United States Patent [19]

Stobb

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[45] **Feb. 18, 1975**

[54] **SHEET STACKING AND PILE SEPARATING APPARATUS AND METHOD**

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[73] Assignee: **Stobb, Inc.**, Clinton, N.J.

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[52] **U.S. Cl.** ..... **214/8.5 SS**, 271/186, 271/212

[51] **Int. Cl.** **B65g 59/06**

[58] **Field of Search** ..... 214/6 S, 8.5 SS; 271/185, 271/186, 212

[56] **References Cited**

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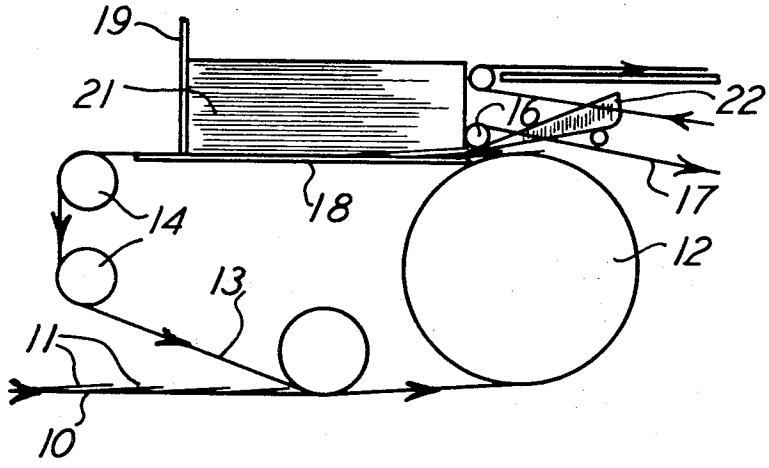
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Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Gene A. Church
Attorney, Agent, or Firm—Arthur J. Hansmann

[57] **ABSTRACT**

A sheet stacking and pile separating apparatus and method, wherein a conveyor supports and moves sheets in an imbricated stream relation and onto a stacking platform. A stop strips the sheets from their stream relation and stacks them on the platform. A sheet combined separator and stack displacer member is disposed adjacent the stream and moves into the stack to divide the stack into an end pile which is subsequently moved off the stack. A counter is disposed adjacent the stream for counting the sheets, and control members and switches are utilized for moving the separator member into the stack when a certain number of sheets have been accounted for and constitute the end pile to be separated. A retainer or stripper member is disposed adjacent the stack for holding the remainder of the stack when the end pile is removed, and the end pile is placed onto a transfer conveyor. The separator member is under the control of a cylinder and piston assembly which moves the separator into the stack and which withdraws the separator member and the end pile from the remainder of the stack, as mentioned.

