Aug. 19, 1958 B. E. CASWELL ET AL 2,848,138

ARTICLE FEEDING APPARATUS

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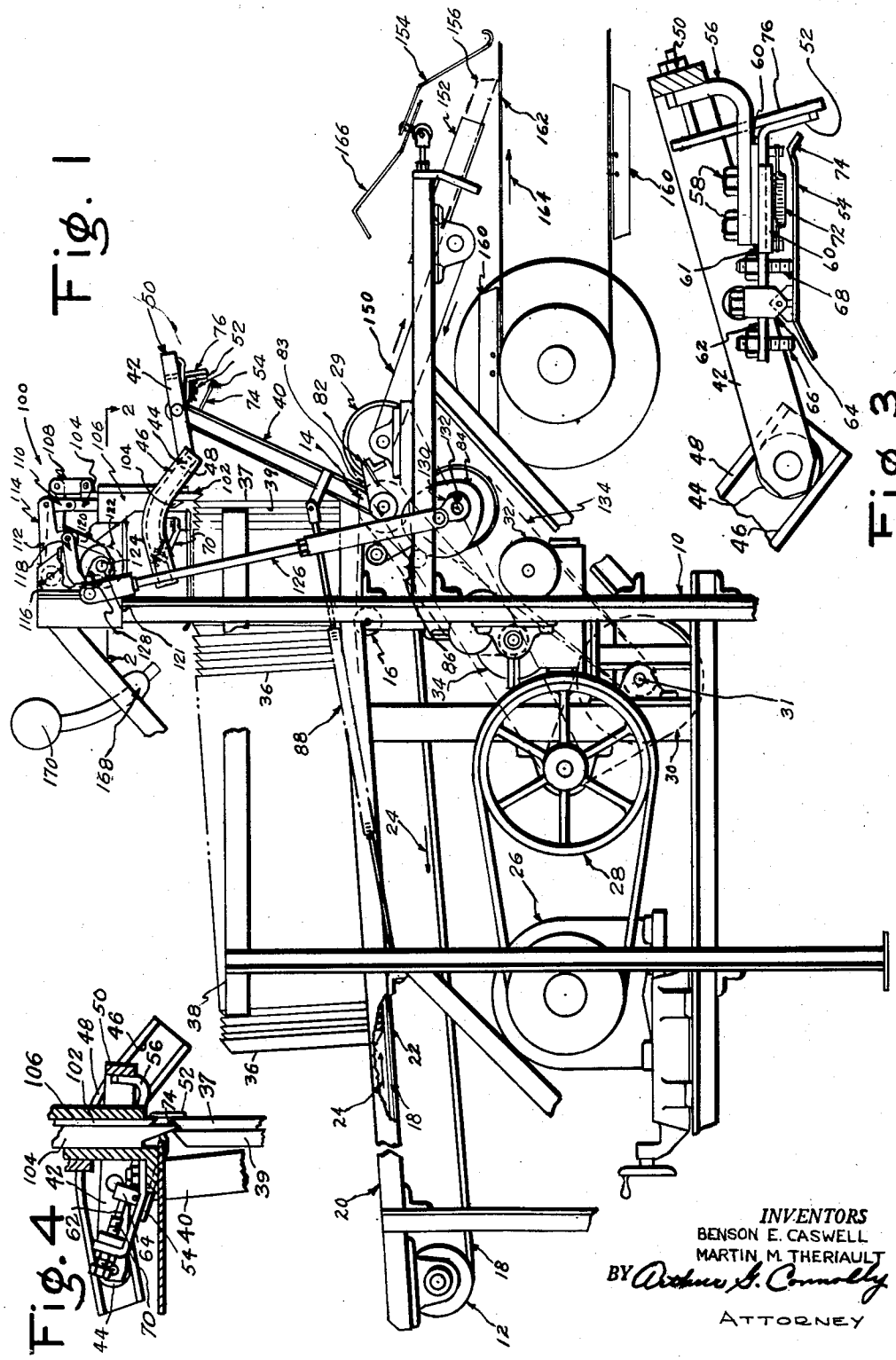


