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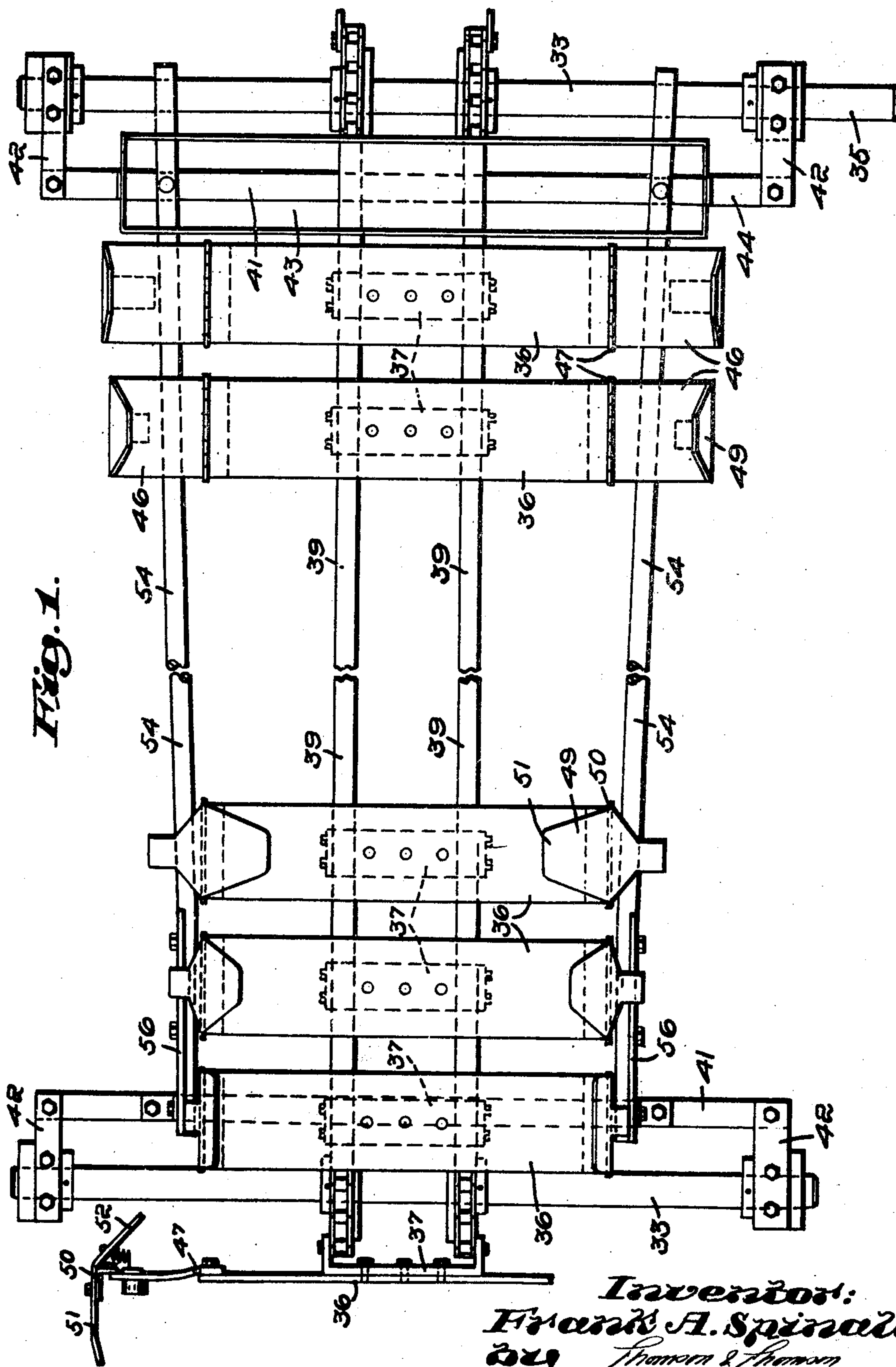
F. A. SPINALE

