

[54] **DEVICE FOR THE ERECTION OF BLANKS
FOR MAKING PLUG-IN-FOLDING BOXES**[75] Inventor: **Georg Kopp**, Neuhausen am
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am Rhinefall, Switzerland[22] Filed: **Jan. 3, 1972**[21] Appl. No.: **215,015**[30] **Foreign Application Priority Data**

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93/53 SD**[51] Int. Cl. **B31b 1/50, B31b 1/78**[58] Field of Search **93/49 R, 51 R, 52,
93/53 R, 53 SD, 53 LF**[56] **References Cited****UNITED STATES PATENTS**

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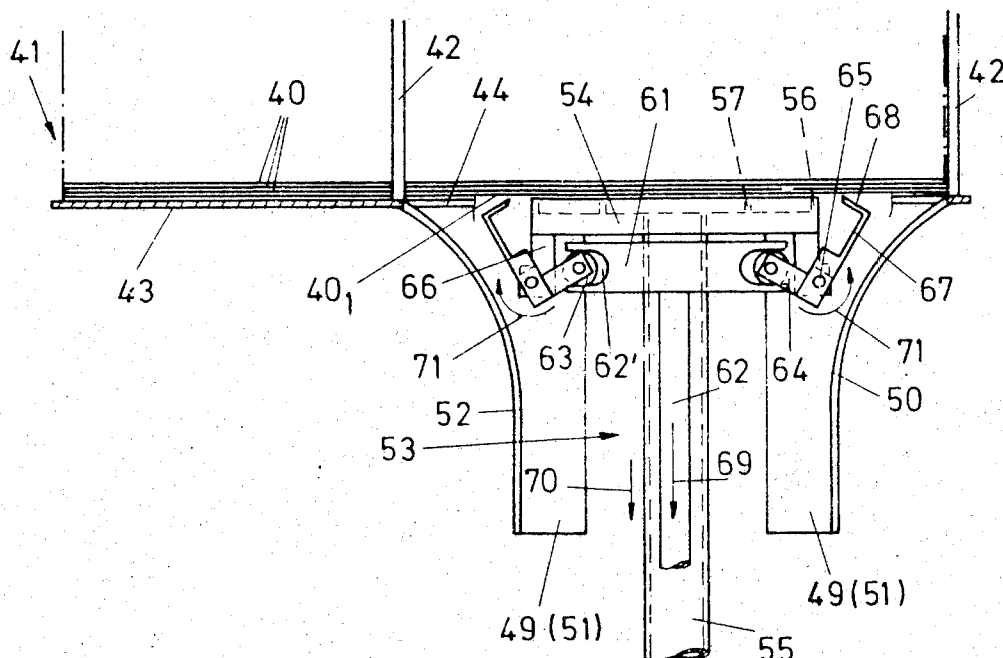
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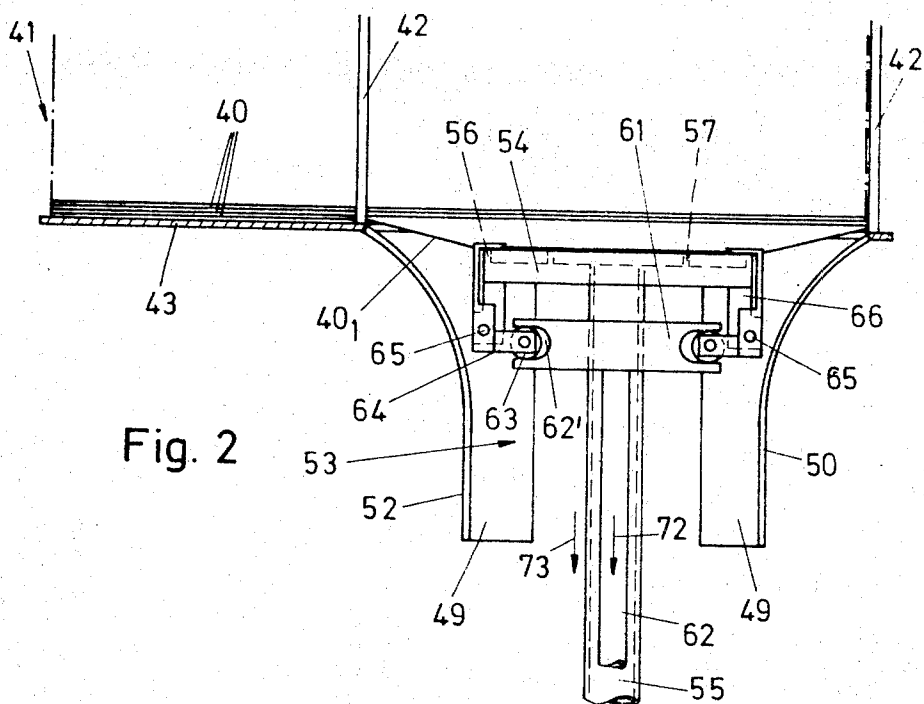
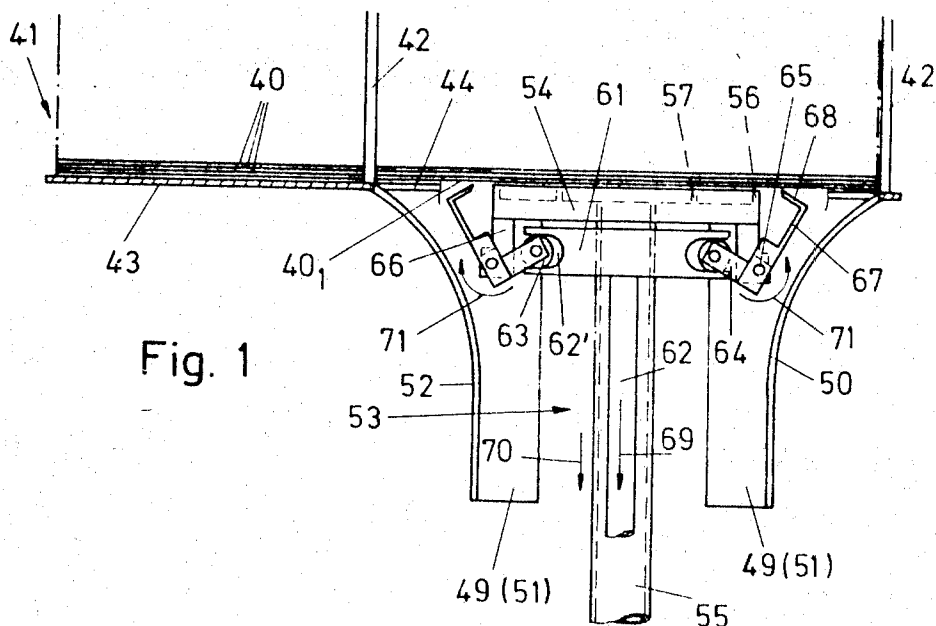
Primary Examiner—Andrew R. Juhasz*Assistant Examiner*—James F. Coan*Attorney*—Benjamin H. Sherman et al.