Fig. 1

Fig. 3

Fig. 4

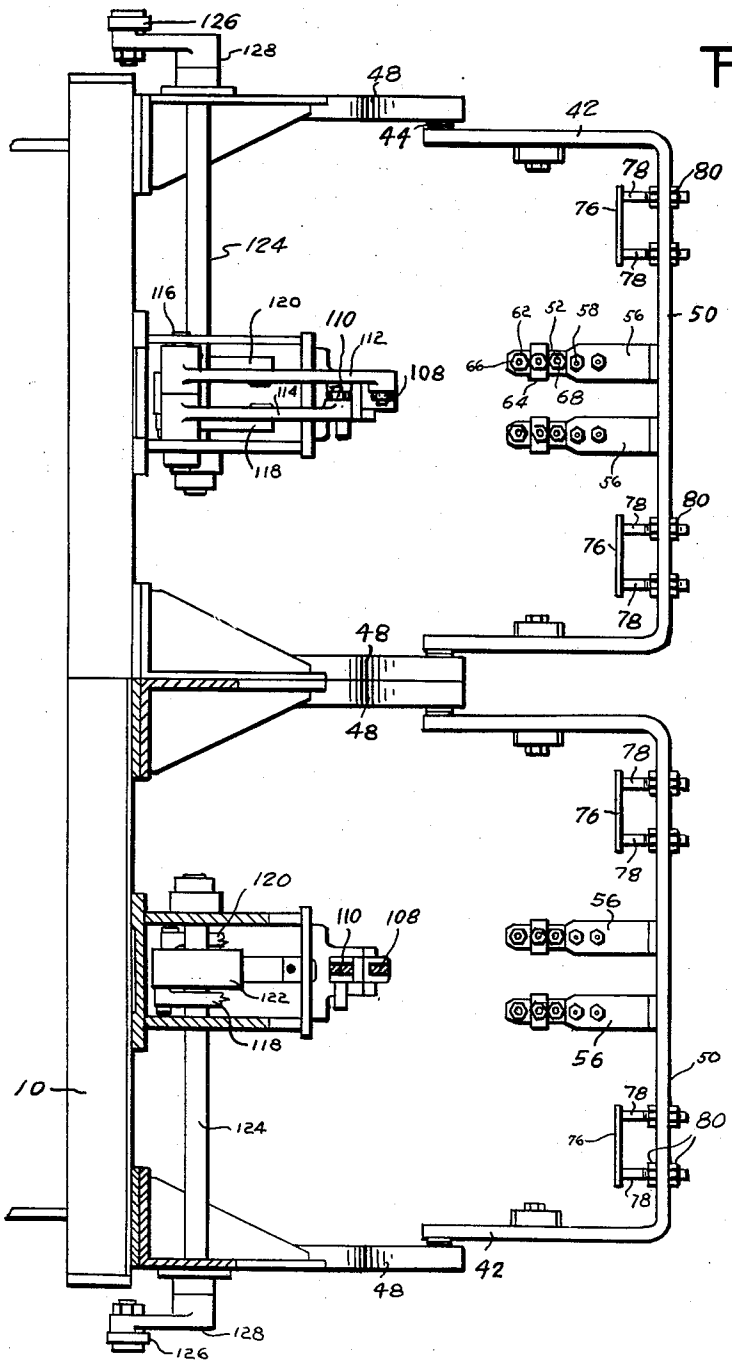
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Fig. 2



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Fig. 5.