22 Claims, 10 Drawing Figures



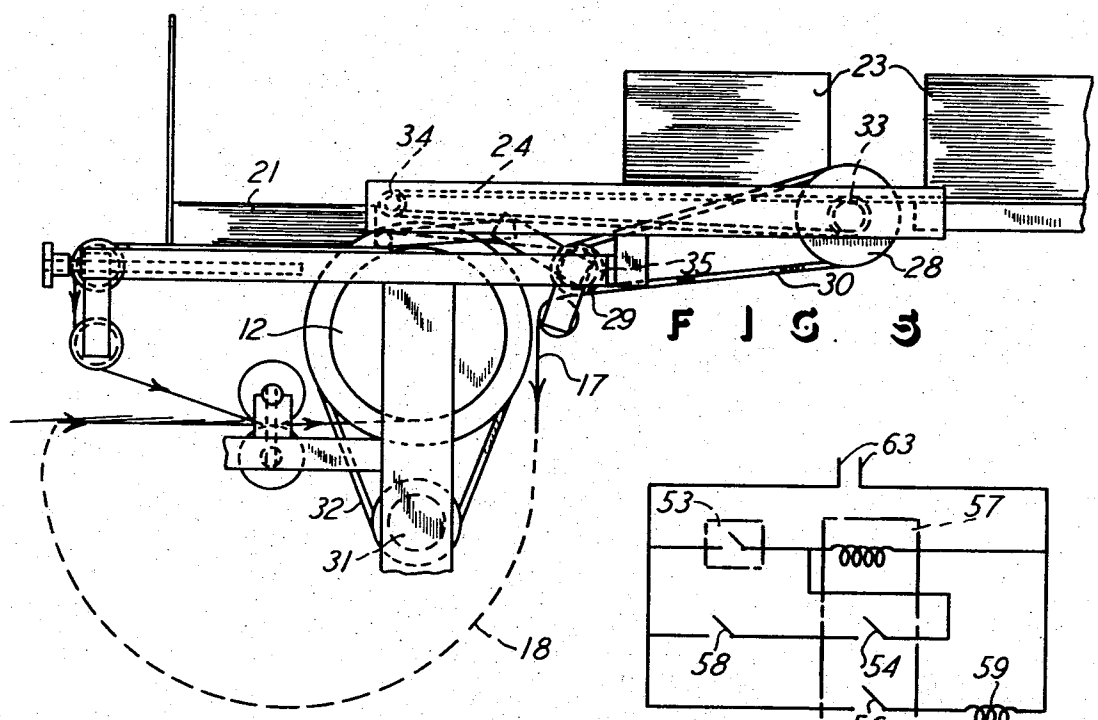


FIG. 5

FIG. 9

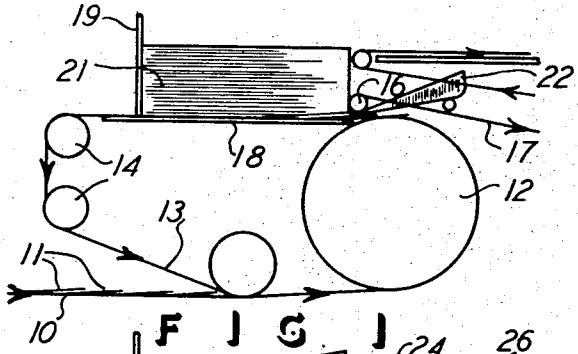


FIG. 1

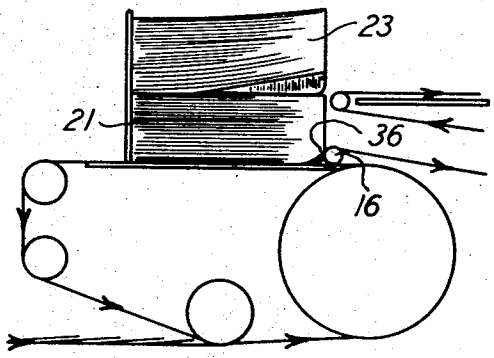


FIG. 3

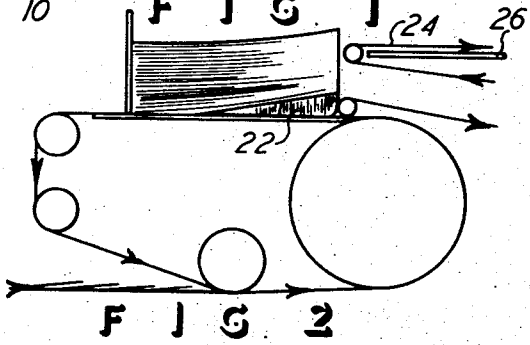


FIG. 2

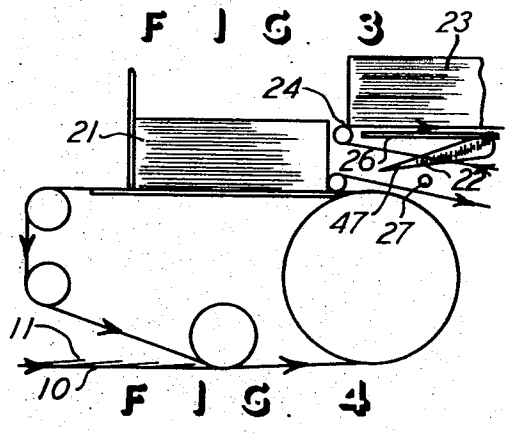


FIG. 4

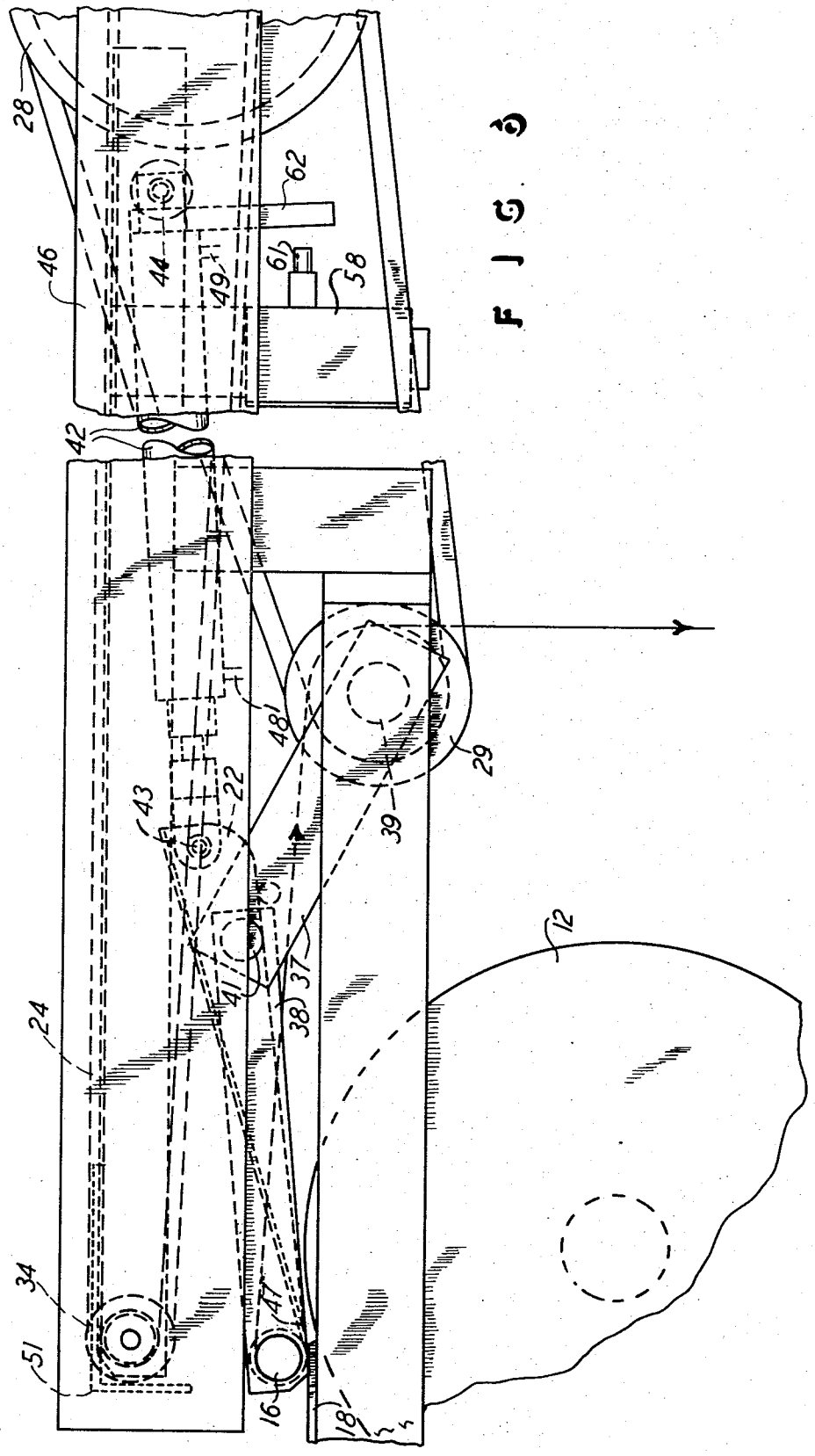


FIG. 3

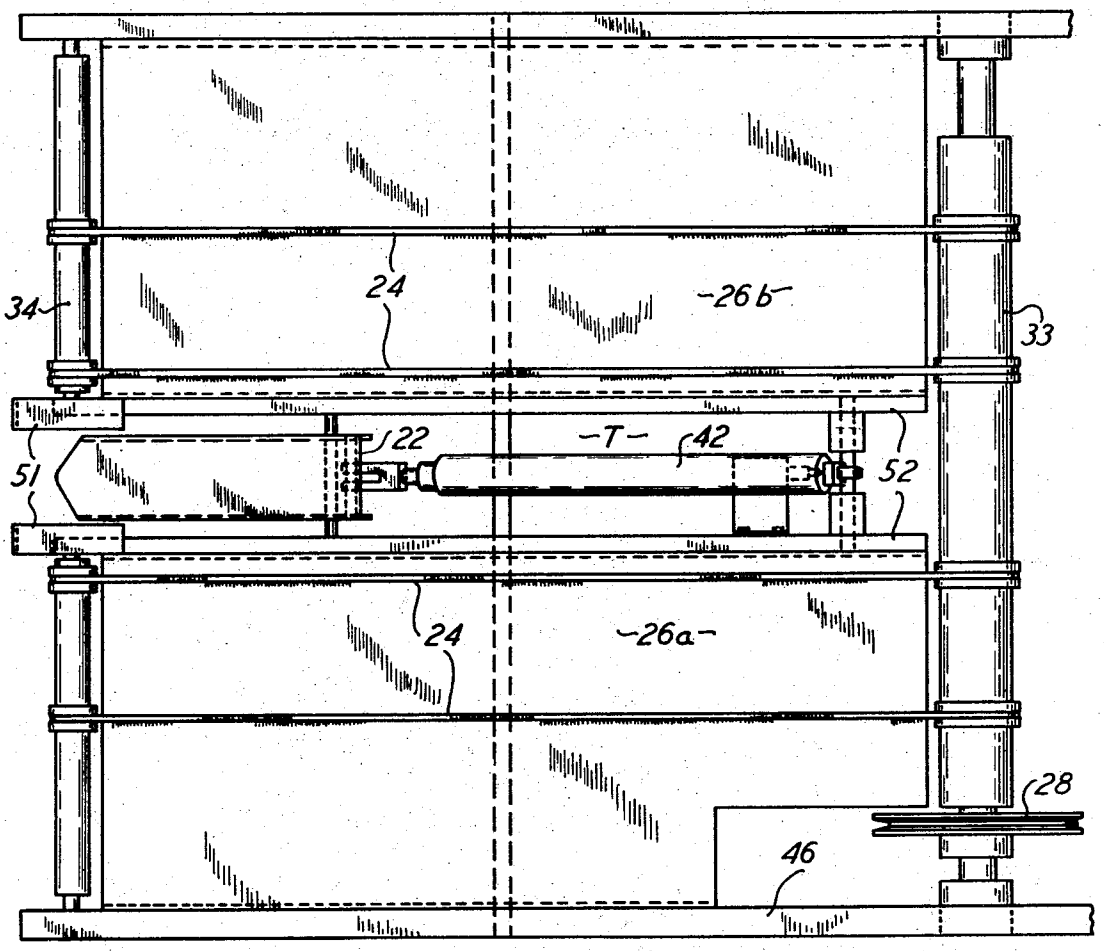


FIG. 7

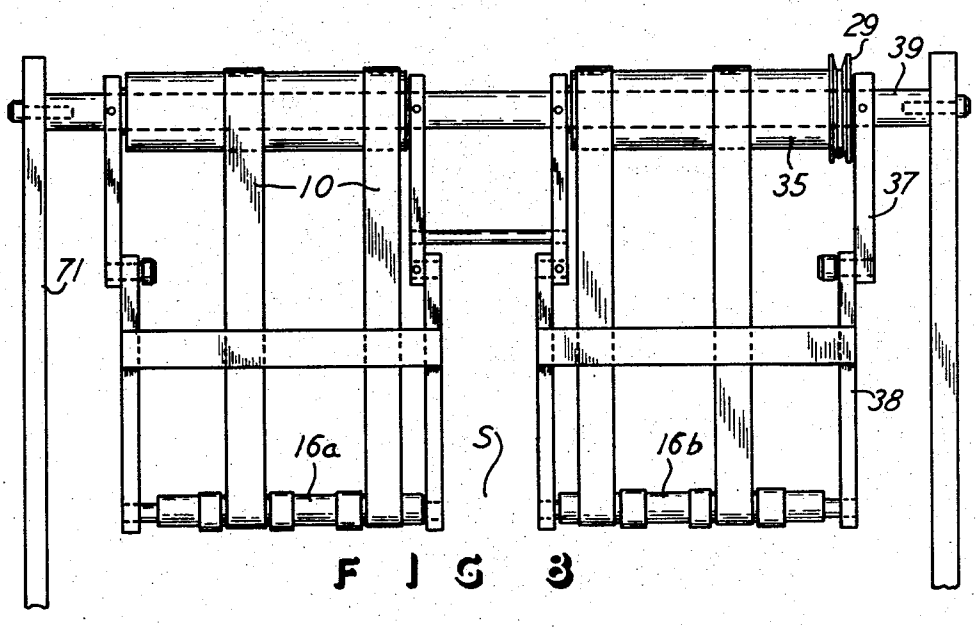
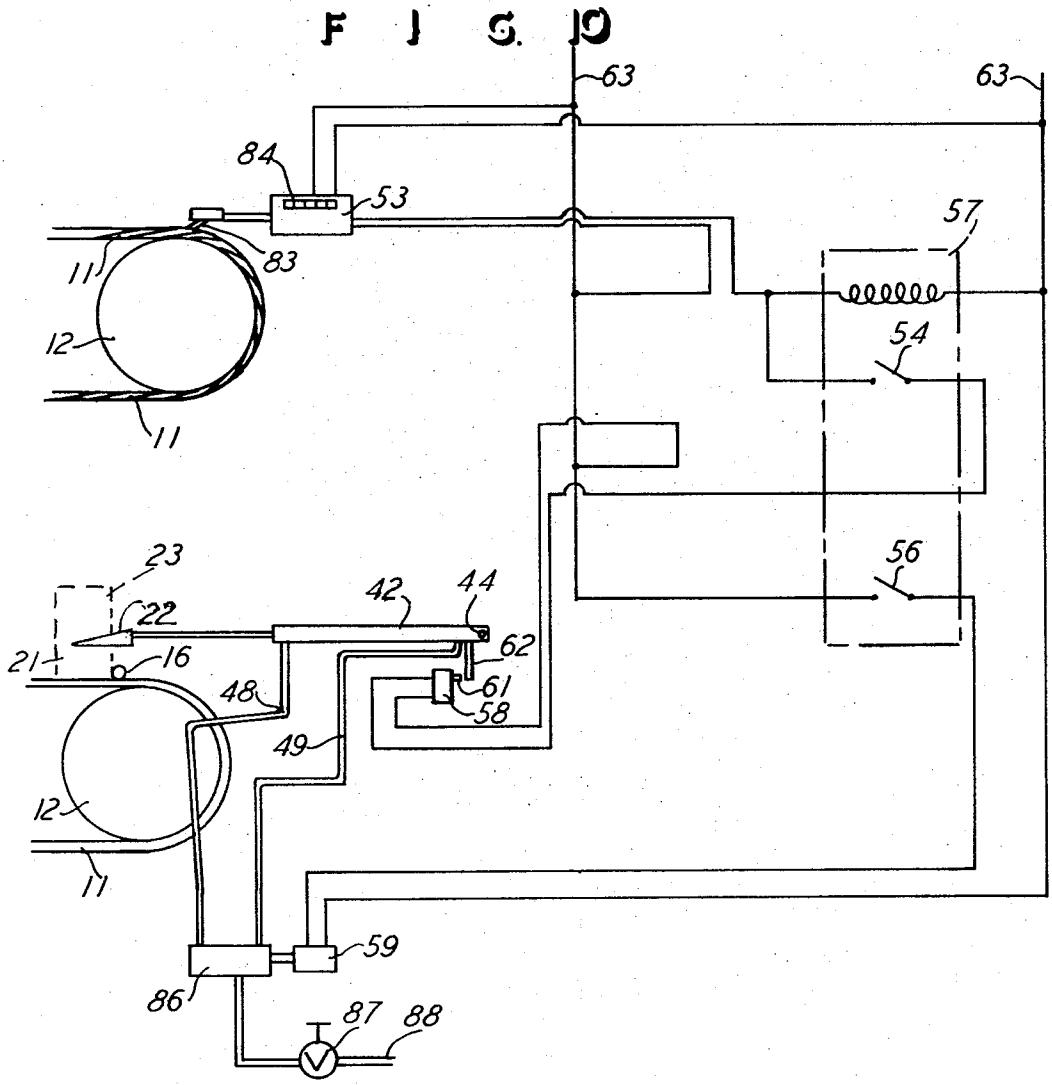


FIG 8

FIG. 10


63
63
84
53
57
83
11
12
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23
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44
22
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21
16
61
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SHEET STACKING AND PILE SEPARATING APPARATUS AND METHOD

This invention relates to a sheet stacking and pile separating apparatus and method, and, more particularly, it relates to stacking and separating of sheets which are deposited in a stream relation onto a conveyor by a printing press or a folder, and the sheets are moved by the conveyor and are then collected in a stack and are counted and separated into piles of selected numbers of sheets.

BACKGROUND OF THE INVENTION

The sheet collecting and stacking art is already aware of various apparatus and methods for supporting and moving sheets in an imbricated or shingled stream and then stripping the sheets off the stream to position them in a stack which can be removed, usually by hand. These prior art devices and methods commonly utilize a drum which is rotatable about a horizontal axis for directing and guiding the stream of sheets around the drum and up to a stack platform where the sheets are stripped from the stream and formed in a vertically growing stack. One example of such prior art is disclosed in U.S. Pat. No. 3,188,082, and another example is found in U.S. Pat. Re-issue No. 26,004, and these two patents show the conveyance of sheets and the subsequent stacking of the sheets in a substantially upwardly growing stack.

