Oct. 18, 1966

A. E. DRESSER

3,279,332

BOX OPENING MACHINE

Filed March 9, 1964

5 Sheets-Sheet 1

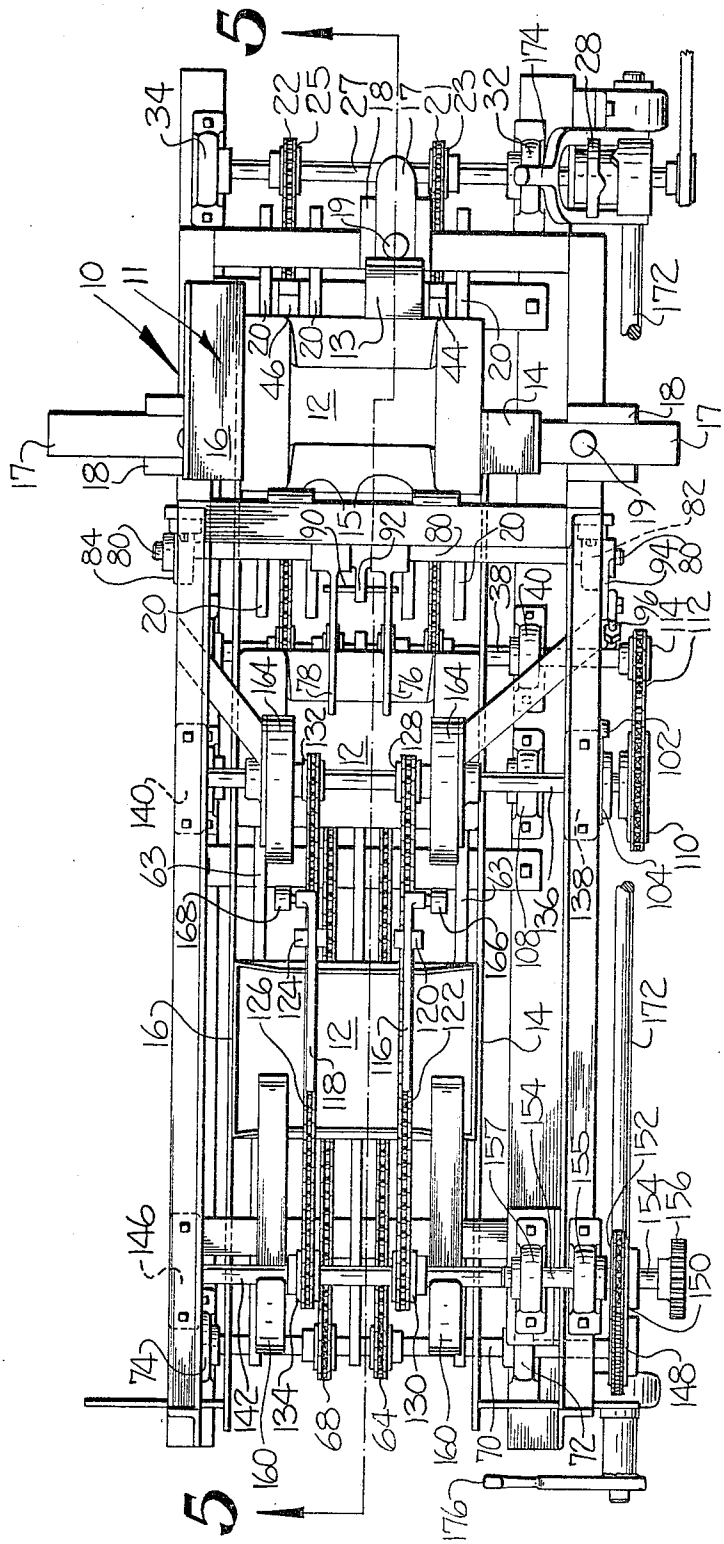


FIG. 1

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BOX OPENING MACHINE

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