2,486,074

BOX FOLDING MACHINE

Filed Nov. 5, 1947

5 Sheets-Sheet 1



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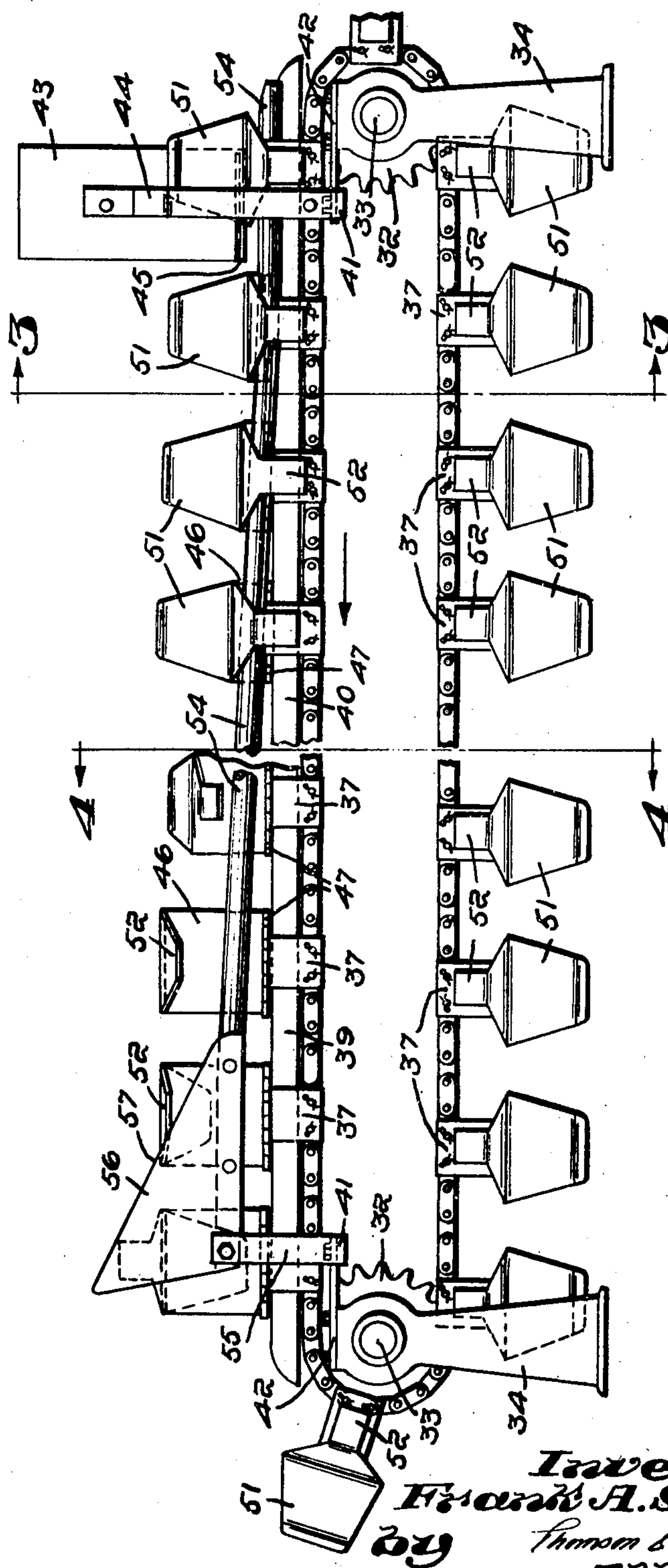
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Fig. 2.



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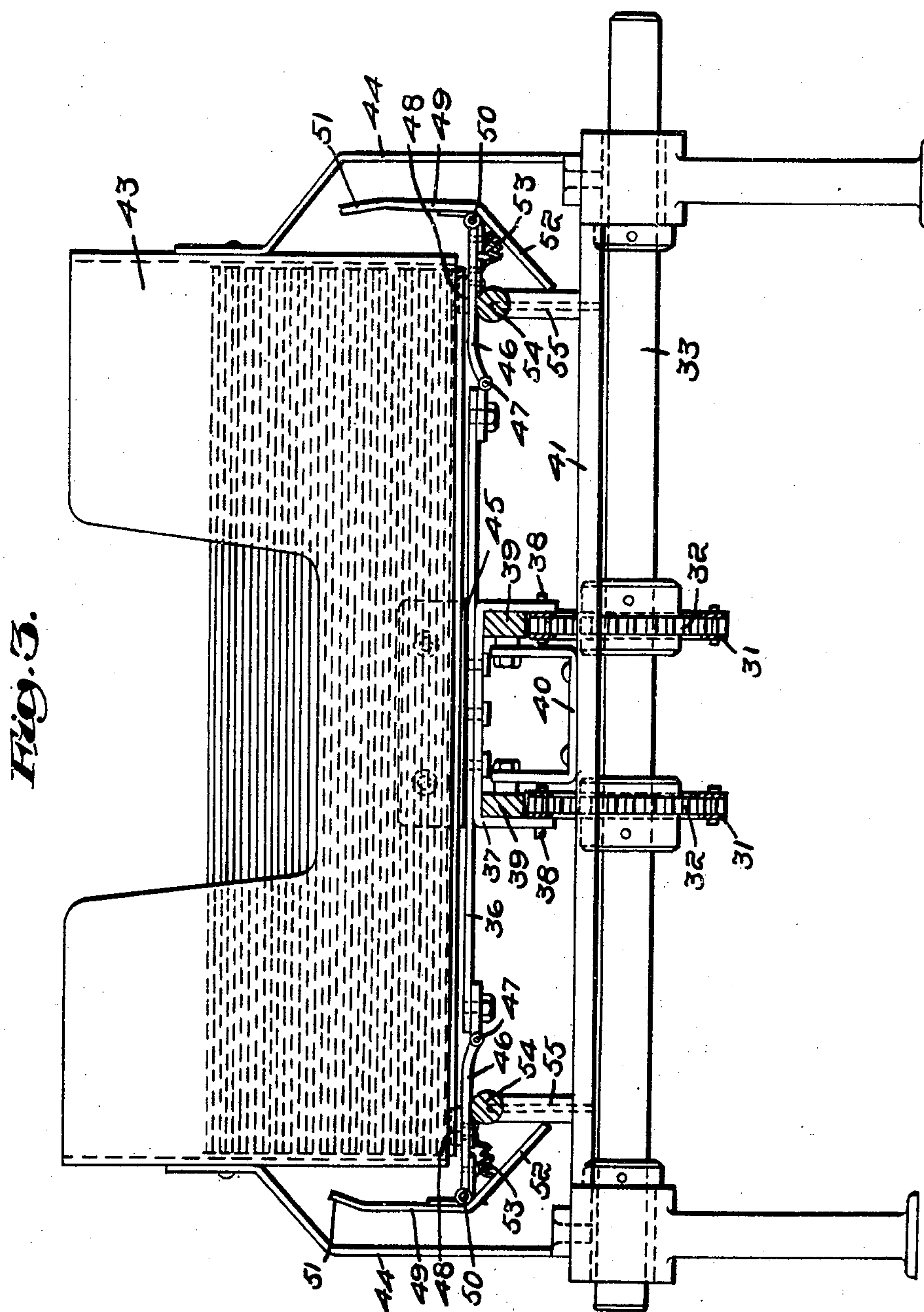
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Fig. 4.