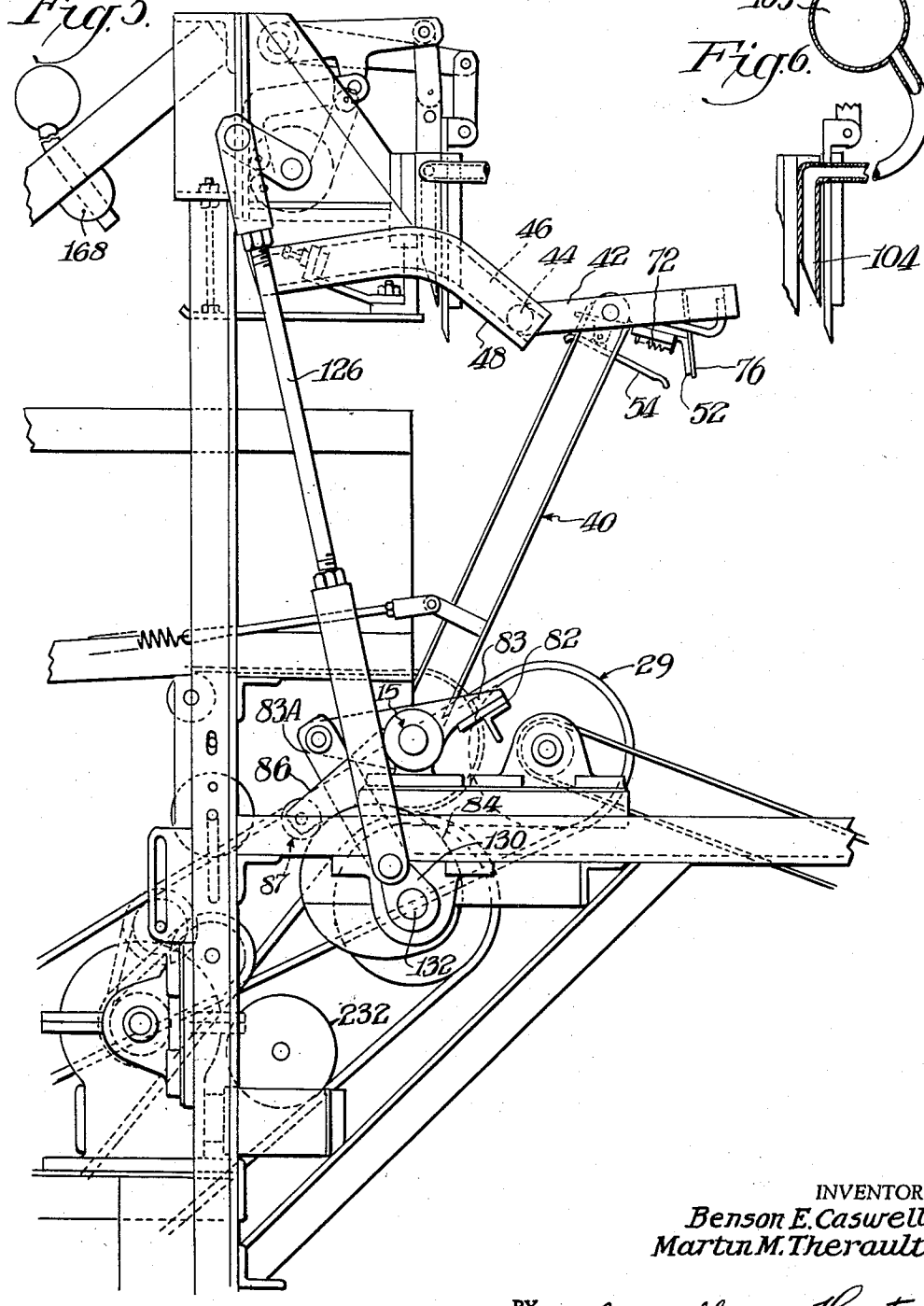


Fig. 6.

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ARTICLE FEEDING APPARATUS

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4 Claims. (Cl. 221—209)

This invention relates to feeding apparatus, particularly for automatically supplying a succession of tray-like articles from a stack of these articles.

Among the objects of the present invention is the provision of novel feeding apparatus that furnishes a highly reliable feed of the above type.

The above as well as additional objects of the present invention will be more completely understood from the following description of several of its exemplifications, reference being made to the accompanying drawings wherein:

Fig. 1 is a side elevation with parts broken away of one form of feeding device illustrative of the present invention;

Fig. 2 is a sectional detail view of the apparatus of Fig. 1 taken along the line 2—2 with other portions shown in plan view;

Figs. 3 and 4 are enlarged side views partly in section of a portion of the apparatus of Fig. 1;

Fig. 5 is an enlarged detailed side elevational view of the picker and escapement assemblies and their associated parts; and

Fig. 6 is a fragmentary detailed view, partly in elevation and partly in section, of the hollow escapement bar assembly.