In addition to the aforementioned patents showing examples of the stacking of a stream of sheets, the prior art has also been concerned about the separation of selected portions of the stack of sheets. One example of that is shown in U.S. Pat. No. 2,233,850 where relatively elaborate mechanism is utilized for collecting the imbricated stream in separated piles or stacks.

Still further, the prior art has also already utilized devices for counting the sheets, or regulating the size of a stack of sheets, prior to removing that stack from the collecting platform. Still further, the prior art has utilized apparatus for interrupting the flow of the stream of sheets to collect and stack a certain number of the sheets, and then permit the flow of sheets to continue, and U.S. Pat. Nos. 3,149,834 and 3,194,127 show the counting apparatus and the interrupting apparatus mentioned above.

Thus, the prior art is concerned with the collecting of sheets in piles or stacks of certain quantities of the sheets, and it is also concerned with separating a stack into end piles or smaller stacks for removal from the main stack. In doing this, the prior art has utilized separator blades wherein the stack moves into the blade for effecting the separation, such as seen in U.S. Pat. Nos. 3,055,516 and 3,206,042. Still further, the prior art is aware of the arrangement wherein a blade moves into a stationary stack, and examples of this are found in U.S. Pat. Nos. 3,690,476 and 3,017,041 and 3,672,516.

In the aforementioned prior art examples, the concern is to collect the sheets in a stack but to have the sheets counted and separated into stacks of selected numbers of sheets, and to do this in an automatic fashion. Of course there have been manual operations where a person can insert a separator or can remove a portion of the stack manually, but the present invention is concerned with an automated system where an accurate number of sheets can be separated from the collected stack of sheets, and this is the primary object of this invention.

Another object of this invention is to provide apparatus and a method for stacking and then separating a portion of the stack into a specified or selected number of sheets and to do so with efficient and inexpensive but yet highly reliable apparatus and corresponding methods. Still further, in accomplishing this object, the invention described herein is adaptable to the stacking apparatus already in existence, and thus this invention is applicable to the existing apparatus, and may be an addition thereto, for performing the function of accurately counting and separating the counted pile of sheets.

Another object of this invention is to provide the aforementioned apparatus and method wherein the apparatus requires no supervision and no manual labor, and it is adjustable to separating out a selected number of sheets in each stack, and there is no damage done to the sheets which are being handled by this apparatus and method. Also, the separated stack and the remaining stack are kept in a neat form, so that they can be properly and neatly handled by other apparatus, or for the purpose of bundling or tying or whatever.

Other objects and advantages will become apparent upon reading the following description in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1** through **4** are side elevational views of an embodiment of this invention, shown somewhat diagramatically.

FIG. **5** is a side elevational view of the apparatus shown in FIGS. **1** through **4**, with parts removed and parts added thereto.

FIG. **6** is an enlarged side elevational view of the apparatus shown in FIGS. **1** through **4**, with parts removed and parts added thereto.

FIGS. **7** and **8** are top plan views of portions of the apparatus shown in FIGS. **1** through **6**.

FIG. **9** is a wiring diagram for the electrical components of the apparatus shown in FIGS. **1** through **8**.

FIG. **10** is a schematic view of the parts and the wiring diagram and electrical components of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. **1** through **4** show the arrangement of a conveyor **10** which is movable in the direction of the arrows shown thereon and which supports an imbricated stream of sheets **11** which are shown in shingled or overlapped relation with the sheet leading edges on the top of the stream in the horizontal position shown in FIG. **1**. A drum **12** is rotatably mounted, and the conveyor **10** is preferably in the form of conveyor belts which are trained around the drum and which carry the stream of sheets **11** against a conveyor belt **13**. The conveyors **10** and **13** are trained around the drum **12**, and the conveyor **13** extends around rotatable supports or pulleys **14** and moves in the direction of the arrows shown thereon. Thus the conveyors **10** and **13** are preferably in the form of endless belts which carry the stream of sheets **11** therebetween and around the drum **12**, and the conveyor **10** moves away from the drum **12** and around the roller **16**, and the conveyor **10** moves off in the section **17** and in the direction of the arrow

shown thereon. That is, FIG. 5 shows the dotted line 18 which indicates the endless nature of the conveyor 10 as its section 17 moves around to the horizontal position to again collect the sheets 11 as they are deposited onto the conveyor 10 in the usual manner, such as that shown and described in some of the patents cited herein.

The stream of sheets 11 is thus led around the drum 12 and to the top thereof and onto a stacking platform 18 which is horizontally disposed, and a stop 19 extends down to the platform and into the path of the stream of sheets to strip the sheets off their stream relation and cause them to form into the stack 21, as shown.

The aforementioned is already known in the art, and no further description thereof is necessary for one skilled in the art to understand the present teaching.

FIGS. 1 through 4 further show a combined separator and stack displacer member 22 which is disposed above the incoming stream of sheets 11 and which is movable from the position shown in FIG. 1 and to the sequential positions of FIGS. 2, 3, and 4 and back to the position shown in FIG. 1. Thus, under suitable control means which are not shown in FIGS. 1 through 5, the member 22 is positioned above the stream of sheets 11 at the top of the drum 12, as shown in FIG. 1, and the member 22 moves into the stack 21 to the position shown in FIG. 2. The stream of sheets 11 is a continuous stream and thus the sheets 11 continue to form and increase the height of the stack 21, as shown in FIG. 3, and thus an end pile or stack 23 is defined by the member 22, and the stack 21 grows in its height and the member 22 moves upwardly with the growth of the stack, as shown by FIG. 3. Finally, the member 22 is withdrawn and it thereby moves the end pile 23 to the position shown in FIG. 4 to displace the end pile 23 from the remainder of the stack 21 and to thus position the end pile 23 onto a transfer conveyor 24 which is also preferably a belt type of conveyor moving in the direction of the arrows shown thereon and having a supporting surface or platform 26, as shown. From the position of the member 22 in FIG. 4, the member falls or is lowered through an opening in the center portion of the supporting plate 26, and a support 27 can hold the member 22 upwardly while the member 22 is repositioned to the position in FIG. 1 and is ready for reinsertion into the stack for separating the next pile.