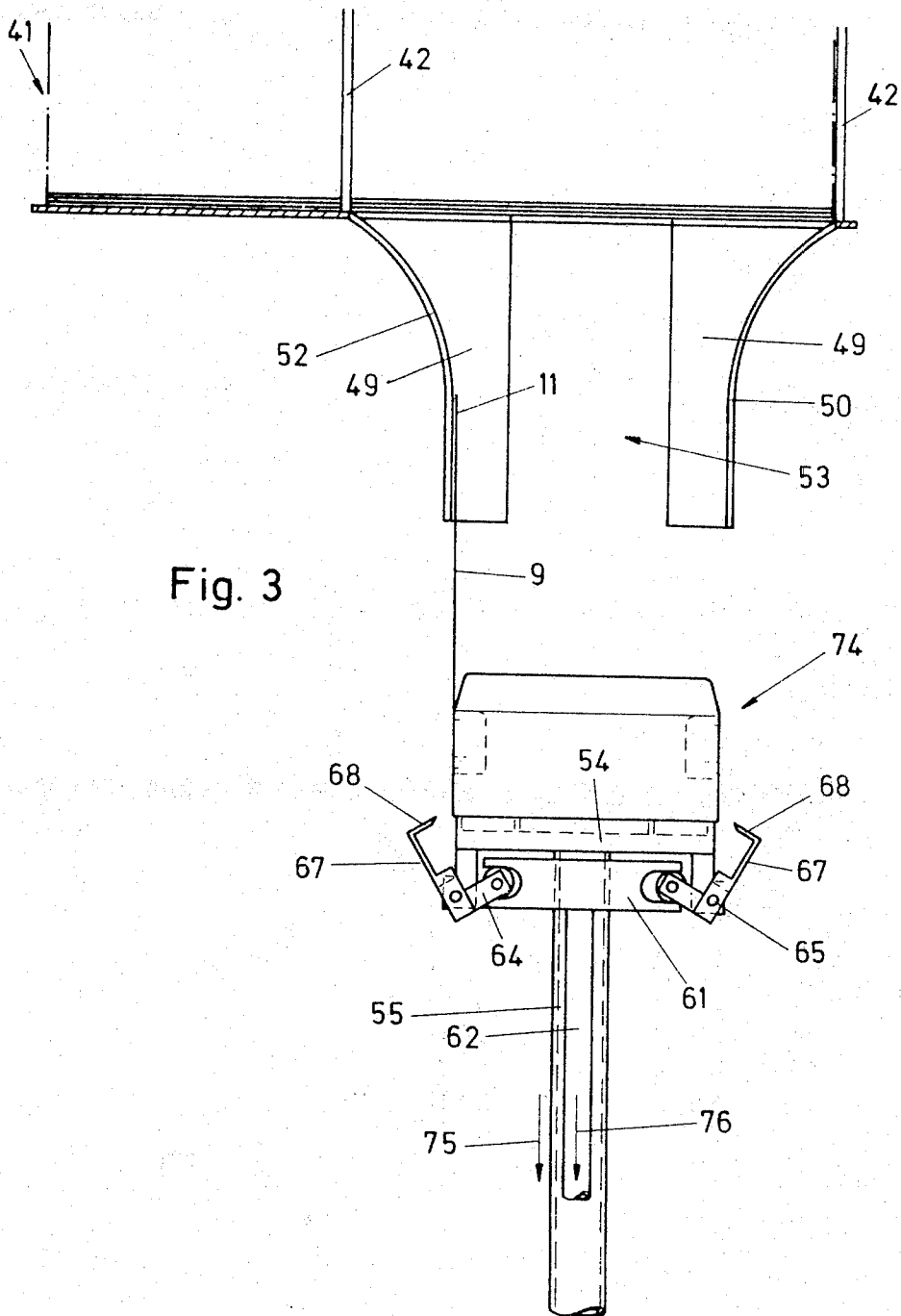
[57]

