Jan. 29, 1957 J. A. HARTMAN 2,779,592

FEED HOPPER

Filed Sept. 9, 1954 2 Sheets-Sheet 1

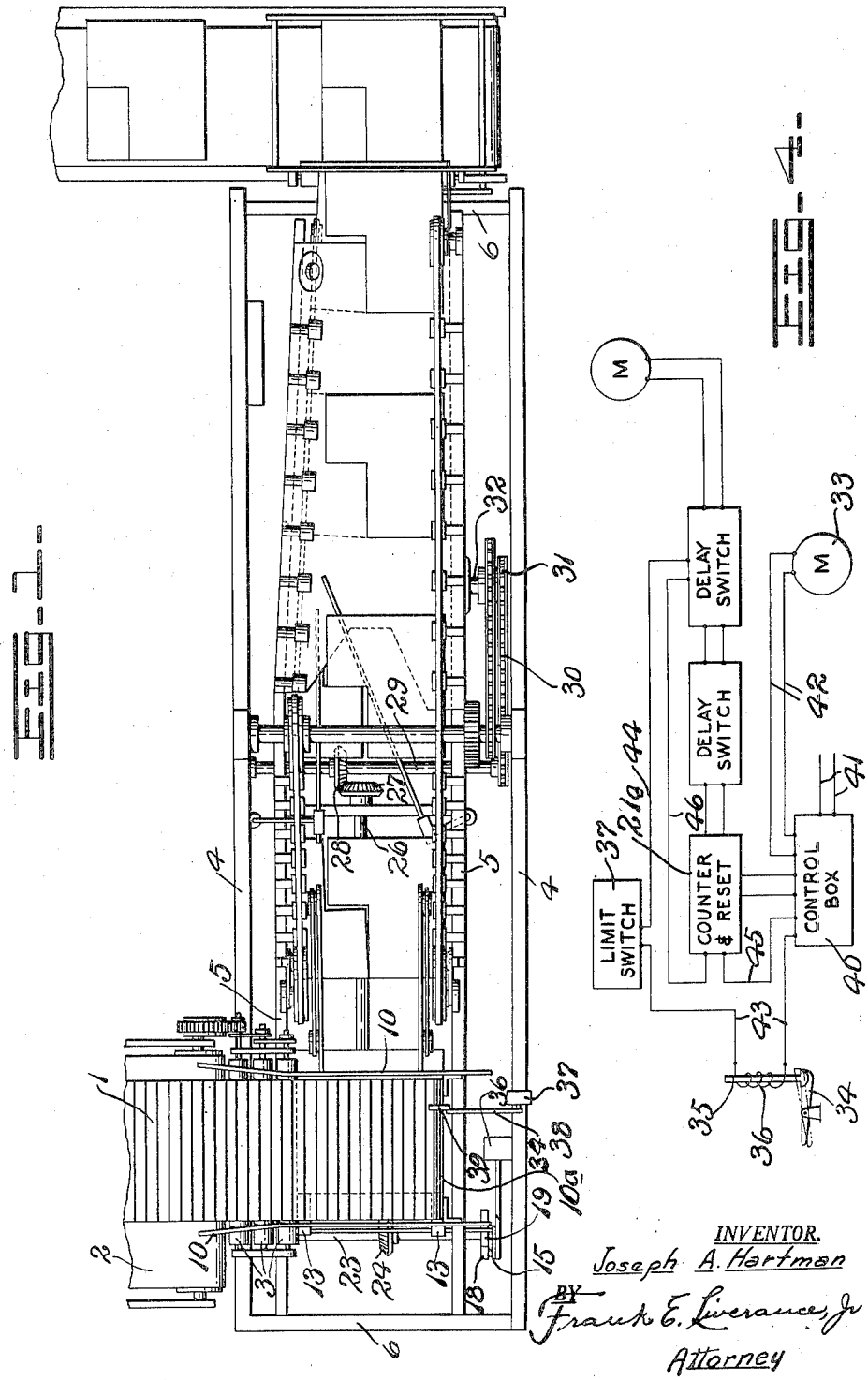


FIG. 1

FIG. 4

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Filed Sept. 9, 1954 2 Sheets-Sheet 2

