Feb. 21, 1956 O. E. LARSSON 2,735,344

BOX FOLDING AND STAPLING MACHINES

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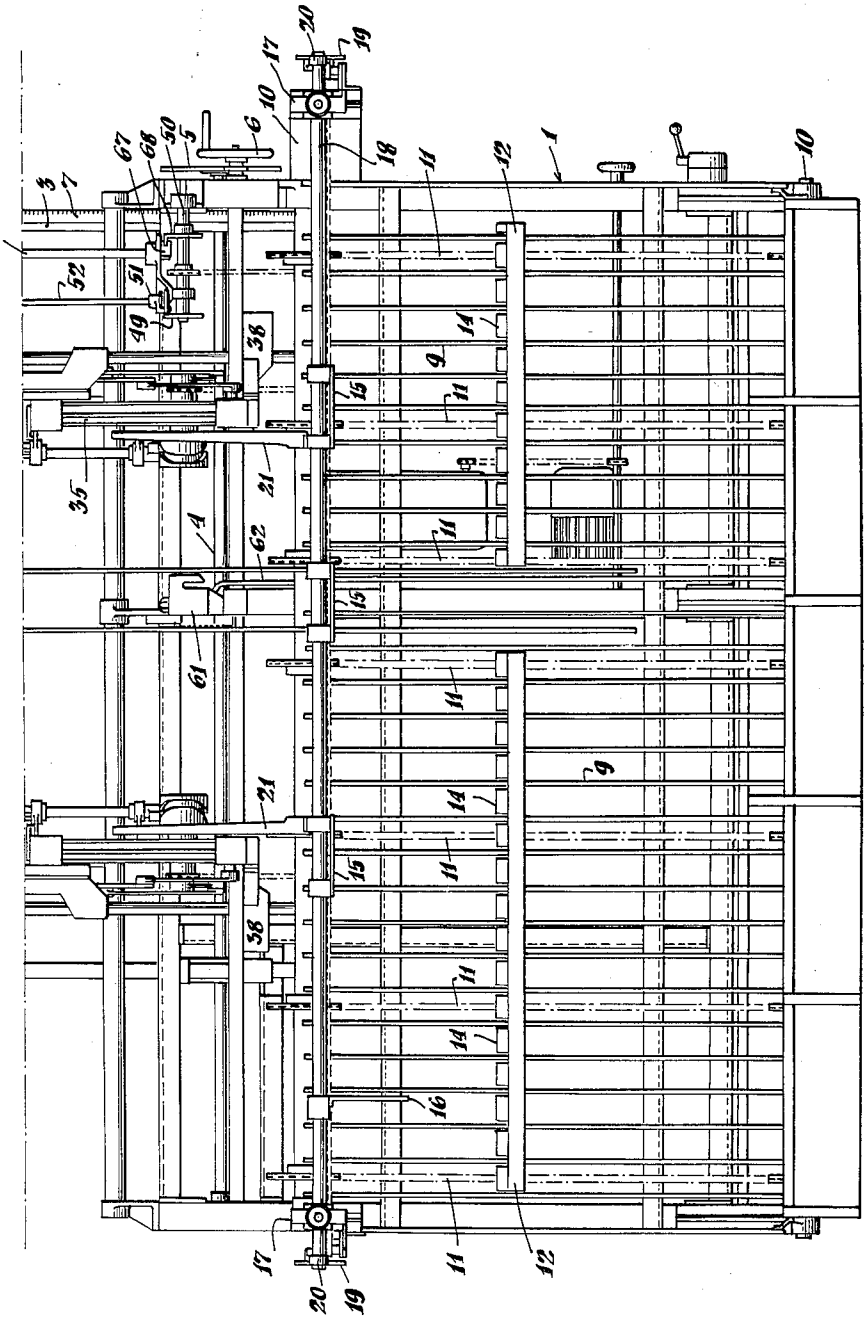


