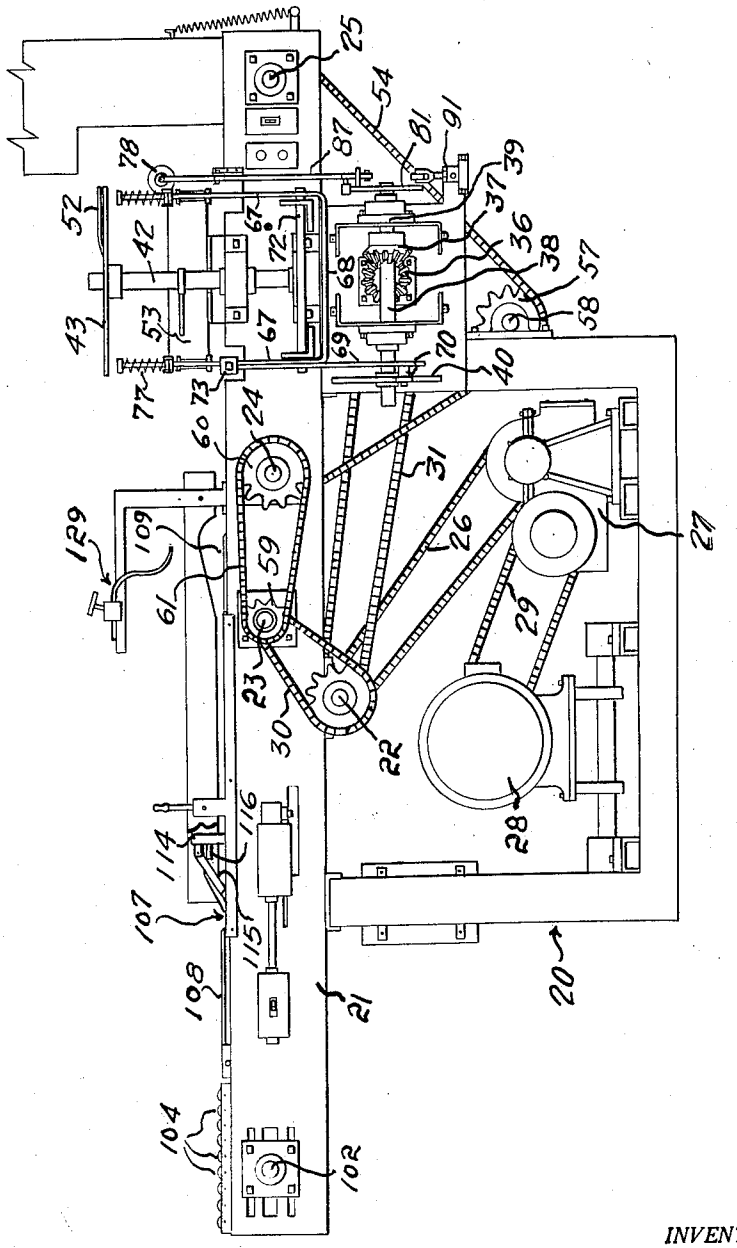
Sept. 29, 1959 L. G. VOGEL 2,906,075

BOX ERECTING AND LOADING APPARATUS

Filed Sept. 29, 1955 6 Sheets-Sheet 1

Fig. 1.



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BOX ERECTING AND LOADING APPARATUS

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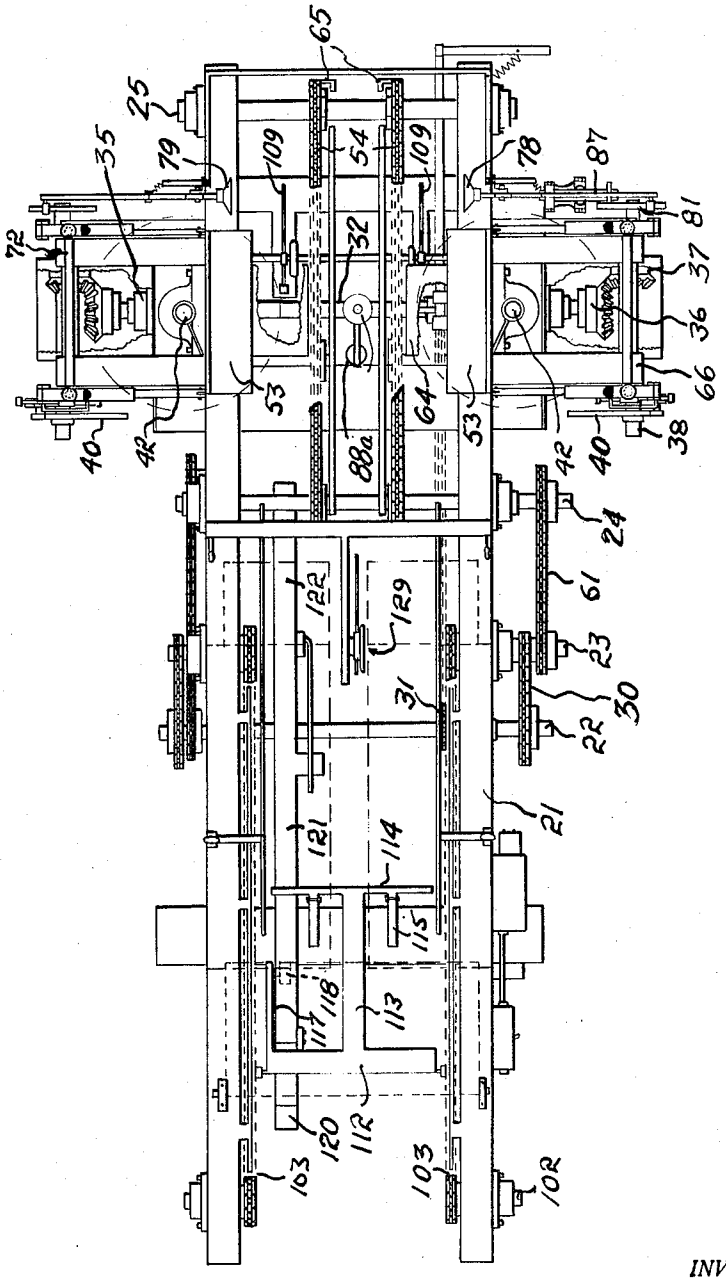