FIG. 2

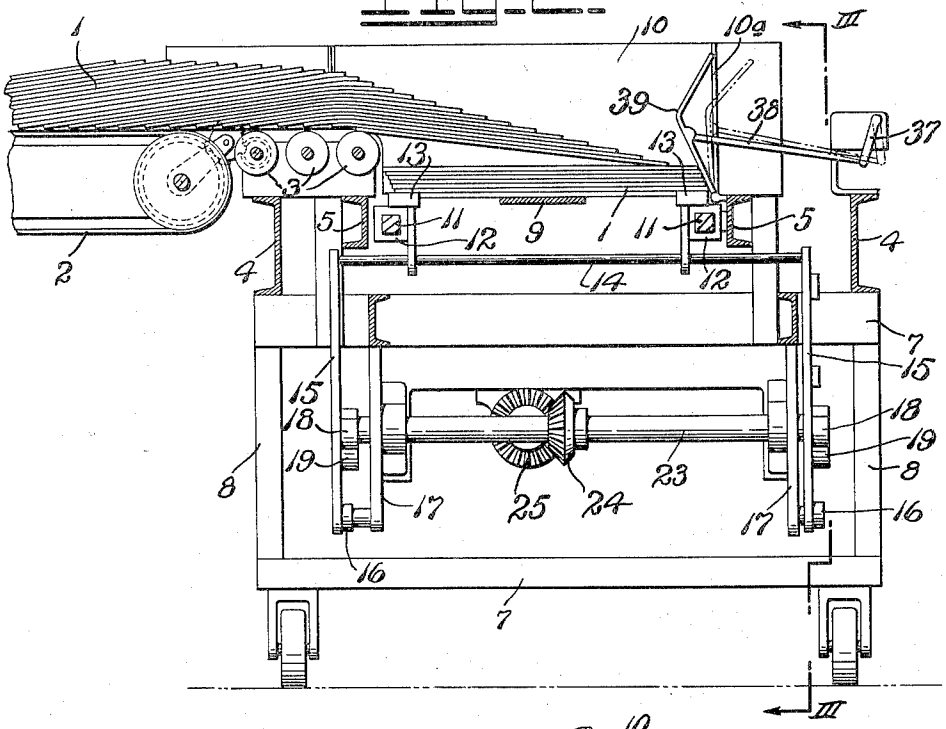
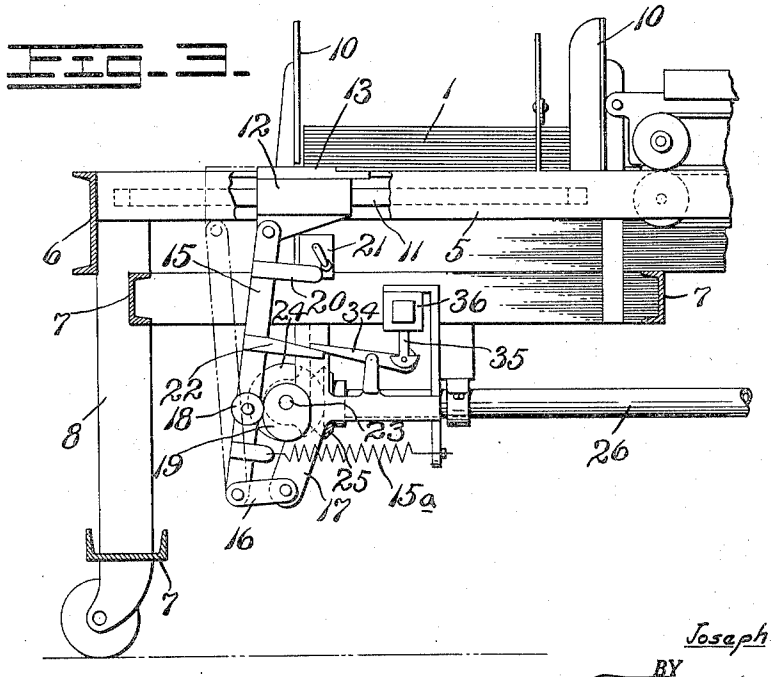