Fig. 1A

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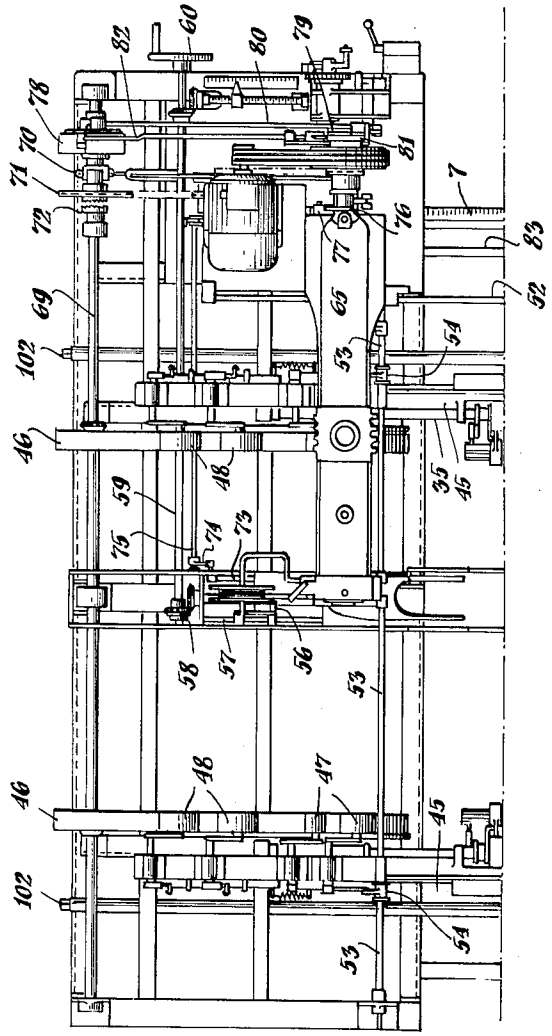


Fig. 1B

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BOX FOLDING AND STAPLING MACHINES

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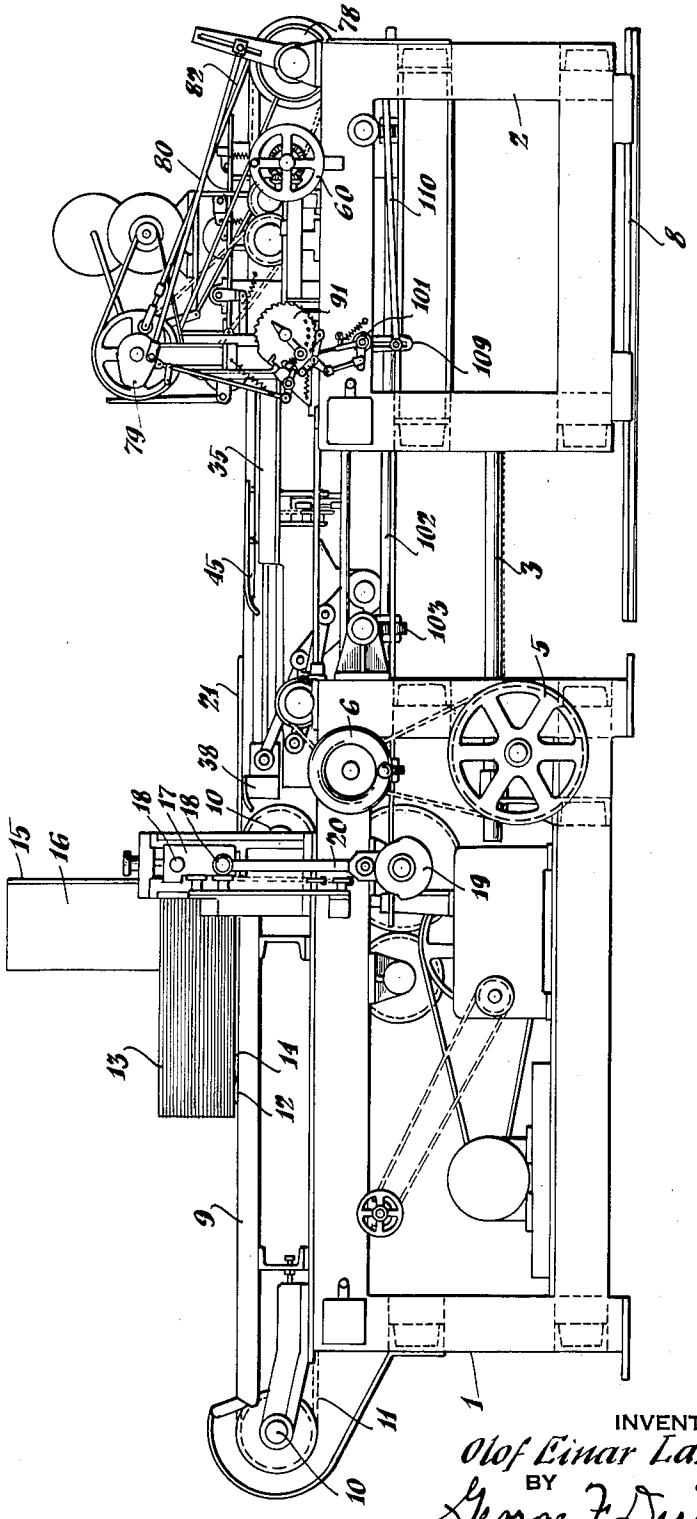