ABSTRACT

Below a stack of blanks in a receiving frame is arranged an upwardly and downwardly movable piston which engages and sucks in the bottom forming portion of the lowermost blank and moves it downwardly past stationary guide members which fold the side wall forming portions and cover upwardly. A control piston actuates pivotally mounted grippers which enter into corner slots at the bottom forming portion of the blank and clamp the bottom of the box against the suction piston during its downward movement.

5 Claims, 5 Drawing Figures





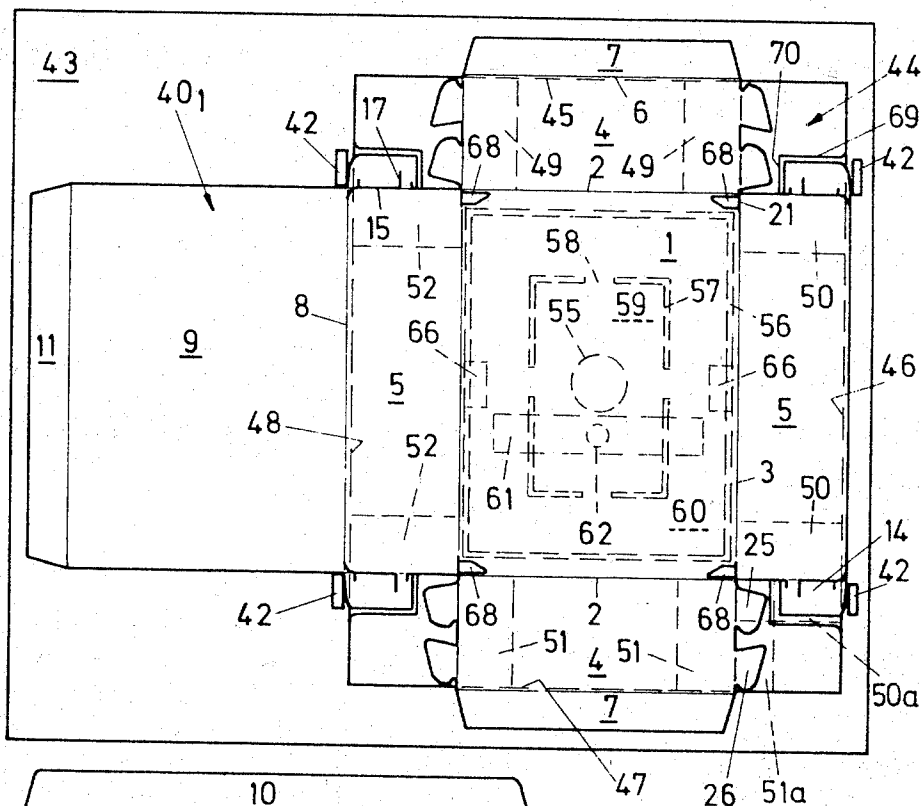


Fig. 4

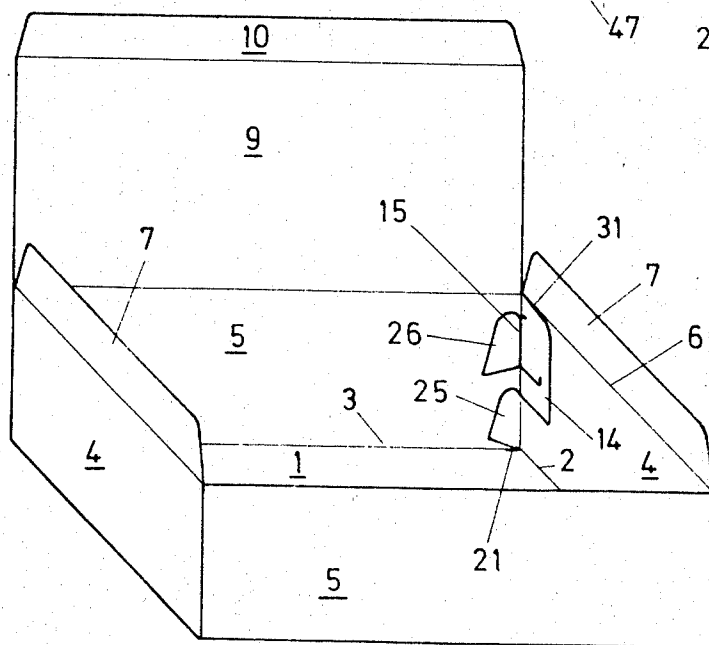


Fig. 5

DEVICE FOR THE ERECTION OF BLANKS FOR MAKING PLUG-IN-FOLDING BOXES

The invention relates to a device for the erection of blanks for plug-in folding boxes.

For the upward folding of the walls of the folding-box-blanks one employed heretofore devices in which the blank was first separated from a supply stack and then transferred to an erection station. At this station, the blank is pressed by a plunger between guide members. These known devices require much space, are complicated and expensive. Besides, there frequently occur disturbances on the path from the stack to the erection station.

The device according to the present invention overcomes these disadvantages in that it has a receiving device for a stack of blanks, below which a suction plunger is movable downwardly and upwardly for drawing downwardly the bottom of the lowermost blank, and for feeding the blank between downwardly projecting guide members, which bring about the folding-up of the walls of the blank and their mutual plug-in-fastening to the edges of the box.

The drawing illustrates diagrammatically by way of example an embodiment of the invention.

In the drawings:

FIG. 1 is an elevation view of the erection device in a first operative phase.

FIG. 2 is the same view in a second operating phase.

FIG. 3 is the same view in a third operating phase, and

FIG. 4 is a plan view as in FIG. 2, with omission of all stacked blanks up to the lowermost, and

FIG. 5 a perspective showing of an erected blank.

The device shown is intended for the erection of cardboard blanks, which are supplied to the same device in the form of a stack 41, which is inserted between four vertical posts 42, arranged in the corners of a rectangle. In FIGS. 1 to 3, are shown only a few of the lowermost blanks 40 of the stack 41, each in the form of a single line. The shape of the blank 40 is apparent from FIG. 4, which shows the lowermost blank 40₁ of the stack 41. The stack 41 rests on a table 43, on which are disposed the corner posts 42 and has a rectangular opening 44, whose edges 45 to 48 coincide approximately with the lines 6, 8, 6 and 31 of the blank 40. From the edges 45 to 48, extend each two parallel sheet-metal guides 49 to 52 inwardly and downwardly. The upper parts of these sheet metal guides 49 to 52, which are reinforced in a manner not described in greater detail, are curved inwardly convexly, while their lower parts project vertically downwardly, and accordingly delimit a shaft 53 of rectangular cross-section. This shaft-cross-section corresponds with the bottom 1 of the blank 40 delimited by the fold-lines 2, 3.