FIG. 3



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FEED HOPPER

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Application September 9, 1954, Serial No. 454,898

3 Claims. (Cl. 271—4)

This invention relates to a novel, practical and useful feed hopper apparatus by means of which articles carried continuously into the hoper and deposited one over the other may have the lowermost of such articles in succession fed from the hopper to desired processing apparatus for acting upon said articles in accordance with desired steps of procedure.

It is an object and purpose of the present invention to provide intermittent feeding apparatus and to also further provide a control of the feeding which may be automatic so that the feeding is automatically stopped when the articles in the hopper are diminished in number to a predetermined extent, and the feeding automatically resumed upon a predetermined increase of articles in the hopper, thereby insuring that the hopper shall never have the articles therein exhausted nor shall they be supplied to such an extent that they fill and overflow the hopper at the top thereof. My invention is not necessarily limited to automatic operation and control in all respects but may be subject to manual operation in part for insurance against the hopper becoming empty or overflowing, the novel feeding aparatus which I have provided being adapted to be controlled in either manner.

I have filed in the United States Patent Office a prior application having Serial No. 210,249, filed February 9, 1951, for Separating and Stacking Machine, now Patent No. 2,693,742, issued November 9, 1954. This applica- has been allowed and will be issued in due course. The subject matter of the present invention is fully disclosed and described in such prior application. It is a separate subject matter of invention adapted to be used for operations other than in the separating and stacking machine with which it is disclosed in use in such preceding application, and is directed to a separate invention and one which is properly divisible from the application, the claims of which have been allowed in Serial No. 210,249.

An understanding of the invention and a preferred form of embodiment thereof may be had from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of a machine in which my invention is embodied, into the hopper of which articles to be processed after they have been periodically ejected from the hopper are delivered, preferably as shown.

Fig. 2 is an end elevation showing in section the frame of the machine, the view being taken substantially looking at the machine shown in Fig. 1 from the left thereof.

Fig. 3 is a fragmentary side elevation of the end of the machine at which the hopper and ejecting apparatus are located, illustrating the feeding or ejecting mechanism and the mechanism utilized in control thereof, parts of the outer frame members being broken away and other parts shown in transverse vertical section, and

Fig. 4 is a diagram of electrical circuits and connections used, including that for the control of the hopper supply.

Like reference characters refer to like parts in the different figures of the drawings.

One of the flat articles, a successive number of which may be entered into the hopper and thereafter ejected therefrom is a double box construction, indicated at 1, which is made preferably from paper stock by mechanism which forms no part of the invention. Such double box structure has lines of separation so that by pulling apart at such separation lines two complete boxes are obtained, the separating being done automatically in the machine in accordance with mechanism which forms the subject matter of my above identified application, and delivered from the machine with single boxes in collapsed form stacked one over the other. Such double box or carton structures air old and well known and are delivered one over the other and one following the other into a hopper. As shown in Figs. 1 and 2, an endless belt or conveyor 2 horizontally located, the belt moving slowly, carries the flat structures 1 from a machine in which they are fabricated in overlapped relation, as best shown in Fig. 2, over rollers 3 into the receiving hopper therefor, the box structures 1 being stacked one over the other.

