United States Patent

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Rochester, N.Y.

[54] **ARTICLE DESTACKING APPARATUS**
6 Claims, 3 Drawing Figs.

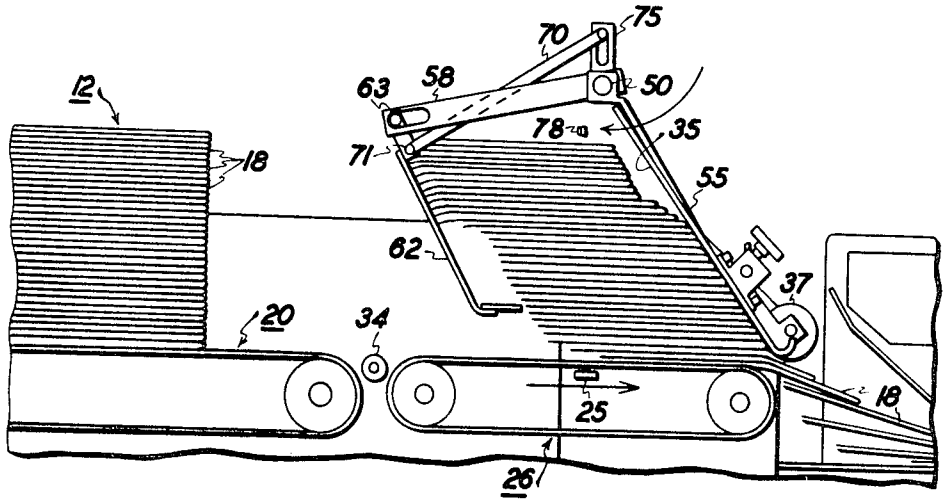
[52] **U.S. Cl.** ..... **271/35,** 214/8.5 B
[51] **Int. Cl.** **B65h 3/04,** B65g 59/12
[50] **Field of Search** ..... 271/35, 37, 38, 18, DIG. 7; 214/8.5 A, 8.5 B, 8.5 G, 8.5 SS

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ABSTRACT: Apparatus for destacking a stack of articles for subsequent handling, the apparatus including a displaceable destack arm arranged to intercept the oversized portion of an article stack; a stack support arm spaced upstream of the destack arm, the stack support arm being normally held out of the path of movement of the article stack; and means responding to contact of the oversized stack portion with the destack arm to move the stack support arm into supporting position behind the article stack to support the stack during destacking thereof.