Fig. 2

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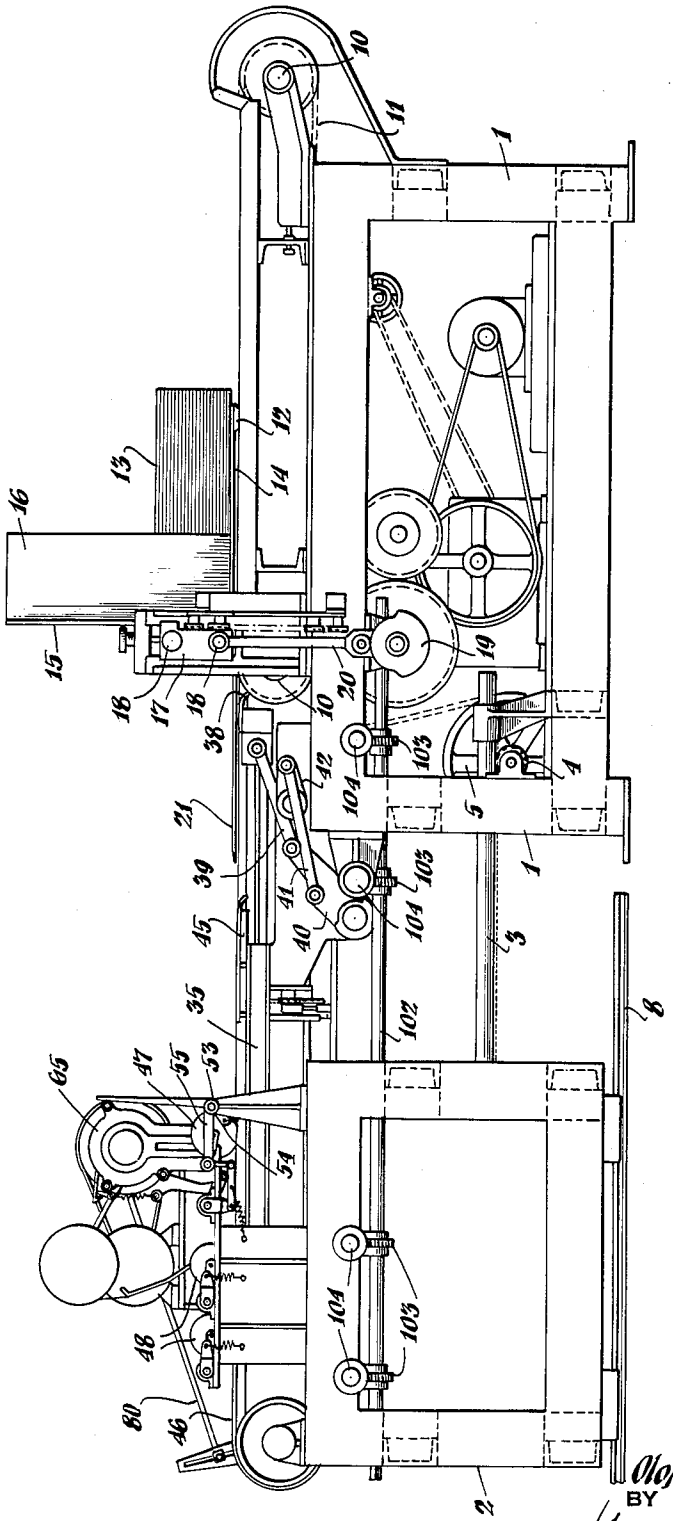