According to the present invention, an article feeding apparatus of the type described above includes a movable support structure for holding an elongated stack of these articles and advancing it along a predetermined path, picker elements are located in said path and actuating mechanism is connected to said elements to move them alternately toward and away from the advancing end of the stack, these picker elements including a set of fingers, some spaced from each other longitudinally of the guided stack, and positioned to engage an edge of the stack, the longitudinal spacing between the fingers being substantially equal to the distance between the corresponding edge portions of the individual articles for causing the engagement of the end of the stack by at least one of the fingers to automatically position at least one other finger between the two articles at the end of the stack and cause the endmost article to be removed from the stack by the movement of the picker elements away from the stack.

The movable stack-supporting structure is advisably in the form of a conveyor belt having an approximately horizontally extending stack carrying portion. It is advantageous to move this belt through an angular break, or change in direction, that causes stacked articles to be loosened from nested relation as they move toward the picker elements. In addition, effective feeding is provided by arranging for the stack support to move faster than the picker elements remove individual articles, and providing a positioning barrier for periodically engaging the advancing stack end in synchronism with the operation of the picker elements.

Referring more particularly to the drawings, Fig. 1 shows a framework **10** on which is mounted a set of conveyor belt rollers **12**, **14** and **16**. Around these rollers is looped conveyor belt **18**, the top run of which is bounded on each side by a side plate or guide **20**. If desired, the top conveyor run can also be backed up by slide plates **22** which keep a load on the conveyor from causing it to sag.

The conveyor is driven in the direction of arrows **24** by an impelling device shown as electric motor **26** through a set of intervening belt-driven pulley wheels or chain-connected gears **28**, **30**, **32** and a speed reducer **34**. The final driving connection is conveniently made to roller **14**. A stack of tray-like articles **36** can be laid down on its side on the top run of conveyor **18** so that it is advanced by the operation of the conveyor toward a feeding zone at its right hand end, as seen in Fig. 1. Additional side supports **38** for this stack can also be provided at this end, if desired.

Pivoted at the feeding zone, as for example about the same shaft which carries roller **14**, there is mounted a picker frame **40** which can in general have an outline corresponding to that of the individual articles in stack **36**, and large enough to fit around them. The upper end of frame **40** carries a journalled link **42** on which is rotatably mounted a follower roller **44** received in a suitably shaped guide channel **46** on a fixed guide member **48** secured to framework **10**. Duplicate links and guides **42**, **46** can be provided on either side of frame **40** with the links connected, if desired, in the general form of an integral U-shaped member **50** (see Fig. 2).

To the links is secured a set of picker elements including slidable fingers **52** and pivoted fingers **54**. As shown more clearly in Fig. 3, fingers **52** are slidably held on angles **56** by means of headed studs **58** bolted to angles **56** and anchoring in place spaced slide plates **60** between which the fingers **52**, provided with suitably shaped stud-receiving slots, are slidably fitted. The plates are shown as held apart by marginal spacer extensions **61** formed on one or both of them.

The fingers **52** include rearward extensions **62** from which are depended pivot clamps **64** to the lower ends of which the picker fingers **54** are pivoted. Stops **66**, **68**, shown as threaded studs held by jam nuts on extensions **62**, limit the amount of pivoting which the fingers **54** can undergo.

Fingers **52** are arranged to resiliently position themselves against the forward face of the stack so that they find the right stopping point even though the forward articles have an irregular front face. Resilient bias, as by springs **72** connected between posts on the fingers and on a slide plate, urges the fingers **52** rearwardly with respect to the advancing stack to provide effective engagement. A rear limit stop **70** which is shown as adjustably fixed in place on framework **10** keeps the fingers **52** from going too far back when the fingers are approaching the end of the stack.

The pivoted fingers **54** are provided with forwardly projecting and downwardly extending ends **74** so located with respect to fingers **52** that when fingers **52** are brought into engagement with the article **37** at the advancing face of stack **36**, finger ends **74** climb over this article and drop between it and the next article **39**.