Such receiving bin or hopper is at one end of a processing machine. It is supported on a frame having spaced parallel longitudinal side beams 4 inwardly of which are smaller generally parallel beams 5 of channel form. The beams 4 at their ends are connected and secured together by beams or channels 6 and there are also other transverse or cross beams 7 supported at a proper height by under structure including cross beams 7 and posts 8. Such frame may be mounted on rollers for transportation or may be fixed in position. The hopper or bin for the structures 1 which are to be received therein includes a horizontal bottom 9 in generally the same horizontal plane as the upper flanges of the beams 4 and 5. Beams 5 at the hopper end of the machine are parallel to the beams 6. The hopper or receiving bin includes two spaced apart vertical front and rear ends 10 which are mounted upon and extend across the bars 4 and 5. A vertical plate 10*a* provides a side which serves as a stop for the structures 1 preventing them moving too far.

The articles at 1 are slowly moved by the conveyor 2 to the right in Fig. 2 passing from said conveyor to the rollers 3 which are driven by gears and belts as shown in Fig. 1 from the end roller of the conveyor 2 and are stacked in superimposed relation in the hopper, one over the other as shown in Fig. 2 in the lower portion of said hopper, passing into said hopper at its open inner side.

Such flat articles 1 are ejected from the hopper, the lowermost structures 1 being successively moved outward under the inner side plate 10 of such hopper. The successive feeding or ejecting mechanism of the lowermost structures 1 includes spaced horizontal guide bars 11 parallel to the beams 11 and secured thereto, upon each of which a member 12 is mounted for sliding reciprocating movements (Fig. 3), each at its upper side having a feeding or ejecting shoe 13 secured thereto which is thicker at its outer portion than at its inner portion, thus providing an engaging shoulder for each to come against an edge of the lowermost member 1 and move it on reciprocation of the members 12 and attached shoes 13 in the proper direction. Each of the members 12 is pivotally connected at its outer end to the end of a horizontal rod 14. Rod 14 at opposite ends is pivotally connected to the upper ends of two spaced generally vertical bars 15, each at its lower end being connected by a link 16 to a downwardly extending arm of a bracket support 17 secured on the under frame of the machine. A distance above the lower end of each link 16 a roller 18 is mounted which rollers are adapted to be engaged by eccentrics or cams 19 substantially of the shape best shown in Fig. 3. Near the upper end of one of the bars 15 a finger 20 projects to one side which in the rocking movement of bar 15 operates a counter 21. Between the rollers 18 and the finger 20 a second bar or finger 22 is permanently secured

extending in the same direction as the finger **21**, the purpose of which will be later described.

The cams **19** are secured at opposite ends of a horizontal cross shaft **23** supported by bearings on the bracket supports **17**. A beveled gear **24** between the ends of the shaft **23** is driven by engagement with a second beveled gear **25** on a longitudinal generally horizontal shaft **26** (Fig. 1) which extends rearwardly underneath the frame of the machine. At its rear end it has a second beveled gear **27** in engagement with a gear **28** on a cross shaft **29**. Shaft **29** is driven by a chain drive **30** around a chain driving wheel **31** on the shaft **32** of an electric motor **33** which is mounted on and suspended from the machine frame.

In operation the motor **33** is driven continuously at a uniform speed so that the shaft **23** and the eccentric cams **19** thereon rotate at a continuously uniform speed. When the rollers **18** are bearing against the cams **19** bars **15** are rocked back and forth, being pushed in one direction against the springs **15***a* by cams **19** and returned by such springs with a reciprocation of the shoes **13** which successively feed or eject the lowermost double box structures **1** in the rearward movement of the shoes moving them out of the hopper to the rear.