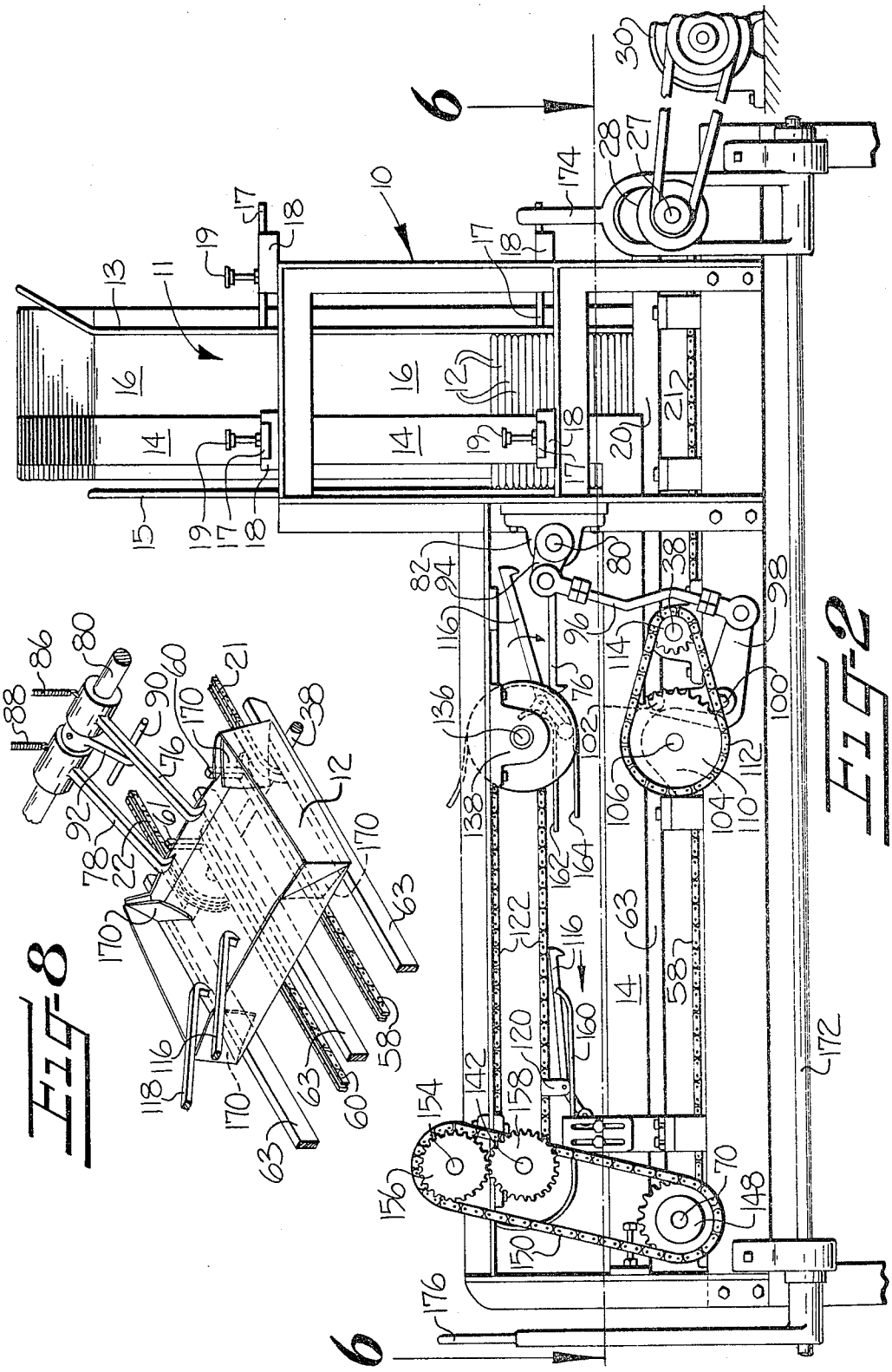


FIG-2

FIG-8

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BOX OPENING MACHINE

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FIG-4

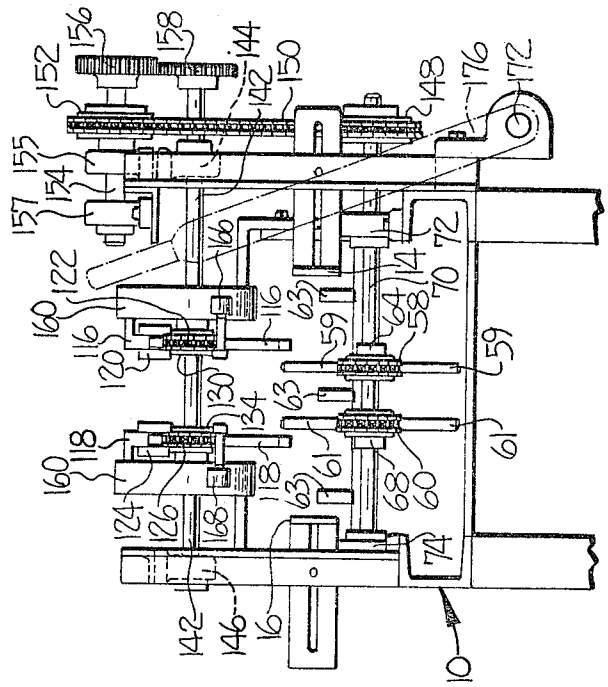
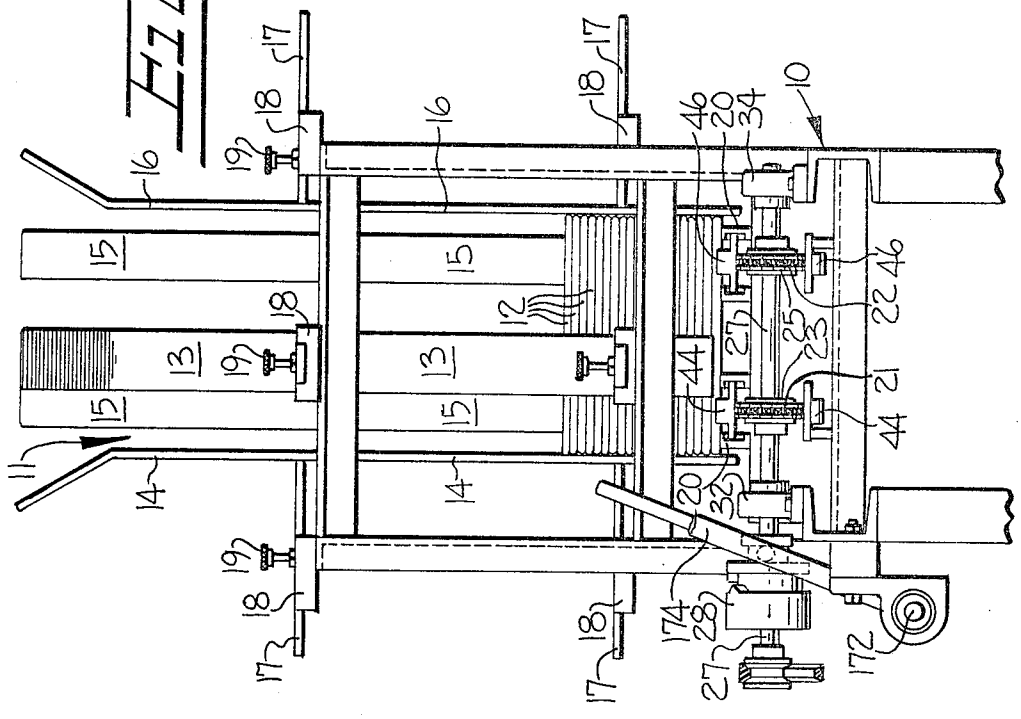