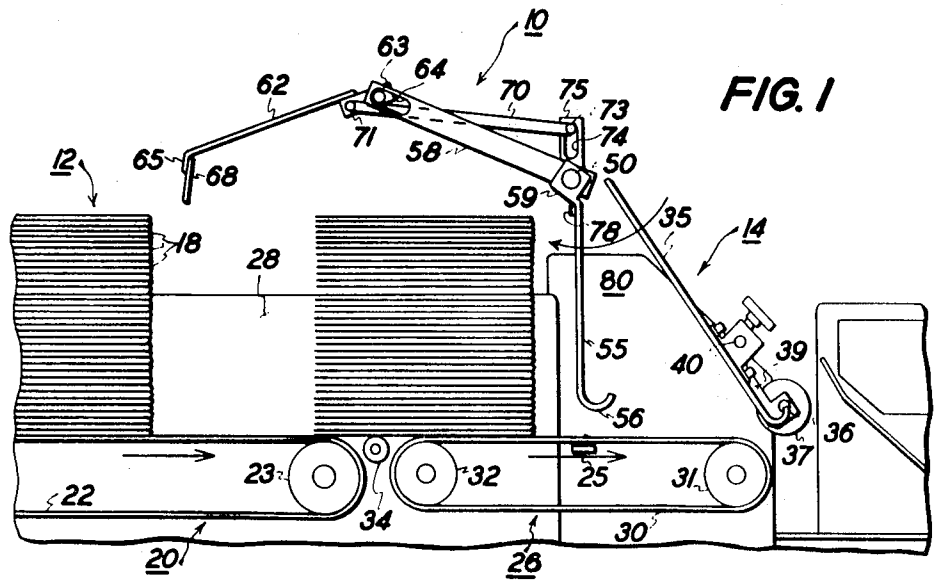


FIG. 1

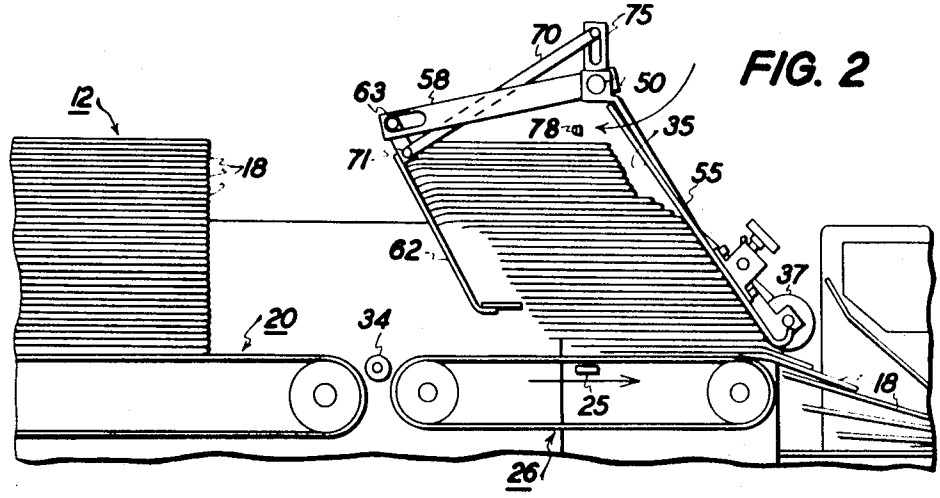


FIG. 2

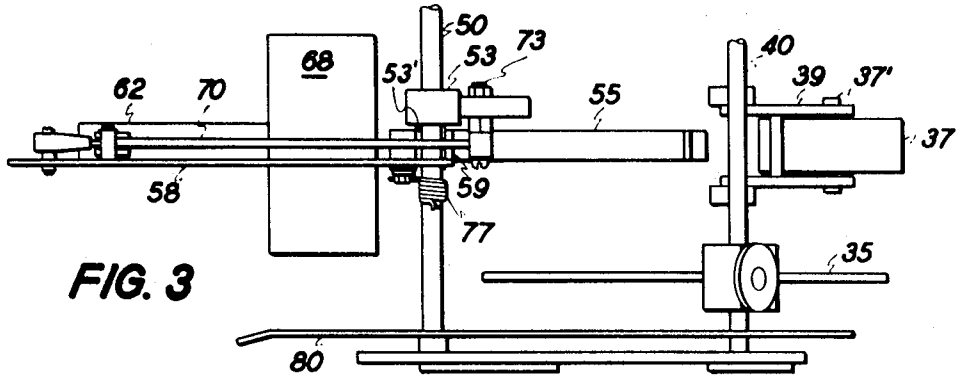


FIG. 3

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ARTICLE DESTACKING APPARATUS

The invention relates to an apparatus for handling oversized article stacks, and more particularly, to an apparatus for destacking such article stacks to facilitate subsequent handling thereof.

In article processing systems such as systems for addressing or labeling articles for mailing, the supply of articles is often in the form of stacks. Where the articles are to be individually processed, for example, addressed, the article supply stack is reduced or broken down into the individual articles. One way of doing this is to rearrange the articles into overlapping or shingled relationship one with another. Unfortunately, the size of the article stack which most shingling devices can handle is limited since the lateral displacement of the articles one upon the other effected by the shingling device may so unbalance the article stack that the stack collapses with the topmost articles turned over end for end. Usually this condition results in an article jam at the shingling device or downstream thereof in the article processing system. It may also result in some articles being processed on their wrong side.

It is a principal object of the present invention to provide a new and improved article destacker.

It is a further object of the present invention to provide an improved article destacker effective to reduce the overall height of an article supply stack without disrupting the article order.

It is a further object of the present invention to provide a destacking apparatus for article supply stacks incorporating means to automatically support the article supply stack against undesired collapse while the articles are being destacked.

