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(54) Securing and conveying system and device for securing and conveying flexible containers in a suspended manner in a packaging machine, and corresponding method

(57) The present invention relates to a securing and conveying system 1 for securing and conveying a flexible container 2 in a suspended manner in a packaging machine, comprising at least one securing device 3 movably mounted in the machine with a first and a second securing member 4,5 with the capacity to mutually move closer to and further from one another controlled by a mechanism 6 operated by a cam follower 10 sliding over a track 7 with at least a first and a second section 8,9 at a different level, the track being adjustable in height, a desired height being able to be preselected depending on container format. The control mechanism is suitable for the movement for moving the securing members closer to or further from one another to differ for one and the same level variation of the tracking element according to the preselected height at which the track has been arranged.

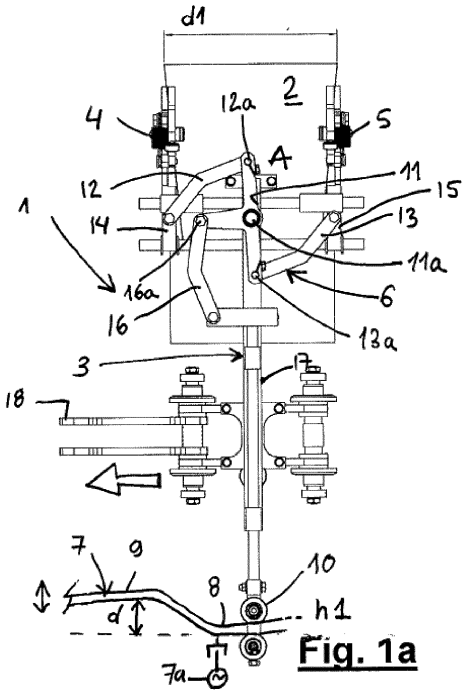

Fig. 1a

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Description

Technical Field of the Invention

[0001] The invention relates to a securing and conveying system for securing and conveying flexible containers in a suspended manner in a packaging machine, and to a securing device for securing containers intended for being part of a packaging machine, particularly suitable for conveying a container in a suspended manner.

Background of the Invention

[0002] In the field of flexible containers, packaging machines are known to use securing devices for securing containers which, conveyed by the machine, are responsible for securing the containers in a suspended manner by means of respective clamp-type securing members each securing opposite zones of one and the same container.

[0003] The conveyance of these securing devices when they secure respective containers allows in the machines with intermittent forward movement arranging the stationary containers in the work stations operating on the containers and also moving them from one work station to another. In machines with continuous forward movement, it allows moving the containers at the required speed so that the necessary operations can be performed on the containers without interrupting their movement. In another type of machines combining operations in stationary stations and operations during the movement of the containers, these securing devices conveyed by the machine and each one responsible for securing a container are also used.

[0004] It sometimes happens that the securing members of one and the same securing device must have the capacity to mutually move closer to and further from one another, such that this maneuver can cause the upper mouth or opening of the flexible containers to open and close, respectively. This opening of the containers is of interest in order to perform the container filling operation.

[0005] In such a machine there arises the drawback that when changing the format of a given container, in addition to adjusting the distance separating the securing members of all the securing devices, adapting it to the width of the new container format, it is necessary to also adjust the travel or distance that these securing members will travel when moving closer to and further from one another to perform the new container opening and closing maneuver. Conventionally, the wider a container, the greater the separating distance of the securing members for conveying the container in its closed position and also the greater the distance the securing members of each container must travel first in the direction of mutually moving closer to one another, to cause the container to open, and then in the direction of moving further from one another, to close the container and leave it in a manner that is suitable, for example, for sealing its upper opening.

[0006] Today, this entails having to manually intervene in each securing device to place the securing members at a different distance, and to adjust the mechanism responsible for mutually moving these securing members closer to and further from one another in order to change their travel during the opening and closing maneuver for the container to be secured.

[0007] Patent document WO 2013019712 discloses a mechanism capable of adjusting in unison the separating distance between two securing members of a securing device for securing containers, wherein said securing members are mounted in a guided manner following a straight path. The mechanical solution proposed in WO 2013019712, however, does not contemplate that the travel of these securing members must also vary when they are mutually moved closer to and further from one another to cause a container to open, depending on the distance initially separating them. On the other hand, the use of these mechanisms in a packaging machine does not prevent having to intervene individually in all the mechanisms one by one, being able to give rise to errors and to an excessive shutdown time for the machine.

[0008] A main objective of the invention is a system that simplifies these format change operations. Another objective of the invention is a system that allows performing this format change more quickly. Another objective of the invention is a system that allows making this format change operation more precise.