FIG-3



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A. E. DRESSER

3,279,332

BOX OPENING MACHINE

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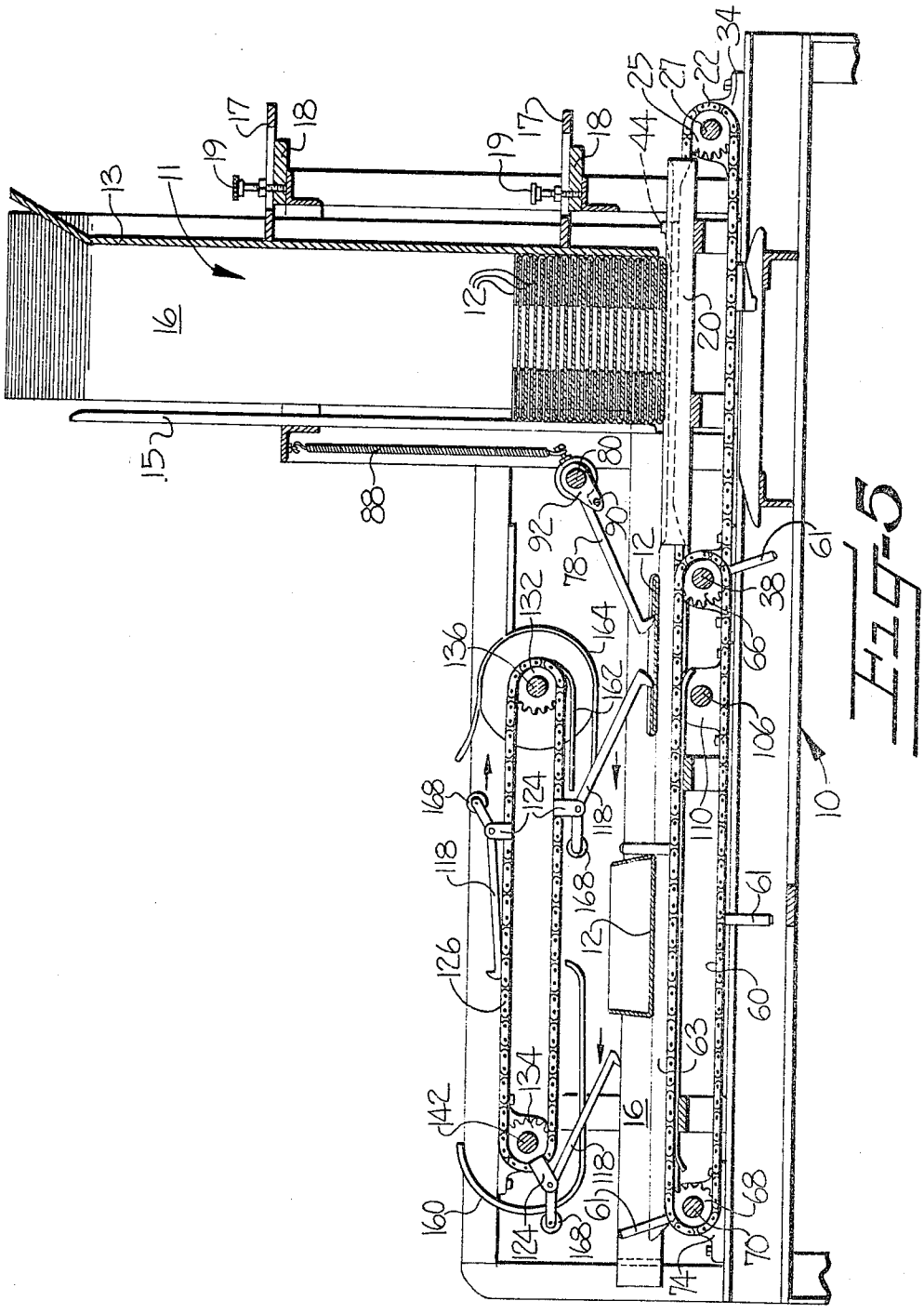
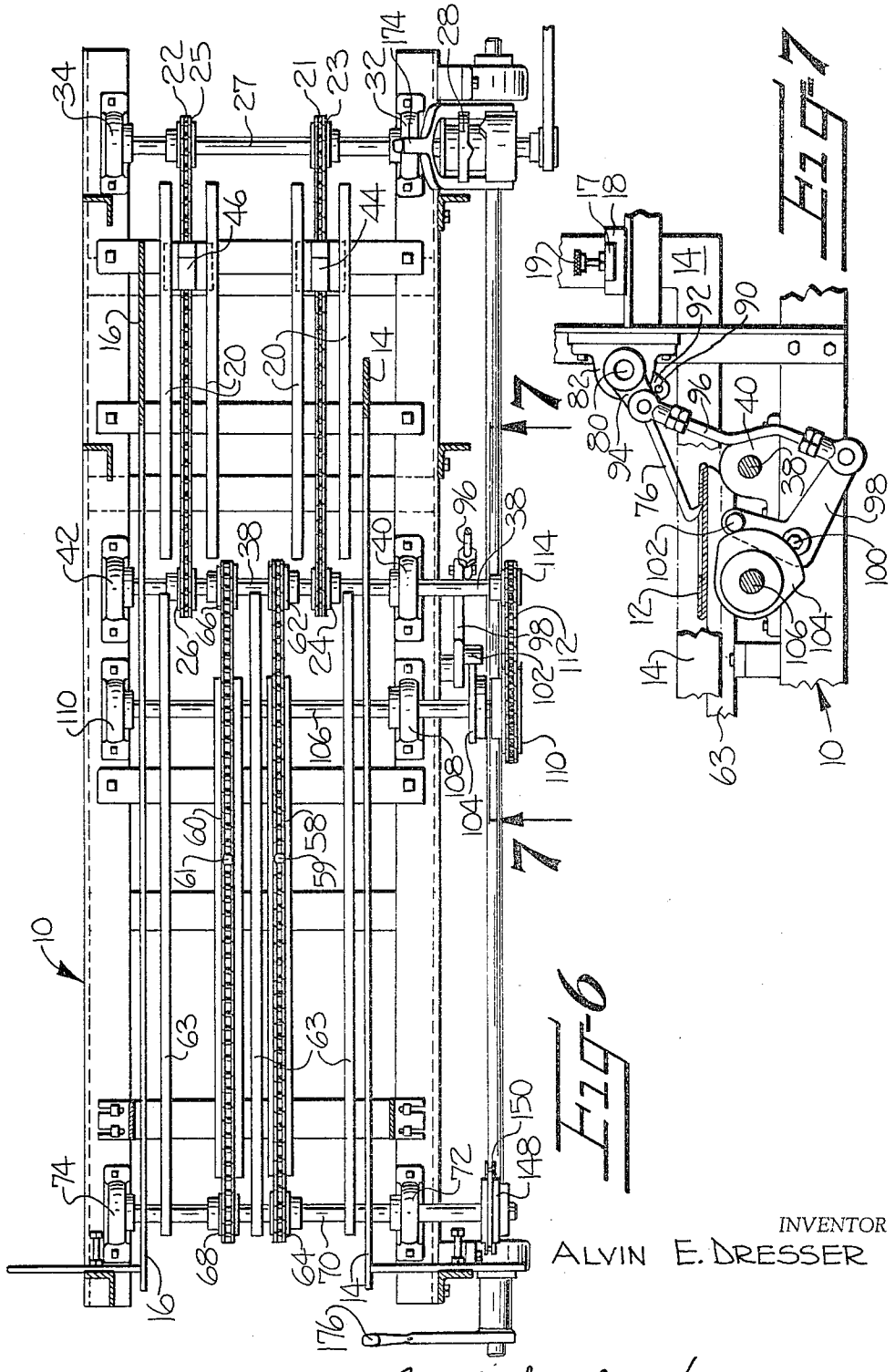


Fig. 5

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BOX OPENING MACHINE

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3,279,332

BOX OPENING MACHINE

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13 Claims. (Cl. 93—53)

The present invention relates to a carton opening machine and more particularly to a mechanism for automatically opening boxes of foldable sheet material from a flat condition to an open condition.