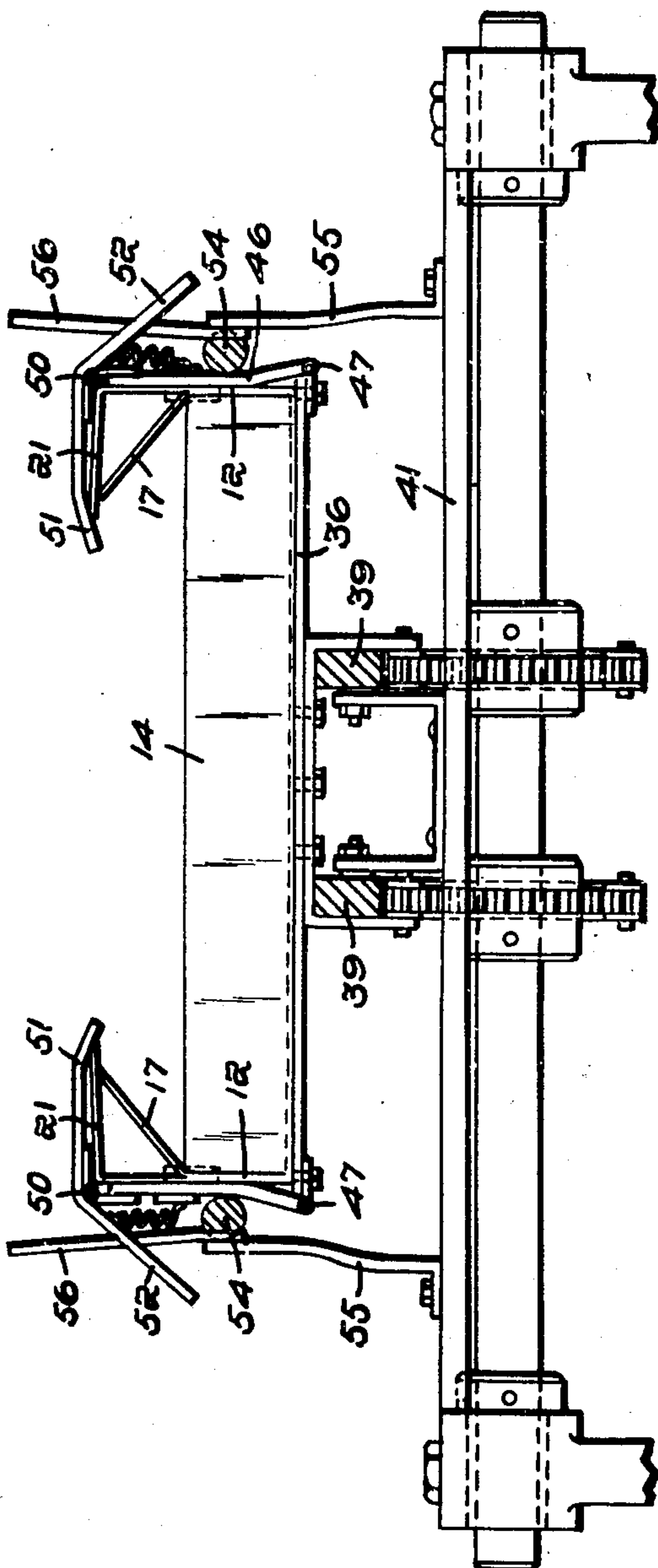


Fig. 5.