It is an object of the present invention to provide an article destacker with a stack support member and means to move the stack support member into a stack supporting position in response to engagement of the article stack with the destacker destacking means.

This invention relates to an apparatus for reducing the size of an oversized stack of articles to facilitate handling thereof, the combination comprising, article conveying means for carrying the article stack forward; at least one destacking member arranged above the conveying means so as to intercept the oversized portion of the article stack and offset articles comprising the oversized stack portion relative to one another into partially shingled relationship whereby the overall size of the stack is reduced, the destacking member permitting the conveying means to carry the remainder of the stack forward underneath the destacking member; and at least one stack supporting member adapted to support the trailing side of the article stack while the size of the article stack is reduced so as to prevent undesired changes in article orientation.

Other objects and advantages will be apparent from the ensuing description and drawings in which:

FIG. 1 is a side view in section showing the article destacking apparatus of the present invention in the ready position;

FIG. 2 is a side view in section of the destacking apparatus shown in FIG. 1 in article destacking position; and

FIG. 3 is an enlarged top plan view of the destacking apparatus of the present invention.

Referring to the drawings there is shown the destacker **10** of the present invention. As will appear, destacker **10** serves to reduce the size of an oversized article stack **12** to facilitate subsequent handling thereof. Destacker **10** may be used in an article labeling system wherein articles such as newspapers **18**, conveniently supplied in the form of stacks **12**, are fed forward in seriatum to an automatic addressing machine (not shown) for addressing thereof. To facilitate handling of newspapers **18** by the addressing machine, a shingling mechanism **14** is provided, shingling mechanism **14** serving to reduce the stack **12** of newspapers to overlapping or shingled form.

While the shingling mechanism **14** is intended to operate with stacked article input, the stack height which the shingling mechanism **14** can effectively accommodate is limited. Where the stack height is too great, as with oversized stacks **12**, the lateral displacement of the articles making up the stack by shingling mechanism **14** may so unbalance the stack that the upper articles thereof tumble backwards onto conveyor **26** turning over end for end. This results in the articles being addressed on the wrong side thereof. And where articles such as newspapers **18** are being handled, the newspapers are normally fed folded end first. If turned over such that the open or looseleaf end of the newspapers is first, the shingling mechanism **14** or the other newspaper handling components of the system may tear or rip the newspapers and cause resultant jamming of the system. To obviate such undesired effects where large or oversized article stacks are supplied, the destacker **10** of the present invention is provided upstream of shingling mechanism **14**.

The supply of articles **18**, arranged in the form of stacks **12**, is carried on supply conveyor **20** upstream of destacker **10** and shingling mechanism **14**. Conveyor **20** has one or more endless feed belts **22** stretched across suitable supporting rollers **23** (only one of which is shown in the drawing) and is intermittently operated by suitable means (not shown) to advance the supply stacks **12** one at a time forward onto article conveyor **16**. A suitable demand switch **25** may be provided adjacent article conveyor **26**, switch **25** responding to a minimum supply of articles **18** on conveyor **26** to operate conveyor **20** and bring the next stack forward. Side guides **28** may be provided to prevent article stacks **12** from falling off supply conveyor **20**.

Article conveyor **26**, downstream of supply conveyor **20**, includes one or more endless feed belts **30** stretched across drive and idler rollers **31**, **32** respectively. Drive roller **31** is driven by a suitable motor means (not shown) in response to the demand of the system for articles.

A suitable bridging roller **34** may be provided between supply and article conveyors **20**, **26** respectively to facilitate carryover of stacks **12** from conveyor **20** to conveyor **26**. It is understood that conveyors **20**, **26** include suitable framework (not shown) to support conveyors **20**, **26** from the ground.

In order to control the feed of articles to the system, the article shingling mechanism **14** is provided proximate the discharge end of article conveyor **26**. Shingling mechanism **14** includes a shingling gate pair **35** suitably supported at a predetermined angle above the surface of article conveyor **26** on shaft **40** carried by the article conveyor framework (not shown). The distance between the bottom **36** of gates **35** and the upper surface of conveyor **26** as well as the angle of inclination of gates **35** is chosen to provide the desired shingling effect for the articles being handled, such as newspapers **18**. Desirably, the supporting mechanism for gates **35** includes means to provide incremental angular and height adjustment of gates **35**.

