United States Patent

[11] 3,586,313

[72] Inventor **Thomas W. Ebeling**
10393 Radabaugh Drive, Montgomery, Ohio 45242

[21] Appl. No. **733,645**
[22] Filed **May 31, 1968**
[45] Patented **June 22, 1971**

[54] **ARTICLE SEPARATOR**
13 Claims, 18 Drawing Figs.

[52] **U.S. Cl.** **271/3, 271/10, 271/62**
[51] **Int. Cl.** **B65h 5/22**
[50] **Field of Search** ..... 271/26, 26 SOE, 30 SOE, 43 SOE, 42, 21, 36, 112, 12, 3, 29, 2, 10, 62

[56] **References Cited**

UNITED STATES PATENTS

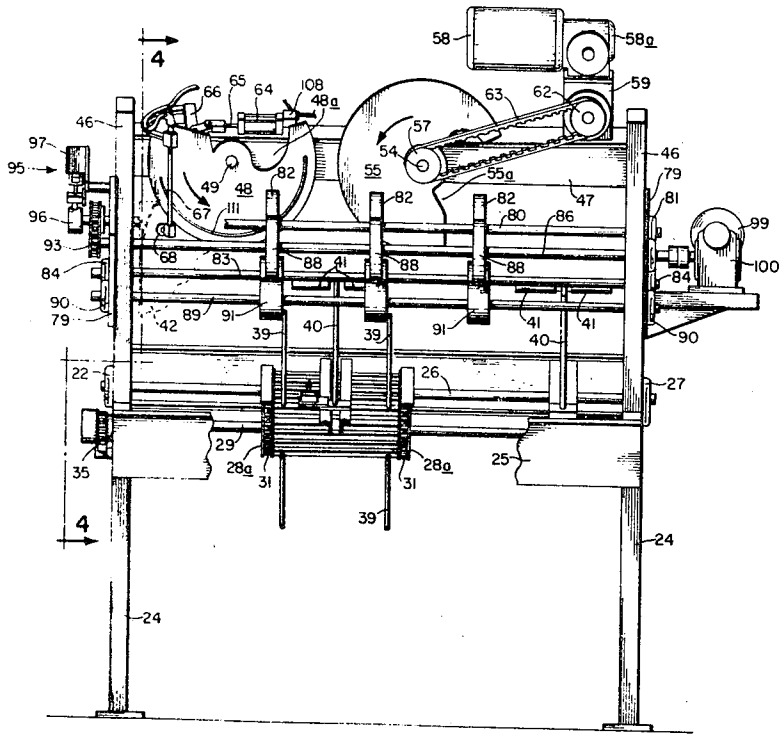
2,292,781	8/1942	Erhardt	271/8
3,019,886	2/1962	Winkler	198/134
3,385,594	5/1968	Preisig	271/12
2,797,092	6/1957	Welsh	271/29

FOREIGN PATENTS

653,864	0/0000	Canada	271/2

Primary Examiner—Richard E. Aegerter
Attorney—Donald L. Johnson

ABSTRACT: An apparatus and method for separating stacked, flat articles. Apparatus includes a conveyor assembly for feeding a plurality of stacked, flat articles to a separator assembly for separating the front article from the remainder of the stacked articles. The separator assembly includes a pivoted vacuum arm engaging a corner of the front article and swings it outwardly to initially enable the first separator disc to cut in behind the outermost article. A pair of rotating discs, having segments cut therefrom, enter between the front article and the one immediately behind to bend the top of the article outwardly for withdrawal from the stack. A forwarding assembly engages the outwardly bent top of the first article and withdraws it from the stack. The forwarding assembly includes a set of delivery segment wheels which are periodically actuated to press the forwardly bent top edge of the article against oppositely mounted wheels to withdraw the article from the stack. Continuously rotating matching forwarding wheels then engages the article and conveys it on to a conveyor belt or other suitable device for carrying away the articles in single file. The apparatus is particularly well adapted for separating stacked blanks used in manufacturing gusseted multiwall bags.