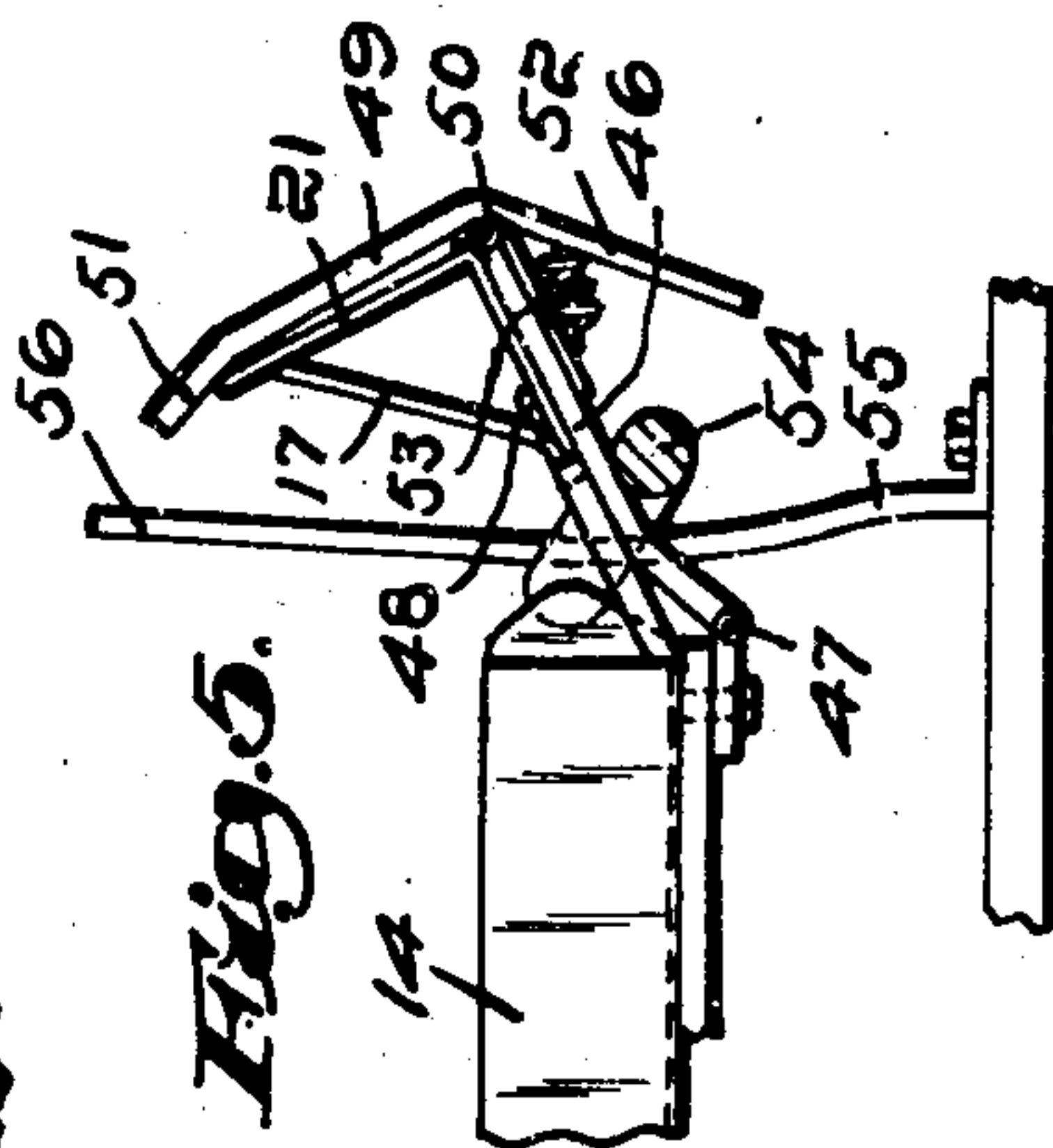
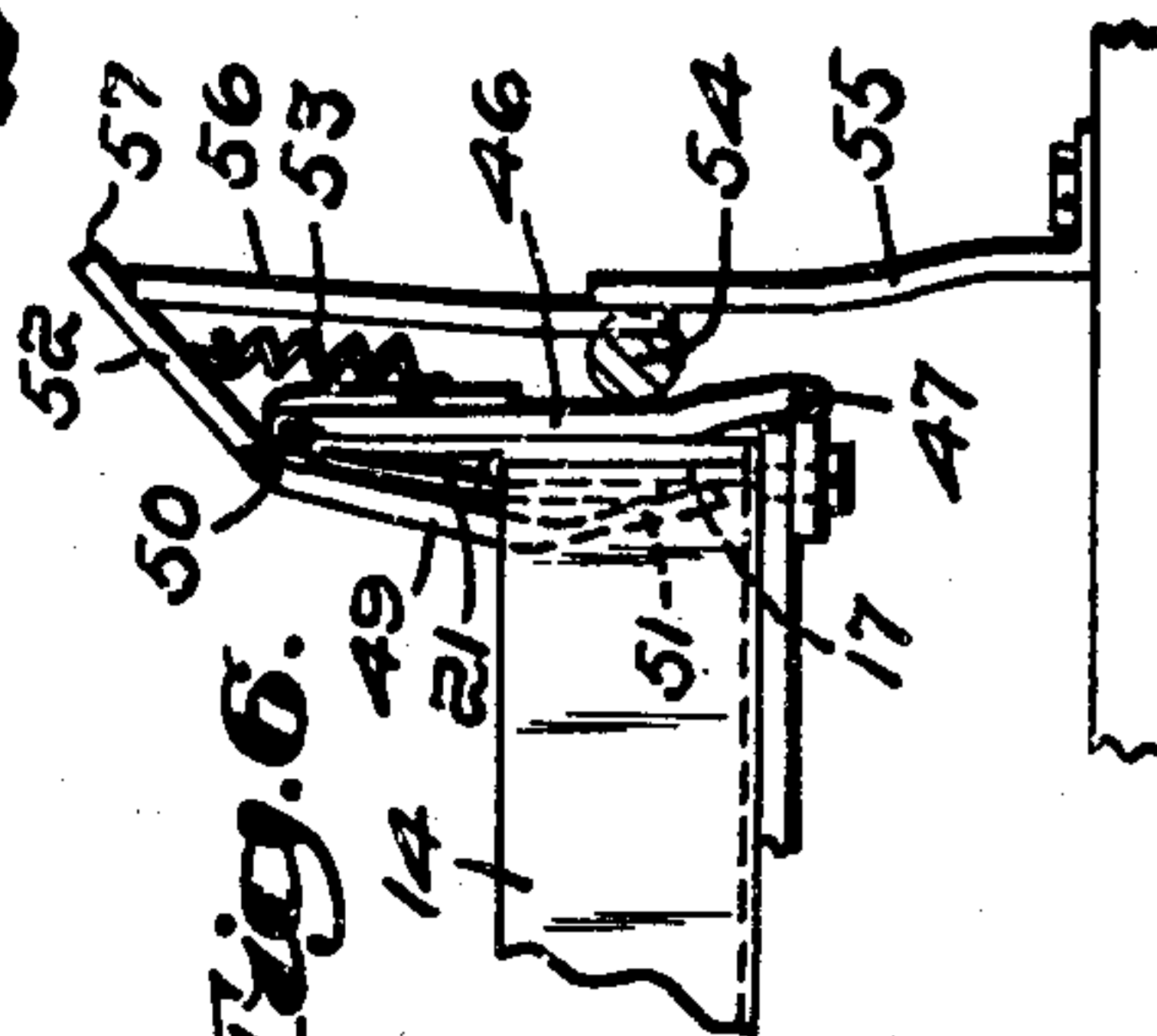


Fig. 6.



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Fig. 7.