Fig. 2.

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BOX ERECTING AND LOADING APPARATUS

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Fig. 3

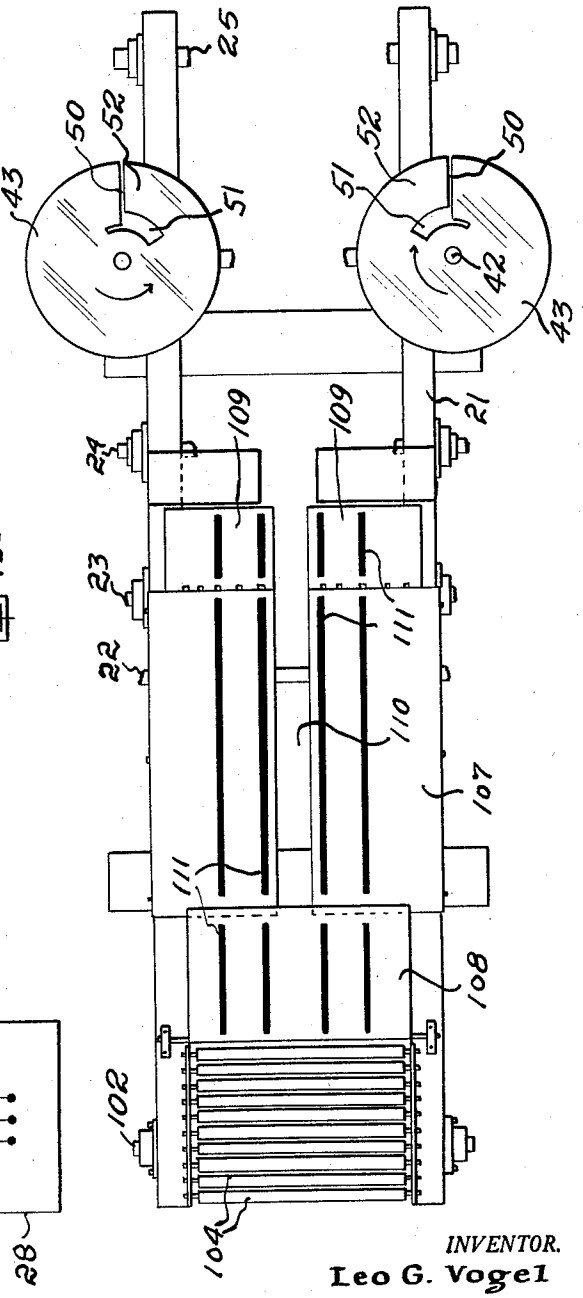
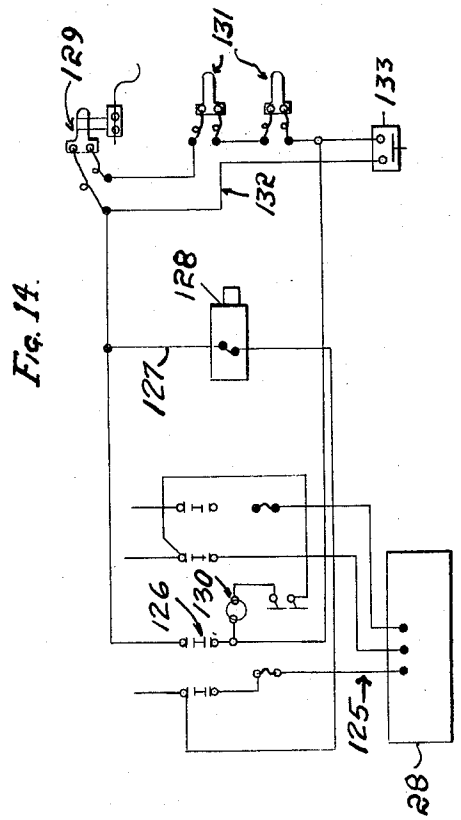


Fig. 14.



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Sept. 29, 1959 L. G. VOGEL 2,906,075

BOX ERECTING AND LOADING APPARATUS

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Fig. 4.