[0009] Another objective of the invention is a securing device of the type intended for being conveyed by a packaging machine, particularly suitable for carrying out the invention.

Disclosure of the Invention

[0010] The system of the invention comprises at least one securing device movably mounted in a packaging machine which is provided with at least a first and a second securing member with the capacity to mutually move closer to and further from one another, prepared for securing a container for conveyance by respective securing zones, said securing device comprising a control mechanism for controlling the instantaneous relative positions of the mentioned securing members.

[0011] The system is essentially **characterized in that** it comprises a track or cam surface with at least a first and a second section at a different level, the track being adjustable in height with respect to the chassis of the machine, a desired height being able to be preselected depending on container format, and in that there is slidably supported on the mentioned track a tracking element transmitting the level variation between sections of the track to the control mechanism for controlling the securing members to operate them and cause the movement for moving said securing members closer to or further from one another, the control mechanism being suitable for the travel of this movement for moving the securing members closer to or further from one another to differ

for one and the same level variation between the first and the second sections of the track according to the preselected height at which the track has been arranged.

[0012] According to the invention, instead of intervening on the securing devices conveyed by the machine, intervention is on the track or cam surface on which the tracking elements of all the securing devices of the packaging machine slide. The instantaneous separating distance between the pairs of securing members of all the securing devices will be modified by raising or lowering this track, preferably maintaining its profile. At the same time, the distance or travel for moving these securing members closer to or further from one another caused by the change in level between two sections of the track on which the tracking element slides will be conditioned by the working height selected for the track.

[0013] In one variant, the control mechanism for controlling the instantaneous relative positions of the securing members comprises a rotating element, operated by the tracking element, connected by means of respective first and second connecting rods to respective first and second support carriages of the respective first and second securing members, said first and second support carriages being mounted in the device in a guided manner according to respective straight paths.

[0014] In an embodiment of this variant, the rotating element is connected by means of a third connecting rod to the tracking element, mounted in the device in a guided manner according to a straight path.

[0015] In a variant of interest, the tracking element is guided according to a direction that is normal to the directions followed by the straight paths of the support carriages of the first and second securing members.

[0016] In a variant of interest, the rotating element is furthermore mounted such that it rotates about a horizontal shaft equidistant from the articulated attachments of the mentioned rotating element with the connecting rods associated with the support carriages of the first and second securing members.

[0017] In a variant of interest, the third connecting rod moves in a plane of movement parallel to that of the first and second connecting rods, such that the third connecting rod can intersect at least one of the first or second connecting rods according to the position adopted by the rotating element.

[0018] In one embodiment, the system comprises power-driven means acting on the assembly of the track to vary its height with respect to the chassis of the machine.

[0019] According to another aspect of the invention, a securing device for securing containers for a packaging machine is disclosed, comprising a frame, intended for being fixed in a vertical orientation to a conveyor belt or chain of the machine, mounting a control mechanism for controlling the instantaneous relative positions of a first and a second securing member secured to the frame with the capacity to mutually move closer to and further from one another and prepared for securing a container for conveyance by respective securing zones in a suspended manner, **characterized in that** the device comprises, mounted on the frame

- a tracking element of a cam pathway, movable in a guided manner according to a vertical reciprocating movement; and
- a first and a second support carriage each of a securing member, movable in a guided manner according to a horizontal reciprocating movement,

[0020] the control mechanism for controlling the instantaneous relative positions of the securing members comprising a rotating element that rotates with respect to the frame, connected by means of respective first, second and third connecting rods to the tracking element and to the support carriages of the securing members, respectively.

[0021] Advantageously, the vertical movement of the tracking element will be transmitted to the support carriages of the securing members to cause them to make a linear movement a distance according to the initial position said tracking element adopted before varying its position. In other words, for one and the same vertical movement of the tracking element, the linear movement of the securing members will vary according to the initial vertical position of the tracking element in the instant prior to its vertical movement.

[0022] In one embodiment, the articulated attachments of the connecting rods with the rotating element are distributed in said rotating element forming a T shape, the rotating shaft of the rotating element coinciding with the point of intersection between the imaginary line joining the articulated attachments of the connecting rods associated with the support carriages of the securing members with the imaginary line joining the articulated attachment of the connecting rod associated with the tracking element with the mentioned rotating shaft.