A suction piston 54 is movable between the sheet-metal guides 49 to 52 upwardly and downwardly. This piston 54 is provided with a vertical tubular piston rod 55. The upper rectangular end surface of the piston 54 is provided with an outer rib 56 which extends along its entire periphery, and advantageously also is provided with a somewhat lower inner rib 57, which extends parallel to the outer rib 56 and has interruptions 58. The inner rib 57 delimits an inner suction chamber 59, which is in communication with the bore of the tubular piston rod 55 and with a vacuum conduit, not shown,

and by the interruptions 58 is also in communication with an outer suction chamber 60 delimited by the ribs 56 and 57. The suction chambers 59 and 60 serve for the sucking in of the lowermost blank 40₁, so that the same is held securely on the ribs 56 and 57, whereby the innermost rib 57 solely prevents too strong a bending of the bottom of the blank 1.

Below the suction piston 54 is disposed a control piston 61, whose vertical piston rod 62 is movable parallel to the tubular piston rod 55 and likewise is movable upwardly and downwardly. The piston 61 has on its circumference two lateral, symmetrical grooves 62', in each of which a roller 63 is slidable. Each of the rollers 63 is rotatably attached to the free end of an arm 64, which is seated on a shaft 65, which is mounted in a support 66 projecting downwardly from the piston 54. At both ends of each of the shafts 65 is mounted a gripper 67, whose upper end is bent at a right angle to form a claw 68. In FIG. 4 the parts 63 to 66 are not illustrated, and of the four grippers 67 solely the claws 68 are shown, which penetrate the short corner slots 21 in the upper side of the blank 40₁.

In the operating phase illustrated in FIG. 1, the pistons 54 and 61 are disposed in their uppermost position, whereby the suction piston 54 sucks in the lowermost blank 40₁. Then the pistons 54 and 61 move downwards and indeed, the control piston 61 moves faster than the suction piston 54, as is indicated by the unequally long arrows 69 and 70. In view thereof, the two arms 64 with their shaft 65 and the associated grippers 67 are pivotal symmetrically in the direction of the arrows 71 of FIG. 1, until the claws 68 reach the position indicated in the FIGS. 2 and 4, in which they clamp tight the bottom portion 1 of the blank on the suction piston 54. According to the operating phase shown in these Figures, the two pistons 54 and 61 move firstly equally fast downwardly, as is indicated by the equally long arrows 72 and 73. During this downward movement, the one wall 4 together with the edge strips 7 comes in contact with the sheet-metal guides 49, the one wall 5 with the sheet-metal guides 50, the other wall 4 together with the associated edge strips 7 with the sheet-metal guides 51, and the other wall 5, the cover 9 and the edge strips 11 with the sheet-metal guides 52. The upper inwardly convex parts of the sheet-metal guides 49 to 52 bring about thereby an upward folding of the walls 4, 4 and 5, 5 and the other flaps coherent therewith about the fold-lines 2, 2 and 3, 3. When the blank is drawn through the shaft 53, the upwardly folded parts of the blank 40₁, come into a position perpendicular to the bottom 1. The forces exerted during the upward folding by the sheet-metal guides 49 to 52 upon the blank 40, have components directed substantially upwardly, so that the suction force carried out by the suction piston 54 on the bottom 1 would not be sufficient to hold the same tight on the piston 54; nevertheless this is obtained satisfactorily by the claws 68 of the gripper 67.

In addition, in this manner, the walls 4 which are in connection through the fold-lines 2 with the bottom 1 are held tight on the suction piston 54. On the walls 5, to the contrary, whose outer ends are separated by the corner slots 21 from the bottom 1, the fastening effect of the gripper 67 is not effective. The ends of these walls to which the flaps 14 are linked, may accordingly in each case during the erection- and plugging-in-operation slide somewhat as compared with the walls

4, in direction of the rim formed by the walls 4 and 5. Thereby the prerequisites are furnished which make possible a satisfactory, automatic formation of the boxes, without subjecting the blank to excessive strains.

In FIG. 3 is shown an operating phase in which still only the cover 9 and the edge strips 11 engage the sheet-metal guides 52 while the erected plug-in, folding box 74, otherwise has already left the shaft 53. Shortly before attainment of the position shown in FIG. 3, the speed 72 of the control piston 61 has been reduced with respect to the speed 73 of the suction piston 54, so that the relative position of both pistons 54 and 61 again corresponds to that shown in FIG. 1. The grippers 67 are accordingly again pivoted outwardly, so that their claws 68 have released the box 74. The two pistons 54 and 61 move now still one step on downwardly with the same speeds 75 and 76, until finally also the edge strip 11 leaves the shaft 53. Then the vacuum in the suction chambers 59 and 60 is abolished, so that the box 74 by means of a slide member, or the like, not shown, may be transferred from the suction piston 54 to a discharge-conveyor-belt, which for example, leads to a filler station.