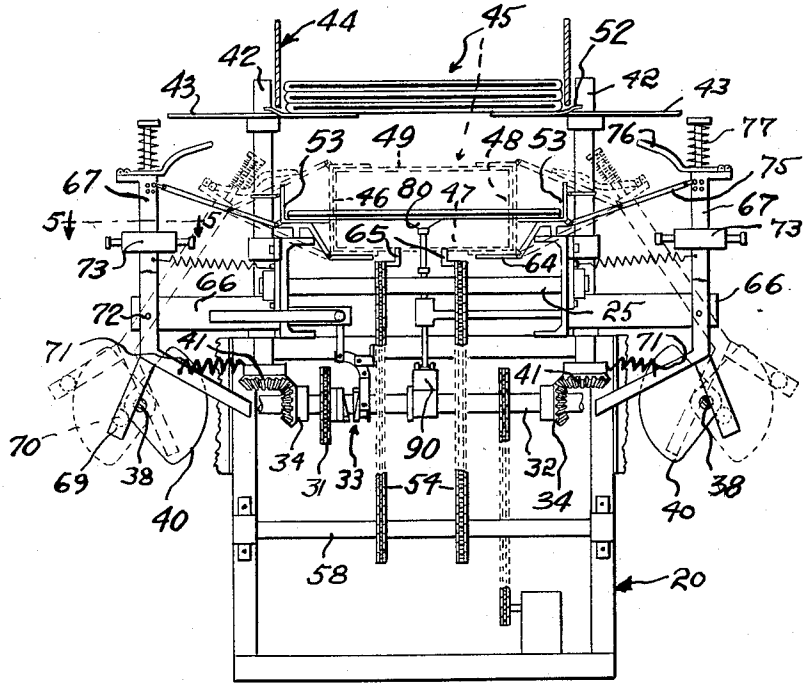


Fig. 5.

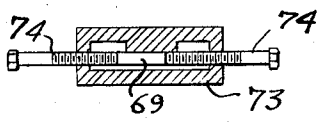
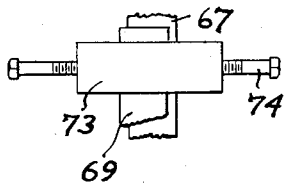


Fig. 6.



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Sept. 29, 1959 L. G. VOGEL 2,906,075

BOX ERECTING AND LOADING APPARATUS

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Fig. 7.

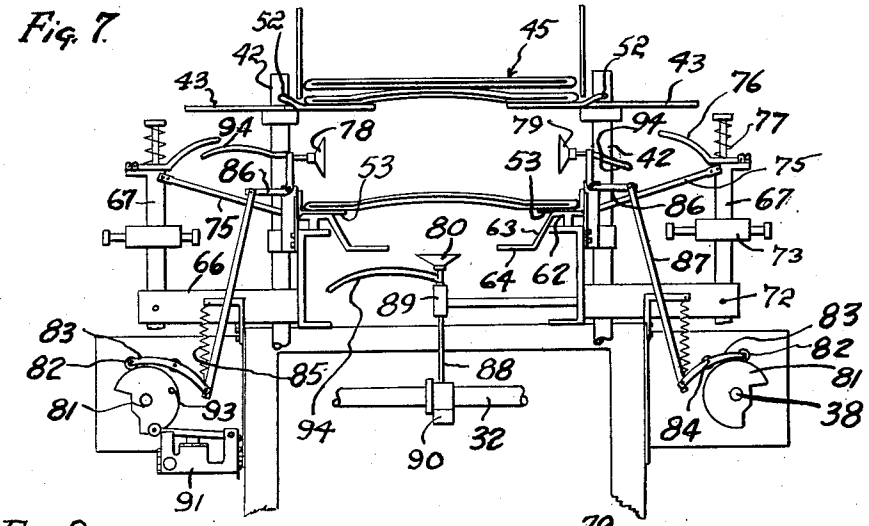


Fig. 8

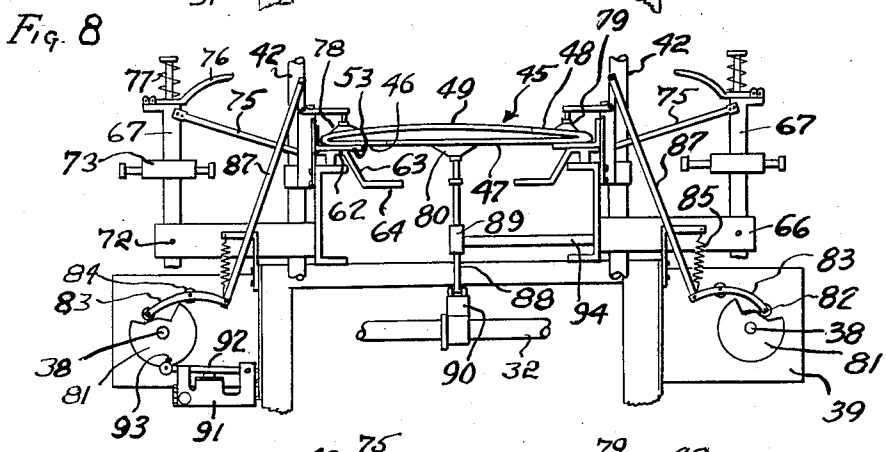
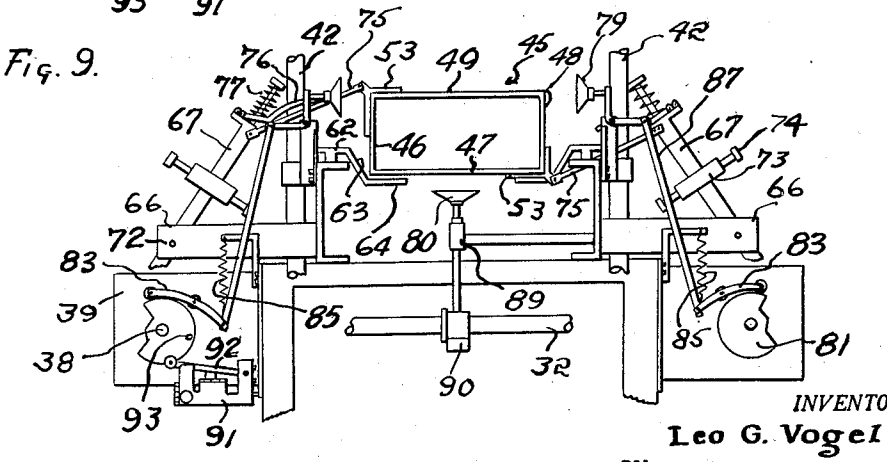


Fig. 9.