The boxes opened by the present invention are of foldable sheet material, such as cardboard, fiberboard, or the like, which are generally used for the packaging of baked goods or the like. Such boxes are normally formed in manufacture so as to provide opposite end, bottom and side walls interconnected along fold lines defining corners for the box and may have flaps in the corners thereof for holding the box in erected condition when set up. For shipping, storing, stacking, and the like, such boxes are normally folded in flat condition. In such condition, a box is usually folded along diagonally related corner fold lines to superimpose the opposite end and side walls onto the bottom wall for a flat structure.

In order to pack or fill the boxes, it is necessary to unfold or erect the boxes into an open substantially rectangular condition. This preliminary unfolding and erecting step has heretofore been performed largely by hand which obviously is a time consuming, laborious, and expensive means of opening the boxes.

In the past machines have been available for opening boxes of this type; however, these machines proved ineffective to fully open the boxes to a satisfactory erected position. This ineffectiveness of the prior machines was found by this invention to be caused by the lack of necessary cooperation between the means conveying the boxes through the machine and the means for opening the boxes. This lack of cooperation resulted in failure of the boxes being fully erected before leaving the means for opening the boxes.

A further and important drawback in these prior machines is the lack of flexibility in the opening of various size boxes. These prior machines are adapted to open only boxes of like dimensions and no provisions are provided therein for satisfactorily adjusting the operating parts of the machines to provide for the opening and erecting of boxes of different sizes.

Accordingly, it is an object of this invention to provide a machine for fully opening boxes of the type described to a satisfactory erected position.

Another object is to provide a means to open the boxes which will also convey the boxes for a predetermined period of time to obtain the necessary cooperation not heretofore obtainable.

Another object is to provide a machine which is operable to open various size boxes satisfactorily.

A more specific object is to provide a machine of the type described which will automatically open boxes of this type in rapid succession while substantially continuously progressing the boxes through the machine.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a top plan view of the machine of this invention;

FIGURE 2 is a side elevational view of the machine with portions broken away;

FIGURE 3 is a front elevational view of the machine;

FIGURE 4 is a rear elevational view of the machine;

FIGURE 5 is a sectional view taken substantially along line 5—5 in FIGURE 1;

FIGURE 6 is a sectional view taken substantially along line 6—6 in FIGURE 2;

FIGURE 7 is a sectional view taken substantially along line 7—7 in FIGURE 6; and

FIGURE 8 is a somewhat schematic, fragmentary perspective view showing a box being erected.

Referring now to the drawings, the machine of this invention includes a stationary frame member **10** which carries a hopper **11** for maintaining a supply of folded flat boxes **12** therein, as shown in FIGURES 2, 3 and 5. The hopper **11** comprises movable side walls **13, 14, 15** and **16**, as may be clearly seen in FIGURES 2 and 3. The side walls **14** and **16** are forwardly extending, as shown in FIGURES 1 and 4, and act as side restraints for the boxes **12** as they pass through the machine. The side walls **13, 14, 15** and **16** each include slide members **17** which are slidingly secured in brackets **18**, fixed to the machine frame **10**, by set screws **19**. The side walls **13, 14, 15** and **16** may thus be moved in and out to accommodate boxes of different sizes by loosening set screws **19** and sliding the slide members **17** in the brackets **18**.

Disposed below the hopper **11** are a plurality of first slide members **20** and a pair of primary conveyor chains **21** and **22**. The primary conveyor chains **21** and **22** are spaced slightly below the first slide members **20** and are carried by sprockets **23, 24, 25** and **26** respectively. The sprockets **23** and **25** are carried by a driven shaft **27** which is constantly rotated through a clutch machanism **28** by a motor **30**. The shaft **27** is journaled in bearings **32** and **34** secured to the stationary frame **10** of the machine. The sprockets **24** and **26** are carried by an idler shaft **38** which is journaled in bearings **40** and **42** secured to the stationary machine frame **10**. The primary conveyor chains **21** and **22** carry conveyor lugs **44** and **46** respectively.

In operation, the boxes **12** are maintained in the hopper **11** resting on slide members **20**, which are disposed slightly above the conveyor chains **21** and **22**, in a flat unopened condition. The primary conveyor chains **21** and **22** are rotating about sprockets **23, 24, 25** and **26** respectively by the drive of the motor **30** through engaged clutch mechanism **28** to shaft **27**. The chains **21** and **22** are carrying conveyor lugs **44** and **46** which are adapted to contact the rear end of the lowermost box **12** in the hopper **11**, as shown in FIGURE 5, and push the lowermost box **12** forwardly through the space between the lower end of wall **15** and the slide members **20**. This space, as shown in FIGURE 5, is approximately the same height as a single flat folded box **12** so that only one unopened box **12** is conveyed forward at a time by conveyor lugs **44** and **46**.