FIG. 5 shows two separated end piles 23, and it will be understood that the insertion and withdrawal of the member 22 can be timed so that the end piles 23 will all contain the same number of sheets, as desired. FIG. 5 also shows that the transfer conveyor 24 is controlled by a driven pulley 28 which is rotatably driven by a driving pulley 29 which is conventionally powered by a motor not shown. A belt 30 drivingly extends between the pulleys 28 and 29, and a roller 35 is driven by pulley 29 and the conveyor belt portion 17 is trained on roller 35. Conveyor 24 is driven through larger pulley 28 which drives a roller 33 carrying the conveyor 24, so the conveyor 24 is moved at a slower speed and thus the end piles 23 are slowly moved to have desired spacing between, as shown in FIG. 5. Also, a driving motor 31 has a driving belt 32 extending to the drum 12 for rotating the drum in the counterclockwise direction and for moving the conveyors 10 and 13 which are trained over the drum 12. Thus, the conveyors 10 and 13 can be driven in the manner described or in other manners, and the conveyor 24 can also be driven by having its pulley or roller 33 rotatable with the pulley 28 to move the conveyor 24 at a slower speed, or any other drive arrangement can be utilized for the conveyor 24 which is trained on the rollers 33 and 34, as shown.

Also, the roller 16 is disposed at the entrance of the stream of sheets 11 into the stack 21, and it is a brush roller which contacts the edges of the sheets which are in the stack 21 and causes the edges to be displaced upwardly, as shown by the edges 36 in FIG. 3, and this permits the member 22 to readily enter the stack 21, and the member 22 may move into the stack along with the movement of the stream of sheets 11. It will of course be understood that the brush roller 16 always contacts the edge of the stack and thus brushes the sheet edges 36 upwardly so that the wedge-shaped member 22 can readily enter the stack 21.

FIGS. 5, 6, and 8 show pairs of pivotal links 37 and 38 which support the brush roller 16 to position the brush roller 16 on top of the stream 11 and in contact with the stack 21 as shown and described in connection with FIG. 3. The link 37 is pivoted on the shaft 39 which supports the pulley 29, and the links 37 and 38 are pivoted together by means of the joining pin 41, as shown. These arms 37 and 38 can then be placed into adjusted position and secured in a non-pivotal position so that the brush roller 16 will bear down on the stream 11 and against the edge of the stack 21, for forcing the stream into the stack and for brushing the sheet edges 36, as mentioned.

FIG. 6 further shows that the member 22 is pivotally connected to a powered member 42 which is shown to be a cylinder and piston assembly connected to the member 22 through the pivot pin 43, and the assembly 42 is pivotally mounted at the pin 44 to the frame 46 of this apparatus. Thus the assembly 42 can pivot up and down about the pin 44, and likewise the assembly 42 and the member 22 are pivoted together so that a complete articulated assembly is provided and the leading and pointed nose end 47 of the member 22 is thus positioned as shown and described so that is can move into the stack 21 as mentioned. That is, extension of the assembly 42 will cause the member 22 to move into the stack and into the position shown in FIG. 2, and the pivot pins 43 and 44 will permit the member 22 to ride upwardly with the stack, to the position shown in FIG. 3. Finally, contraction of the assembly 42 will withdraw the member 22 and the end pile 23, to the position shown in FIG. 4. Therefore, the cylinder and piston assembly 42 are shown to be a double-acting type having fluid inlet and fluid outlet hoses 48 and 49, arranged in the conventional manner for the fluid assembly shown.

To permit the movement of the parts and the performance of the method previously described, the brush roller 16 and the supporting plate 26 are both discontinuous so that the member 22 and the cylinder assembly 42 can move in the manners described. That is, FIG. 8 shows the brush roller 16 is actually in two axially spaced apart sections 16*a* and 16*b*, to provide the center space designated S through which the member 22 can move in making the cycle described in connection with FIGS. 1 through 4. FIG. 7 shows the support plate 26 to be in two sections 26*a* and 26*b* and having the space designated T therebetween for the movement of the cylinder assembly 42 and the member 22. Also, it will be seen that the member 22 is a narrow

member and occupies only a small fraction of the entire width of the sheets **11** which can be as wide as spanning all four of the transfer conveyor belts **24** as seen in FIG. **7.** FIGS. **6** and **7** further show that abutment or stripper members **51** are fixedly disposed on the portions **52** of the apparatus frame and are available for engaging the remainder of the stack **21** when the upper end pile **23** is being withdrawn from the stack.