Preferably, an article control roller **37** is provided adjacent shingling gates **35**. Roller **37** is supported between the pair of shingling gates **35**, the bearing **37'** thereof being carried by depending arms **39**. Arms **39** are in turn journaled from shaft **40** such that roller **37** rests by its own weight on the articles passing therebelow. Suitable bias means (not shown) may be provided to augment the weight of roller **37**.

In operation of the shingling mechanism **14**, the stack of articles carried forward on article conveyor **26** contact the fixed shingling gates **35**, which impede the continued forward movement of the article stack. Due to the angular disposition of gates **35**, the successive articles comprising the stack are displaced laterally relative to one another to a partially overlapping condition. At the same time, the sustained operation of article conveyor **26** carries the lowermost articles forward underneath the lower end **36** of shingling gates **35** with the result that the overall height of the stack is decreased. The articles fed forward overlap or are shingled one upon the other as they pass underneath gates **35**.

Destacker **10** is supported from a shaft **50** which is suitably mounted a predetermined height above article conveyor **26** on

the conveyor frame (not shown). A clamp member **53**, supported on shaft **50** at approximately the midpoint thereof, has an upwardly projecting support arm **75**. Support arm **75** has a slotlike aperture **74** therein within which mounting pin **73** is secured, it being understood that the slotted configuration of aperture **74** permits the position of mounting pin **73** on support arm **75** to be adjusted. It is understood that clamp member **53** itself is releasable to permit the angular position of clamp member **53** on supporting shaft **50** to be adjusted.

Clamp member **53** preferably includes a bearing collar **53'** on which a support **59** is journaled for rotation about the axis of shaft **50**. Depending destack arm **55** is secured to support **59** by suitable means (not shown).

Preferably, lower end **56** of destack arm **55** is curved in the direction of article movement to facilitate movement of articles **18** thereunder.

A rearwardly extending link **58** is attached to support **59** by suitable means (not shown). The length of link **58** is sufficient to accommodate the length of the articles **18** being destacked.

A stack support arm **62** is pivotally carried by link **58** from the rear portion thereof as by mounting pin **63**. To permit the destacker **10** to accommodate various length articles, a longitudinally extending adjusting slot **64** is provided in link **58** for mounting pin **63**.

End **65** of support arm **62** has an inturned shovellike member **68** secured thereto. As will appear, stack support arm **62** is adapted to move behind the stack **12** of articles being destacked, with the shovellike member **68** thereof slightly underneath the lower articles.

As best seen in FIGS. **1** and **2**, stack support arm **62** moves from a raised or neutral position to a lowered or operative position behind the stack during the destacking operation. To operate stack support arm **62**, a control link **70** is provided, link **70** being connected between the stationary clamp member **53** and stack support arm **62** by mounting pins **73, 71** respectively. As can be seen, control link **70** cooperates with support arm **75**, link **58** and stack support arm **62** to effectively form a four bar or parallelogram-type linkage serving on rotation of destack arm **55** to swing stack support arm **62** through a predetermined arc.

A suitable torsion spring **77** is provided to bias destack arm **55** in a clockwise direction shown by the solid line arrow in FIGS. **1** and **2** of the drawings. Stop **78** is provided to limit movement of destack arm **55** in the clockwise direction. As can be seen in FIG. **1**, spring **77** and stop **78** cooperate to hold destack arm **55** in a substantially vertical position. With destack arm **55** in the position shown in FIG. **1**, the aforedescribed linkage including control link **70** cooperate to hold stack support arm **62** in a raised position out of the path of stacks **12**.

To obviate the possibility of articles **18** slipping off article conveyor **26**, upstanding side guides **80** are provided along the opposite sides of conveyor **26** at the destacking position.

A demand for articles is responded to by switch **25** which actuates supply conveyor **20**. Conveyor **20** feeds the supply stacks **12** forward, the foremost of which passes over bridging roller **34** onto article conveyor **26**. Conveyor **26** carries the stack forward underneath destacker **10**, the destack arm **55** of which is disposed in the stack intercepting position shown in FIG. **1** by spring **77**. It is understood that switch **25** responds to the supply of articles on conveyor **26** to shutdown supply conveyor **20**.