[0023] According to another aspect of the invention, the invention relates to a method for adjusting the distance separating two securing members for securing a container in a securing device for securing containers, in which said securing members are each linked by means of respective connecting rods to a rotating element provided in the mentioned securing device, adapting the separating distance to the width of a preselected container, comprising any one of the following

a) to go from a container format of width d1 to one of width d2, where d1>d2, rotating the rotating element from angular position A to angular position B such that in angular position B the securing members are arranged at an operating separating distance d2, and such that the movement that is transmitted to the securing members by means of the connecting rods by a rotation differential of the rotating element from this angular position B is less than that which was produced when this rotating element was in angular position A; and

b) to go from a container format of width d2 to one of width d1, where d1>d2, rotating the rotating element from angular position B to angular position A such that in angular position A the securing members are arranged at an operating separating distance d1, and such that the movement that is transmitted to the securing members by means of the connecting rods by a rotation differential of the rotating element from this angular position A is greater than that which was produced when this rotating element was in angular position B.

Brief Description of the Drawings

[0024]

Figures 1a and 1b are schematic drawings of a system according to the invention, in which the track adopts two different positions h1 and h2 in height, respectively;

Figure 2a illustrates the movement of part of the control mechanism for controlling the securing members of the securing device for securing containers of the system depicted in Figure 1a, with the track at height h1, which would take place when the mentioned securing device moves in the direction indicated by the arrow of Figure 1a and the tracking element slides over consecutive sections of the track at a different level;

Figure 2b illustrates the movement of the same part of the control mechanism for controlling the securing members of the securing device for securing containers in the conditions of the system depicted in Figure 2a, with the track at height h2, which would take place when the mentioned securing device moves in the direction indicated by the arrow of Figure 2a and the tracking element slides over the same consecutive sections of the track at a different level;

Figures 3a and 4a schematically illustrate a container according to a large format, in plan elevational view, the distance dx each of the edges of the container moves to cause the container to open being indicated; and

Figures 3b and 4b schematically illustrate a container according to a small format, in plan elevational view, the distance dx' each of the edges of the container moves to cause the container to open being indicated.

Detailed Description of the Invention

[0025] Figures 1a and 1b schematically show the system 1 of the invention basically comprising a track 7 or cam surface with a predetermined profile including sections 8, 9 at a different level; and several securing devices 3 for securing containers, only one of which has been illustrated, conveyed by a packaging machine (of which machine only a conveyor belt or chain 18 conveying the mentioned securing devices 3 is shown).

[0026] These securing devices 3 for securing containers are provided with a first and a second securing member 4, 5 prepared for securing a container for conveyance by respective securing zones. These securing members 4, 5 are configured in a known manner, for example in the form of clamps or the like and are not described in further detail as they are not part of the invention.

[0027] In the example, the securing members 4, 5 are mounted in the corresponding securing device 3 with the capacity to mutually move closer to and farther from one another, and the instantaneous positions of these securing members will be determined by the instantaneous position adopted by a tracking element 10 travelling with the securing device 3 and slidably supported on the track 7.

[0028] In the example, the track 7 has a main section 8 having a planar or essentially planar profile, such that the height at which this section 8 of the track 7 is arranged will determine the distance between the securing members 4, 5 during the conveyance of a container in the closed position. Nevertheless, the track has at least one also planar or essentially planar short section 9 at a level different from the main section 8 which will determine the distance between the securing members 4, 5 during the conveyance of a container in the open position.

[0029] In fact, this difference in level d between the main section 8 and short section 9 in the track 7 will cause, as explained in detail below, the vertical movement of the tracking element 10 and with it the movement for moving the securing members 4, 5 of the device 3 closer to or farther from one another. Specifically, the short section 9 of the track will be connected to the main section 8 by means of respective sloped transition sections such that it will be the sliding of the tracking element 10 over such sections that will cause the securing members to move in the direction for moving closer along an upward section and in the direction for moving farther away along a downward section, the distance for moving the securing members 4, 5 as close to one another as possible being maintained while the mentioned tracking element 10 slides over the short section 9.

[0030] Naturally, according to manufacturing needs, the track 7 could include more than one section 9 at a level different from a main section 8 or it could alternate sections at a different level without distinguishing between main sections from short sections.

[0031] In the example, the distance of the short section 9 will determine, together with the speed of movement of the securing device 3, the time during which the containers will remain open. Although it is preferable for this short section 9 to be planar, embodiments in which this short section 9 may not be planar are also envisaged, although it will then be preferable for it to be sloped or very slightly sloped.

[0032] In the depicted embodiment, the track 7 is adjustable in height with respect to the chassis of the machine conveying the securing devices 3, a desired height

being able to be preselected depending on container format. A change in height in the track 7 will cause a change in the distances of the securing members 4, 5 along the main section 8, i.e., a change in the distance between the securing members 4, 5 during the conveyance of a container in the closed position.

[0033] Figures 1a and 1b illustrate this change when the height of the track goes from h1 in Figure 1a to height h2 in Figure 1b. The securing members 4, 5 go from being separated by distance d1 in Figure 1a to being separated by distance d2 in Figure 1b. These distances d1 and d2 are those which correspond for holding the containers 2 and 2' of Figures 4a and 4b, respectively.