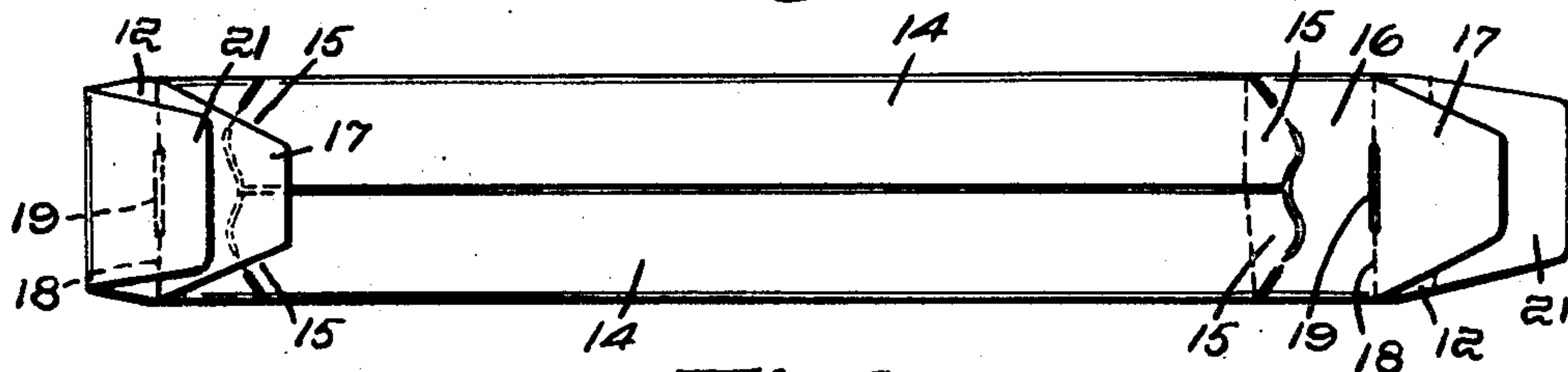


Fig. 8.

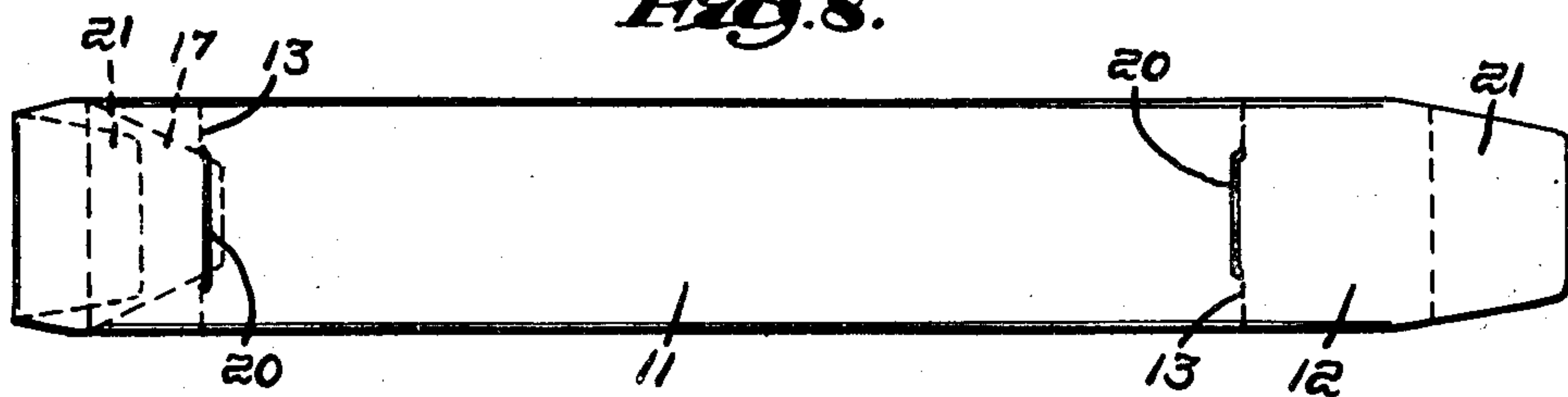


Fig. 9.