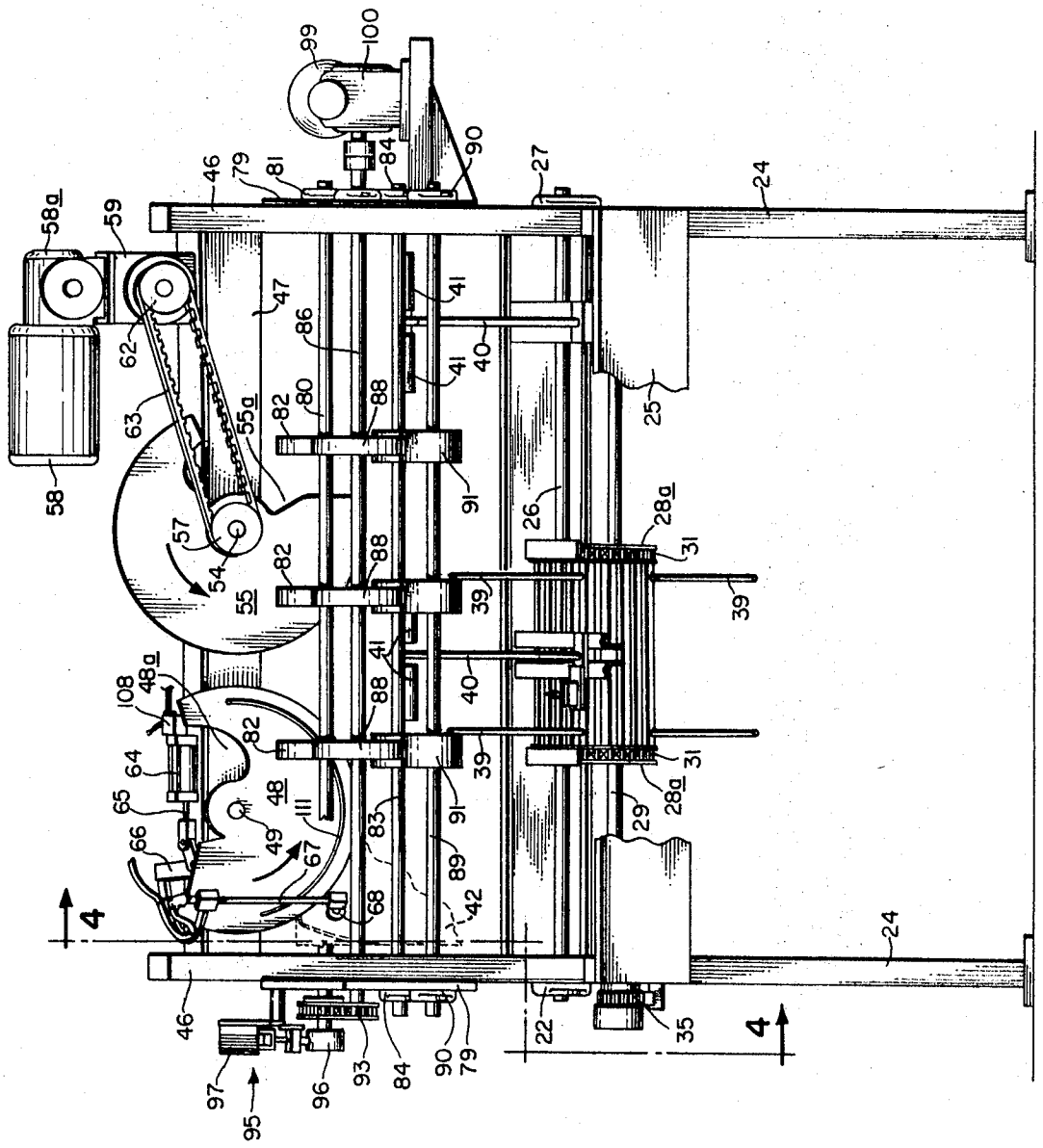

99
100
90
84
81
79
46
27
24
58a
59
62
63
47
86
41
40
80
82
88
91
55a
58
57
54
55
26
28a
31
39
25
48a
108
64
65
66
48
111
49
67
83
89
42
68
4
22
35
93
96
97
95

FIG. 1.

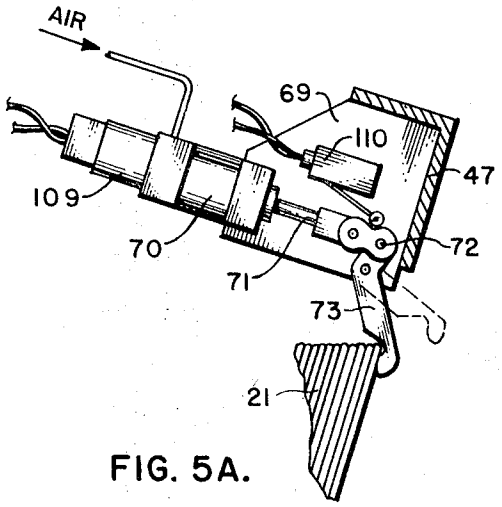

AIR
69
110
47
109
70
72
71
73
21

FIG. 5A.

