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(54) **AUTOMATIC CLOSING GROUP FOR LIDS OF CARDBOARD BOXES FORMED BY PUNCHING**

(57) An automatic closing group for lids of cardboard boxes (10), formed by punching and fed consecutively with a coverage flap (12) open by means of a lower conveyor (19), wherein the closing group comprises a frame (18) on which a manipulator column (20) is positioned, carrying a closing head of the coverage flap (12) open above a box-shaped body (13) of the box, wherein the closing head is positioned on a slide (36) which moves transversally with respect to the advance direction of the boxes (10), wherein the slide (36) is in turn carried by another vertically movable slide (25) in the manipulator column (20), wherein the closing head comprises a front

pusher (28) acting, in a first phase, on a central panel (15) of the coverage flap (12) and, in a second phase, on a further panel (16) situated in front of the central panel (15) and connected to the same by a folding invitation line, and a pair of side pushers (29), acting on two further side panels (16') of the coverage flap (12), also connected to the central panel (15) with respective folding invitation lines, control means being envisaged for the traversing of the slides and for moving the pushers (28,29) in addition to a computer (44) for setting the dimensions of the box being closed.

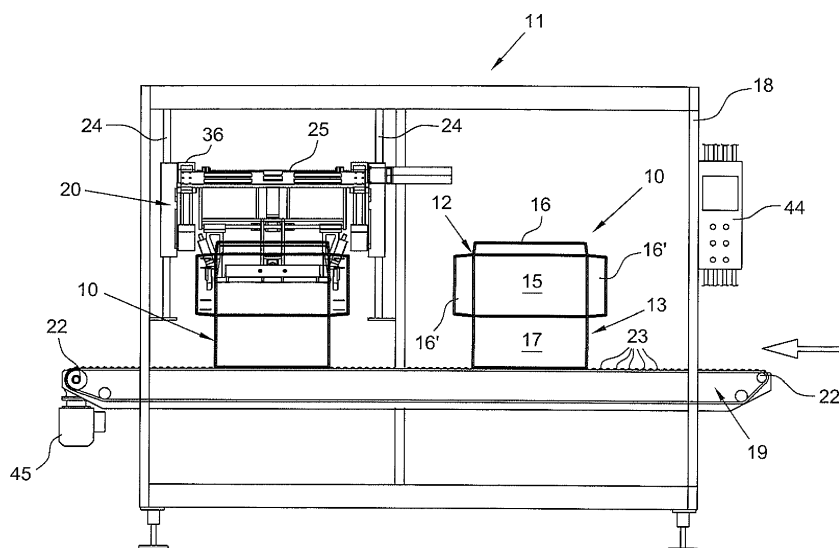


Fig. 1

Description

[0001] The present invention relates to an automatic closing group for lids of cardboard boxes formed by punching.

[0002] In the packaging field, in order to accelerate packaging operations, various apparatuses and groups have been developed, which automatically interact with the containers, i.e. the boxes, to be filled with products.

[0003] In particular, there are various apparatuses that receive punched or sheared cardboard blanks suitable for forming, once suitably folded, containment boxes of products, such as jars, food products in bags, and so forth.

[0004] A cardboard blank consists of a series of panels having various dimensions and generally quadrilateral, variably connected to each other by folding invitation lines so that, when folded, the panels define the bottom, walls and top of the box.

[0005] Known devices automatically fold the cardboard blank, according to the above-mentioned folding invitation lines, forming a box-shaped base, parallelepiped or prismatic to which a coverage flap is constrained with a relative hinged folding invitation line. This coverage flap is composite and divided into a four-sided panel, directly connected at one side by means of a folding invitation line to the box-shaped body, whereas at the remaining three sides, the panel has further smaller four-sided flaps, that form connection strips to the outer surface of the box-shaped body, once folded. A typical example of this type of box still open is shown in figure 1a.

[0006] The various panels of the box, as well as the coverage flap, are constrained to each other in the correct position by means of strips of glue automatically applied during the forming of the box and which act during the closing of the coverage flap.

[0007] As far as the folding and connection of the panels forming the bottom and side walls of the box are concerned, various types of groups have been proposed, which fold the various panels together, by applying strips of glue and connecting them in the correct position to form the box-shaped containment body.

[0008] Furthermore, in packaging lines, after the containment body of the box has been formed, moved forward on a conveyor belt and has received the packaging products, the composite coverage panel for the final closing of the box thus filled with the relative products, must be firmly positioned.

[0009] Groups consisting of a rotating arm, carrying at its end movable pushing elements for interaction with the composite coverage flap to firmly couple it above the box-shaped containment body, which has been moved forward on the conveyor belt, are present and in use on the market.

[0010] This rotating arm is positioned laterally with respect to the advance direction of the filled box carried by the conveyor belt and with the coverage flap still raised. The arm acts transversally on the box being closed, which

is moved in correspondence with an abutment element, facing the same arm, and only then does it rotate to bring the movable pushing elements situated at its end to interact on the coverage flap to firmly couple it above the box-shaped containment body. The flap has previously received strips of glue which allow it to be firmly positioned on the walls of the box-shaped containment body.

[0011] Although this type of solution functions with a certain accuracy, it creates various problems.

[0012] A first problem is linked to the rotating arm which, in its rotational movement, in a transversal direction with respect to the conveyor belt carrying the box to be closed, has vibrations that do not favour a correct coupling between the parts. The vibrations, in fact, prevent an increasingly correct coupling between the coverage flap and the underlying box-shaped containment body and create an impact variably positioned on the box, still open, or on its flaps to be folded.

[0013] A second problem is associated with the fact that the boxes have various formats in width, length and height and a regulation of the run of the arm, which is positioned integral with the frame, is not envisaged, and acts always and exclusively when the box, regardless of its size and position, is brought in abutment with the above-mentioned abutment element.

[0014] The length of the arm is fixed and this cannot be regulated, and consequently the action on the coverage flap of the box varies in relation to the dimensions of the box.

[0015] A further problem relates to the fact that the known apparatuses envisage that the movable pushing elements, interacting with the coverage flap, each have only two fixed positions and it is difficult or almost impossible to intervene and effect regulations in relation to the single format. The functioning and position are the same for different formats. This again does not favour the correct closing and relative coupling between the box-shaped body and the coverage flap.

[0016] Furthermore, the advancing of the box must be stopped to correctly fold the coverage flap in order to avoid distortions between the parts in movement.

[0017] Numerous attempts have been made in recent years to overcome these problems and drawbacks, without, however, finding a valid solution and without so far reaching the desired result.

[0018] A general objective of the present invention is therefore to solve the drawbacks of the known art indicated above, in an extremely simple, economical and particularly functional manner.

[0019] A further objective of the present invention is to provide a closing group for lids of cardboard boxes formed by punching, which can be effected automatically with a variation in the various formats.