Fig. 3

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BOX FOLDING AND STAPLING MACHINES

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Fig. 4

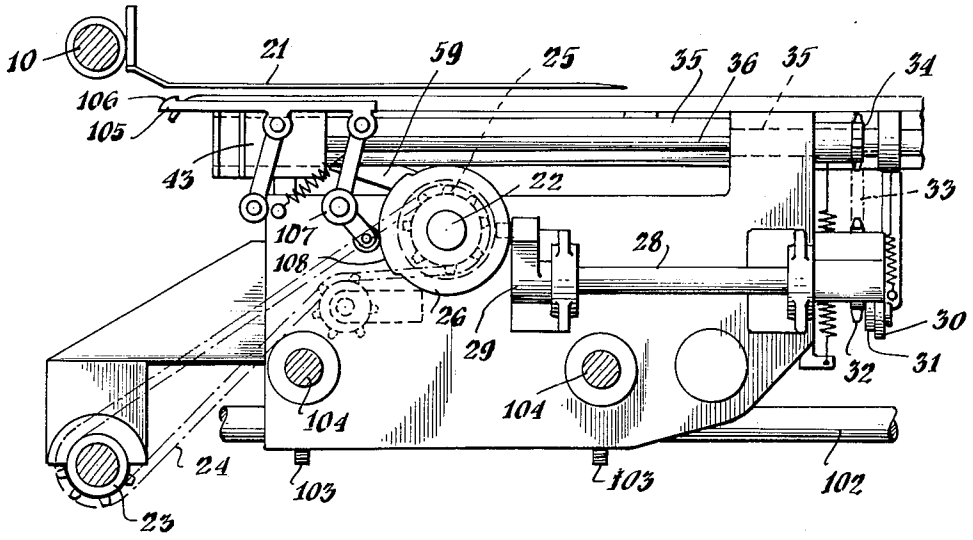
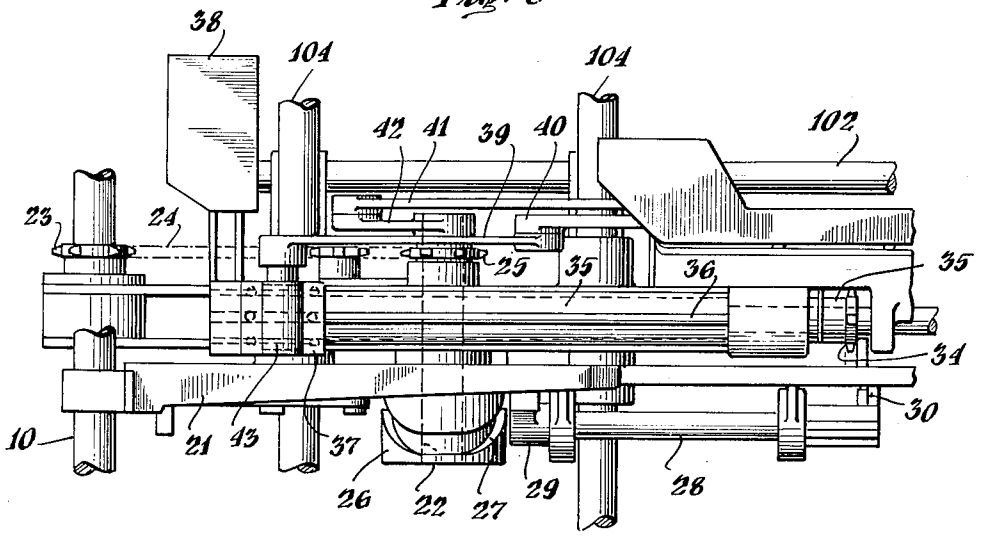


Fig. 6



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BOX FOLDING AND STAPLING MACHINES