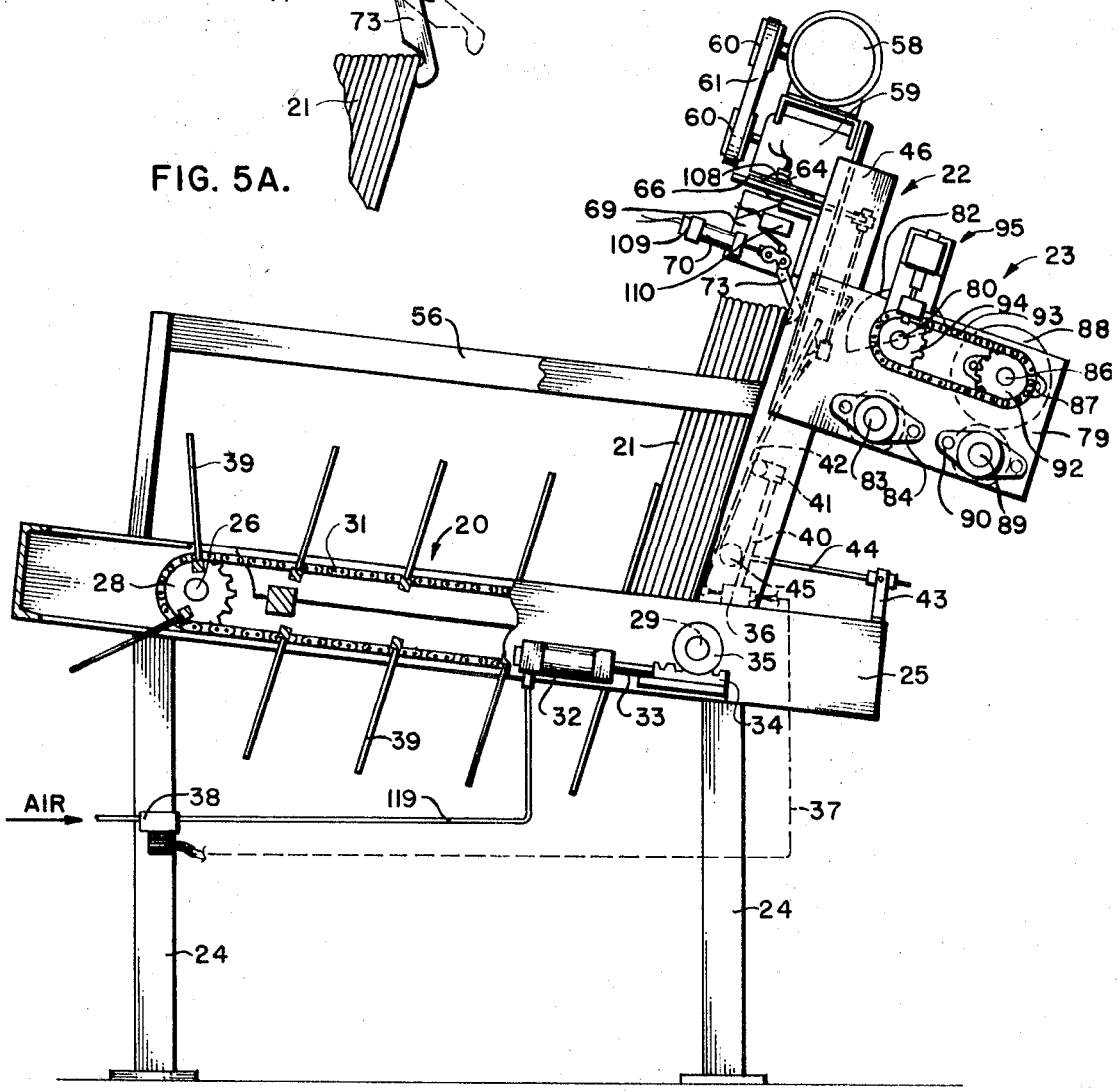

60
58
61
59
60
46
64
22
66
108
69
82
95
109
70
23
73
110
80
94
93
88
56
86
87
21
79
42
92
39
83
84
41
90
89
26
31
20
40
44
28
45
43
29
36
35
25
32
33
34
39
AIR
38
119
37
24
24

FIG. 2.