[0020] Another objective of the present invention is to provide a closing group for lids of cardboard boxes formed by punching which allows a correct intervention with a variation in the formats always in correspondence with the folding invitation line of the coverage flap, avoid-

ing incorrect folding.

[0021] Yet another objective of the present invention is to provide a group of the type indicated above which allows a firm positioning of coverage flaps for closing the box-shaped body without any stoppage of the conveyor belt.

[0022] An additional objective of the present invention is to provide a group of the type indicated above which is particularly functional and can be very rapidly adapted to the format of the box being packaged.

[0023] In view of the above objectives, according to the present invention, an automatic closing group for lids of cardboard boxes formed by punching having the characteristics indicated in the enclosed claims, has been conceived.

[0024] The structural and functional characteristics of the present invention and its advantages with respect to the known art will appear even more evident from the following description, referring to the enclosed drawings, which, *inter alia*, show a schematization of an embodiment of an automatic closing group for lids of cardboard boxes formed by punching produced according to the same invention. In the drawings:

- figure 1 shows a raised longitudinal view of an automatic closing group for lids of cardboard boxes formed by punching produced according to the same invention;
- figure 2 shows a plan view from above of the group shown in figure 1;
- figure 3 shows an enlarged raised side view of the group shown in figure 1 and figure 3a shows a perspective view of the box as set up in the group shown in figure 3;
- figure 4 shows an enlarged raised side view of the group similar to that of figure 3 in a subsequent closing position of the box;
- figure 5 shows an enlarged raised side view of the group similar to that of figure 3 in a further closing phase of the box and figure 5a shows a perspective view of the box as arranged in said movement position of the closing group;
- figure 6 shows an enlarged raised side view of the group similar to that of figure 3 in a final closing phase of the box and figure 6a shows a perspective view of the box as closed in this final position of the closing group;
- figure 7 shows an enlarged front view of the closing group as arranged in the final position of figure 6;
- figure 8 shows an enlarged front view of the closing group as arranged in the final position with a box having a different and smaller format;
- figures 9 and 10 show enlarged details of an embodiment of the front pusher and two of its positions referring to the previous figures 3 and 6.

[0025] With reference to the figures, these illustrate an

automatic closing group for lids of cardboard boxes formed by punching produced according to the invention, indicated as a whole with 11, which is generally positioned inside a packaging line downstream of an entry unit of products in the box format with a raised coverage flap, as clearly shown in figure 1a.

[0026] The group of the invention promotes the automatic closing of a coverage flap 12 on a box-shaped body 13 exploiting the folding invitation line 14 positioned between the coverage flap 12 and the box-shaped body 13 of a box 10 formed from punched or sheared cardboard.

[0027] It should also be noted that the coverage flap 12 is of the composite type and is divided into a four-sided central panel 15, directly connected at one side, by means of a folding invitation line 14, to the box-shaped body 13. In the remaining three sides of the central panel 15, a further three panels are provided, a first additional front panel 16 (opposite the folding invitation line 14) and two additional side panels 16', all four-sided and having smaller dimensions with respect to the central panel 15, which define connection strips with respective walls 17 of the outer surface of the box-shaped body 13, once folded.

[0028] The panels, as also the walls of the box, as previously indicated, are constrained to each other in a known way in the correct position by means of strips of glue automatically applied during the forming of the box and before closing the coverage flaps.

[0029] The automatic closing group for lids of cardboard boxes 11 essentially comprises a frame 18 in which there is a lower conveyor 19 associated with a manipulator column 20.

[0030] The lower conveyor 19 comprises a belt 21 ring-arranged between end pulleys 22, said belt 21 is motorized in 45 and receives and consecutively feeds boxes 10 with the coverage flap 12 open, in which a series of products (not shown) have been introduced in a boxing station, also not shown.

[0031] The belt 21 envisages, according to the invention, the arrangement of a plurality of idle rolls 23 that protrude from its surface and allow it to slide freely, also in the case of stoppage of the box 10 that is, in turn, sliding on the same.

[0032] Profiled longitudinal edges 30 are arranged laterally with respect to the conveyor 19, suitable for being moved above the belt 21 towards and away from each other by means of arms 31 driven by actuators (not shown) with a variation in the size of the box 10 which is filled with products.

[0033] The manipulator column 20 automatically intervenes in folding the coverage flap 12 above the box-shaped body 13, so as to close the box 10.

[0034] The manipulator column 20 comprises a pair of columns 24 between which a vertically movable slide 25 is arranged, which is caused to slide by means of two motorized vertical drive screws 26, spaced and parallel with respect to each other and coupled in their rotation.

[0035] The slide 25 carries a closing head of the cov-

erage flap 12 on the box-shaped body 13 of the box 10.

[0036] The closing head is, in turn, positioned on a second movable slide 36 on guides 27 tilted transversally to the advance direction of the conveyor 19 of boxes 10, tilted downwardly towards said conveyor 19. The guides can also be arranged horizontally or with another appropriate inclination. The second slide 36 is moved forwards and backwards, for example, along the guides 27 by means of toothed belts, chains or similar commands.

[0037] The closing head comprises a front pusher 28 positioned on the structure of the slide 36 and acting in a first phase on the coverage flap 12 alone, and in a second phase on the further front panel 16. The closing head also comprises a pair of side pushers 29 acting on the two further side panels 16' of the coverage flap 12.

[0038] The front pusher 28 comprises two series of rolls 32, 33 spaced from each other, positioned on shafts 34, 35. The first series of rolls 32 is positioned on the shaft 34 which oscillates between a position on a horizontal plane aligned with the second shaft 35 carrying the second series of rolls 33 and a position on a vertical plane, rotated by 90° with respect to the first position. In this way, the first series of rolls 32 passes from a position above the central panel 15 to a position above the first further front panel 16, forcing it to be arranged alongside and in contact with the wall 17 of the box-shaped body 13.

[0039] Said oscillation or rotation can be effected as the shaft 34 is positioned on an angular shaped bracket 37 forced to rotate by a stem 38 of a cylinder 39 situated on the slide 36 (figure 9). The second shaft 35 is carried directly by a part of the slide 36 and its series of rolls 33 always and exclusively acts above the central panel 15, pushing it and keeping it in correct closure (figure 9).

[0040] Each pusher 29 of the pair of side pushers acting on the two further side panels 16' of the coverage flap 12, is carried on further slides 40 caused to move according to the advance direction of the lower conveyor 19 on the slide 36. In this way, said pushers are regulated in relation to the widths of the box to be closed.

[0041] In particular, each pusher 29 comprises a support 41 integral with the slide 40 bearing a cylinder 42, which carries, at the end of its stem 46, an overturned L-shaped plate 43. When said overturned L-shaped plate 43 descends, it pushes the further side panels 16' of each side of the coverage flap 12 from a horizontal plane to a vertical plane aligned with the respective side wall 17 of the box-shaped body 13.