The links **42** are also shown as carrying a set of positioning bars or plates **76** shown in Fig. 2 as adjustably held by means of threaded studs **78** and lock nuts **80** for engaging the advancing face of the stack **36** adjacent the engagement zone for the picking fingers every time the picker frame **40** reaches its rearmost position against the stack **36**. An additional bar **82** is shown as separately pivoted by means of arms **83** suitably journalled on shaft **15** for oscillation by any convenient linkage such as a crank **83A** on the far end of an operating shaft, this crank **83A** being connected to a crank arm **130** on shaft **132**. This bar **82** extends across the width of the con-

veyor to similarly engage the lower portion of the stack face at the same time as plates **76** engage the upper portion. It is not necessary to use all the positioning bars shown or even to use a symmetrical arrangement of such bars. One of the bars **76** can be omitted for example without changing the operation materially.

In operation, frame **40** is oscillated to and fro about shaft **15** under the action of a suitably shaped cam **84** carried by shaft **132**, and a cam follower arm **86** integral with the frame **40** and advantageously provided with a contact roller **87**. A bias spring **88** is arranged to bias frame **40** in counterclockwise direction as seen in Fig. 1 thereby holding the cam-following end of the follower arm **86** against its actuating cam.

An escapement mechanism indicated generally at **100** is also arranged to cooperate with the picker mechanism. The escapement mechanism includes a stop bar **102** and a release bar **104**, both slidably held for vertical reciprocation in a housing **106**. The stop end release bars are connected respectively by links **108**, **110** to one arm of T-shaped levers **112**, **114**, the other arms of which are pivoted to pivot pin **116** suitably fixed in place on the framework **10**.

The stems of these T levers are in turn connected by links **118**, **120** to an oscillating wheel **122** (see Fig. 2) fixed to a journalled shaft **124**. The shaft is oscillated by means of a drive arm **126** connected between a crank **128** fixed to shaft **124** and the crank arm **130** carried by the shaft **132** rotatably held on framework **10** and driven as by the belt or chain **134** connecting with a pulley or sprocket on shaft **31**. Picker-frame-actuating cam **84** is shown also as carried by shaft **132** so that escapement bars **102**, **104** are synchronized with movements of picker frame **40**. Lower positioning bar **82** is also synchronized by driving it from shaft **132**. The various linkages are designed to bring the stop bar **102** down into blocking position, and withdraw release bar **104**, as shown in Fig. 1, while picker frame **40** is moving toward the endmost article **37** of stack **36**. As the picker frame begins to move away from the stack after engaging the endmost article of the stack, stop bar **102** is lifted and release bar **104** is lowered to permit the endmost article to be pulled away from the stack by fingers **74**. Before the picker frame **40** returns, the escapement bar **102** is lowered and the release bar **104** then raised, so that the face of the stack can advance to the position shown after the previous endmost article is removed. To help the lower end of bar **104** in making its way between the last two articles in the stack, a stream or blast of air can be projected against the upstanding edges of these articles. Such a stream or blast is conveniently introduced through the bar **104** as by making it hollow and connecting it to a compressed air tube not shown. This is illustrated in Fig. 6 where hollow release bar **104** is shown connected, through suitable valving, not shown, to a source of fluid pressure **105**.

In the form of the invention shown in Fig. 1, a second conveyor **150** is suitably positioned to receive the individual articles pulled forward by the picker frame **40** which permits them to drop after they are sufficiently tilted. Inasmuch as only the upper portion of the articles are pulled forward, these articles tilt about their lower edges. By reason of the upward travel of the fingers **52** at the forward end of their stroke under the guiding action of channel **46**, these fingers are disengaged from in front of the tilted articles, permitting them to drop on conveyor **150**. The tilting can be accelerated by having the lower bar **82** timed to move rearwardly and strike the lower portions of the dropping articles. Such striking causes the forward ends of the articles to reach conveyor **150** more promptly and positively. Conveyor **150** can be conveniently connected for rotation as by pulley **29** connected to the shaft driven by pulley **28** as shown. Conveyor **150** can be arranged to carry the fed articles in uniformly spaced single file to any desired treating apparatus such as an after-press unit as described in the Randall Patent No. 2,704,493, granted March 22, 1955.