The sheet-metal guides 49 to 52 for the purpose of facilitating the illustration and the understanding are not shown in their full width. In FIGS. 1 to 4, as is indicated solely in the right-hand lower corner of FIG. 4, the sheet-metal guide 51 is also provided with an edge strip 51a, which is disposed on the respective side of the adjacent wall 4 under its corner flaps 26 and their plug-in tongues 25. Furthermore, the sheet-metal guide 50 is also provided with an edge flap 50a, which is located on the respective side of the adjacent wall 5 under its corner flap 14. The same holds true also for all other sheet-metal guides. Through suitable, empirically easily determinable curvatures of the sheet-metal guide and their edge strips or edge-flaps, respectively, it is attained that upon upward folding of the walls 4 and 5, first on each common corner edge, — the corner flap 25 of the wall 4 is placed on the inner side of the wall 5, whereupon the corner flap 14 of the wall 5 is placed on the inner side of the wall 4, while at the same time, the plug-in tongue 26 of the wall 4 passes through the slot 15 provided along a part of the fold-line 13, lies on the inner side of the wall 5, and prevents an undesired folding apart of unfolding of the erected blank, that is, of the folded-up and plugged together box 74. This is also apparent from FIG. 5, which shows the plug-in-folding box in the condition in which it leaves the folding device.

Advantageously the table 43 is provided with stops 69 in the range of the corner flaps 14. During the removal of the individual blanks 40 from the stack 41, the flaps 14 moves over the inner edges 70 of the associated stop member 69 and are thereby subjected to a bending stress. This has the result that the tongue delimited by the notches 15 and 17 is released from the flap 14, which works out to advantage upon plugging-in of the tongue 26 in the slot 15. This is then of particular importance when the slots 15 and 17 are not stamped out quite satisfactorily.

It is clear that countless variations of the device

shown are possible. Thus one may for example, in place of providing for each a pair of sheet-metal guides 49 to 52, provide a single sheet-metal guide, which extends over the entire length or width of the bottom and is provided in addition on both sides with edge flaps or edge-strips, respectively. Furthermore, one may replace the sheet-metal guides 49 to 52 by corresponding guide members made of other material than sheet metal. The actuating mechanism for the grippers 67 does in no manner need to have the described control pistons 61, although the same is especially simple and advantageous. The table 43, on which the stack 41 rests, need not consist of a solid table-plate, but may also be grate-shaped or frame-shaped.

Finally it is pointed out that the concepts "under," "downward," "upward," "lowermost blank" and the like, in the preceding description and the following claims relate to the position of the device coming into question as shown in the drawing. These device would also remain capable of functioning upon a change in its spatial orientation, in that one could also tilt it as a whole for example by 90° or 180° with reference to the vertical direction.

What I claim is:

1. Device for the erection of blanks for making plug-in-folding boxes, comprising receiving means for a stack of blanks, guide members extending downwardly from said receiving means, an upwardly and downwardly movable suction piston arranged below said receiving means for sucking in the bottom portion of the lowermost blank of said stack and drawing it downwardly between the guide members to produce an upward folding of the walls of the blank and their mutual plug-in-fastening to the edges of the folded box and pivotably mounted grippers, when after an introducing downward movement of the suction piston during which the portion of the blank is separated from the remaining stack, enter slots in the blank and engage its bottom portion for clamping the same to the suction piston.

2. Device according to claim 1, including an upwardly and downwardly movable control piston, which through an advancing or lagging movement with reference to the suction piston controls said grippers in such manner that the same engage and release the bottom portion, respectively, of the blank.

3. Device according to claim 1, in which said receiving means for the stack of blanks is provided with stops in the range of the corner flaps of the blank, said stops having an inner edge over which said corner flaps slide upon removal of the lowermost blank from the stack.

4. Device according to claim 1, wherein each of the guide members has an upper portion which is convex inwardly to a vertically extending lower portion, the guide members being arranged with their lower portions forming a rectangular shaft for the passage of the blank during the folding operation.

5. Device according to claim 4, in which said guide members have edge zones serving for the mutual plug-in-fastening of the upwardly folded walls formed by projecting blank sections.

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