As conveyor **26** brings the stack **12** forward, the leading edge thereof contacts destack arm **55** and swings arm **55** in a counterclockwise direction about shaft **50** against the bias of spring **77**. Link **58**, which is carried by destack arm support **59**, is similarly moved to carry stack support arm **62** downwardly and forwardly into position behind the stack and prevent the topmost articles of the stack from falling downward onto the article conveyor **26**. The stack **12** carries the destack arm **55** forward until the leading edge of the stack contacts gates **35** of shingling mechanism **14** which inhibit further forward movement of the stack proper. At this point, destack arm **55** is substantially parallel with shingling gates **35** as seen in FIG. **2**.

The continued movement of article conveyor **26** carries the lower articles of stack **12** forward under destack arm **55** and shingling gates **35** to provide a shingled article output at the discharge side of article conveyor **26**. At the same time, the articles comprising stack **12** are laterally offset relative to one another through engagement of their leading edges with destack arm **55** and shingling gates **35** so that the entire stack is arranged in a substantially shingled form. Stack support arm **62**, disposed behind and partially underneath the article stack, prevents the topmost articles of the stack from falling down onto the conveyor **26**.

While the invention has been described with reference to the structure disclosed, it is not confined to the details set forth, but is intended to cover such modifications, or changes as may come within the cope of the following claims.

I claim:

1. In an apparatus for reducing the size of an oversized stack of articles to facilitate handling thereof, the combination of,

article conveying means for carrying said article stack forward;

at least one destacking member arranged above said conveying means so as to intercept the oversize portion of said article stack and offset articles comprising said oversized stack portion relative to one another into partially shingled relationship whereby the overall size of said stack is reduced, said destacking member permitting said conveying means to carry the remainder of said stack forward underneath said destacking member as said stack overall size is reduced, and

at least one stack supporting member adapted to support the trailing side of said article stack while the size of said article stack is reduced so as to prevent undesired changes in article orientation.

2. The apparatus according to claim **1** including means mounting said stack supporting member for movement from a neutral position out of the path of movement of said stack to a stack supporting position behind said stack trailing edge and,

means responsive to interception of said stack oversized portion by said destacking member for moving said stack supporting member into said stack supporting position.

3. The apparatus according to claim **2** including means supporting said destacking member for limited movemment by said stack form a stack intercepting position to a destacking position; said stack supporting member moving means comprising said destacking member.

4. The apparatus according to claim **3**, including means for returning said destacking member to said stack intercepting position and said stack supporting member to said neutral position on reduction of said article stack to a predetermined normal size.

5. An apparatus for reducing the size of a stack of articles to facilitate handling thereof, comprising,

a destacking member adapted to be disposed in the path of movement of the stack of articles at a predetermined height above the lowermost article of said stack such that any portion of said stack above said predetermined height is intercepted by said destacking member;

means supporting said destackimg member for limited lost motion in the direction of movement of the stack from a stack intercepting position to a destacking position;

a stack supporting member upstream of said destacking member and normally positioned out of the path of said stack so as to permit said stack to pass thereby unimpeded toward said destacking member;

means supporting said stack supporting member for movement into a position behind the stack; and

means drivingly connecting said stack supporting member with said destacking member such that movement of said destacking member from said stack intercepting position to said stack destacking position moves said stack supporting member behind said stack whereby to support the

articles comprising said stack against undesired reorientation while said articles are being destacked.

6. In an apparatus for handling stacks of articles, the combination of:

means for conveying said stacks along a predetermined path;

means disposed astride said predetermined path to intercept the portion of any stack above a preset height;

means supporting said intercept means for movement so that contact of a stack with said intercept means moves said intercept means therewith;

stack support means adapted to move into supporting position behind any stack intercepted by said intercept means to support the intercepted stack upper portions against excessive rearward displacement while said stack is in contact with said intercept means; and

means operatively connecting said stack support means with said intercept means such that movement of said intercept means following contact thereof with a stack moves said support means into supporting position behind said stack.

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