Where the molded pulp articles fed by the apparatus of Fig. 1 are egg cartons or the like, they can be directly taken by conveyor **150** through a filling apparatus where they can be filled with eggs, either manually or automatically. Alternatively, they can be fed through a printing unit as for example by providing a chute **152** and a resiliently held escapement finger **154** against which the conveyor **150** moves the fed articles. The successive articles are arranged to take the face-down positions shown at **156**. A printing block **160** carried by an endless chain **162** in the direction of arrow **164** brings its forward edge into the concave end of the article that projects from chute **152**, thereby positively engaging the article and carrying it past the escapement finger which it forces to tilt up out of the way. This tilting brings another finger **166** pivotally held integral with finger **154** down against the conveyor **150**, preventing the next article from moving down, until the first article has cleared the finger **154** and this finger has dropped down again raising finger **166**. The dropping can be under the bias action of a spring or suitably distributed weights. The next article accordingly slides down to the position shown at **156** and awaits the arrival of the next printing block.

The blocks **160** have an upper face that matches all or part of the lower face of the fed articles and can also be used as a pressing mold against which the fed articles are pressed by a mating mold moved down from above for example, and carried by a rotary holder for example. Where the articles are printed on, a printing roller can be used instead of a pressing arrangement.

Any type of molded pulp or similar articles can be fed by the apparatus of the present invention, from molded pulp plates to egg cartons, egg flats, etc. It is usually helpful, particularly where the articles have been tightly pressed together in the stack, to direct an air jet from a nozzle **168** at the tops of the articles over the break in the conveyor at roller **16** to better loosen the articles and assure a good separation by the picker fingers. The nozzle is connected to a source of fluid pressure diagrammatically illustrated at **170**. When the articles are of generally concave or dished shape, as in egg cartons or dishes, they can be fed while facing in either direction. Some articles such as foldable egg cartons have weakened fold lines along which they bend relatively readily. Such articles are best fed with their fold lines directed toward the edge engaged by the picking fingers. However, additional fingers can also be mounted on the vertically extending side members of picker frame **40** to engage the vertically extending sides of the articles, so that easily folded articles can be fed in any position. If desired, the side mounted picker fingers can even be used without the top mounted ones.

The article feeding apparatus of Fig. 1 can advantageously be driven by the machine it is feeding as by a chain-and-sprocket or gear drive replacing pulley **28**. This will assure that the machine being fed automatically is kept operating at its highest efficiency.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope hereof, it is to be understood that the invention is not limited to the specific embodiments hereof, except as defined in the appended claims.

What is claimed is:

1. A feeding device comprising a framework, a feed conveyor on said framework, an escapement mechanism and a picker mechanism on said framework in operative relationship to said feed conveyor, said escapement mechanism comprising a pair of vertically movable escapement bars movable in a vertical plane situated adjacent one end of said feed conveyor, linkage individually connecting each of said escapement bars to a reciprocating means for alternate vertical movement thereby, said

escapement bars being adapted to engage the endmost article of a stack of articles on said feed conveyor upon movement of the escapement bars to their lowermost vertical positions, said picker mechanism being positioned adjacent said escapement mechanism and comprising a pivotally-mounted picker frame having picker fingers at one end, said picker fingers comprising a slidable finger having a pivoted finger connected thereto, said fingers being resiliently biased in the direction toward the end of the stack, whereby said slidable finger is urged into engagement against one face of said endmost article, and said pivoted finger being provided with an offset end adapted to climb over one edge of said endmost article and engage the opposite face thereof while the said one face thereof is engaged by said slidable finger, an oscillating means for rocking said picker frame about its pivot, and linkage operatively connecting said picker frame to said oscillating means, said oscillating means being connected to said reciprocating means for synchronous operation therewith.

2. The device of claim 1 wherein said escapement mechanism includes an air-blast means to direct a blast of air between a pair of stacked articles held on the conveyor adjacent said escapement bars, said air-blast means comprising a hollow portion in one of said escapement bars, said hollow portion being connected to a source of air under pressure.

3. The device of claim 1 wherein said feed conveyor comprises a belt movable around supporting pulleys, additional supporting means for the uppermost flight of said belt, said additional supporting means deflecting the belt to provide a peaked portion adjacent the vertical plane of said escapement bars.

4. The device of claim 1 wherein said picker fingers are movable in a guide channel, said guide channel being fixed to the framework and being convexely curved at a predetermined position intermediate its length whereby when said fingers move across the curved predetermined position, they are moved vertically upward and out of engagement with said endmost article.

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