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Fig. 5

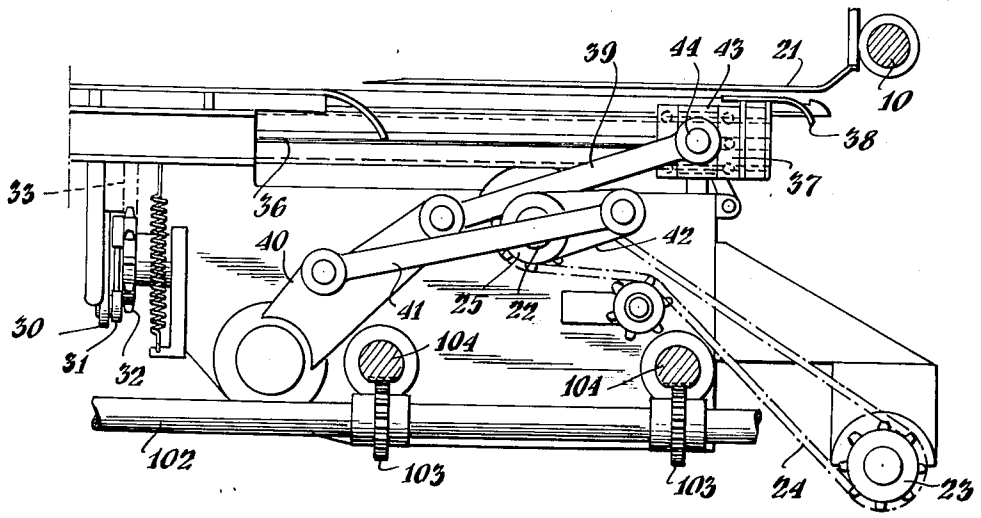
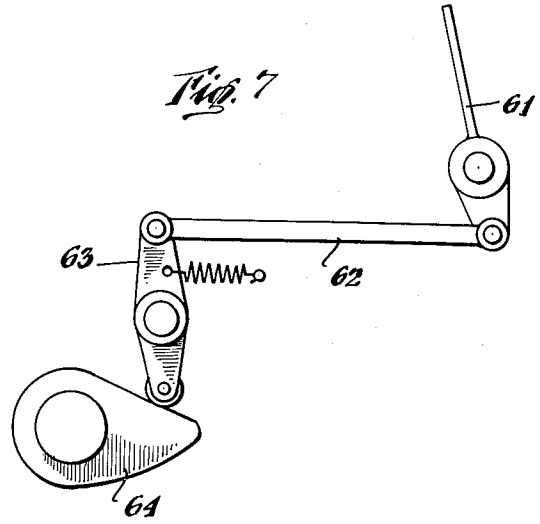


Fig. 7



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2,735,344

BOX FOLDING AND STAPLING MACHINES

Olof Einar Larsson, Orebro, Sweden

Application October 3, 1952, Serial No. 313,002
Claims priority, application Sweden October 3, 1951
2 Claims. (Cl. 93—49)

This invention relates to a combined folding and stapling machine for making boxes or packing receptacles. It is customary in making boxes of this type to cut blanks of the required dimensions and to score or crease the blanks along the folding lines, after which one blank at a time is folded such that the edges of the infolded flaps overlap each other, whereafter said edges are united by a stapling operation. The term stapling used hereinafter includes all equivalent customary uniting methods, such as sewing or taping. The blanks cut to proper sizes are supplied to the machine in a stack or pile in which the blanks assume substantially horizontal positions. The lowermost blank of the stack is conveyed to the folding device, and new blanks can be placed on the stack while the machine is in operation.

The object of the invention is to provide a combined folding and stapling machine of the kind indicated which can be easily adapted to different lengths of blanks, the length of a blank being understood to mean the distance between the leading edge and the trailing edge of the blank.

I attain this object by mechanism described hereinbelow with reference to the accompanying drawings, in which:

Figs. 1A and 1B illustrate a coherent top view of the entire machine, Fig. 1A comprising the folding device and Fig. 1B and stapling device. Fig. 2 shows a lateral elevation of the machine as viewed from the right with respect to the conveying direction. Fig. 3 is a lateral elevation of the machine as viewed from the opposite side as compared with Fig. 2. Fig. 4 is an elevation, partly in section, of the folding mechanism as viewed from the inside thereof. Fig. 5 is a similar elevation as viewed from the outside. Fig. 6 is a top view of the folding mechanism, and Fig. 7 is a side elevation of the alignment member with appertaining actuating parts.