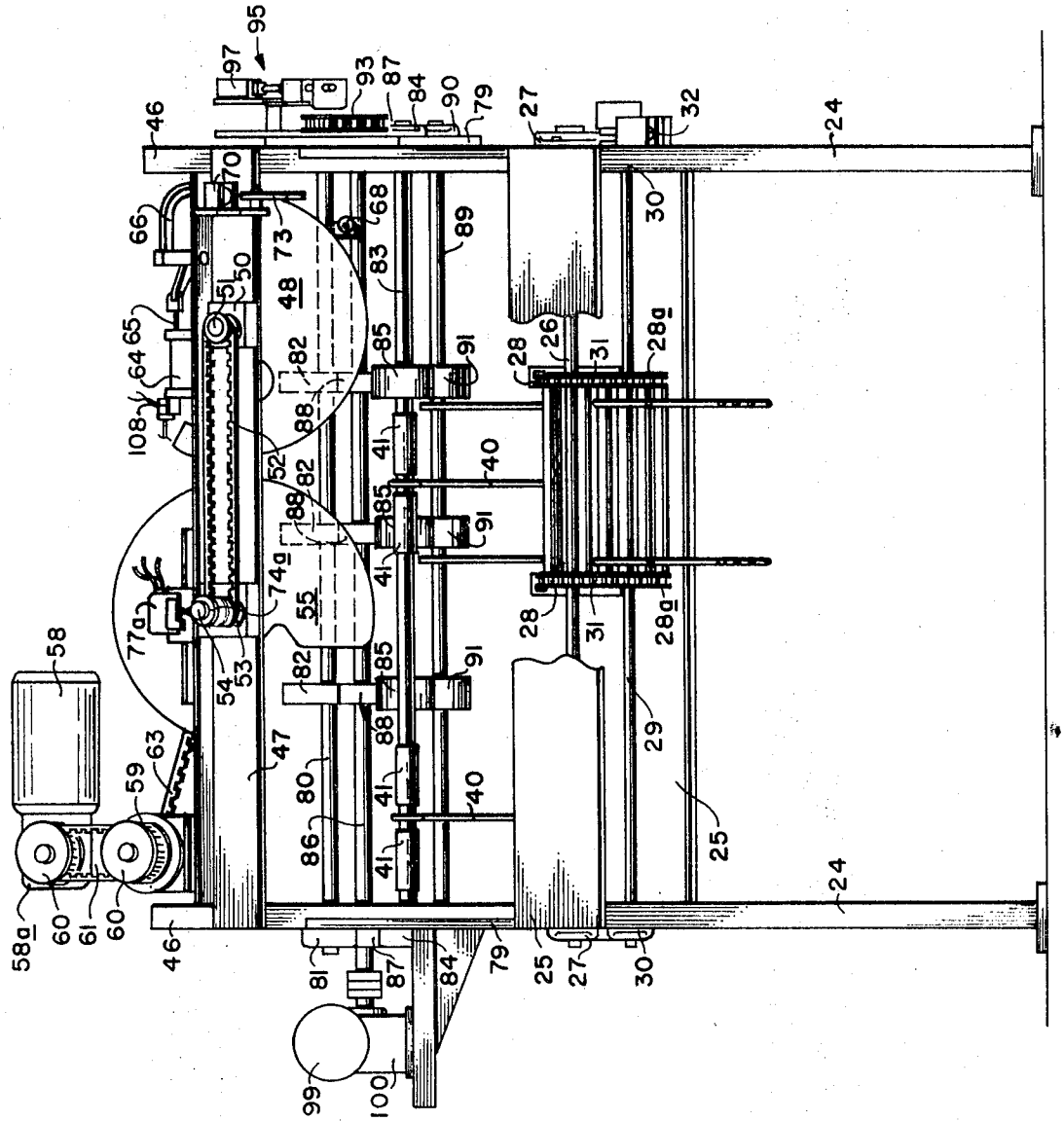

95
97
93
87
84
90
79
27
32
24
46
70
66
68
73
89
30
48
83
50
51
65
64
85
91
82
28
26
31
28a
108
88
52
41
40
89
74a
55
77a
58
54
53
63
59
47
80
86
60
61
58a
81
99
100
25
29