[0042] It should be pointed out that, as already mentioned, the slides 40 can be caused to move according to the advance direction of the lower conveyor 19 as indicated in figures 7 and 8 in relation to the various widths of the box. This regulation movement of the position takes place, for example, thanks to the presence of worm screws 47 and relative lead screws (not shown) positioned inside the slides 40, collaborating with each other.

[0043] It is envisaged that the front pusher 28 and side pushers 29, as also the longitudinal edges 30, can be moved and positioned in the various operating positions

thanks to relative control means previously indicated, which are activated by inserting and setting the dimensions of the box 10 to be closed in a central computer 44 of the closing group, schematized in figure 1. In this way, boxes having various dimensions can be immediately closed thanks to the fact that the computer 44 enables the movements required by the specific dimensions of the box 10 on the basis of the data inserted and set by the operator at the beginning of the operating phase, without requiring manual or local regulations and consequently making the group completely automatic.

[0044] The central computer 44 is therefore suitable for receiving the size values of the box 10 to be closed and automatically activates the positions and movements of both the front pusher 28 and the side pushers 29, together with the longitudinal edges 30, the vertical slide 25, and also the forward and backward movement of the slide 36 in the various operative positions.

[0045] The functioning of the closing group 11 according to the invention can be briefly summarized as follows.

[0046] After selecting the dimensions of the boxes 10 which, when filled with products, are to be closed, said dimensions are inserted in the computer 44. This operation ensures that all the control and movement means are activated for treating that particular type of box 10 having said dimensions. The boxes 10 then reach the group after being formed from the blank, filled with products and with the coverage flap 12 raised and open (see, for example, figures 1, 3 and 3a) carried by the belt 21 of the lower conveyor 19.

[0047] The advancing formed boxes 10 are guided by the profiled longitudinal edges 30 that have been moved by means of the arms 31 to the size of the boxes 10 filled with products.

[0048] When the boxes arrive in correspondence with the manipulator column 20 carrying the closing head of the open coverage flap 12 closed above the box-shaped base body 13, the closing procedure is activated.

[0049] The slide 36 moves on the guides 27 carrying the head towards the box 10 with the coverage flap 12 open.

[0050] Consequently, with the advancing of the slide 36, the coverage flap 12 is pushed by the pusher 28 (figure 4), in particular by the rolls 32 arranged in front of it, until, rotated by 90°, it is positioned above the box-shaped body 13 (figure 10). In this first phase, the front pusher 28 acts on the central panel 15 of the coverage edge 12.

[0051] The various further panels 16 and 16', which extend from the central panel 15 to the coverage flap 12 in this position (figure 5 and 5a) are still completely aligned with the central panel 15.

[0052] Only at this point, when all the panels 15, 16 and 16' of the coverage flap 12 are thus positioned, are the pushers 28 and 29 activated to act on the further front 16 and side 16' panels which had been previously provided with lines of glue for allowing them to firmly adhere to the walls 17 of the underlying box-shaped body 13.

[0053] This is a second phase in which the rolls 33 of

the front pusher 28 enter into action, acting on the further panel 16 positioned in front of the central panel 15 which is folded thanks to the presence of a folding invitation line.

[0054] This action takes place due to the fact that the first series of rolls 32, positioned on the shaft 34, in turn carried by the angular shaped bracket 37, is forced to rotate by the stem 38 of the cylinder 39 situated on the edge of the slide 36.

[0055] In this way, the rolls 32 rotate from a position on a horizontal plane, aligned with the second series of rolls 33, to a position on a vertical plane, rotated by 90° with respect to the first position. The first series of rolls 32 passes from a position above the central panel 15 to a position above the first further front panel 16, forcing it to be arranged alongside and in contact with the wall 17 of the box-shaped body 13

[0056] During this rotation, the series of rolls 33 of the second shaft 35, carried directly by the slide 36, always and exclusively acts above the central panel 15, pushing it and keeping it in correct closure.

[0057] Furthermore, the pair of side pushers 29 is activated to act on the two further side panels 16' of the coverage flap 12, wherein said panels 16' are also connected to the central panel 15 with folding invitation lines.

[0058] This is all shown in figures 6 and 7, or in figure 8 for a box having different reduced dimensions with respect to those of the previous figures.

[0059] A correct folding of the coverage flap 12, i.e. a correct closing of the box 10 is therefore obtained, as illustrated in figure 6a.

[0060] During these closing operations, the belt 21 of the conveyor 19 continues to advance thanks to the presence of the rolls 23 positioned on the same, which slide on the bottom of the box which is being closed.

[0061] A correct closure of the coverage flap of the box is ensured as the pushers 28 and 29 act when the coverage flap 12 has reached its final position on the box-shaped body 13.

[0062] The arrangement of the closing head on slides 25 and 36 also guarantees the elimination of any vibration and its easy movement and optimum interaction with the closing edge 12.

[0063] As both the slides 25 and 36 and also the edges 30 are associated with respective actuators, a correct positioning of the same in relation to the dimensions of the box which is being closed, is always ensured.

[0064] All the most important features forming part of the present invention can be found in these non-limiting examples.

[0065] The objective mentioned in the preamble of the description has therefore been achieved.

[0066] The forms of the structure for producing a group of the invention, as also the materials and assembly modes, can naturally differ from those shown for purely illustrative and non-limiting purposes in the drawings.

[0067] The protection scope of the present invention is therefore defined by the enclosed claims.

Claims

1. An automatic closing group for lids of cardboard boxes (10), formed by punching and fed consecutively with an open coverage flap (12) by means of a lower conveyor (19), wherein the closing group essentially comprises a frame (18) on which a manipulator column (20) is positioned, carrying a closing head for the positioning of said open coverage flap (12) closed above a parallelepiped or prismatic box-shaped base body (13) of the box, to which said coverage flap (12) is connected with a folding invitation line (14), **characterized in that** said closing head is positioned on a slide (36) which moves transversally with respect to the advance direction of the boxes (10), wherein said slide (36) is, in turn, carried by another vertically movable slide (25) in said manipulator column (20), wherein said closing head comprises a front pusher (28) acting, in a first phase, on a central panel (15) of said coverage flap (12) and in a second phase, on a further panel (16) situated before said central panel (15) and connected to the same by a folding invitation line, and a pair of side pushers (29), acting on two additional side panels (16') of the coverage flap (12), also connected to said central panel (15) with respective folding invitation lines, control means being envisaged for the traversing of said slides and for moving said pushers (28,29) in addition to a computer for setting the dimensions of said box being closed.
2. The automatic closing group according to claim 1, **characterized in that** said slide (36) is transversally movable with respect to the advance direction of the boxes (10) on guides (27) tilted downwardly towards the above-mentioned conveyor (19).
3. The automatic closing group according to claim 1 or 2, **characterized in that** said front pusher (28) comprises two series of rolls (32, 33) spaced from each other, positioned on shafts (34, 35), wherein the first series of rolls (32) positioned on the shaft (34) oscillates between a position on a horizontal plane aligned with the second shaft (35) carrying the second series of rolls (33) and a position on a vertical plane, rotated by 90° with respect to the first position.
4. The automatic closing group according to claim 3, **characterized in that** said shaft (34) is positioned on an angular shaped bracket (37) forced to rotate by a stem (38) of a cylinder (39) situated on the slide (36).
5. The automatic closing group according to claim 3, **characterized in that** said second shaft (35) is carried on said slide (36) and said rolls (33) always and exclusively act above the central panel (15), pushing it and keeping it in a correct closing position on the

box-shaped body (13).