Referring to the drawings, the unit shown in Fig. 1A is mounted on a frame 1, while the unit shown in Fig. 1B is separately mounted on a frame 2. According to the invention, the frames 1 and 2 are adjustable relative each other so as to adapt the machine to different lengths of blanks. This adjustment is rendered possible by means including a rack 3 secured to the frame 2 and engaging gear wheel 4 mounted on a shaft the bearings of which are secured to the frame 1. On the shaft of the gear wheel 4, there is mounted a sprocket wheel 5 which by means of a chain is connected with a sprocket wheel connected with a hand-wheel 6. By turning the hand-wheel 6 in one or the other direction, the frame 2 will be moved towards or away from the frame 1 which is stationarily mounted on the floor, whereas the frame 2 is displaceably mounted on tracks 8 parallel to the conveying direction of the blanks. The position of the frame 2 relative to the frame 1 can be read off on a scale 7.

On the frame 1, there is mounted a platform consisting of parallel bars 9 adapted to support a stack of blanks 13. At the front and rear end of the platform there are provided two parallel shafts 10 having a number of sprocket wheels for conveyor chains 11 which have articulated thereto two conveyor bars 12 located in alignment with each other at right angles to the conveying direction. The bars 12 serve to feed the lowermost blank in the stack towards the folding device. The bars 12 are provided on their lower sides with downwardly projecting members 14 which slip under the lowermost blank of the stack and maintain the upper edges of the bars below the upper surface of the lowermost blank and thereby prevent the bars from catching the blank lying above the lowermost blank of the stack, said members 14 being movable in the spaces between the tracks 9.

The stack of blanks abuts at its forward end against plates 15 which are adjustable in vertical direction such as to provide a passage below themselves for the lowermost blank of the stack. The blades 15 are adjustable simultaneously with the folding and stapling devices. A lateral plate 16 is adjustable in a direction at right angles to the conveying direction so as to define the lateral position of the stack with respect to the folding and stapling devices. Adjustment of the plates 15 and 16 is effected by means of blocks 17, which carry bars 18 secured to the plates 15 and 16. When the conveyor bars 12 have to pass below the plates 15, the bars 18 are temporarily lifted by means of cams 19 which act upon rods 20 secured to the blocks 17.

Two plates 15 are connected with folding shoes 21 round which the blanks are to be folded. As will be seen from Figs. 4 to 6, the folding mechanism comprises a drive shaft 22 to which movement is imparted by a chain 24 and sprocket wheels 23 and 25. The shaft 22 has mounted thereon a cam wheel 26 having a peripheral groove 27 in engagement with a crank 29 on a shaft 28. At its other end, the shaft 28 has a crank 30 which by means of a link 31 is connected with a sprocket wheel 32. The sprocket wheel 32 is by means of a chain connected with a sprocket wheel 34 mounted on the folder shaft 35. The shaft 35 is provided with splines 36 and has mounted thereon a sleeve 37 which is slidable along the shaft. A ring 43 mounted on the sleeve 37 has a pivot 44 for a link 39. The ring 43 is mounted on the sleeve such as not to participate in the rotation of the folder shaft 35. The sleeve 37 is connected with a wing 38 for folding a blank. After the blank has been folded the sleeve 37 is acted upon by the link 39 which is connected with an arm 40 which in turn is acted upon by a link 41 connected with a crank arm 42 on the drive shaft 22. After having been folded the blank is moved into the stapling position by means of the wing. As will be seen from Fig. 1A, there are provided two wings 38 for folding the blanks round the shoes 21. Members 45 are provided to guide the blank on its way to the stapling apparatus.

The stapling device includes conveyor belts 46 on which the folded blanks are moved forward. Pressure rolls 47, 48 are resting near the lateral edges of the folded blanks. When a blank is approaching the pressure rolls 47, these rolls are lifted by means of a cam 49, Fig. 1A, which is mounted on a shaft 50 driven by the same shaft as the sprocket wheel 23. The cam 49 actuates an arm 51 on a shaft 52 which by means of arms and links is connected with a shaft 53, Fig. 1B. By means of an arm 54, the shaft 53 lifts another arm 55, Fig. 3, and consequently also the rolls 47 during the time the blank is conveyed into stapling position. In this position, the leading edge of the blank abuts against a pivotably mounted abutment plate 56, Fig. 1B, said plate being mounted on slide bars 57. The position of the abutment plate 56 on the slide bars is adjustable in the conveying direction of the blank by means of bevel gears 58 and a shaft 59 having a hand-wheel 60. When the leading edge of the blank arrives at the abutment plate 56, the trailing edge