FIG. 3

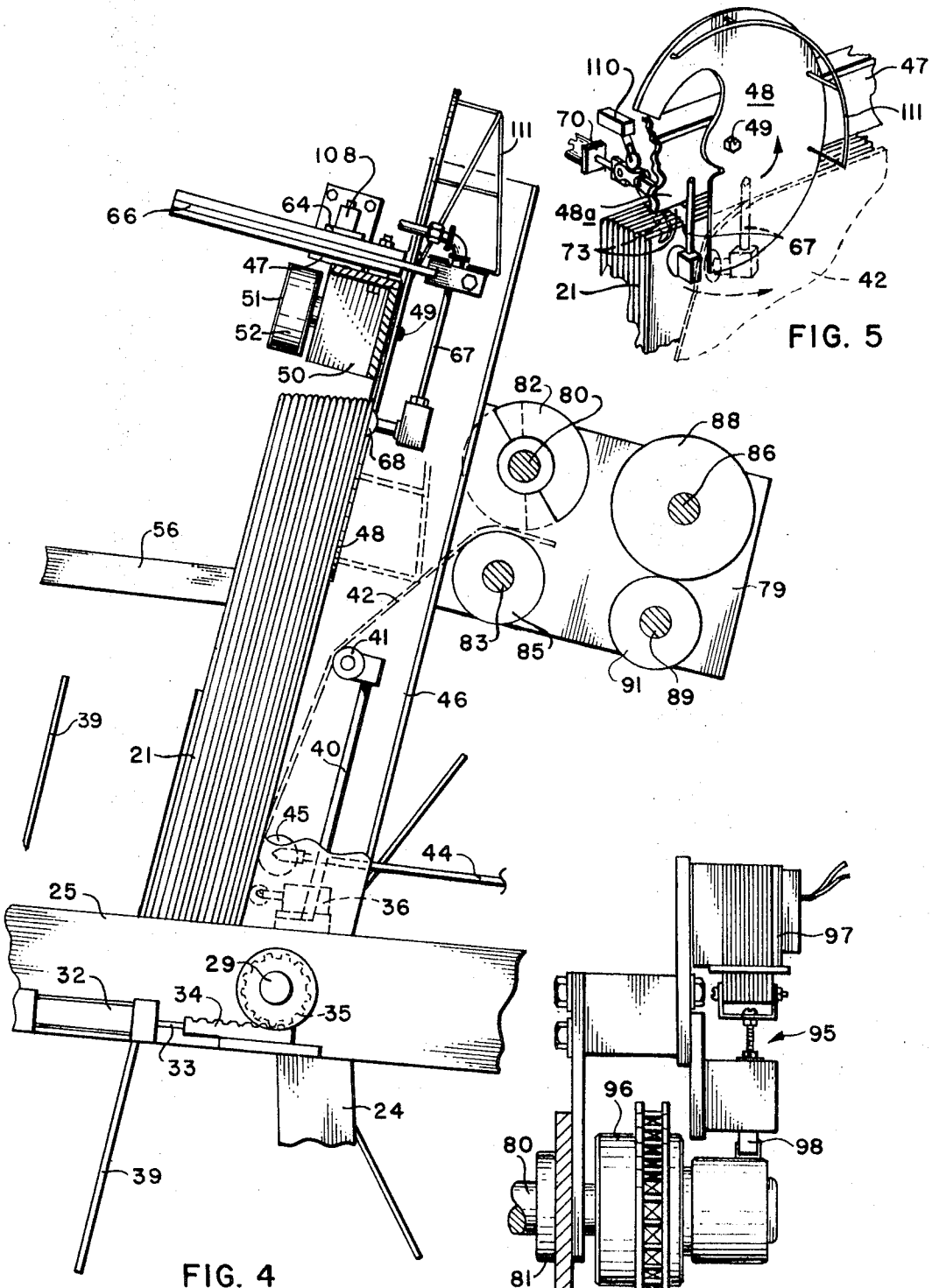


FIG. 5

FIG. 4

FIG. 6

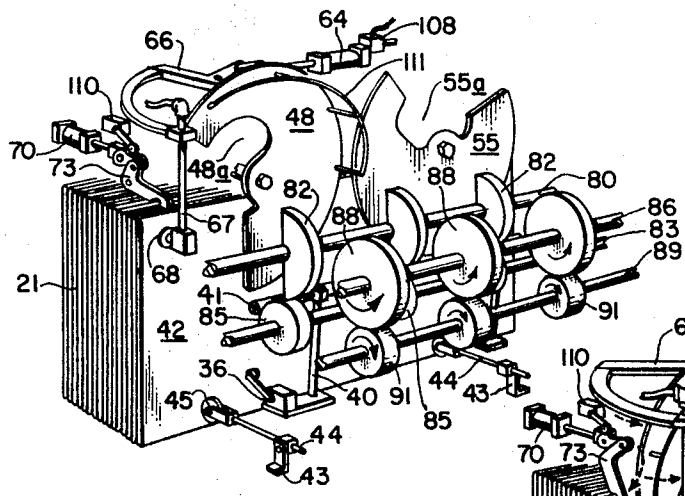


FIG. 7.