[0034] In one embodiment, the system 1 is provided with power-driven means 7a acting on the assembly of the track 7 to vary its height with respect to the chassis of the machine, schematically illustrated in Figures 1a and 1b.

[0035] On the other hand, in the example of Figures 1a and 1b, the device 3 comprises a control mechanism 6 prepared for transmitting movement to the securing members 4, 5 for moving them closer to and farther from one another based on a vertical movement of the tracking element 10, with the special particularity that this movement for moving the securing members 4, 5 closer to or further from one another differs for one and the same level variation d between the sections 8, 9 of the track 7 according to the preselected height h1 or h2 at which the track 7 has been arranged. In this case, the movement will be greater when the track 7 is located at height h1, the preselected position for a container 2 having a wider format.

[0036] To achieve this effect, it is seen in Figures 1a and 1b that the securing device 3 for securing containers comprises a frame 17 fixed in a vertical orientation to the conveyor belt, chain 18 or equivalent element of the machine, mounting the mentioned control mechanism 6 for controlling the instantaneous relative positions of the securing members 4, 5 secured to the frame 17 with the capacity to mutually move closer to and further from one another.

[0037] The tracking element 10, provided in the example with a pair of wheels applied to each on a face of the track 7 one by one, is movably mounted in the frame 17 and guided according to a vertical reciprocating movement.

[0038] In turn, a first and a second support carriage 14, 15 each of a respective securing member 4, 5 are also movably mounted in the frame 17 and guided according to a horizontal reciprocating movement. For that purpose, the frame 17 is provided with a pair of guiding rods that are arranged in a horizontal orientation and on which the aforementioned carriages 14, 15 slide.

[0039] The control mechanism 6 for controlling the instantaneous relative positions of the securing members 4, 5 further comprises a rotating element 11 that rotates with respect to the frame 17, connected by means of respective first, second and third connecting rods 12, 13, 16 to the tracking element 10 and to the support carriages 14, 15 of the securing members 4 and 5, respectively.

[0040] In the depicted embodiment, the articulated attachments 12a, 13a, 16a of these connecting rods 12, 13 and 16 with the rotating element 11 are distributed in said rotating element forming a T shape, the rotating shaft 11a of the rotating element 11 coinciding with the point of intersection between the imaginary line 18 joining the articulated attachments of the connecting rods associated with the support carriages of the securing members with the imaginary line 19 joining the articulated attachment of the connecting rod associated with the tracking element with the mentioned rotating shaft, as illustrated by the detail of Figures 2a and 2b.

[0041] In the example, the horizontal shaft 11a about which the rotating element 11 rotates is equidistant from the articulated attachments 12a, 13a of the mentioned rotating element 11 with the connecting rods 12, 13 linked at one and the same level with the support carriages 14, 15 of the first and second securing members 4 and 5, such that the rotation of this rotating element 11 will be equally transmitted to the securing members 4, 5 but in opposite directions.

[0042] The arrangement of this rotating element 11 and the dimensions of the connecting rods 11, 12 are selected (see Figures 1a and 2a) such that to arrange the securing members 4, 5 at distance d1 corresponding to a container 2 having a larger format, and to move these securing members 4, 5 during the container 2 opening maneuver, the mentioned rotating element 11 rotates, arranging the aforesaid imaginary line 18 in the sector comprised between 45º to 135º angles, and preferably between 75º and 105º, with respect to the horizontal. This location allows transmitting maximum movement to the carriages 14 and 15, and therefore to the securing members 4, 5, due to the angle of rotation of the rotating element. This effect is determined by the cosine ratio existing between the variation of the angular position of the rotating element 11 and the movement in the horizontal direction that is transmitted to the support carriages 14 and 15. A suitable position of the rotating element 11 for a large container 2 format is position A illustrated in Figure 1a.

[0043] In a preferred manner, the arrangement of this rotating element 11 and the dimensions of the connecting rods 11, 12 will furthermore be suitable so that (see Figures 1b and 2b) when arranging the securing members 4, 5 at distance d2 corresponding to a container 2' having a smaller format, and to move these securing members 4, 5 during the container 2' opening maneuver, the mentioned rotating element 11 rotates, arranging the aforesaid imaginary line 18 in the sector comprised between 315º to 45º angles, and preferably between 345º and 15º with respect to the horizontal. This locations allows transmitting minimal movement to the carriages 14 and 15, and therefore to the securing members 4, 5, due to the angle of rotation of the rotating element 11. A suitable position of the rotating element 11 for a smaller container 2' format is position B illustrated in Figure 1b.