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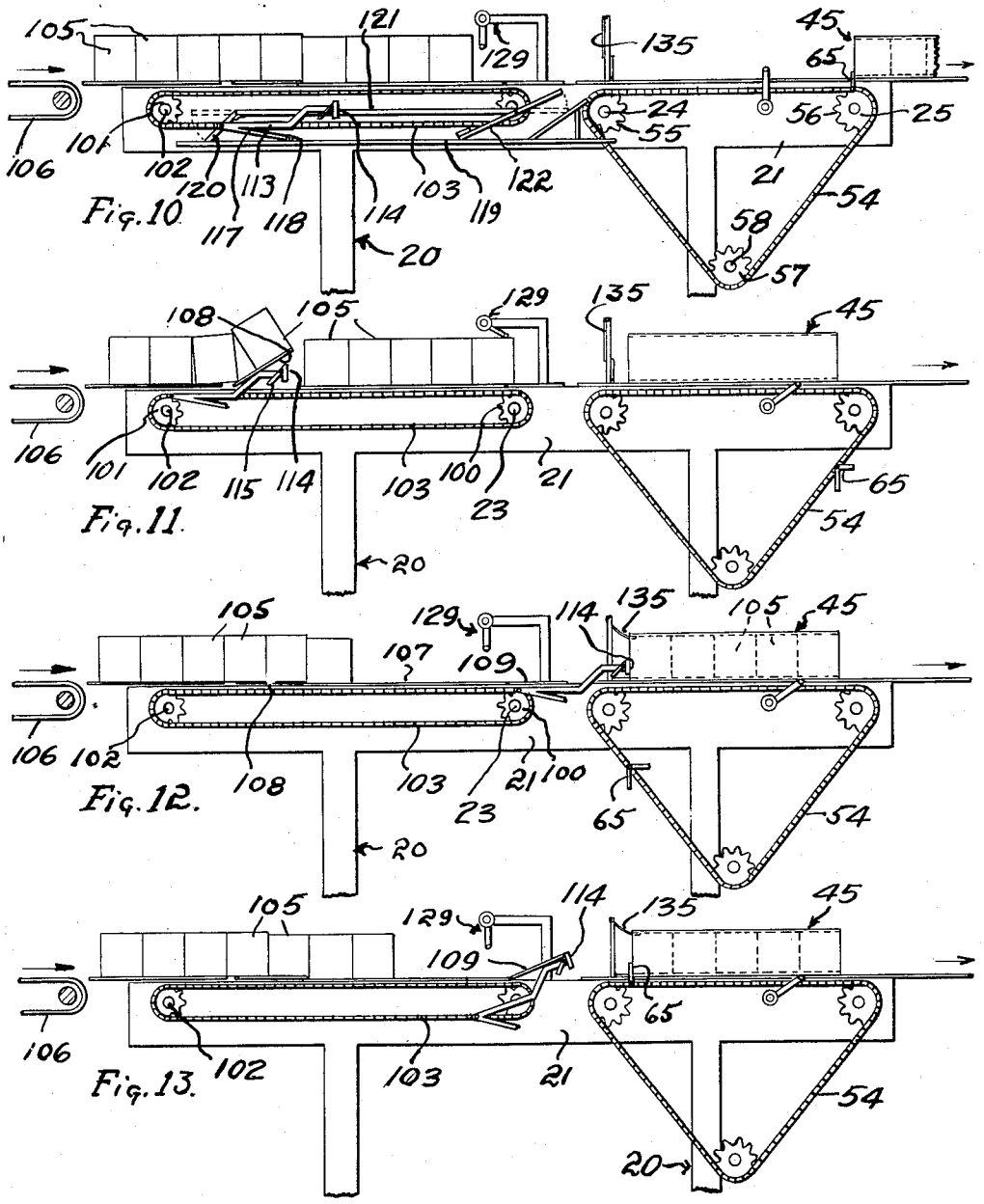
Sept. 29, 1959 L. G. VOGEL 2,906,075

BOX ERECTING AND LOADING APPARATUS

Filed Sept. 29, 1955 6 Sheets-Sheet 6



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United States Patent Office 2,906,075 Patented Sept. 29, 1959

2,906,075

BOX ERECTING AND LOADING APPARATUS

Leo G. Vogel, Portland, Maine

Application September 29, 1955, Serial No. 537,467

20 Claims. (Cl. 53—186)

This invention relates to box erecting and loading apparatus.

Different products are packaged in boxes that are supplied to the manufacturers in collapsed form. Such boxes have four panels whose edges are hinged together and which are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded more or less together as to the respective ones of the other pair thereof. Commonly alternate panels are narrower than the others with the wider panels usually being the tops and bottoms of the erected boxes.