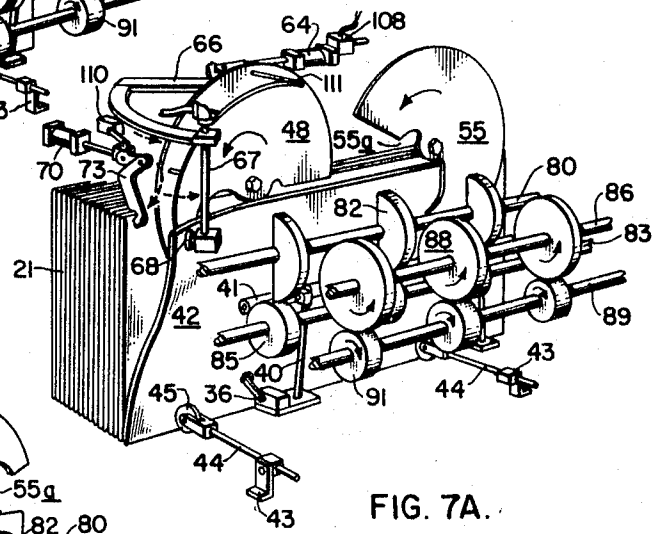


FIG. 7A.

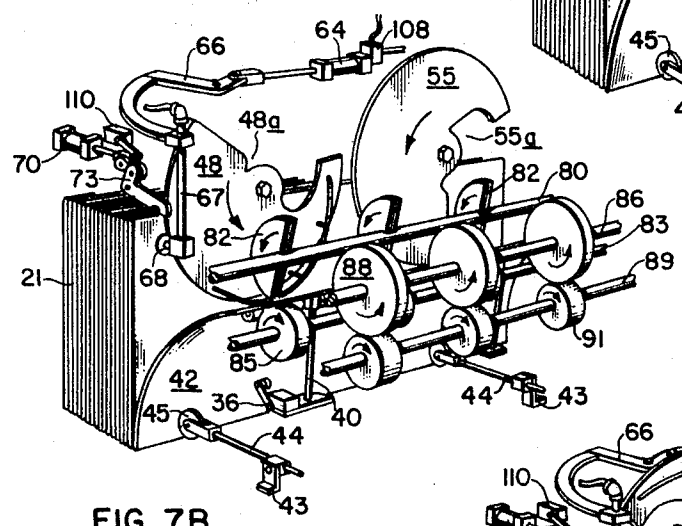


FIG. 7B.

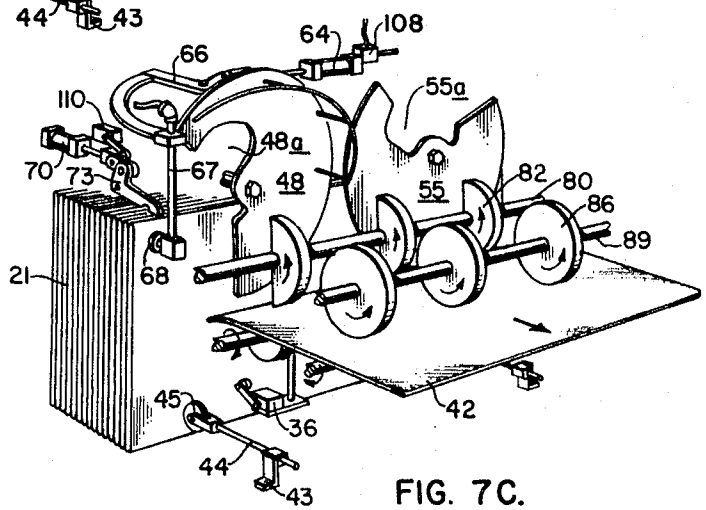


FIG. 7C.