(30), the vertical slide (25), and also the forward and backward movement of the slide (36) in the various operative positions.

6. The automatic closing group according to one or more of the previous claims, **characterized in that** said additional slide (25) of said manipulator column (20) is caused to slide vertically by means of two motorized vertical drive screws (26), spaced from and parallel to each other, coupled in their rotation and supported on a frame (18) of the group. 5
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7. The automatic closing group according to one or more of the previous claims, **characterized in that** each of said pair of side pushers (29), acting on two further side panels (16') of the coverage flap (12), is carried on a further single slide (40) which can move on the slide (36) according to the advance direction of the lower conveyor (19). 15
8. The automatic closing group according to claim 7, **characterized in that** each side pusher (29) comprises a support (41), integral with the slide (40), bearing a cylinder (42), which carries, at the end of its stem (46), an overturned L-shaped plate (43) acting on one of said side panels (16') of said coverage flap (12) in order to push it from a horizontal plane to a vertical plane aligned with the respective side wall (17) of the box-shaped body (13). 20
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9. The automatic closing group according to claim 7 or 8, **characterized in that** said slides (40) carrying said side pushers (29) have lead-screws positioned in their interior which collaborate with worm-screws (47) supported on said slide (36). 30
10. The automatic closing group according to one or more of the previous claims, **characterized in that** said lower conveyor (19) comprises at least one belt (21) ring-arranged between end pulleys (22) and motorized (in 45) which receives and consecutively feeds said boxes (10) with a coverage flap (12), and which comprises a plurality of idle rolls (23) which protrude from its surface. 35
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11. The automatic closing group according to claim 10, **characterized in that** longitudinal edges (30) are arranged laterally with respect to said conveyor, suitable for being moved above the belt (21) towards and away from each other by means of arms (31) driven by actuators with a variation in the size of the box (10). 45
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12. The automatic closing group according to one or more of the previous claims, **characterized in that** it comprises said central computer (44) suitable for receiving the size values of the box (10) to be closed, which automatically activates the positions and movements of both the front pusher (28) and the side pushers (29), together with the longitudinal edges 55