[0044] It must be observed that in the depicted embodiment, in which the articulated attachments 12a, 13a, 16a of these connecting rods 12, 13 and 16 with the rotating element 11 are distributed in said rotating element forming a T shape, the third connecting rod 16 moves in a plane of movement parallel to that of the first and second connecting rods 12, 13, such that the third connecting rod can intersect at least one of the first or second connecting rods according to the position adopted by the rotating element 11, for example that shown in Figure 1b.

[0045] Figures 2a and 2b depict this described effect, according to which the distance transmitted to a support carriage of a securing member for one and the same variation d in the vertical position of the tracking element 10 operating the rotating element varies according to the sector in which the articulated attachment of this rotating element with the connecting rod linking it with the support carriage is located.

[0046] More specifically, Figures 2a and 2b illustrate that for one and the same movement d of the tracking element 10, the distance dx that the distal end of the connecting rod 12 will travel will be greater than the distance dx' that the same connecting rod 12 will travel according to the initial angular position of the rotating element 11.

[0047] In the first case, distance dx will be the optimal distance to cause the container 2 to open, as illustrated in Figure 3a; whereas distance dx' will be the optimal distance to cause the container 2' to open, as illustrated in Figure 3b. In both cases, the vertical movement d of the tracking element will be the same, and it corresponds with a jump in level d between sections 8 and 9 of the track 7, but in the first case the track 7 being arranged at height h1 and in the second case the track 7 being arranged at height h2, which is higher than height h1.

Claims

1. A securing and conveying system (1) for securing and conveying a flexible container (2, 2') in a suspended manner in a packaging machine, comprising at least one securing device (3) movably mounted in the packaging machine and provided with at least a first and a second securing member (4, 5) with the capacity to mutually move closer to and further from one another, prepared for securing a container for conveyance by respective securing zones, said securing device comprising a control mechanism (6) for controlling the instantaneous relative positions of the mentioned securing members, **characterized in that**

   - the system comprises a track (7) or cam surface with at least a first and a second section (8, 9) at a different level, the track being adjustable in height (h1, h2) with respect to the chassis of the machine, a desired height being able to be preselected depending on container format, and **in that**
   - there is slidably supported on the mentioned track (7) a tracking element (10) transmitting the level variation (d) between sections of the track to the control mechanism (6) of the securing members to operate them and cause the movement for moving said securing members closer to or further from one another,
   the control mechanism being suitable for this movement for moving the securing members closer to or further from one another to differ for one and the same level variation (d) between the first and the second sections (8, 9) of the track (7) according to the preselected height (h1 or h2) at which the track has been arranged.

2. The system (1) according to the preceding claim, **characterized in that** the control mechanism (6) for controlling the instantaneous relative positions of the securing members comprises a rotating element (11), operated by the tracking element (10), connected by means of respective first and second connecting rods (12, 13) to respective first and second support carriages (14, 15) of the respective first and second securing members (4, 5), said first and second support carriages (14, 15) being mounted in the device (3) in a guided manner according to respective straight paths.

3. The system (1) according to the preceding claim, **characterized in that** the rotating element (11) is connected by means of a third connecting rod (16) to the tracking element (10), mounted in the device (3) in a guided manner according to a straight path.

4. The system (1) according to the preceding claim, **characterized in that** the tracking element (10) is guided according to a direction that is normal to the directions followed by the straight paths of the support carriages (14, 15) of the first and second securing members (4, 5).

5. The system (1) according to the preceding claim, **characterized in that** the rotating element (11) is mounted such that it rotates about a horizontal shaft (11a) equidistant from the articulated attachments (12a, 13a) of the mentioned rotating element with the connecting rods (12, 13) associated with the support carriages (14, 15) of the first and second securing members (4, 5).

6. The system (1) according to any one of claims 3 to 5, **characterized in that** the third connecting rod (16) moves in a plane of movement parallel to that of the first and second connecting rods (12, 13), such that the third connecting rod can intersect at least one of the first or second connecting rods according to the

position adopted by the rotating element (11).

7. The system according to any one of the preceding claims, **characterized in that** it comprises power-driven means (7a) acting on the assembly of the track (7) to vary its height (h1 or h2) with respect to the chassis of the machine.