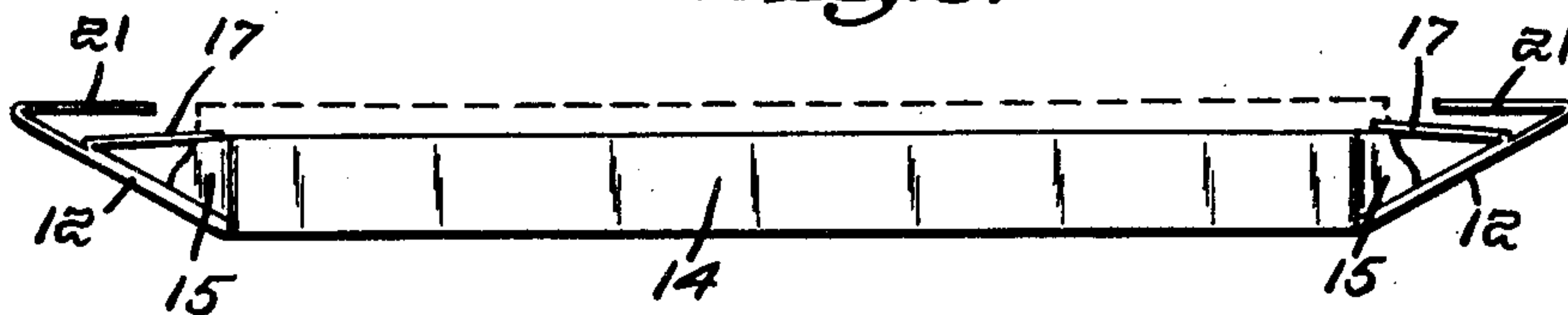
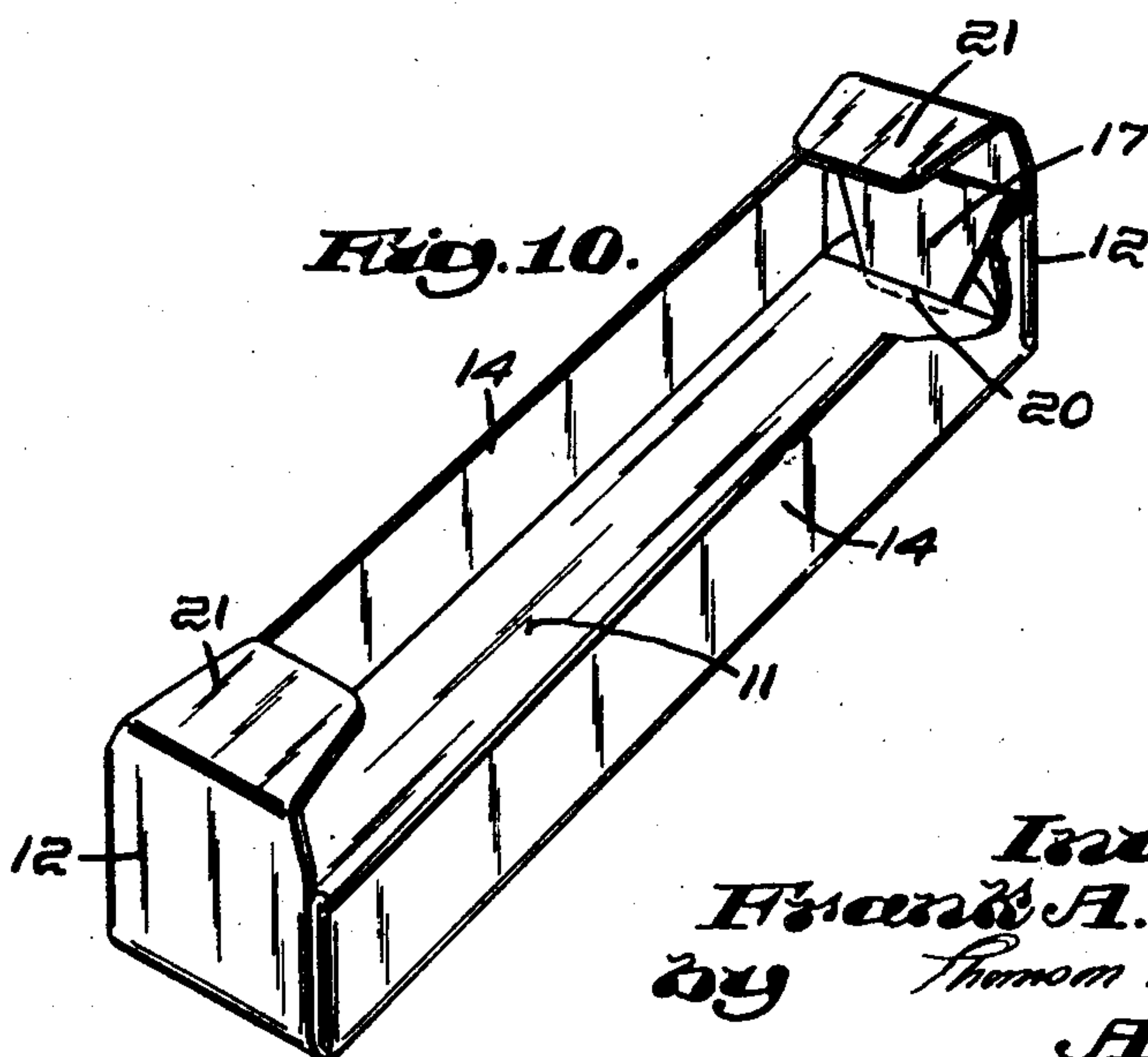


Fig. 10.



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UNITED STATES PATENT OFFICE

2,486,074

BOX FOLDING MACHINE

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Application November 5, 1947, Serial No. 784,166

6 Claims. (Cl. 93—49)

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This invention relates to box folding machines, and pertains more particularly to automatic machines for unfolding the ends and sides, and infolding the locking flaps at the ends of collapsed or cartons prior to the packing or filling of the opened box with vegetables or other merchandise.

The new machine is designed expressly for manipulating tomato boxes of a type commonly supplied to the tomato packer by the box manufacturer in flat or collapsed form as herein illustrated and described. It is thus necessary that the flattened cartons be opened for the reception of tomatoes by unfolding the ends and sides and locking the end flaps thereof, to hold the box in the form of a packing tray, at the packing plant. These operations have heretofore been performed by hand on the individual boxes, at a substantial expenditure of time and labor.

It is accordingly the principal purpose of the present invention to reduce the time and expense of such hand folding operations by providing automatic mechanism for continuously receiving and manipulating a succession of flattened tomato boxes, or the like, and delivering the opened and locked boxes in condition for immediate packing. It will be understood, however, that the boxes so manipulated by the machine may be used, if desired, for packing various types of food products or other merchandise, the tray-like box and its contents being preferably covered with cellophane, or other wrapping material to provide a closed, sanitary container for shipment, display and sale.