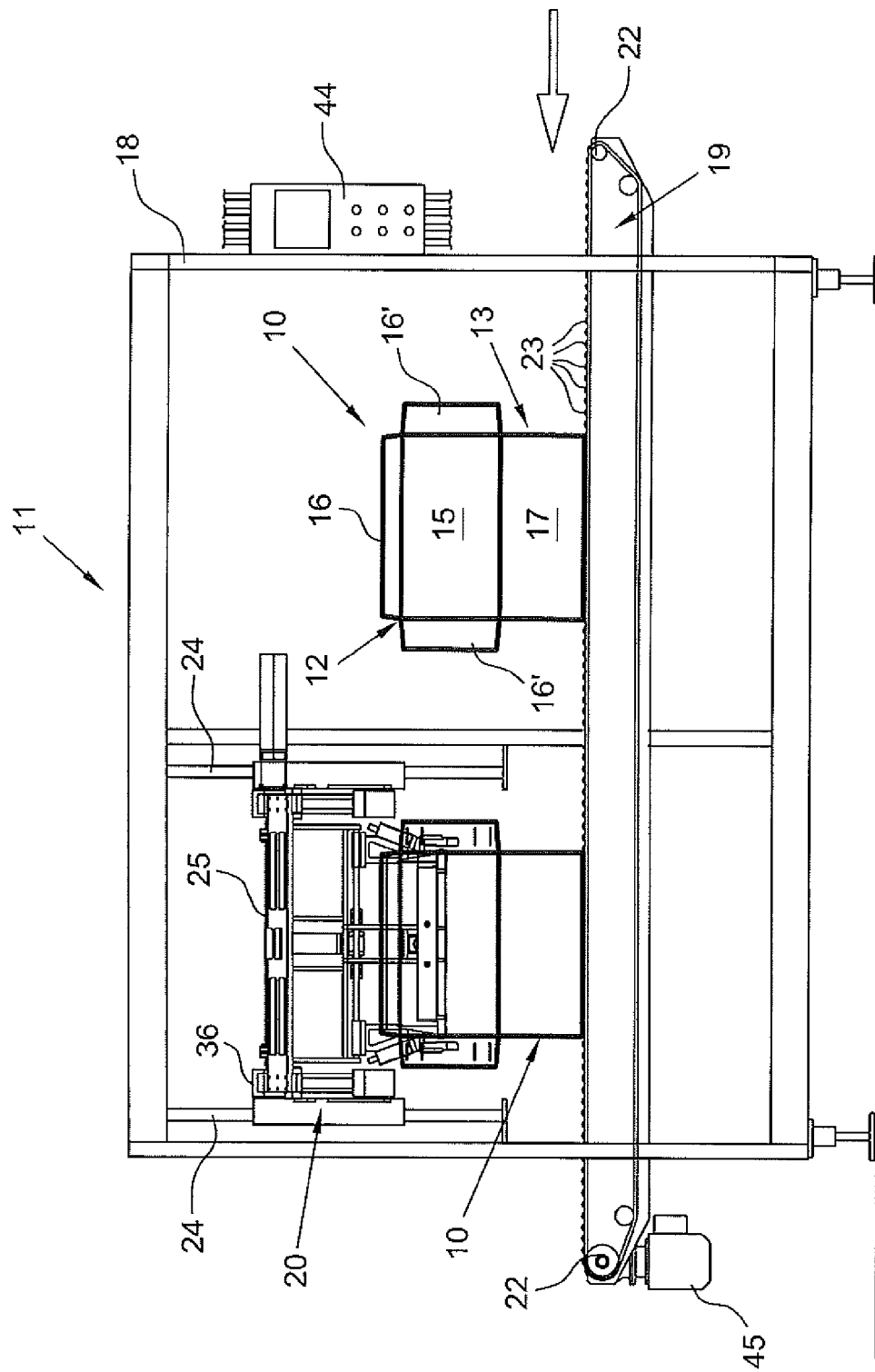


Fig. 1

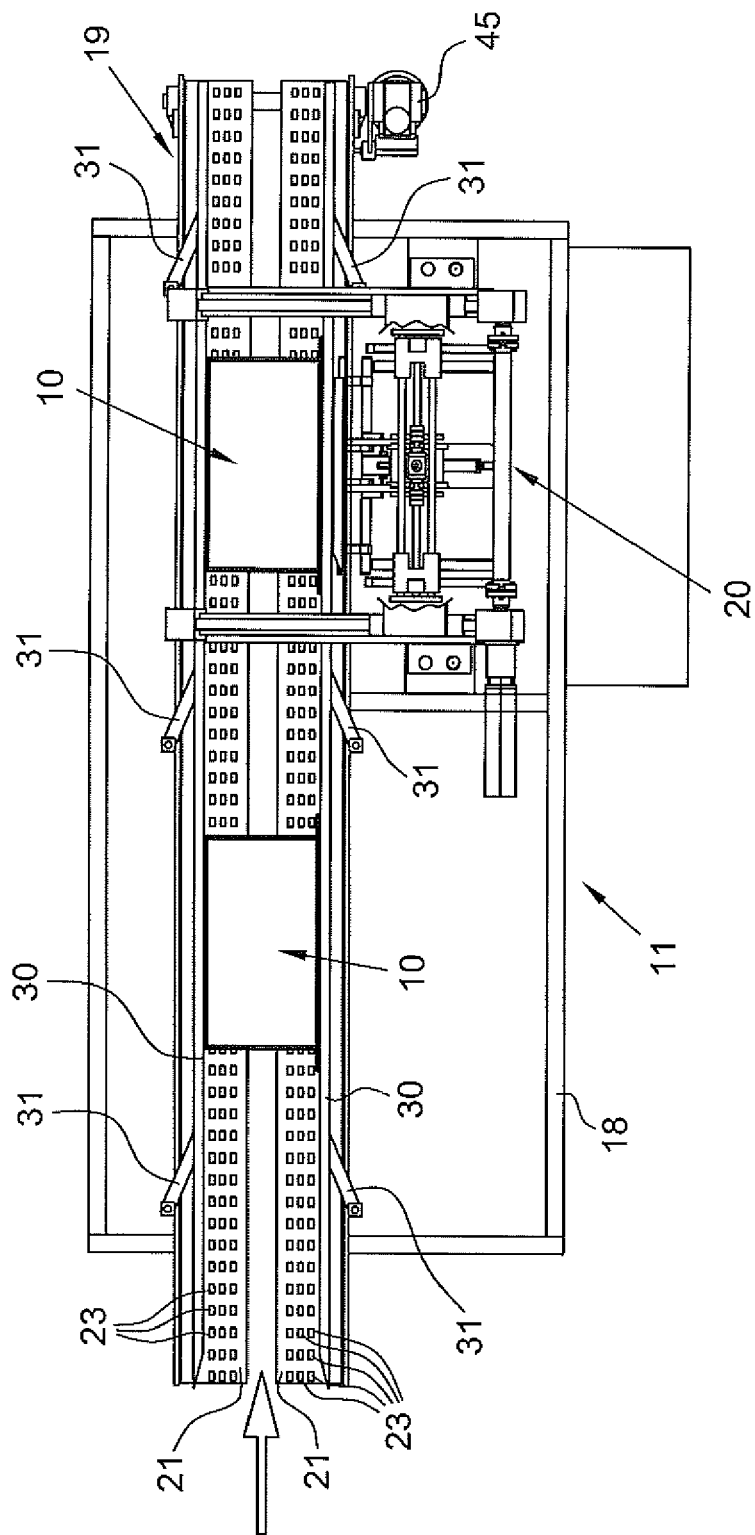


Fig. 2

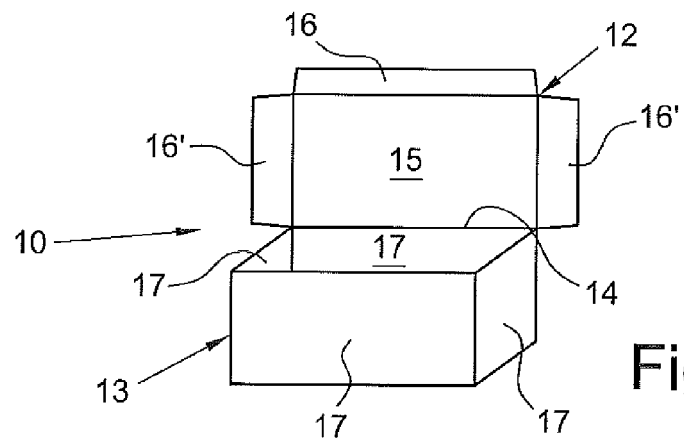


Fig. 3a