A lever **34** is pivotally connected between its ends on an upwardly extending finger of the bracket **17** (Fig. 3) pivotally connected with which is the lower end of a vertical armature **35** of a solenoid **36** interposed in an electric circuit which will later be described. One end of a circuit wire of such circuit is connected to a limit switch **37** which, as shown in Fig. 2, is supported at a spaced distance from the outer open end of a hopper which receives the double box structures **1**. The limit switch **37** is operated by a link bar **38** connected at one end to the switch and at its other end to a bent lever **39** pivotally mounted at its lower end and extending upwardly at the outer side of the box receiving hopper. When, as shown in Fig. 2, the lever **39** is in its full line position the switch at **37** is closed, solenoid winding **36** is energized and the lever **34** instead of having its free end tilted upwardly as in Fig. 3 is moved to a substantially horizontal position so that its free end and the end of the finger **22** abut against each other. The rollers **18** under such conditions are held at a sufficient distance from the cams **19** that such cams while freely rotating do not operate bars **15** and the shoes **13** and ejection of the lowermost double box structures **1** from the hopper is stopped. With the filling of the hopper the edges of the double boxes **1** come against the bent lever **39**, move it progressively toward the dashed line position thereof shown in Fig. 2 whereupon switch **37** is operated to break the circuit and the solenoid winding **36** is de-energized. The switch **37** is actuated by lever **39**.

Upon the circuit being broken, the armature **35** drops by gravity and turns lever **34** to move it at its free end out of the path of movement of the finger **22**. When this occurs, springs **15***a* pull upon the bars **15** to press the rollers **18** against the cams **19** and the reciprocating shoes **13** operate as long as the circuit is broken through the limit switch remaining open but when the supply in the hopper diminishes with lever **39** returning to its full line position in Fig. 2, rollers **18** are held away from the cams **19** and the feeding of the double box structures **1** is interrupted until there is a sufficient replacement of the supply within the hopper to move lever **39** from the full line position in Fig. 2 to the dashed line position thereof to close the switch **37**.

The speed of movement of the conveyor belt **2** is at a rate of speed such in comparison with the reciprocating movement of the shoes **13** that ejection if continuous would exhaust the supply of box structures **1** coming into the hopper. The structure described insures that the feeding or ejecting will always operate when there is a sufficient supply within the hopper, will stop when the supply has diminished to a predetermined extent and that the hopper will fill to a predetermined maximum but not over fill which if it happened would not only interfere with the inward movement of the box structures **1** into the hopper, but spill over and interfere with other machine operation. Such inward movement caused by the slow moving conveyor belt **2** is continuous and uninterrupted.

The capacity of ejecting being greater than the rate of supply no interference occurs. There is merely an interruption and stopping of the feeding or ejection. The rotation of the driving motor **33** and the cams **19** being uniformly continuous, an immedaite re-start of the operation of feeding or ejecting takes place when the hopper has been re-supplied to a maximum level at which the limit switch at **37** is moved to open position.

The double box structure ejected to the rear in succession from the lower end of the hopper are received by conveying mechanism so constructed that the double box structures are pulled apart, superimposed upon each other and delivered at the rear end of the machine where they are stacked one over the other and the stacks conveyed by an adidtional conveyor in parallelism with but moving in opposition to the movement of the conveyor belt **2** which carries the double box structure to the hopper. This mechanism is not a part of the present invention but pertains to the invention which is described and claimed in the above entitled allowed application. A repetition of the description of such structure and its operation is not made in the present application because of such describing and claiming, the present invention being separable and divisible therefrom, inasmuch as the feeding mechanism of the present invention is operable for delivery of flat members, either identical with or similar to the double box structures **1**, or widely different in structure therefrom for a processing thereof after delivery from the hopper in many and various ways and in different ways from the particular separation of the double box structure disclosed in my prior allowed application.