A recommended embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a plan view, partly broken away and with certain elements omitted, of a machine for folding a flattened tomato box to open the box for packing;

Fig. 2 is a side view of the machine, partly broken away, and partly in section;

Fig. 3 is an enlarged transverse section, taken on line 3—3 of Fig. 2, showing a feeding hopper with a stack of flattened cartons therein;

Fig. 4 is an enlarged transverse section, taken on line 4—4 of Fig. 2, showing one of the boxes at one stage of the folding operation;

Figs. 5 and 6 are fragmentary sectional views of a part of the mechanism illustrated in Fig. 4, respectively, illustrating antecedent and subsequent positions of the end-folding devices;

Fig. 7 is a plan view of a conventional, flattened tomato box of the character passed through the machine, the flaps at one end of the box being folded over flatwise, as the box is delivered to the

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packer, and the flaps at the opposite end being unfolded to illustrate the construction thereof;

Fig. 8 is a bottom view of the flattened box;

Fig. 9 is a side view of the box with the ends thereof partially unfolded; and

Fig. 10 is a top perspective view of the opened and locked box in condition for packing, a portion of the box-side being broken away.

The conventional tomato box for which this machine is designed, is made of cardboard and is folded flat by the box manufacturer for supply to the tomato packer, with the end members folded over flatwise as shown at the left of Figs. 7 and 8. It has a rectangular bottom 11 with integral projecting end members 12 defined by scored fold lines 13; integral sides 14 folded onto the bottom 11 on weakened fold lines, and provided with foldable webs 15 at the opposite ends thereof; and inner end reinforcements 16 integrally connected at fold lines to the straight sides of the respective members 12, and to the slanting sides of the respective webs 15, and terminating in locking flaps or tabs 17 defined by weakened fold lines 18 which may include slits 19. Locking slits 20 are provided in the respective end folds 13 of the box bottom; and the end members 12 have foldable flaps 21.

When the collapsed box is opened by folding up its ends and sides (Fig. 9) and folding its locking tabs inwardly against the raised ends, the tips of the tabs are inserted in the slots 20 to lock the box in open position (Fig. 10). These operations have been, as aforesaid, performed by hand by grasping the ends of the flattened box and raising them at right angles to the bottom. This action also elevates the box sides, and the locking tabs are finally engaged in the slots 20 by the fingers of the operator.

In accordance with this invention, these operations are performed by the machine shown in Figs. 1 to 6, which comprises an endless, flexible conveyor having a pair of parallel chains 31 carried by sprockets 32 mounted on shafts 33 journaled in standards 34, one of the shafts being driven by gearing or belting (not shown) suitably applied, for example, to the projecting shaft end 35 (Fig. 1).

The revolving chains carry a series of spaced transverse plates or carriers 36 respectively, having U-shaped supports 37 riveted or bolted to their under sides and attached by pins 38 to the respective chains. The plate supports 37 bear upon guide bars 39 bolted or otherwise attached to brackets 40 suitably fastened to cross bars 41 which are mounted on struts 42 secured to the top

of the standards 34 at opposite ends of the machine.

A hopper 43 shaped to receive a stack of the flattened boxes of Figs. 7-10 with the flap pieces 17 and 21 folded over, as aforesaid, is mounted at the feeding end of the machine, for example by braces 44 attached to the cross bar 41 at said end. The bottommost box rests upon a centrally disposed feeding table 45 extending forwardly as an extension of the back of the hopper, or suitably connected to the back of the hopper, so that said bottom box of the stack may be slid forwardly off the feeding table and onto one of the carrier plates 36 by abutments engaging its rearward edge near the ends of the box, as hereinafter described.

Each of the transverse plates 36 has a box-end folding arm 46 hinged at 47 to the opposite ends thereof; and each of said arms has a box catching lug or abutment 48 at its rearward edge for engaging the rearward edge of a box resting on the feed plate 45 of the hopper 43, whereby one box is removed and deposited on a carrier 36, as each carrier passes under the hopper, on the endless conveyor. The lugs 48 also hold the boxes against rearward or angular displacement, as they are conveyed along the machine by the respective carriers.

Each of the pivoted arms 46 carries a flapper plate 49 hinged thereto at 50. Each flapper has a normally upstanding tongue portion 51 and a normally depending tail portion 52, and the tongue portion is normally held at right angles to the arm 46 (Fig. 3) by a spring 53 attached to the tail portion 52 and to the bottom of arm 46. The flattened box deposited on plate 36 from the hopper 43 is disposed between the flapper pivots 50 with the weakened fold lines 13 of the box ends located approximately at the arm hinges 47 (Fig. 5).

As the carriers 36 are conveyed over the sprockets at the box-feeding end of the machine and pick up the bottom-most box of the stack, the folding arms 46 successively contact and are slidingly guided by a pair of rails 54 disposed along opposite sides of the machine and mounted on posts 55 fastened upright on the respective cross bars 41. The rails 54 are inclined upwardly and converge laterally toward the discharge end of the machine (Figs. 1 and 2). Hence, as the carriers 36 with the flattened boxes thereon travel toward the discharge end (at the left of Figs. 1 and 2) the arms 46 are raised upwardly by the rails until they assume a vertical position and the box ends are correspondingly upfolded to vertical positions in contact with said arms. The elevation of the box ends 12 also raises the sides 14 thereof, by action on the web portions 15 (Fig. 4).

Adjacent the discharge end of the machine, the rails 54 are straightened to parallel relation and are provided with upright plates 56 which have inclined upper edges 57. These edges engage the tail pieces 52 of the flapper plates hinged to the upright arms 46, thereby swinging the tongue portions 51 of said plates downwardly as the tail pieces slide upwardly along the edges of the guide plates 56, and infolding the box flaps 21 and locking tab 17 (Figs. 4 and 6). In the ultimate position of the flapper tongue 51 (Fig. 6), the tip of the locking tab 17 enters and is engaged in the box slit 20, as best indicated in Fig. 10.