It should also be understood that the member **22** may be moved into the stack **21** either at the speed of the incoming stream or at a faster speed, if desired, and there could be controls operative on the member **22** for the speed of the movement, and also for the timing of the movement so that when a certain number of sheets are in the end pile section **23,** as determined either by count or by pile height, then the member **22** would be inserted into the stack. FIG. **9** shows a diagramatic view for achieving this, and there could be a sheet counter switch which is designated **53,** and when the counter switch **53** is closed it makes only a momentary electric contact and switches **54** and **56** will also then close as these switches are internal to the entire relay which is designated **57.** The switch **54** is of a nature to serve as a holding circuit and another switch **58** is then also closed. A solenoid valve coil **59** is also in the circuit, and, when the switches are closed, the solenoid valve **59** is closed and this valve controls a fluid supply for the cylinder assembly **42** to thus cause flow into the line **49** and to advance the member **22** into the stack. Switch **58** is thus held closed as the member **22** rides up to the position shown in FIG. **3.** At that time, the switch **58** is tripped open, and this opens the holding circuit described and causes the cylinder assembly **42** to retract and move to the position shown in FIG. **4.** To do this, FIGS. **6** and **7** show the switch **58** to be mounted adjacent the cylinder assembly **42** and to have a switching button **61** in the path of movement of the arm **62** affixed to the assembly **42** such that when the assembly **42** is pivoted upwardly, the arm **62** contacts the button **61** to open the switch **58** and cause the retracting action described. It will now be understood that the switch **58** will not be tripped until the member **22** is above the transfer support **26** and its conveyor **24,** so that the end pile **23** will be placed on top of the transfer members **24** and **26,** as shown in FIG. **4.** It will also be understood that the switches **53, 54,** and **56** are normally open switches and the switch **58** is a normally closed switch, and FIG. **9** shows the power line **63** which can carry a 115 volt single-phase 60-cycle current. Also, the counter used can be a Durant brand predetermining batch counter, series No. 2,000, and the solenoid valve can be a Bachman brand No. MS-45, and the switch **58** can be a micro switch No. BZ-2RQ-A2.

FIG. **10** diagramatically and schematically further shows the apparatus with the controls and switches, and it will be noted that the switch **53** is a counter switch and has a counter member **83** which is shown on the stream of sheets **11** for counting the sheets in the stream of sheets **11,** and it also has a digital display means at **84** for showing the count of the sheets. This counter, generally designated **53,** can be a conventional type, such as that already mentioned, and it is shown connected electrically to the power line designated **63.** FIG. **10** also shows the relay **57** and the two switches **54** and **56** and it shows the micro switch **58.** The switch **56** is shown connected to the solenoid valve or member **59** which controls the supply of fluid to the flexible fluid lines **48** and **49** through the diverting block or fluid valve **86** which can be of a conventional construction. Further, a fluid regulator valve **87** is shown connected in the fluid line **88** for controlling the flow of fluid passing through the valve **87** and into the lines **48** and **49** for controlling the speed of insertion and retraction of the member **22,** all according to the setting of the valve **87,** and preferably the system works with compressed air so that the flow of the air through the valve **87** can be controlled to control the speed of movement of the member **22.** With the arrangement described, the counter **53** is one which can be and would be set for a certain number of sheets to be registered on the counter and then the counter switch would close and actuate the circuit in the manner previously described. The count sensor or finger **83** can be one made by the company Eburn Inc., and the electronic digital counter member **53** is the one made by the company Durant Inc., as previously mentioned.

The foregoing description includes the description of the apparatus and the method and it will therefore be understood that the method includes the steps of supporting and conveying the imbricated stream of sheets **11** and collecting the stream in a stack **21** and positioning the member **22** adjacent the stack and inserting the member **22** into the stack and then retracting the member **22** with the separated end pile **23** of the sheets. Also, the method includes the engagement of the remainder of the stack by the stripper members **51,** for retaining the remainder of the stack in a neatly aligned stack when the end pile is being separated and placed onto a transfer conveyor, all as described herein.

What is claimed is:

1. A sheet stacker and pile separator apparatus comprising a conveyor for supporting sheets in a horizontal orientation and an imbricated relation and moving said sheets in a stream relation in the direction of the imbrication, a stop disposed at the downstream end of the stream in the path of movement of said sheets for stripping said sheets from their stream relation and causing them to form a stack of said sheets, a stack platform disposed adjacent said stop for receiving and supporting said stack, a combined separator and stack displacer member movably mounted directly above the stream and being movable along with said stream for movement of said member into said stack in the direction of movement of the stream of sheets and thereby separating the end of said stack into an end pile of said sheets, and a powered member connected to said combined separator and stack displacer member for displacing said end pile from the remainder of said stack.

2. The sheet stacker and pile separator apparatus as claimed in claim **1,** wherein said combined separator and stack displacer member includes a pointed nose portion in contact with the stream for riding on said stream and into said stack, said combined separator and stack displacer member and said powered member being articularly mounted for positioning said combined separator and stack displacer member on said stream and for movement of the latter said member in the direction of the growth of said stack.

3. The sheet stacker and pile separator apparatus as claimed in claim **1,** wherein said powered member is a cylinder and piston assembly articularly connected to said combined separator and stack displacer member.

4. The sheet stacker and pile separator apparatus as claimed in claim 1, including power controls operatively connected to said powered member for synchronizing the movement of said combined separator and stack displacer member into said stack according to the quantity of said sheets moving into said stack, for defining a selected quantity of said sheets in said end pile.

5. The sheet stacker and pile separator apparatus as claimed in claim 1, including a movable transfer support disposed adjacent said stack for receiving said end pile, and power controls operatively connected to said powered member for moving said combined separator and stack displacer member and said end pile to said transfer support.

6. The sheet stacker and pile separator apparatus as claimed in claim 5, wherein said transfer support has an opening therein and provides support surfaces for said sheet pile on opposite sides of said opening, and said combined separator and stack displacer separator member is of a width less than that of said opening for movement of the latter said member through said opening in the depositing of said end pile on said support surfaces.