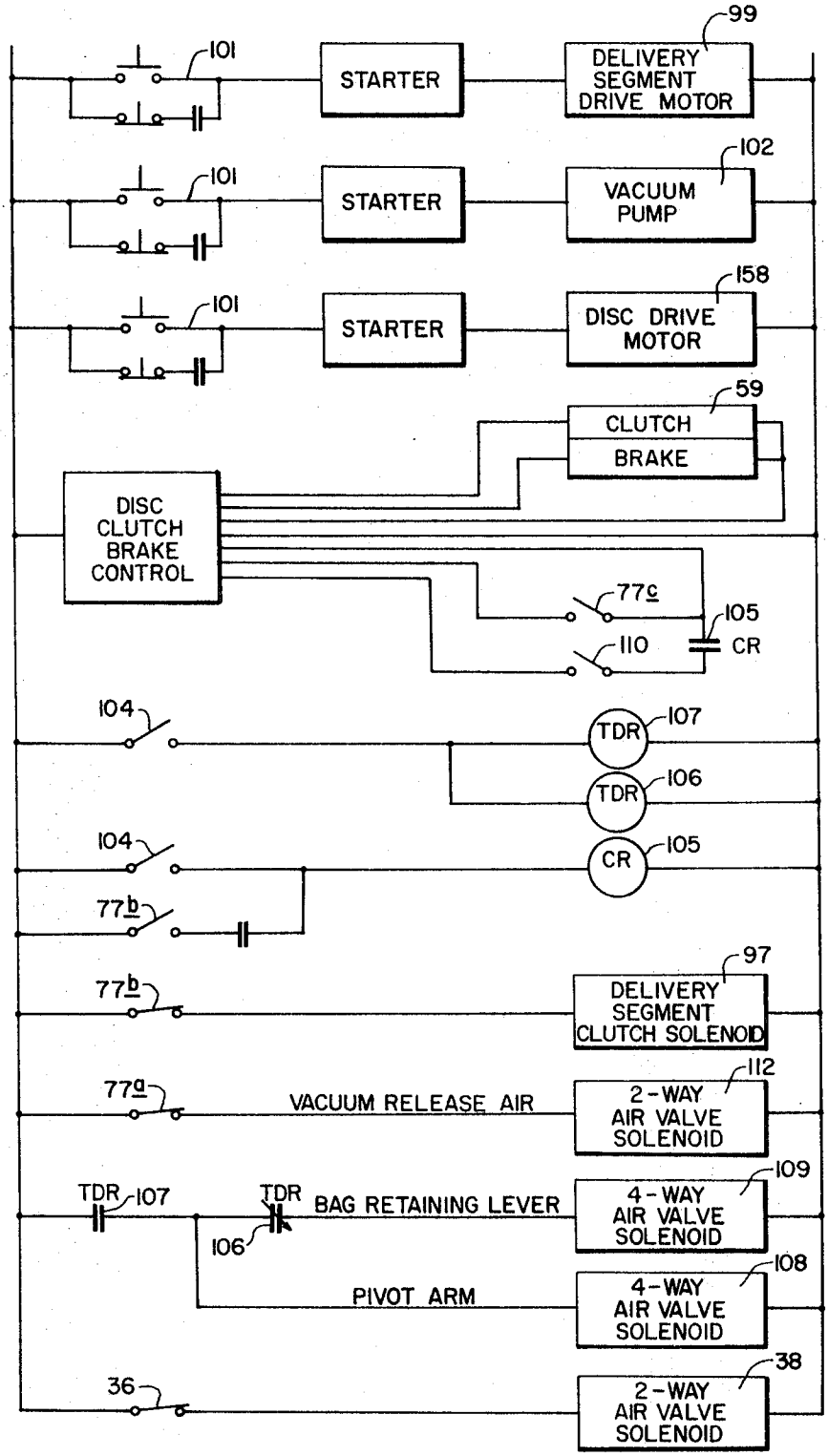

99
101
STARTER
DELIVERY SEGMENT DRIVE MOTOR
102
VACUUM PUMP
158
DISC DRIVE MOTOR
59
CLUTCH
BRAKE
DISC CLUTCH BRAKE CONTROL
77c
105
110
CR
104
TDR
107
106
CR
77b
97
DELIVERY SEGMENT CLUTCH SOLENOID
77a
VACUUM RELEASE AIR
112
2-WAY AIR VALVE SOLENOID
TDR
BAG RETAINING LEVER
109
4-WAY AIR VALVE SOLENOID
PIVOT ARM
108
36
38

FIG. 8.