The carriers 36 then pass beyond the ends of the rails 54 and guide plates 56, so that the folding arms and flapper plates swing outwardly by

gravity action; and the opened boxes may be dropped into a receptacle or onto a traveling belt (not shown), as indicated at the extreme left of Fig. 1, the flaps 21 of the box ends assuming the position of Fig. 10. The box is then ready to be packed with tomatoes, and the packed container may be wrapped in transparent paper or sheeting.

A box folding machine of the type above described may be constructed in any desired size and equipped with any feasible number of box carriers, suitably spaced in parallel relation across the endless conveyor mechanism, so that a number of the flattened boxes may be picked up by successive carriers and progressively manipulated by the automatic folding devices, as the successive boxes are carried along the machine to be deposited from the discharge end thereof in open and locked position for immediate packing.

A machine designed and operating as herein illustrated and explained fully satisfies the purposes of this invention, but it is evident that the structural elements of the apparatus may be refined and modified within wide limits without departing from the essence of the invention as defined in the following claims.

I claim:

1. A machine for folding to open position flattened boxes of the character described, comprising an endless conveyor having a series of transverse, box-receiving carriers connected thereto in spaced parallel relation, arms hinged to the ends of the respective carriers for up-folding the respective ends of the flat box, and flappers hinged to the outer ends of the respective arms for infolding a flap on the respective box ends, rails extending along the sides of the machine and engageable by said arms for gradually lifting the arms from substantially horizontal to substantial vertical position, as said carriers are conveyed longitudinally of the machine, and means near the discharge end of the machine and engageable by said flappers for depressing the inner ends of said flappers to infold said flaps.

2. A machine for folding to open position flattened boxes of the character described, comprising an endless conveyor having a series of transverse, box-receiving carriers connected thereto in spaced parallel relation, arms hinged to the ends of the respective carriers for upfolding the respective ends of the flat box, and flappers hinged to the outer ends of the respective arms for infolding a flap on the respective box ends, rails extending along the sides of the machine and engageable by said arms, said rails being inclined upwardly and inwardly toward the discharge end of the machine for gradually lifting the arms from substantially horizontal to substantially vertical position, as said carriers are conveyed longitudinally of the machine, and means near the discharge end of the machine and engageable by said flappers for depressing the inner ends of said flappers to infold said flaps.

3. A machine for folding to open position flattened boxes of the character described, comprising an endless conveyor having a series of transverse, box-receiving carriers connected thereto in spaced parallel relation, arms hinged to the ends of the respective carriers for upfolding the respective ends of the flat box, and flappers hinged to the outer ends of the respective arms for infolding a flap on the respective box ends, springs interconnecting said flappers to the

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respective arms for normally holding said inner ends of the flappers substantially at right angles to said arms, rails extending along the sides of the machine and engageable by said arms for gradually lifting the arms from substantially horizontal to substantially vertical position, as said carriers are conveyed longitudinally of the machine, and means near the discharge end of the machine and engageable by said flappers for depressing the inner ends of said flappers to infold said flaps.

4. A machine for folding to open position flattened boxes of the character described, comprising an endless conveyor having a series of transverse, box-receiving carrier plates connected thereto in spaced parallel relation, arms hinged to the ends of the respective plates for upfolding the respective ends of the flat box, and flappers hinged to the outer ends of the respective arms for infolding a flap on the respective box ends, rails extending along the sides of the machine and engageable by said arms for gradually lifting the arms from substantially horizontal to substantially vertical position, as said carrier plates are conveyed longitudinally of the machine, and means near the discharge end of the machine and engageable by said flappers for depressing the inner ends of said flappers to infold said flaps, said means consisting of guide members associated with the respective rails and extending above them, the upper edges of said members being inclined upwardly toward the discharge end of the machine.

5. A machine for folding to open position flattened boxes of the character described, comprising an endless conveyor having a series of transverse, box-receiving carrier plates connected thereto in spaced parallel relation, arms hinged to the ends of the respective plates for upfolding the respective ends of the flat box, and flappers hinged to the outer ends of the respective arms for infolding a locking tab on the respective box ends, springs interconnecting said flappers to the respective arms for normally holding said inner ends of the flappers substantially at right angles to said arms, rails extending along the sides of the machine and engageable by said arms, said rails being inclined upwardly and inwardly toward the discharge end of the machine for grad-

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ually lifting the arms from substantially horizontal to substantially vertical position, as said carrier plates are conveyed longitudinally of the machine, and means near the discharge end of the machine and engageable by said flappers for depressing the inner ends of said flappers to infold and lock said tab.

6. A machine for folding to open position flattened boxes of the character described, comprising an endless conveyor having a series of transverse, box-receiving carrier plates connected thereto in spaced parallel relation, arms hinged to the ends of the respective plates for upfolding the respective ends of the flat box, and flappers hinged to the outer ends of the respective arms for infolding a locking tab on the respective box ends, rails extending along the sides of the machine and engageable by said arms, said rails being inclined upwardly and inwardly toward the discharge end of the machine for gradually lifting the arms from substantially horizontal to substantially vertical position, as said carrier plates are conveyed longitudinally of the machine, and means near the discharge end of the machine and engageable by said flappers for depressing the inner ends of said flappers to infold said tab, said means comprising guide plates attached to the respective rails and extending above them, the upper edges of said guide plates being inclined upwardly toward the discharge end of the machine, and the respective flappers having tail portions slidably engaging said inclined edges and tongue portions movable downwardly into the opened box and against the respective ends thereof when the hinged flappers are tilted by said slidable engagement of the tail portions on said edges, to press said tab into locking engagement with the box bottom.

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The following references are of record in the file of this patent:

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