8. A securing device (3) for securing containers (2, 2') for a packaging machine, comprising a frame (17), intended for being fixed in a vertical orientation to a conveyor belt or chain (18) of the machine, mounting a control mechanism (6) for controlling the instantaneous relative positions of a first and a second securing member (4, 5) secured to the frame with the capacity to mutually move closer to and further from one another and prepared for securing a container for conveyance by respective securing zones in a suspended manner, **characterized in that** the device comprises, mounted on the frame

- a tracking element (10) for tracking a cam pathway, movable in a guided manner according to a vertical reciprocating movement; and
- a first and a second support carriage (14, 15) each of a securing member (4, 5), movable in a guided manner according to a horizontal reciprocating movement,

the control mechanism (6) for controlling the instantaneous relative positions of the securing members (4, 5) comprising a rotating element (11) that rotates with respect to the frame (17), connected by means of respective first, second and third connecting rods (12, 13, 16) to the tracking element (10) and to the support carriages (14, 15) of the securing members, respectively.

9. The device (3) according to the preceding claim, **characterized in that** the articulated attachments (12a, 13a, 16a) of the connecting rods (12, 13, 16) with the rotating element (11) are distributed in said rotating element forming a T shape, the rotating shaft (11a) of the rotating element (11) coinciding with the point of intersection between the imaginary line (18) joining the articulated attachments of the connecting rods associated with the support carriages of the securing members with the imaginary line (19) joining the articulated attachment of the connecting rod associated with the tracking element with the mentioned rotating shaft.

10. A method for adjusting the distance separating two securing members (4, 5) for securing a container in a securing device (3) for securing containers, wherein said securing members are each linked by means of respective connecting rods (12, 13) to a rotating element (11) provided in the mentioned securing device (3), adapting the separating distance to the width of a preselected container, comprising any one of the following

a) to go from a container format of width d1 to one of width d2, where d1>d2, rotating the rotating element (11) from angular position A to angular position B such that in angular position B the securing members (4, 5) are arranged at an operating separating distance d2, and such that the movement that is transmitted to the securing members by means of the connecting rods (12, 13) by a rotation differential of the rotating element from this angular position B is less than that which was produced when this rotating element was in angular position A; and
b) to go from a container format of width d2 to one of width d1, where d1>d2, rotating the rotating element (11) from angular position B to angular position A such that in angular position A the securing members (4, 5) are arranged at an operating separating distance d1, and such that the movement that is transmitted to the securing members by means of the connecting rods (12, 13) by a rotation differential of the rotating element from this angular position A is greater than that which was produced when this rotating element was in angular position B.

