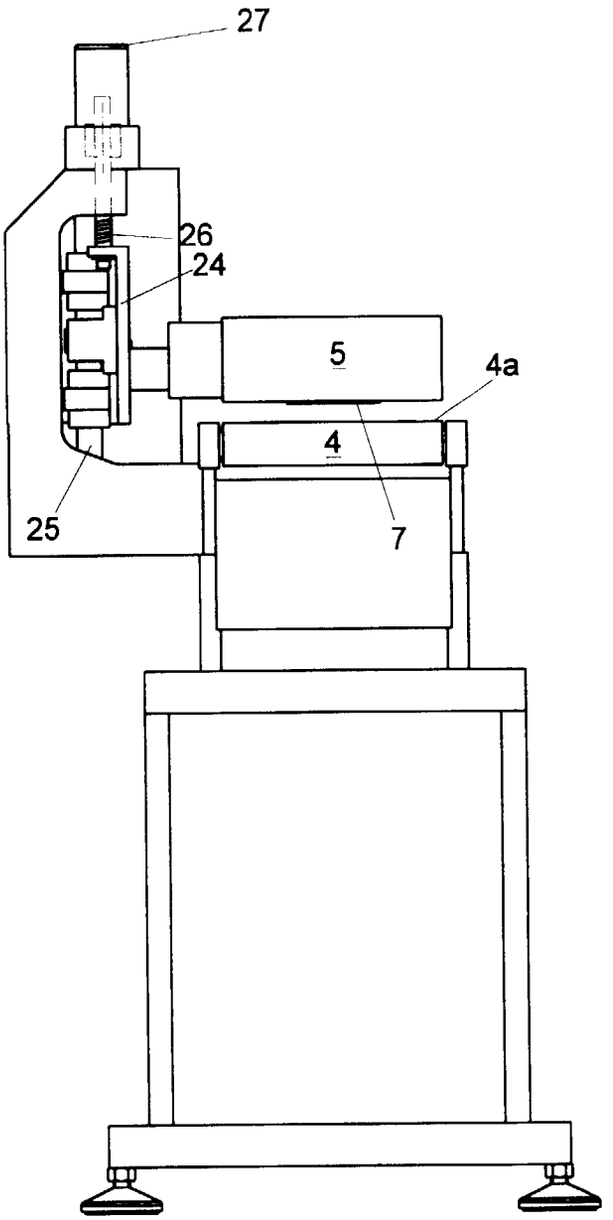

Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 20 1040

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.6)
D,A	EP 0 685 417 A (BUHRS-ZAANDAM) 6 December 1995 * column 4, line 1 - column 5, line 38; figures *	1,6	B65B9/06 B65B25/14 B65B57/16
A	US 5 255 495 A (L. KOVACS) 26 October 1993 * column 5, line 67 - column 8, line 33; figures *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	1 July 1998	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

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
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)