Cooperating with the above described mechanisms is a pair of secondary conveyor chains **58** and **60**. These secondary conveyor chains are carried by sprockets **62, 64** and **66, 68** respectively. The sprockets **62** and **66** are carried by idler shaft **38** and the sprockets **64** and **68** are carried by an idler shaft **70** which is journaled in bearings **72** and **74** secured to the stationary machine frame **10**. The secondary conveyor chains **58** and **60** carry a plurality of conveyor lugs **59** and **61** respectively for the purpose hereinafter described. The secondary conveyor chains **58** and **60** and lugs **59** and **61** are driven at the same speed as primary conveyor chains **21** and **22** through idler shaft **38** and sprockets **62** and **66**. Disposed immediately above the secondary conveyor chains is a plurality of secondary slide members **63** onto which the flat unopened boxes **12** are conveyed from the primary slide members **20**.

For opening the rear side of the boxes **12**, a first pair of hook members **76** and **78** is provided. The first hook members **76** and **78** are disposed above the conveyor

chains and are movably mounted on a rock shaft **80**. The shaft **80** is journaled in bearings **82** and **84** secured to the stationary machine frame **10**. The first hook members **76** and **78** are biased toward the slide members and any box carried thereby by a pair of coil spring members **86** and **88** which are tensioned between the hook members **76** and **78** and the stationary machine frame **10**, as may be seen in FIGURES 5 and 8. The first hook members **76** and **78** are normally biased into engagement with a finger member **90** carried by an arm **92** which is fixedly secured to the shaft **80**.

To raise and lower the first hook members **76** and **78** out of and into contact with the rear side of a box **12**, the shaft **80** is fixedly secured at one end to an arm **94** which is pivotally connected to one end of a connecting rod **96**. The connecting rod **96** is pivotally connected at its other end to one end of an L-shaped lever **98** which is pivoted at **100** to the stationary machine frame **10**. The L-shaped lever **98** carries a cam follower **102** at the other end thereof. The cam follower **102** rests against a cam **104**, carried by a shaft **106** which is journaled in bearings **108** and **110** secured to machine frame **10**. The shaft **106** is driven by a sprocket **110**, fixed to the outer end thereof, and chain **112** which is driven by a sprocket **114** fixed to the outer end of shaft **38**. It may be seen that the movement of cam **104** is in timed relationship with the primary and secondary conveyor chains **21**, **22**. **58** and **60** since it is driven by shaft **38** through the sprocket and chain drive.

Cooperating with the first hook members **76** and **78** to open the boxes **12** are three pairs of second hook members **116** and **118** adapted to engage and erect the front sides of the boxes **12**. The second hook members **116** are pivotally secured to spaced brackets **120** which are fixed to an endless chain **122**. The second hook members **118** are pivotally secured to spaced brackets **124** which are fixed to an endless chain **126**. The endless chains **122** and **126** are disposed around sprockets **128**, **130** and **132**, **134**, respectively. Sprockets **128** and **132** are carried by an idler shaft **136** which is journaled in bearings **138** and **140** secured to the stationary machine frame **10**. Sprockets **130** and **134** are carried by a shaft **142** slidably journaled in bearings **144** and **146** secured to the stationary machine frame **10**.

For driving the endless chains **122** and **126**, the shaft **70** has a sprocket **148** secured to the outer end thereof which carries a chain **150**. The chain **150** drives a sprocket **152** fixed to a shaft **154** which is journaled in bearings **155** and **157** secured to the machine frame **10**. The shaft **154** has a gear member **156** fixed to the outer end thereof which meshes with and drives a gear member **158** fixed to the shaft **142** which drives the endless chains **122** and **126** through sprockets **130** and **134**. The shaft **142** is adapted to slide in bearings **144** and **146** to disengage gear **156** from gear **158** so that gear **156** can be rotated to adjust the positions of the second hook members **116** and **118** according to the size of box being opened.

Cooperating with the second hook members **116** and **118** are pairs of stationary cam members **160**, **162** and **164**. The cam members **160** are disposed generally around one end of the chains **122** and **126**, as shown in FIGURES 1, 2, 4 and 5, and are secured to the stationary frame **10** in any suitable manner. The cam members **162** and **164** are disposed around the other end of chains **122** and **126**, as shown in FIGURES 1, 2 and 5, and are secured to the stationary machine frame **10** in any suitable manner with the cam members **164** being spaced from and superimposed over cam members **162**. The second hook members **116** and **118** have cam followers **166** and **168** respectively secured to one end thereof, as shown in FIGURES 1, 2, 4 and 5, which are adapted to contact cam members **160**, **162** and **164** for moving second hook members **116** and **118** about their pivots in a manner to be described.