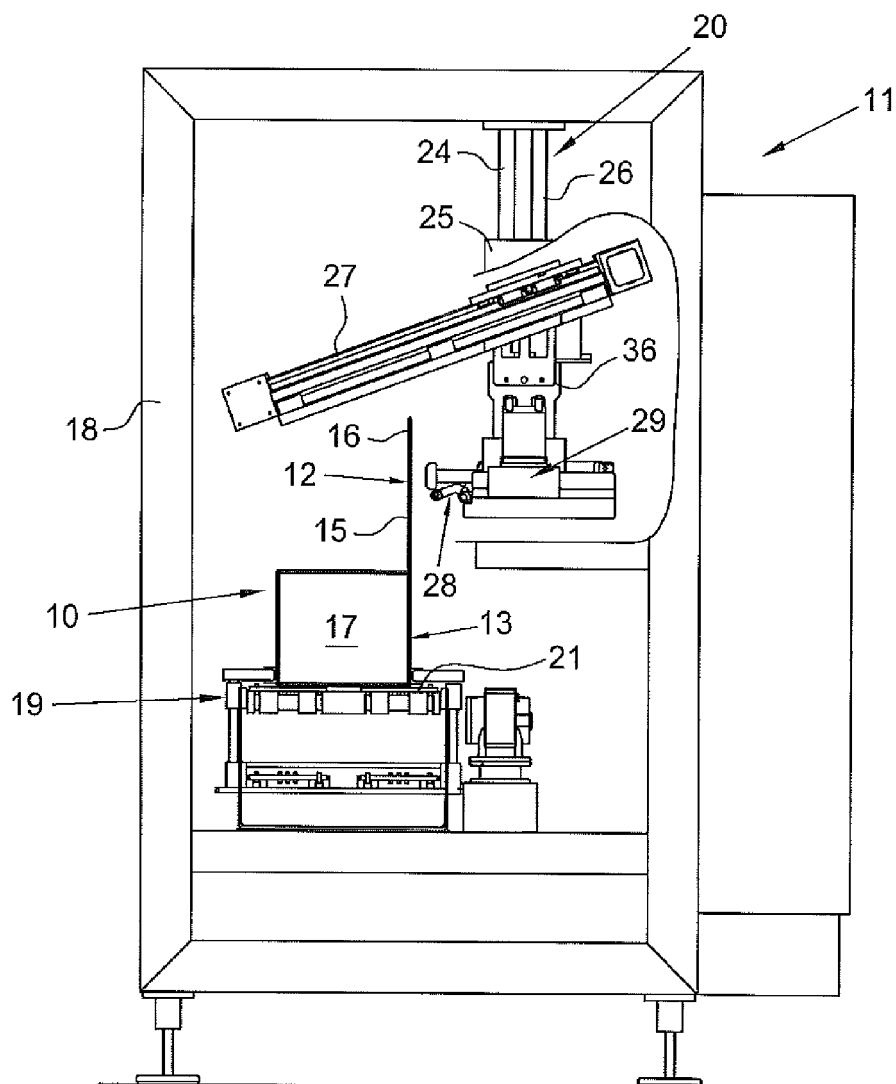


Fig. 3

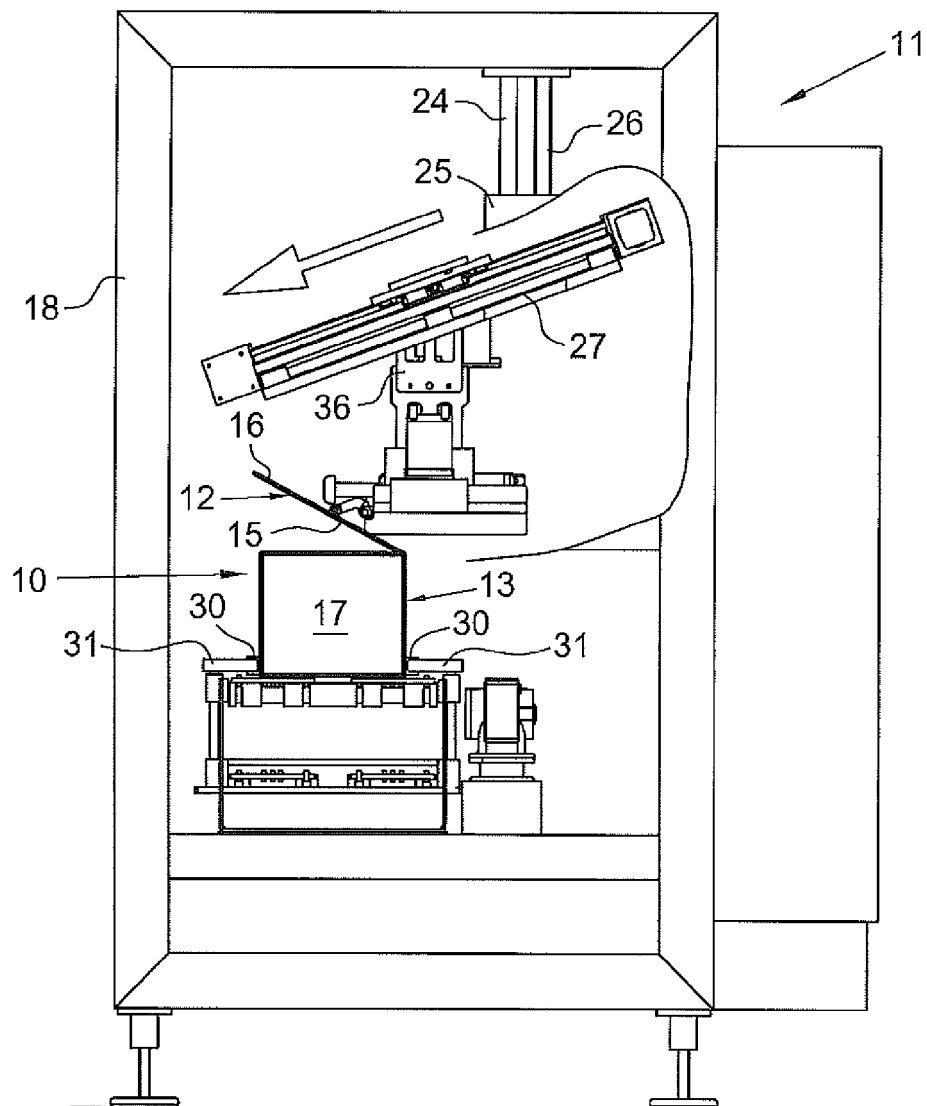


Fig. 4

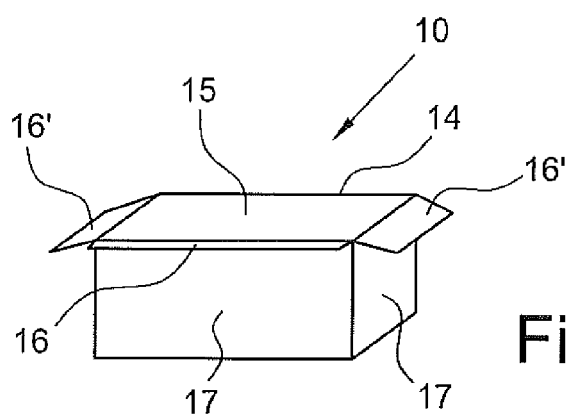


Fig. 5a

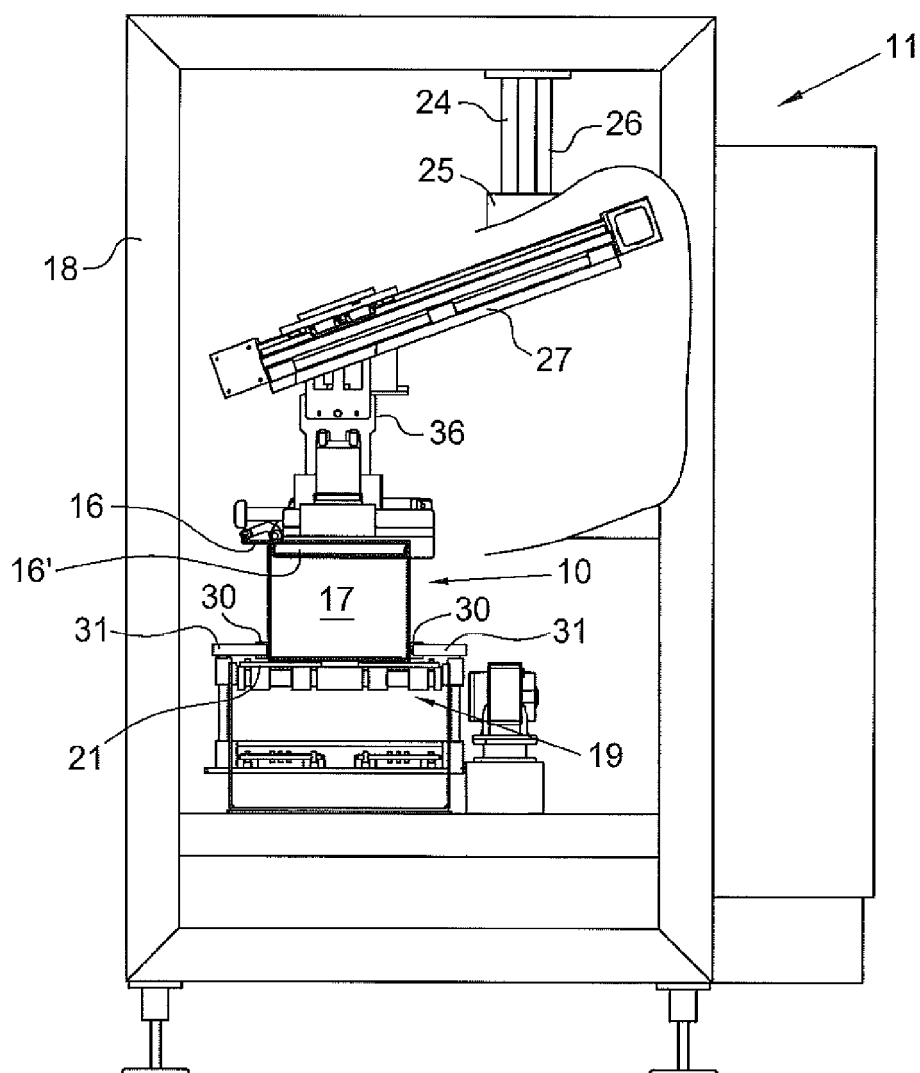