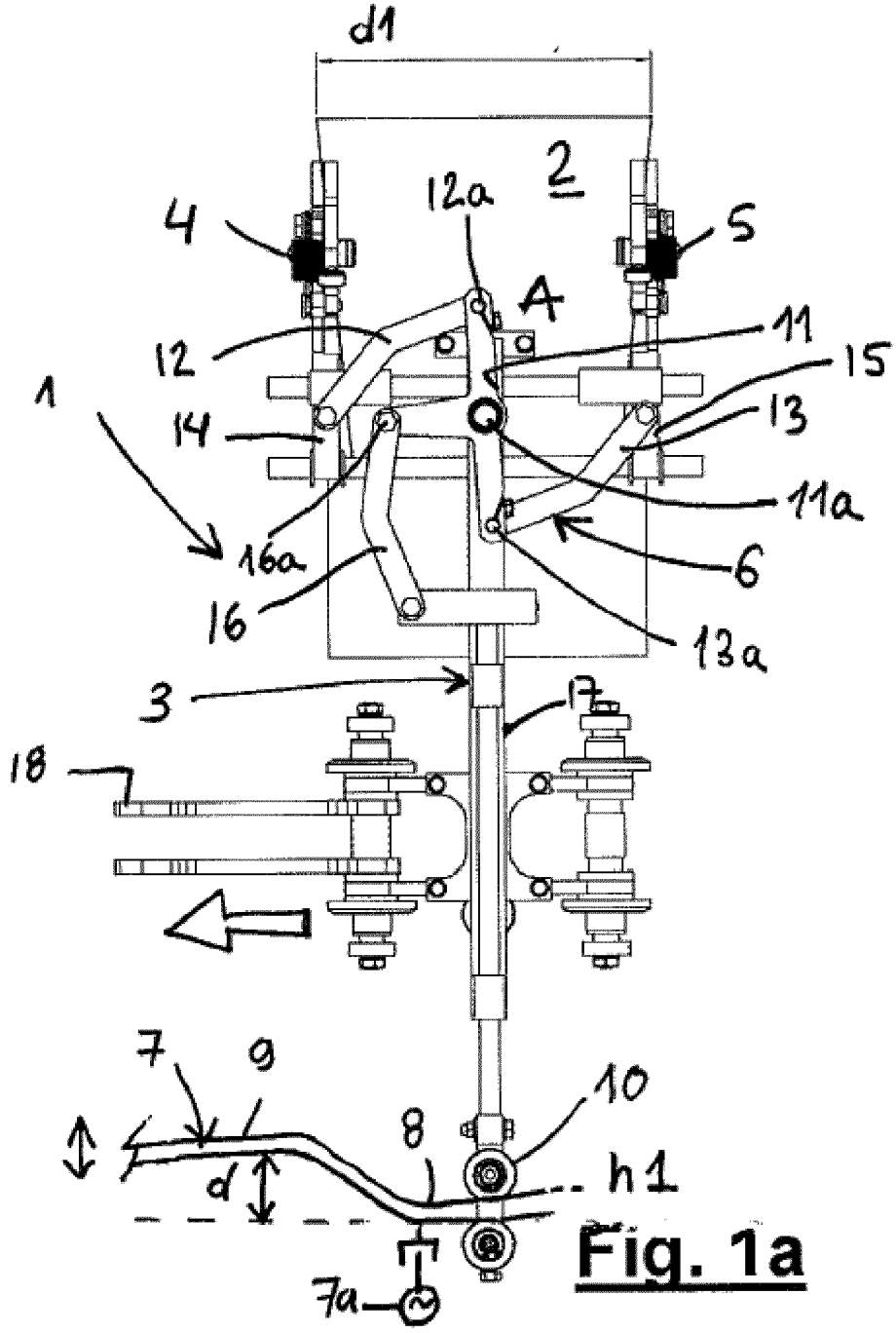

Fig. 1a

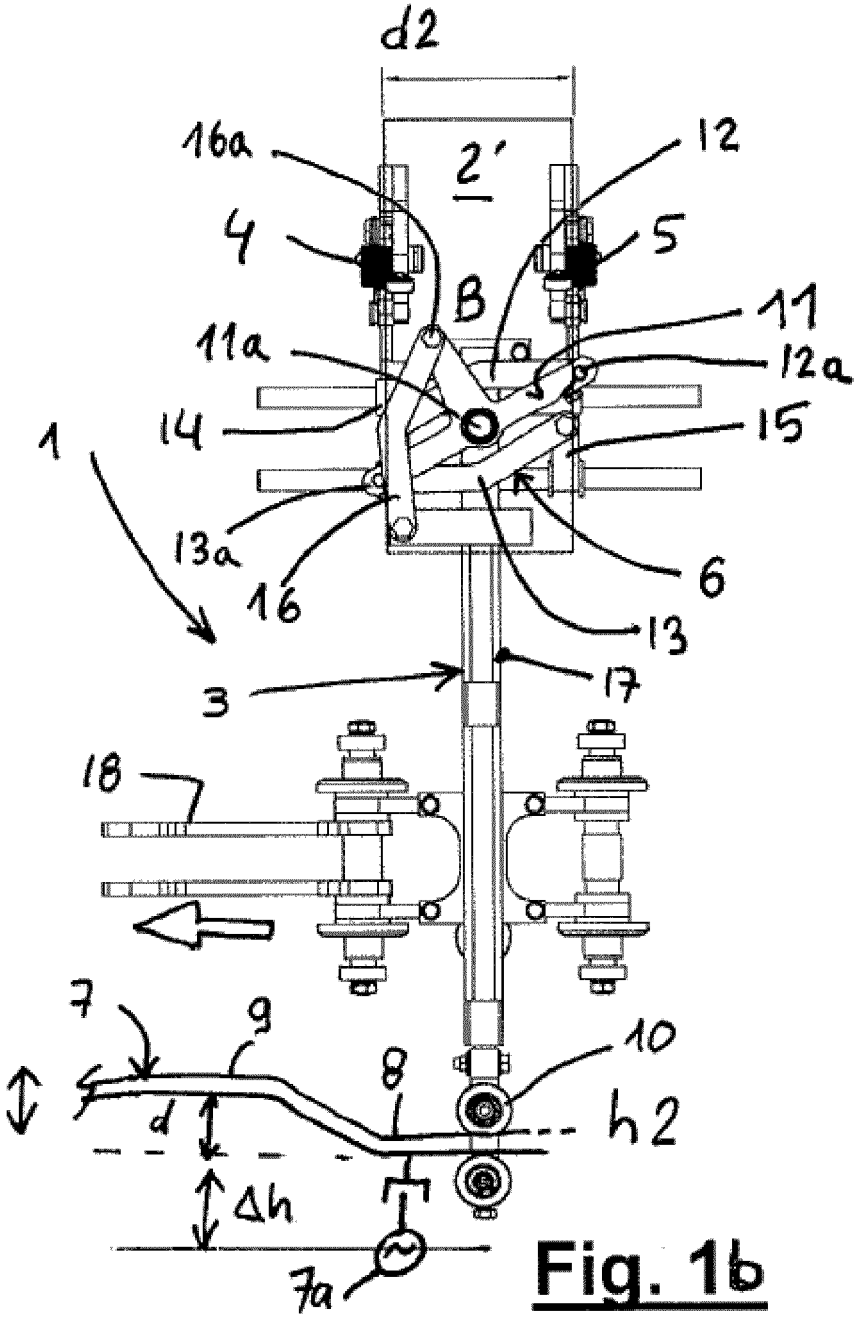

Fig. 1b

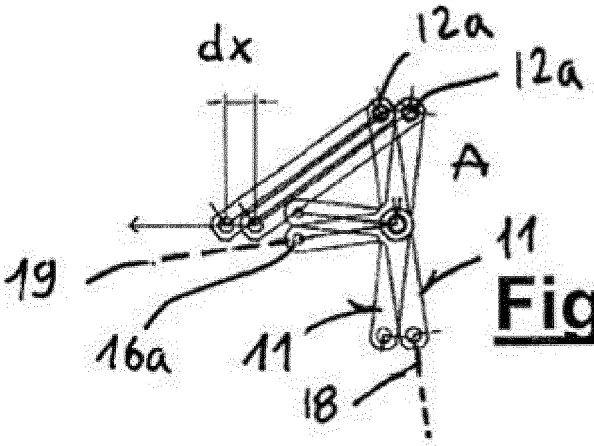

Fig. 2a

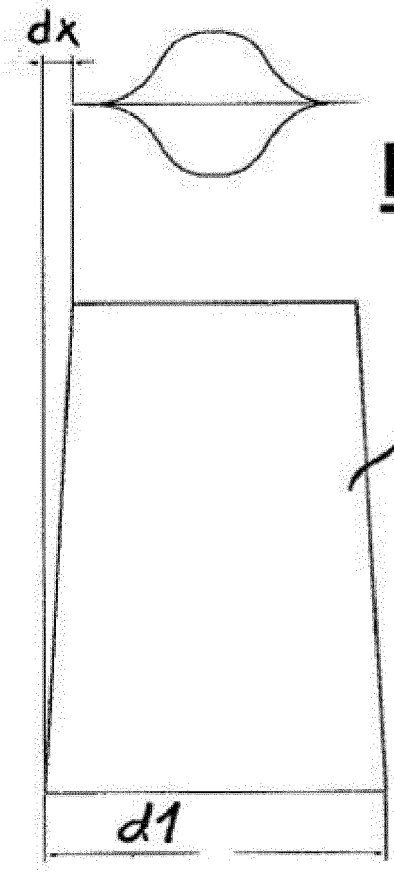

Fig. 3a

Fig. 4a

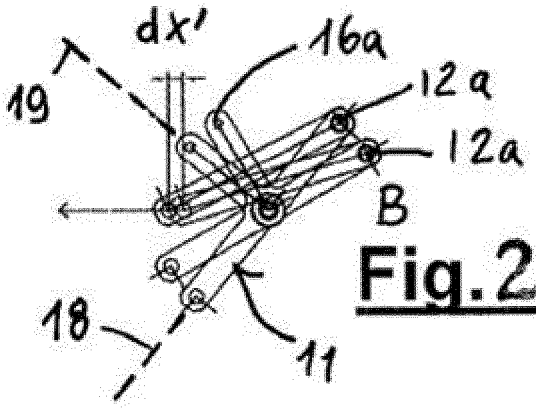

Fig. 2b

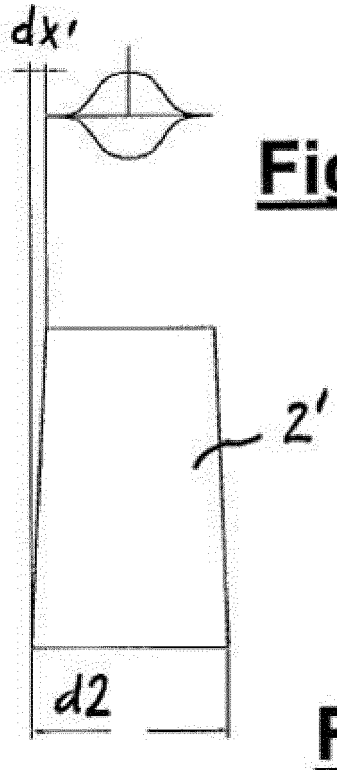

Fig. 3b

Fig. 4b

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 13 38 2379

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 4 956 964 A (JONES WICKLIFFE [US] ET AL) 18 September 1990 (1990-09-18) * column 6, line 8 - column 8, line 33; figures 7-10 *	1,7 2,8,10	INV. B65B43/28 B65B59/00 B65B43/46
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 March 2014	Dick, Birgit

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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