In Fig. 4, a diagrammatic outline of the electric circuits in conjunction with the entire machine disclosed in my prior application is shown, including not only the motor **33** and its connections but an additional motor (not numbered) which drives the conveyor at the delivery end of the machine together with certain delay switches used therewith. So much of the electrical circuits as are necessary for the operation of the limit switch **37**, solenoid **36** and lever **34** will be described. A control box **40** with the usual manual starting and stop switches and the like has leading thereinto current feed wires **41** and therefrom current carrying wires **42** connected with the motor **33**. Within a circuit wire **43** connected with the control box the solenoid winding **36** is interposed and the other end of the wire **43** is connected at one side of the limit switch **37**. The circuit is completed by wires **44**, **45** and **46**, the first shown as leading from the other side of the limit switch to a delay switch, wire **45** from the counter reset **27***a* to the control box and wire **46** connecting the counter reset with the mentioned delay switch. However, so far as the present invention is concerned wires **44** and **46** may be replaced by a single wire completing a circuit which will be closed or broken by operation of the limit switch **47**, which operation has been previously described by pressure against the bar **39** to move it from its full line to dotted line position in Fig. 2 to open the swtich **37**, such switch being closed upon the return of the bent bar **39** to its full line position in Fig. 2 when the supply within the hopper **2** has lowered sufficiently but before such supply within the hopper is exhausted.

Feeding the flat box structures **1** through the machine is dependent upon the control ejection from the receiving hopper and such control ejection depends upon the automatic operation of the limit switch **37**, which in

turn depends for its operation upon the automatic movement of the bent bar 39 from full to dotted line position as shown in Fig. 2 as the hopper is filled sufficiently that bar 39 is moved to the dotted line position in Fig. 2, but before the hopper is completely filled. Thereupon, the feeding or ejecting mechanism which has not been operating during such filling of the hopper with a greater supply of the boxes 1 starts its operation, and the ejection being faster than the supply of the boxes coming into the hopper, the number of boxes within the hopper is diminished until the limit switch is again automatically operated to close the circuit which controls the lever 34 to move it through solenoid operation into a position such that its free end is abutted against the finger 22, the feeding stopping until the supply within the hopper has replenished.

As previously mentioned it is to be understood that the invention is not limited in its use to feeding solely the double box structures shown and mentioned. Such interrupted feeding, while a supply of the articles to be fed to the hopper is continuous, is desirable in other machines than those which separate double boxes into two complete single box structures. The invention therefore directed to such feeding mechanism is to be considered comprehensive of all forms of structure within their scope and of use wherever it may be desirable.

I claim:

1. Apparatus as described comprising, a hopper having a bottom, spaced vertical walls and an open entrance side, means for continuously supplying said hopper through its open side with flat horizontally moving articles and stacking said articles one over another in the hopper, means for ejecting the lowermost articles in said hopper, one after another, said means being located at the lower end of the hopper, generally vertical bars pivotally mounted at their lower ends, at the upper ends of which said ejecting means is connected, continuously operating means for swinging said bars back and forth about their pivotal mounting, and means for holding said bars out of operative engagement with said operating means upon diminishing of said articles in the hopper to a preselected minimum, and for releasing said bars into operative engagement with said operating means on filling the hopper to a predetermined maximum of articles therein.

2. Apparatus as described comprising a hopper for containing a stack of flat articles therein, ejecting means at the lower end of said hopper mounted for reciprocation from one side to the other thereof and return, a vertical bar pivotally mounted at its lower end at the upper end of which said ejecting means is mounted, a power driven continuously rotating horizontal shaft, a cam thereon, means on said bar normally riding against said cam for rocking said bar and reciprocating the ejecting means, a movably mounted stop, cooperating stop means on the bar, and means for moving the movable stop into the path of movement of said stop means on said bar on reduction of articles in the hopper to a predetermined minimum, thereby holding said bar away from said cam until the supply of articles in the hopper is replenished.

3. A construction having the elements in combination defined in claim 2, said movable stop means comprising a pivotally mounted lever having a free end movable into and out of the path of movement of the stop means on said bar, an electric circuit having an opening and closing switch and solenoid winding therein, an armature for said solenoid winding connected to the other end of said lever, and actuating means for said switch movably mounted at a side of the hopper and connected to the switch against which edges of upper articles in said hopper engage to hold the switch in open position and freed when the articles in the hopper are diminished to bring the uppermost article below said actuating means to thereby close said switch and move said lever into position to stop operation of said bar and ejecting means until the hopper is resupplied with articles to a sufficient height to open the switch.

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