In operation, as an unopened box **12** is being conveyed from the hopper **11** on the primary slide members **20** by the primary conveyor chains **21** and **22** and the conveyor lugs **44** and **46**, the cam **104** is in the position shown in FIGURE 2 and the first hook members **76** and **78** are being held in the upward position shown in that figure by the action of linkages **102**, **98**, **96**, **94** and members **92** and **90**. As the unopened box **12** is transferred from the primary slide members **20** to the secondary slide members **63**, the cam **104** is rotated to the right, as seen in FIGURE 7, by the rotation of shaft **38** through sprockets **114**, **110** and chain **112** to shaft **106**. As the cam **104** assumes the position of FIGURE 7, the cam follower **102** rides up on the high side of the cam which pivots the L-shaped lever **98** downwardly. This downward motion of the L-shaped lever **98** pulls the connecting rod **96** down to pull the arm **94** downwardly. This action rocks shaft **80** to lower arm **92** and finger member **90**. The lowering of finger member **90** allows the first hook members **76** and **78** to be lowered through the action of springs **86** and **88** to engage the rear side of the unopened box **12**, as shown in FIGURE 7, to subsequently open the rear side of the box **12** as it is conveyed forward through the machine. As the unopened box **12** is transferred from the primary slide members **20** to the secondary slide members **63** and the first hook members **76** and **78** are lowered into engagement with the rear end of the unopened box **12**, the second hook members **116** and **118** are being advanced by endless chains **122** and **126** in the direction of the arrow shown in FIGURES 2 and 5. The leading pair of second hook members **116** and **118** is pivoted from the position shown in FIGURE 2 into engagement with the front side of unopened box **12**, as shown in FIGURE 5, as the cam followers **166** and **168** advance forwardly of the cam members **162** and **164**. The first and second hook members **76**, **78**, **116** and **118** are now in position for opening or erecting the flat folded box **12**.

To make certain that the second hook members **116** and **118** are always in proper position for opening any size box, the gear **158** may be disengaged from gear **165** by sliding shaft **142** in bearings **144** and **146** and adjusting gear **158** to obtain the proper positions for the second hook members relative to the first hook members.

To open a box **12**, the pair of second hook members **116** and **118** in engagement with the box **12** are continuously moved forward by endless chains **122** and **126** thereby pulling and conveying the box **12** forwardly on secondary slide members **63**. This pulling and conveying action will completely open or erect the front and rear sides of the box **12** in the manner shown in FIGURE 8. As the front side is erected, the cam followers **166** and **168** on the pair of second hook members **116** and **118** in engagement with the box **12** will strike the cam members **160** to pivotally raise this pair of second hook members out of engagement with the box **12**, as shown in FIGURE 2. The movement of the box **12** will then momentarily stop to allow this pair of second hook members to advance out of engagement with the box **12** and be carried by the chains **122** and **126** around the cam members **160**, as shown in FIGURE 5. Almost simultaneously with this described action, one pair of the conveyor lugs **59** and **61**, which are secured to the secondary conveyor chains **58** and **60**, contact the rear side of the box **12** as shown in FIGURE 8. These secondary conveyor lugs **59** and **61** push or convey the box **12** forwardly causing the first hook members **76** and **78** to complete the erection of the rear side of the box **12** if the same has not been completely erected previously by the cooperation of first hook members **76** and **78** and second hook members **116** and **118**. The first hook members **76** and **78** will be raised out of engagement with the box **12** after the rear side of the box **12** has been completely opened by the action of cam **104** as described hereinbefore and the opened box **12** will be conveyed through the remainder of the machine by lugs **59** and **61** to be collected in any suitable manner.

Referring to FIGURE 8, the box **12** is shown to have corner flaps **170** which will maintain the boxes **12** in an open, erect condition following the above described action of the hook members.

To disengage or stop the operation of the above described machine, the clutch mechanism **28** includes a disengaging rock shaft **172**, disposed in bearings secured to the machine frame, which has levers **174** and **176** on each end thereof for manual engagement and disengagement by an operator of the clutch mechanism **28**.

As may be seen, a supply of boxes **12** are continuously opened and erected without any appreciable pausing in the flow of the boxes through the machine due to the interconnections between all of the driven mechanisms of the machine.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A machine for opening boxes of the type formed of foldable sheet material in which the boxes are folded flat in manufacture to provide opposite side, end, and bottom walls superimposed and interconnected along fold lines to define corners, said machine comprising a stationary frame, a hopper means secured to said frame for maintaining a supply of flat unopened boxes, conveyor means operatively associated with said hopper means for continuously conveying the boxes one at a time to a predetermined point in the machine, oscillating hook means for engaging and erecting one wall of the boxes, cooperating traveling hook means associated with said conveyor means to engage another wall of the boxes for erecting the walls and for conveying the boxes forward for a predetermined distance following the conveying action of said conveyor means, and means for operating said conveyor means and said hook means.

2. A machine for opening boxes, as set forth in claim **1**, in which said conveyor means comprises slide means for supporting the boxes, a pair of driven endless chains spaced below said slide means, and conveyor lugs secured to said pair of chains and adapted to contact the rear side of a box in said hopper for conveying it along said slide means.