The principal objective of this invention is to furnish means for erecting such boxes delivered to it in a collapsed state. This objective is attained by providing a pair of members to receive side edges of a collapsed box, at least one member being movable towards the other thus to cause the co-planar panels to fold along their respective axes and at least one member being free to move along the pathway defined by the box corner developed at the edge with which it is in engagement. Preferably both members are movable towards each other and also both may move upwardly or downwardly as required by the developing box corners.

Such means also includes, in addition to safety controls ensuring operation only when a box is properly erected and properly positioned, power operated means effective to initiate the folding of one pair of co-planar panels prior to the application of pressure to the edges of the collapsed box.

In the accompanying drawings, there is shown an illustrative embodiment of the invention from which these and other of its objectives, novel features, and advantages will be readily apparent. In the drawings:

Fig. 1 is a side view of apparatus in accordance with the invention.

Fig. 2 is a top plan view of the apparatus with certain parts either removed or broken away.

Fig. 3 is a similar view of the apparatus showing other of its detail.

Fig. 4 is a view of the outfeed end thereof.

Fig. 5 is a section, on a substantially increased scale, approximately along the indicated lines 5—5 of Fig. 4.

Fig. 6 is a fragmentary elevation on the same scale of the parts shown in Fig. 5.

Fig. 7 is a fragmentary view, on a scale greater than Fig. 1, and illustrating an imperfect collapsed box delivered from its magazine.

Fig. 8 is a similar view but with the box erection properly initiated.

Fig. 9 is a like view but with the box erected and the means initiating the unfolding of the boxes returned to their inoperative position.

Figs. 10, 11, 12, and 13 are somewhat schematic views illustrating a cycle of the loading mechanism, and

Fig. 14 is a schematic view of the wiring diagram.

In the embodiment of the invention shown in the drawings, and as may be seen in Figs. 1, 2 and 4, there

is a base 20 in support of a pair of parallel, horizontally disposed members 21 by which suitably journalled, transverse shafts 22, 23, 24 and 25 are rotatably mounted. The shaft 22 is rotated as by a chain drive 26 from the speed reducer 27 shown as connected to the motor 28 by the chain 29. The speed reducer 27 and the motor 28 are conveniently located within the framework of the base 20.

The shaft 22 is connected by the chain drive 30 to the shaft 23, and by the chain drive 31 to the transverse shaft 32 through a manually disengageable clutch 33 adapted to engage when its parts are in a predetermined position relative to one another as in the case of a single revolution clutch. The clutch 33 is located between bevel gears 34 and the shaft 32 is journalled in mounts 35 with a bevel gear 36 secured to each of its exposed ends. (See Figs. 1 and 2). Each of the bevel gears 36 meshes with a like gear 37 mounted on a horizontal shaft 38 journalled in brackets 39 and disposed at right angles to the shaft 32. Each shaft 38 is provided with a cam 40.

Each of the bevel gears 34 meshes with a like gear 41 fast on the end of a respective one of the vertically mounted shafts 42, each located proximate to a respective one of the members 21 to which it is shown as being connected. At the upper end of each shaft 42 there is secured a disc 43 and these discs are located with their axes outside a magazine suggested at 44 but with supporting segments at the bottom thereof.

Reference is now made to the boxes which are located in the magazine 44. These boxes are generally indicated at 45 and are of the type having marginally hinged panels 46, 47, 48, and 49 with the panels 46 and 48 being typically but not necessarily of the same width but narrower than the panels 47 and 49 which separate them. (See Figs. 4, 8 and 9). In the collapsed position of such a box, particularly in the case of a new box, the panels are co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof. These collapsed boxes are stored in the magazine 44 with their hinge axes parallel to the path of the various chains and with the lower-most collapsed box supported by the discs 43.

Each disc 43 has a radial slot 50 as may best be seen in Fig. 3, at whose inner end there is an arcuate pocket 51 disposed in the trailing direction and has, at one edge thereof, a portion 52 raised a distance equal to the thickness of a collapsed box 45 and provided with an edge ensuring easy entry of that portion between the two lowermost boxes in the magazine 44. The discs 43 thus support the upper one and free the lower one to fall downwardly onto the spaced members 53 shown as of right angular section. A released, collapsed box is accordingly held by its margins above the pair of chains 54, each trained over sprockets 55, 56, and 57 on the shafts 24, 25, and 58, respectively, the latter shaft 58 being shown as transversely journalled to the base 20. Sprockets 59 and 60 are provided on the shafts 23 and 24, respectively, and these are interconnected by a chain 61.

The members 53 are each seated on a respective one of the supports 62 and, as may best be seen in Figs. 7–9, include a downwardly inclined part 63 terminating in a horizontal flange 64 located at one side of and slightly above a respective one of the chains 54 which carry box-ejectors 65 (see Fig. 4) dimensioned to extend upwardly between the flanges 64 into the space occupied by an erected box.

At each side of the apparatus, there is a mount 66 to which are pivotally connected a pair of arms 67, interconnected as at 68, to swing toward and away from a box

seated on the members 53. Secured to one of the arms 67 of each pair is an extension 69 provided with a pin 70 engaged with the proximate cam 40 by virtue of the spring 71. In order to provide adjustability, and as may best be seen in Figs. 1, 4, 5, and 6, each extension 69 and its arm 67 have a common pivot 72 with the arm 67 having a sleeve portion 73 receiving freely the upper end of its extension 69. Threaded through opposite edges of each sleeve portion 73 are opposite set screws 74 enabling its received extension 69 to be adjusted relatively thereto as required by the dimensions of the boxes to be erected.