of the blank is acted upon by an alignment plate **61**, Figs. 1A and 7. The alignment plate is swung upwards by means of a cam **64** which acts upon a lever **63** and a link **62** pivotally connected with the plate **61**. By means of the plates **56** and **61**, the leading and trailing edges of the infolded flaps are aligned with each other and maintained in position until the first staple has been applied.

With the blank in this position, the stapling apparatus **65** is put into operation by means of a member **83** having an arm **67** which is acted upon by a cam **68** on the shaft **50**. At the same time, the movement of the shaft **69** for the conveyor belts **46** is interrupted by means of a lever **70** which displaces one member of a clutch **72** and thereby disconnects the shaft **69** from a driving wheel **71** connected with said clutch member. The lever **70** is acted upon by a shaft **101**, Fig. 2, having an arm **109** which by means of a link **110** is pivotally connected with the lever **70**. Immediately thereupon the pressure rolls **47** are lowered again, and the first staple is applied to the blank. After that, the abutment plate **56** is swung out of the path of the blank by means of a rod **73** which is connected with a shaft **75** by means of links **74**. The shaft **75** is acted upon by a cam **76** and a link **77**.

The intermittent feeding movement of the conveyor belts **46** is then started by means of a one-way clutch **78** which is actuated by a cam **79**. This cam is mounted on the shaft of the stapling apparatus **65** and connected to the clutch **78** by means of a connecting rod **80**. The distance between the staples applied to the blank can be varied by varying the radial distance at which the connecting rod **80** is attached to the clutch **78**. In order to prevent variation of the distance between the staples on account of the action of the centrifugal force, the one-way clutch **78** is provided with a brake adapted to be actuated by means of a cam **81** on the shaft of the stapling apparatus and a connecting rod **82**.

Lateral adjustment of the folding mechanism and the conveyor belts can be effected by means of shafts **102** having gear wheels **103**, and racks **104** meshing with the gear wheels. The gear wheels **103** are axially displaceable on the shafts **102** so as to maintain their engagement with the racks in different positions of the frame **2** relative to the frame **1**.

In order to move the blanks from the position in which the conveyor bars **12** come out of engagement with the trailing edge into the position for folding, there is provided an additional conveyor **105**, Fig. 4. The rear end of the conveyor **105** has a projection **106** which moves

the blank between the last named positions. The conveyor **105** performs a reciprocating movement which is obtained by means of the cam **26** and a cooperating lever **107** engaging the cam face **108** and connected with the conveyor **105**.

From the above description it will be evident that for any given length of blank the frame **2** has to be adjusted such that the distance between the plates **56** and **61** in their operative positions is equal to the length of the blank, that is, the distance between the leading edge and the trailing edge of the blank. If it were not for this adjustment of the frame it would be necessary to provide means for adjusting the alignment plate **61** in the conveying direction Such adjustment involves, however, considerable difficulties which are overcome by the arrangement according to the invention.

By means of the adjustable abutment plate **56**, the distance between the leading edge of the blank and the first staple applied to the blank can be varied.

The various devices for conveying, folding and stapling or similar treatment of the folded blanks form per se no part of the invention and may be constructed in any suitable conventional manner departing from the constructions illustrated in a more or less diagrammatic manner.

What I claim is:

1. A box folding and stapling machine consisting of two separate units, the first unit comprising a folding device, means for conveying a cardboard blank to said folding device, and an alignment member adapted to abut against the trailing edge of the blank in the stapling position thereof, said second unit comprising a stapling apparatus and an abutment member adapted to abut against the leading edge of the blank in the stapling position thereof, and manually operable means for moving one of said units in toto with respect to the other unit in the conveying direction of the blank to set the machine in condition for conveying, folding and stapling blanks of another length.

2. A box folding and stapling machine as claimed in claim 1 and further comprising means for changing the location of said abutment member relative to said stapling apparatus in the conveying direction of the blank.

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