7. The sheet stacker and pile separator apparatus as claimed in claim 5, wherein said movable transfer support includes spaced-apart conveyor belts for moving said end pile away from the remainder of said stack.

8. The sheet stacker and pile separator apparatus as claimed in claim 5, wherein said powered member is a cylinder and piston assembly pivotally mounted directly above said stream of sheets for pivotal movement in accordance with the growth of said stack, and said power controls including a switch mounted adjacent said assembly and having a trip member engageable with said assembly when said assembly pivots to a selected position, said switch being operatively connected with said assembly for controlling the operation of said assembly when tripped by the pivotal action of said assembly.

9. The sheet stacker and pile separator apparatus as claimed in claim 1, including two spaced-apart brush rollers rotatably disposed at the entrance of said stream to said stack for moving the edges of said sheets in said stack away from said stream to form an opening for the insertion of said combined separator and stack displacer member into said stack, and said combined separator and stack displacer member being of a width less than the dimension of the spacing between said rollers for movement of the latter said member between said rollers.

10. The sheet stacker and pile separator apparatus as claimed in claim 1, including a sheet counter disposed adjacent said stream for counting the sheets moving in said stream, and trippable controls operatively associated with said powered member to actuate said powered member and move said combined separator and stack displacer member relative to said stack, said counter and said trippable controls being operatively connected together for operatively tripping said trippable controls in accordance with the number of said sheets counted by said counter.

11. The sheet stacker and pile separator apparatus as claimed in claim 10, wherein said counter and said separator member are disposed in contact with said sheets in said stream, and said combined separator and stack displacer member includes a pointed end for movement with said stream into said stack.

12. The sheet stacker and pile separator apparatus as claimed in claim 1, wherein said powered member is a cylinder and piston assembly, a fluid valve operatively connected with said assembly for actuation of the latter, a first switch operatively connected with said valve for controlling the latter in the insertion of said combined separator and stack displacer member into said stack, a second switch operatively connected with said valve for controlling the latter while said combined separator and stack displacer member is in said stack, and a third switch operatively connected with said valve for controlling the latter for the movement of said combined separator and stack displacer member and said end pile away from the remainder of said stack, and connectors extending between all said switches to have all said switches interconnected with each other.

13. The sheet stacker and pile separator apparatus as claimed in claim 12, wherein said third switch is a trippable switch disposed adjacent said assembly in the path of movement of said assembly to be actuated by movement of said assembly in the growth of the stack.

14. The sheet stacker and pile separator apparatus as claimed in claim 1, including controls operatively connected with said powered member for actuating the latter and thereby inserting said combined separator and stack displacer member into said stack, said controls including a timing member for operation of said powered member in accordance with the speed of movement of said stream.

15. The sheet stacker and pile separator apparatus as claimed in claim 1, including a stripper member disposed adjacent said stack for engaging said remainder of said stack when said end pile is being removed.

16. Apparatus for performing the steps of stacking sheets and then separating an end pile of the sheets from the stack, comprising means for supporting and moving sheets in an imbricated relation of a horizontally disposed stream of said sheets and with the trailing edge of the said sheets which are on top of the stream being spaced from the trailing edge of the said sheets which are on the bottom of the stream and with the said top sheets being in the forward direction of stream movement, means for stripping said sheets off their stream relation and forming said sheets into a stack, means for dividing said stack to form an end pile of said sheets, and means for positioning said dividing means on the top of said stream in contact with said stream between said trailing edges and subsequently inserting said dividing means into said stack along with the movement of said stream into said stack to define said end pile and subsequently moving said dividing means and said end pile away from the remainder of said stack.

17. A sheet stacker and pile separator apparatus comprising a conveyor for supporting sheets in a horizontal orientation and an imbricated relation and moving said sheets in a stream relation in the direction of the imbrication, a stop disposed at the downstream end of the stream in the path of movement of said sheets for stripping said sheets from their stream relation and causing them to form a stack of said sheets, a stack platform disposed adjacent said stop for receiving and supporting said stack, a combined separator and stack displacer member movably mounted adjacent said stack for insertion into said stack of sheets and thereby separating the end of said stack into an end pile of said sheets, and a powered member connected to said com-

bined separator and stack displacer member for displacing said end pile from the remainder of said stack.

18. A method of stacking sheets and then separating an end pile from the stack, comprising the steps of supporting and moving sheets in an imbricated relation of a horizontally disposed stream of said sheets, stopping said sheets in their stream movement and forming a stack of said sheets, positioning a stack divider directly on top of said stream at a location adjacent said stack, moving said divider into said stack along with the movement of said sheets into said stack to define an end pile of said sheets in said stack, and removing said divider from said stack to remove said end pile.

19. The method of stacking sheets and then separating an end pile from the stack as claimed in claim **18,** including the step of counting said sheets with a counter means before moving said divider into said stack, to define a selected number of said sheets in said end pile.

20. The method of stacking sheets and then separating an end pile from the stack as claimed in claim **18,** including the step of restraining the remainder of said stack relative to said end pile while said divider and said end pile are being removed from said stack.

21. The method of stacking sheets and then separating an end pile from the stack as claimed in claim **18,** including the step of moving the edges of the said sheets in said stack away from the said sheets in said stream and providing an opening for the movement of said divider into said stack.

22. The method of stacking sheets and then separating an end pile from the stack as claimed in claim **18,** including the step of retaining said divider in said stack until said stack is increased in size, and the step of sliding said end pile off said stack and onto a moving support for moving said end pile away from the remainder of said stack.

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