Pivotally connected to each of the arms 67 is a push rod 75. The pair of push rods 75 at each side of the chains 54 are pivotally connected to the apex of the proximate member 53. The member 53 is normally positioned on the supports 62 to receive a box 45 released from the magazine 44.

In order to erect a collapsed box 45 into its rectangular form, the cams 40 rock the pairs of arms 67 thus to push their rods 75 and their respective member 53 inwardly towards the corresponding member 53 on the opposite side of the chains 54. At this point, it will be helpful to note that a box that has been used and not damaged has its hinge axes relatively well defined so that it usually responds readily to the erecting pressure applied by the members 53 at its engaged edges. As the box responds to such pressure and the corners start to form, one of the engaged corners must rise relative to the other engaged corner as the rectangular cross-sectional shape is assumed. In practice, the box customarily folds to bring its narrower panels in position as sides and the wider panels in position as the top and bottom and as the box is erected, it is lowered to the level of the flanges 64 thus to be in a position to be engaged by the box ejectors 65 and to be filled. The downwardly inclined parts 63 of the supports 62 ensure proper guidance of the members 53.

When the collapsed box has alternate panels narrower than the others, the hinge axes of the upper coplanar panels do not register with the hinge axis between the lower pair thereof and will be nearer one side of the magazine 44 or the other depending on how the collapsed boxes are placed therein. In the embodiment of the invention shown in the drawings, either pair of push rods 75 and their member 53 accordingly have to swing upwardly or downwardly. Hinged to the upper end of each arm 67 is an arm 76 yieldingly backed by a spring 77 and engaged by the corresponding push rod 75 when it swings upwardly thus to maintain its member 53 in contact with the engaged box corner as the box becomes erected. (See Fig. 9.)

After a box 45 is fully erected, it is firmly held at opposite corners by the members 53 until the loading cycle, later to be described, is completed. The erected and filled box is then released and ejected by the ejectors 65 and another collapsed box is then discharged from the magazine to be erected and filled.

It will be appreciated at frequently the condition of a collapsed box is such that its hinge axes are not so well defined that it can be erected simply by pressure applied at its edges. While this is particularly true in the case of new boxes, it is also true of damaged boxes where bends often invite the crumpling of one or more box walls. Accordingly, means are provided to initiate movement of at least one pair, and preferably both pairs, of the co-planar panels.

For accomplishing this purpose, and as may best be seen in Figs. 1, 2, 7, 8, and 9, there are shown suction devices 78, 79, and 80. The devices 78 and 79 are to engage with the two uppermost panels adjacent the outer edges thereof while the member 80 is to engage with a central part of the lowermost pair thereof.

Each shaft 38 has a cam 81 with which the roller 82 of the rocker arm 83, whose pivot is indicated at 84, is held in engagement by the spring 85. Each of the suction cups 78, 79 is carried by one end of a bell crank lever 86. The other end of each bell crank 86 is connected to a respective end of the rocker arms 83 by a link 87. From Figs. 7, 8, and 9, it will be apparent that on each revolution of the shafts 38, the suction cups 78, 79 are forced into contact with the margins of the uppermost pair of box panels and then pulled upwards by the spring 85.

The suction cup 80 has a stem 88 slidable in the mount 89 between its inoperative position shown in Fig. 7 and that shown in Fig. 8 in which it is raised to engage the central part of the lowermost pair of box panels. To effect upward movement, there is a cam 90 on the shaft 32 engageable with the stem 88 while downward movement of the cup 80 is effected by gravity and by the spring 88a (Fig. 2).

Any one or all of the suction cups 78, 79, and 80 may be connected to a suitable suction source (not shown). For the control of the suction line, there is shown a vacuum breaker 91, having an operating arm 92 engaged by a pin 93 on one of the cams 81 thus to momentarily break the suction in the line 94 to the suction cup 80 after the erection of a box has been properly initiated.

While the apparatus as thus far described is effective to erect boxes, there is always the possibility of failure due to improper loading of boxes in the magazine 44, imperfect boxes, etc. For this reason, there are provided safety controls as will be apparent after the box loading means have been discussed in connection with which reference is made to my co-pending application Serial No. 477,003, filed December 22, 1954.

It will be noted, see Figs. 2, 3, and 10–13, that the shaft 23 is provided with sprockets 100 connected to sprockets 101 on the shaft 102 by chains 103. The shaft 102 is journalled to the members 21 adjacent the infeed end of the apparatus where a series of transverse rollers 104 serve to ensure the easy passage of articles suggested at 105 as from a supply conveyor suggested at 106, to the table 107 which is supported by the members 21 and provided with a door 108 transversely hinged to swing upwardy adjacent said infeed end, and a pair of doors 109 transversely hinged to swing upwardly adjacent the box erecting mechanism. A centrally disposed slot 110 effects communication with the spaces normally closed by said doors. The table 107 and its doors have a plurality of parallel, longitudinally disposed track elements 111.

The chains 103 are interconnected, see Fig. 2, by a pivotally supported cross member 112 having a central arm 113 provided with a transversely disposed pusher head 114. The head 114 has a pair of trailing fingers 115 pivotally connected thereto to swing downwardly into engagement with the able 107 and stops 115 are provided to limit the extent to which said fingers may pivot downwardly when not in contact with the table. The cross member 112 is also provided with an arm 117 as having a roller 118 and disposed at an acute angle relative to the central arm 113.