3. A machine for opening boxes, as set forth in claim **1**, including a second conveyor means associated with said traveling hook means for conveying the boxes following the conveying action of said traveling hook means comprising slide means following said first conveyor means in the direction of travel of the boxes for supporting the boxes, a pair of driven endless chains spaced below said slide means, conveyor lugs secured to said pair of chains and adapted to contact the rear side of the boxes to aid in erecting the boxes and for conveying the boxes along said slide means.

4. A machine for opening boxes, as set forth in claim **1**, in which said oscillating hook means comprises a pair of hook members and a pair of spring members each of which are connected between one of said hook members and said stationary frame of the machine to bias said hook members toward the unopen box.

5. A machine for opening boxes, as set forth in claim **4**, in which said means for operating said oscillating hook means comprises a constantly rotating cam, an L-shaped lever pivoted to said stationary machine frame and having a cam follower secured to one end for contact with said cam, a connecting rod pivotally secured at one end to the other end of said L-shaped lever, a first arm pivotally secured at one end to the other end of said connecting rod, a shaft journaled in bearings secured to the machine and drivingly secured to said first arm, a second arm drivingly secured to said shaft, and a finger member secured to said second arm adapted to contact said oscillating hook members for raising and lowering said oscillating hook members into and out of contact with the boxes under the action of said cam.

6. A machine for opening boxes, as set forth in claim **1**, in which said traveling hook means are adjustable relative to said oscillating hook means to open boxes of various sizes.

7. A machine for opening boxes, as set forth in claim **1**, in which said traveling hook means comprises a plurality of pairs of hook members.

8. A machine for opening boxes, as set forth in claim **7**, in which, said means for operating said traveling hook means comprises a pair of driven endless chains moving in the direction of travel of the boxes and having a plurality of brackets secured thereto for movement therewith, each of said traveling hook members being pivotally secured to said brackets on said endless chains, cam means disposed partially around said endless chains, and cam followers secured to each of said traveling hook members adapted to contact said cam means for pivoting said traveling hook members into and out of engagement with the boxes.

9. A machine for opening boxes of the type formed of foldable sheet material in which the boxes are folded flat in manufacture to provide opposite side, end, and bottom walls superimposed and interconnected along fold lines to define corners, said machine comprising: a stationary frame; a hopper means secured to said frame for maintaining a supply of flat, unopened boxes; a first conveyor means operatively associated with said hopper means for conveying the boxes one at a time to a predetermined point in the machine comprising first side means for supporting the boxes, a first pair of driven endless chains spaced below said first slide means, and first conveyor lugs secured to said first pair of chains and adapted to contact the rear side of a box in said hopper for conveying it along said first slide means; oscillating hook means for engaging and erecting one wall of the boxes; cooperating traveling hook means associated with said first conveyor means to engage another wall of the boxes for erecting the walls and for conveying the boxes forwardly for a predetermined distance following the conveying action of said conveyor means; second conveyor means associated with said traveling hook means for conveying the boxes following the conveying action of said traveling hook means comprising second slide means following said first slide means in the direction of travel of the boxes for supporting the boxes, a second pair of driven endless chains spaced below said second slide means, second conveyor lugs secured to said second pair of chains and adapted to contact the rear side of the boxes to aid in erecting the boxes and for conveying the boxes along said second slide means; and means for operating said conveyor means and said hook means.

10. In a machine for opening boxes, oscillating hook means adapted to engage and erect one side of the boxes, and cooperating traveling hook means adapted to engage and erect another side of the boxes and to convey the boxes forward for a predetermined distance through the machine.

11. In a machine for opening boxes, as set forth in claim **10**, in which said traveling hook means comprises a pair of driven endless chains, a plurality of brackets fixed to said endless chains, a plurality of pairs of hook members pivotally secured to said brackets and having cam followers secured thereto, and cam means disposed around said endless chains, said cam followers being adapted to engage said cam means for pivoting said traveling hook members into and out of engagement with the boxes as said traveling hook members are carried around said endless chains.

12. In a machine for opening boxes, as set forth in claim **10**, in which said oscillating hook means comprises a pair of hook members, a pair of spring members secured to said hook members for normally biasing said

hook members into engagement with the boxes, a rotating cam means, and mechanical linkages including cam follower means adapted to raise and lower said oscillating hook members with and against the bias of said spring members into and out of engagement with the boxes through the action of said cam.

13. In a machine for opening boxes, as set forth in claim **10**, in which said traveling hook means are adjustable relative to said oscillating hook means to open boxes of various sizes.

References Cited by the Examiner

UNITED STATES PATENTS

1,868,873	7/1932	Berestein	93—53
2,582,393	1/1952	Perilli	93—53
2,753,770	7/1956	Chapman	93—53
2,774,286	12/1956	LaBombard	93—49
2,863,371	12/1958	Tonna	93—53

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