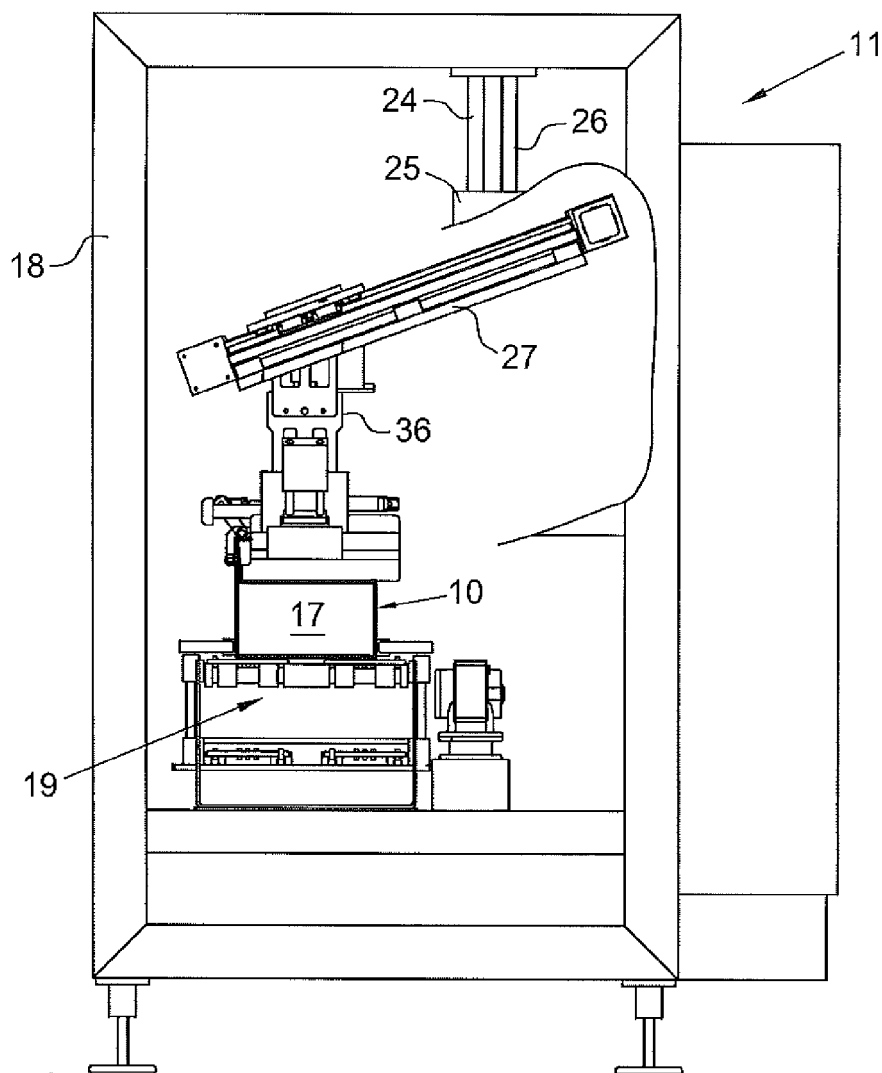
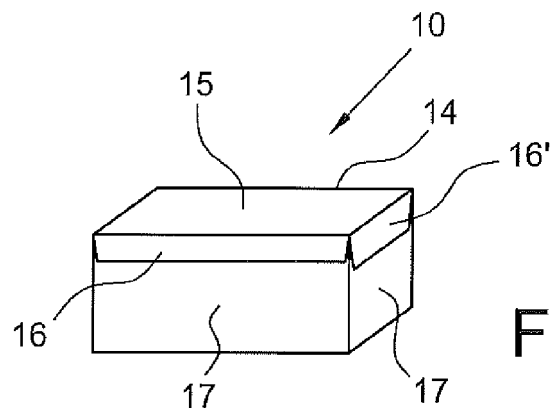
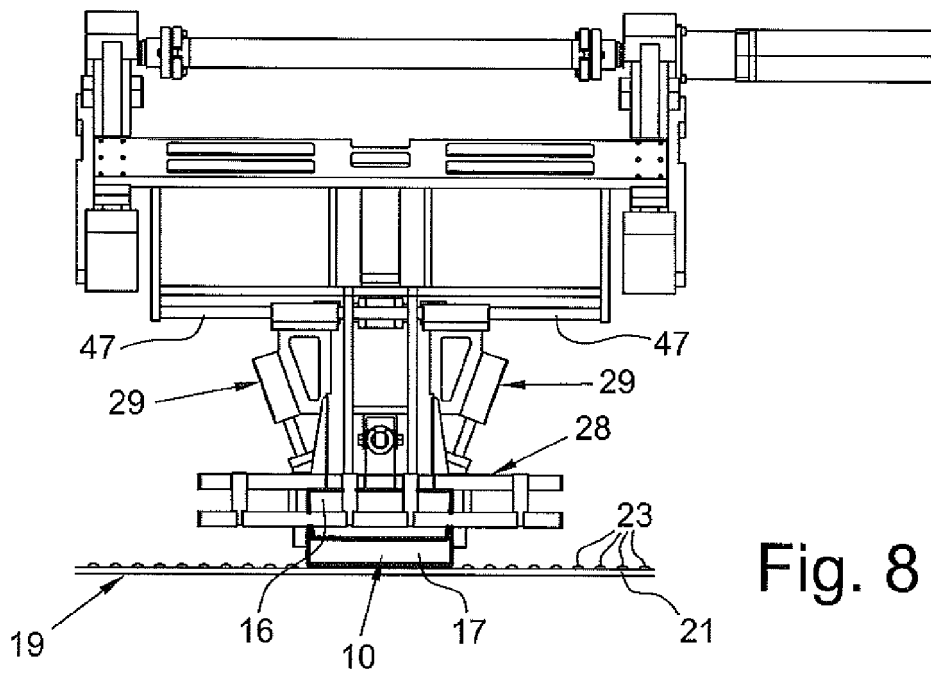
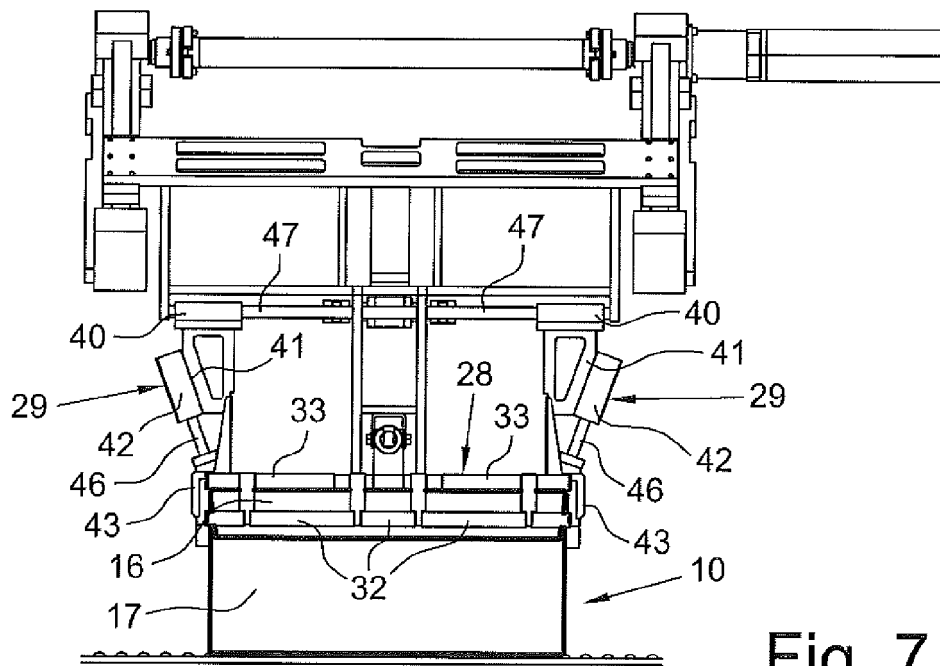