When the member 112 is moving along the lower course of the chains 103, it is moving towards the infeed end and the roller 118 is in engagement with the track 119, see Fig. 10. The arm 113 and the pusher head 114 are wholly below the table 107. As the cross member 112 approaches the sprockets 101, the roller 118 raises the ramp 120, pivotally connected to the infeed end of the upper track 121, so that as the member 112 travels along the upper chain course, the roller 118 travels up the ramp 120 to the track 121. In so doing, the pusher 114 lifts the door 108 so that it may then travel along the table 107 to push whatever articles 105 are ahead of it on the table 107 into an erected box 45 held in position by the member 53.

When the extreme forward portion of the pusher head 114 is reached it has passed beyond the pivoted counter-

weighted extension **122** and the free extremities of its fingers **115** are beyond the doors **109**. When movement of the pusher head **114** in the opposite direction is commenced, the fingers **115** are free to cam open the doors **109** to enable the pusher head **114** to return below the table **107** thus to complete the loading cycle and to permit articles to advance along the table.

In Fig. 14, there is shown an electric circuit illustrating features that are both necessary and desirable. The circuit **125** to the motor **28** has a normally open switch **126** and a lead **127** in which there is a normally closed switch **128**, a normally open switch **129**, and a relay **130**. The switch **128** is opened by travel of the pusher **114** as by engagement by its cross member **112** while the switch **129** is located and disposed to be closed by articles **105** travelling along the table **107**. The function of the relay **130** is to close the circuit **125** to the motor **28**.

The above circuit is operative to operate the loading mechanism through a cycle and continue that operation as long as articles move along the table **107** to close the switch **129**. In order that the loading and box erecting means may operate in timed relation to each other with appropriate safeguards, the lead **127** has a pair of normally open switches **131** located to be engaged by a box properly positioned to receive its load of articles. The switches **131** are in series with the switches **128** and **129**.

There is also a bypass **132** for by-passing the switches **129** and **131** and this includes a normally open, manually operated switch **133** permitting control by the operator in the event of a jammed box, for example, making automatic operation impossible.

It will be appreciated that when the articles **105** to be packaged in the boxes are, as in the case of bread, both a reasonably tight fit and relatively easily damaged, care must be taken to avoid such damage. For that reason, there is shown in Figs. 10–13 a depending flexible flapper **135** of sufficient length so that its free end is carried into an erected box by the leading article thus protecting it and subsequent articles from being damaged by the upper box edge. When the box is ejected, the flapper **135** readily pulls free.

From the foregoing, it will be apparent that the invention provides a sturdy and compact apparatus adapted to function efficiently and economically in erecting and loading boxes.

What I therefore claim and desire to secure by Letters Patent is:

1. Apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, said apparatus comprising members for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, and means to cause the co-planar panels to fold along their respective axes by urging at least one of said members towards the other, and at least one of said members being movable along the pathway defined by the box corner developed as the folded together panels at the edge it engages unfold as the box is erected.

2. Apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, said apparatus comprising members for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, and means to cause the co-planar panels to fold along their respective axes by urging at least one of said members towards the other and along a pathway defined by the box corner developed at the edge it holds as the box is erected.

3. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, and means to cause the co-planar panels to fold along their respective axes by urging said members towards each other but along pathways defined by the box corners developed at the held edges as the box is erected.

4. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, erecting means to cause the co-planar panels to fold along their respective axes by urging said members towards each other but along pathways defined by the box corners developed at the held edges as the box is erected, a source of collapsed boxes, means to deliver a box from said source to said members, a box ejector and a box loader associated with said members, and a control operable to actuate said erecting means to urge said members towards each other and then to move them apart, said control actuating said delivery means when said members are spaced apart, said box loaders when said members are held, and said ejector when the members move apart but in advance of said delivery means.

5. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the hinge axes with reference to which the panels are folded together, means to cause the coplanar panels to fold along their respective axes by urging said members toward each other but along path-ways defined by the box corners developed at the held edges as the box is erected, and means operable upon at least one of the panels to so move it as to initiate the folding towards each other of the co-planar panels.

6. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the hinge axes with reference to which the panels are folded together, means to cause the co-planar panels to fold along their respective axes by urging said members towards each other but along pathways defined by the box corners developed at the held edges as the box is erected, a control operable to release said members, a box ejector operable on the release of said members to eject an erected box, and means operable in timed relation to said ejector on at least one panel to so move it as to initiate the folding of two co-planar panels.

7. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the hinge axes with reference to which the panels are folded to-

gether, means to cause the co-planar panels to fold along their respective axes by urging said members toward each other but along the pathways defined by the box corners developed at the held edges as the box is erected, a loader operable to load a box held by said members and including a drive, and a control for said drive rendered operative by the erection of a box by said members.

8. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the hinge axes with reference to which the panels are folded together, means to cause the co-planar panels to fold along their respective axes by urging said members towards each other but along pathways defined by the box corners developed at the held edges as the box is erected, a loader operable to load a box held by said members and including a drive, an ejector to eject loaded erected boxes and including a drive and a control for said drives rendered operative by the erection of a box by said members and a manually operable emergency control for said apparatus.

9. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members of right angular section for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, said members being movable upwardly and downwardly towards each other, a support for each member, and means to cause the co-planar panels to fold along their respective axes by urging said members towards each other with one following an upward pathway and the other a downwardly pathway as the corners develop at the held edges as the box is erected, each support constituting a guide for the associated one of said members when it moves downwardly as erecting pressures are applied to a box.

10. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members of right angular section for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, said members being movable upwardly and downwardly towards each other, a support for each member, means to cause the co-planar panels to fold along their respective axes by urging said members towards each other with one following an upward pathway and the other a downward pathway as the corners develop at the held edges as the box is erected, each support constituting a guide for the associated one of said members when it moves downwardly as erecting pressures are applied to a box, and means yieldably opposing the member that moves upwardly in response thereto.

11. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members of right angular section for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, said members being movable upwardly and downwardly towards each other, an ejector having a predetermined pathway between said members, a support for each member, and means to cause the co-planar panels to fold along their respective axes by urging said members towards each other with one following an upward pathway and the other a downward pathway as the corners develop at the held edges as the box is erected, each support constituting a guide for the associated one of said members when it moves downwardly as erecting pressures are applied to a box and including an upper part for supporting the members when holding a collapsed box and a lower part for supporting the members when holding an erected box and located to bring the erected box in said pathway.

12. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members of right angular section for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, said members being movable upwardly and downwardly toward each other, an ejector having a predetermined pathway between said members, a support for each member, means to cause the co-planar panels to fold along their respective axes by urging said members towards each other with one following an upward pathway and the other a downward pathway as the corners develop at the held edges as the box is erected, each support constituting a guide for the one of said members that moves downwardly as erecting pressures are applied to a box and including an upper part for supporting the members when holding an erected box and located to bring the erected box in said pathway, and a suction unit movable into and out of said pathway into contact with one of the lowermost panels of a collapsed box and operable in timed relation to said ejector and said means to initiate the folding of said lowermost panels when on said upper support parts.

13. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members of right angular section for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, actuating mechanism for each member, said actuating mechanisms being pivoted to swing towards and away from each other, and linkage pivotably connected to each member and the mechanism thereof to enable said members to be movable upwardly and downwardly towards each other.

14. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members of right angular section for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, actuating mechanism for each member, said actuating mechanisms being pivoted to swing towards and away from each other, linkage pivotably connected to each member and the mechanism thereof to enable said members to be movable upwardly and downwardly towards each other, a support for each member including an upper part for the members when holding a collapsed box and a lower part for supporting the members when holding an erected box, and a suction unit driven upwardly and downwardly in predetermined relation to the movement of said members into and out of contact with the box panel that is to be

the box bottom, said suction unit including a valve open in its upward position.

15. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, actuating mechanism for each member including a cam, a pivoted member swung by said cams towards and away from the corresponding member of the other mechanism, and linkage connecting each pivoted member to its box holding and supporting member, said mechanisms being operable to urge said holding and supporting members towards each other thereby to apply box erecting pressures on a box held thereby.

16. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, actuating mechanism for each member including a cam, a pivoted member swung by said cam towards and away from the corresponding member of the other mechanism, and linkage connecting each pivoted member to its box holding and supporting member, said mechanisms being operable to urge said holding and supporting members towards each other thereby to apply box erecting pressures on a box held thereby, and at least one suction device engageable with a box panel and including mechanism timed with one of said cams to move it into and out of contact with said panel when engaged by said holding and supporting members and render it operative.

17. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, a pair of members of right angular section for holding and supporting the collapsed box by the edges that are defined by the panels that are folded together, actuating mechanism for each member pivoted to swing towards and away from each other, linkage pivotably connected to each member and the mechanism thereof to enable said member to be movable upwardly and downwardly towards each other, a support for each member including an upper part for the members when holding a collapsed box and a lower part for supporting the members when holding an erected box, and said mechanisms each including a spring yieldably resisting upward swinging of its linkage.

18. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, means for applying pressure to the edges of the collapsed box that are defined by the panels that are folded together thereby to unfold them and to cause the co-planar panels to fold along their respective hinge axes, means to feed articles into the thus erected box to fill it while pressure is applied thereto, said articles having a longitudinal sectional shape approximately equal to the cross sectional dimensions of the erected boxes, and a depending flexible member disposed and proportioned to have its free end carried into the erected box by the first articles fed therein by the feeding means thus to provide protection at the front edge of the box top.

19. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, means for applying pressure to the edges of the collapsed box that are defined by the panels that are folded together tereby to unfold them and to cause the co-planar panels to fold along their respective hinge axes, said means including supporting structures provided with portions operable when the box is collapsed and portions at a lower level operating when the box is erected, a suction unit driven upwardly and downwardly in predetermined relation to the operation of said means into and out of contact with the box panel that is to be the box bottom, and suction units, one for each side and movable into and out of contact with the uppermost box panels, all of said suction units being operable to initiate box erection.

20. In apparatus for erecting a box of the type having four panels whose edges are hinged together and having a collapsed position in which the panels are approximately co-planar as to the respective ones of the hinge axes that define one pair of opposite corners and folded together as to the respective ones of the other pair thereof, means for applying pressure to the edges of the collapsed box that are defined by the panels that are folded together thereby to unfold them and to cause the co-planar panels to fold along their respective hinge axes, and means to feed articles into the thus erected box to fill it, while pressure is applied thereto, said feeding means comprising an article supporting table provided with forward and rearward doors and a slot connecting the spaces normally closed by the doors, and a pusher having a forward course along said table and a rearward course under said table, said pusher including trailing pivoted fingers for camming open said forward doors even when said pusher is raised from the table by resistance at the erected box.

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