Fig. 5





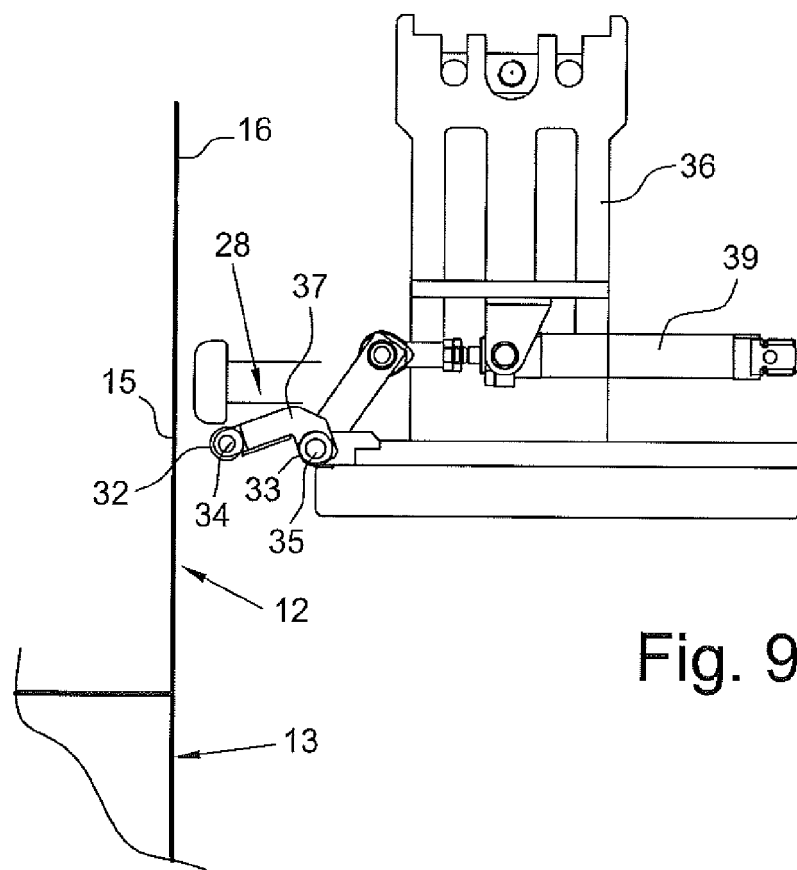


Fig. 9

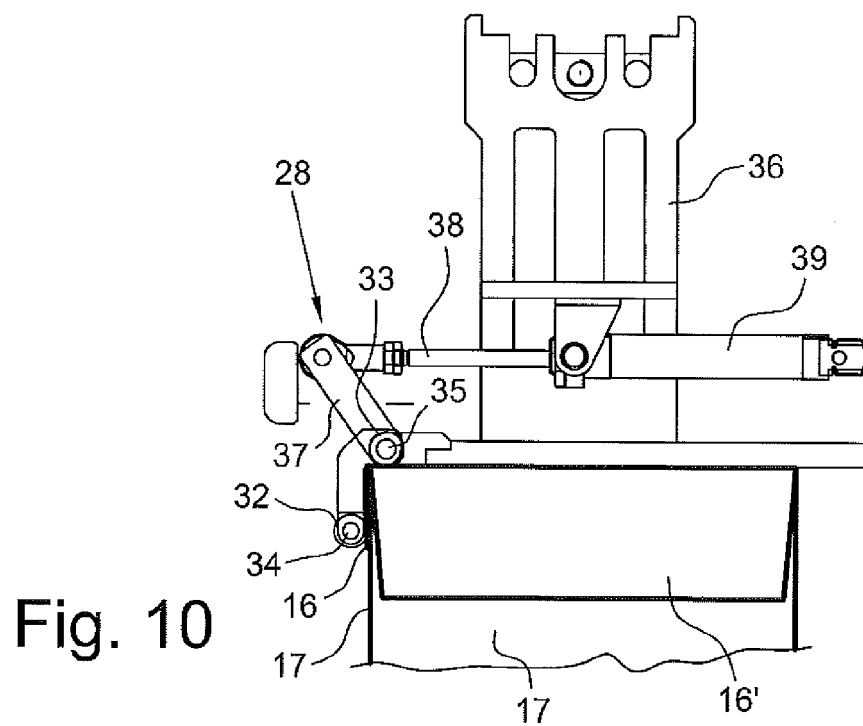


Fig. 10



EUROPEAN SEARCH REPORT

Application Number
EP 15 19 1380

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A	* paragraphs [0028] - [0058]; figures 1-9 *	2-12	B65B51/00
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A	* column 2, line 3 - column 4, line 54; figures 1,5,7,8 *		
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	* the whole document *		
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 January 2016	Examiner Cardoso, Victor
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)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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