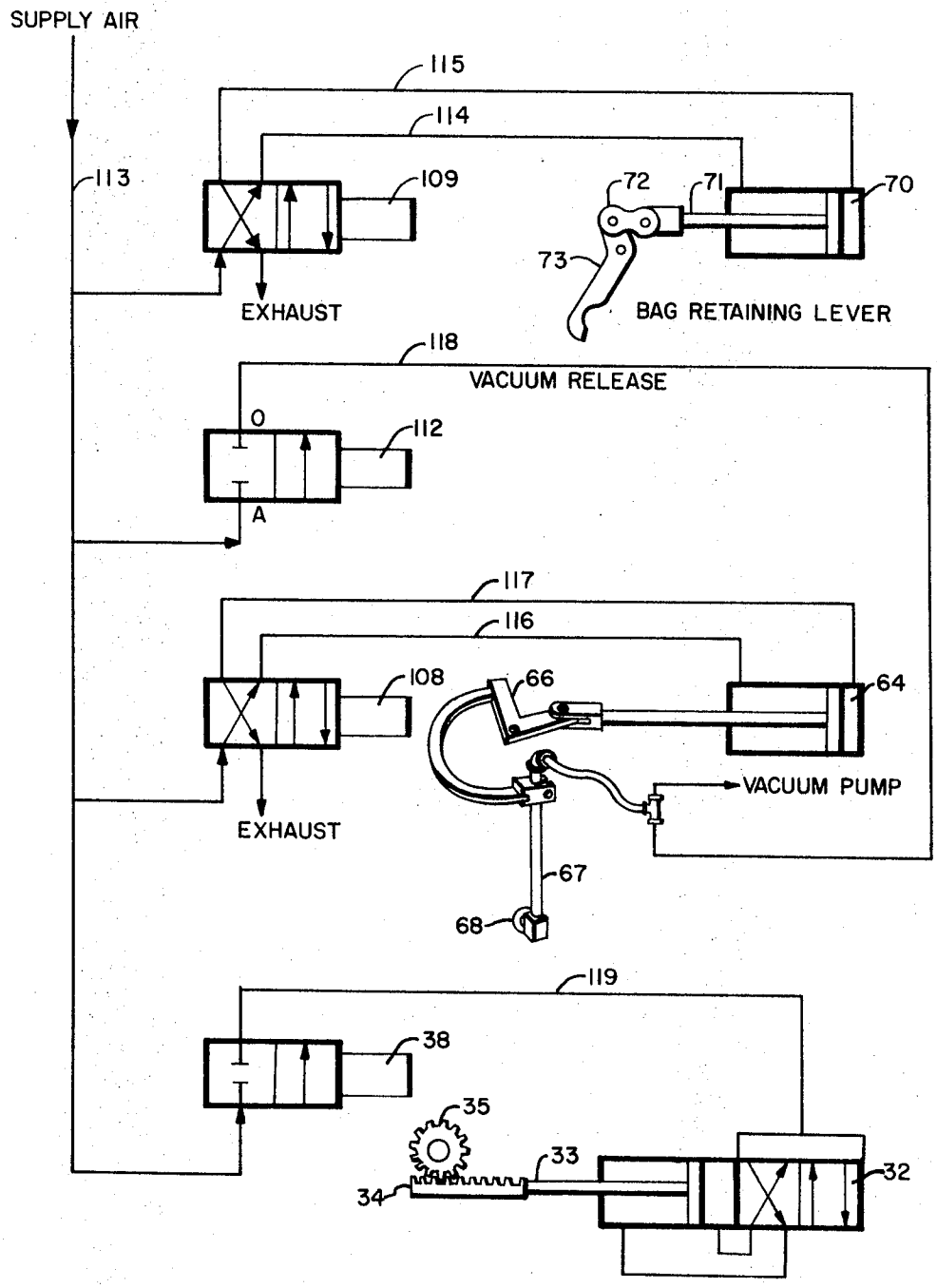

SUPPLY AIR
115
114
113
109
72
71
70
73
EXHAUST
BAG RETAINING LEVER
118
VACUUM RELEASE
0
112
A
117
116
108
66
64
VACUUM PUMP
EXHAUST
67
68
119
38
35
33
32
34

FIG. 9.

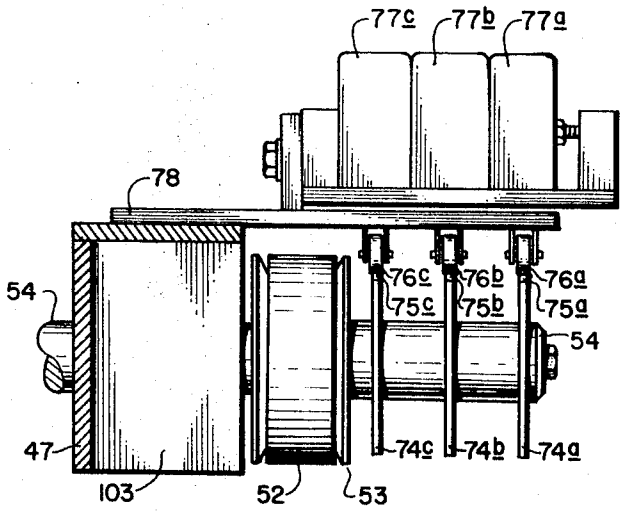


FIG. 10.

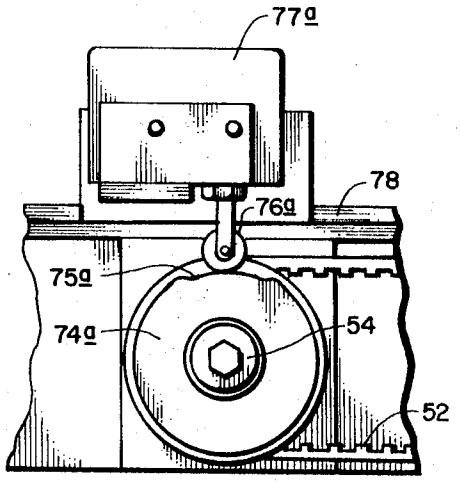


FIG. 10A.

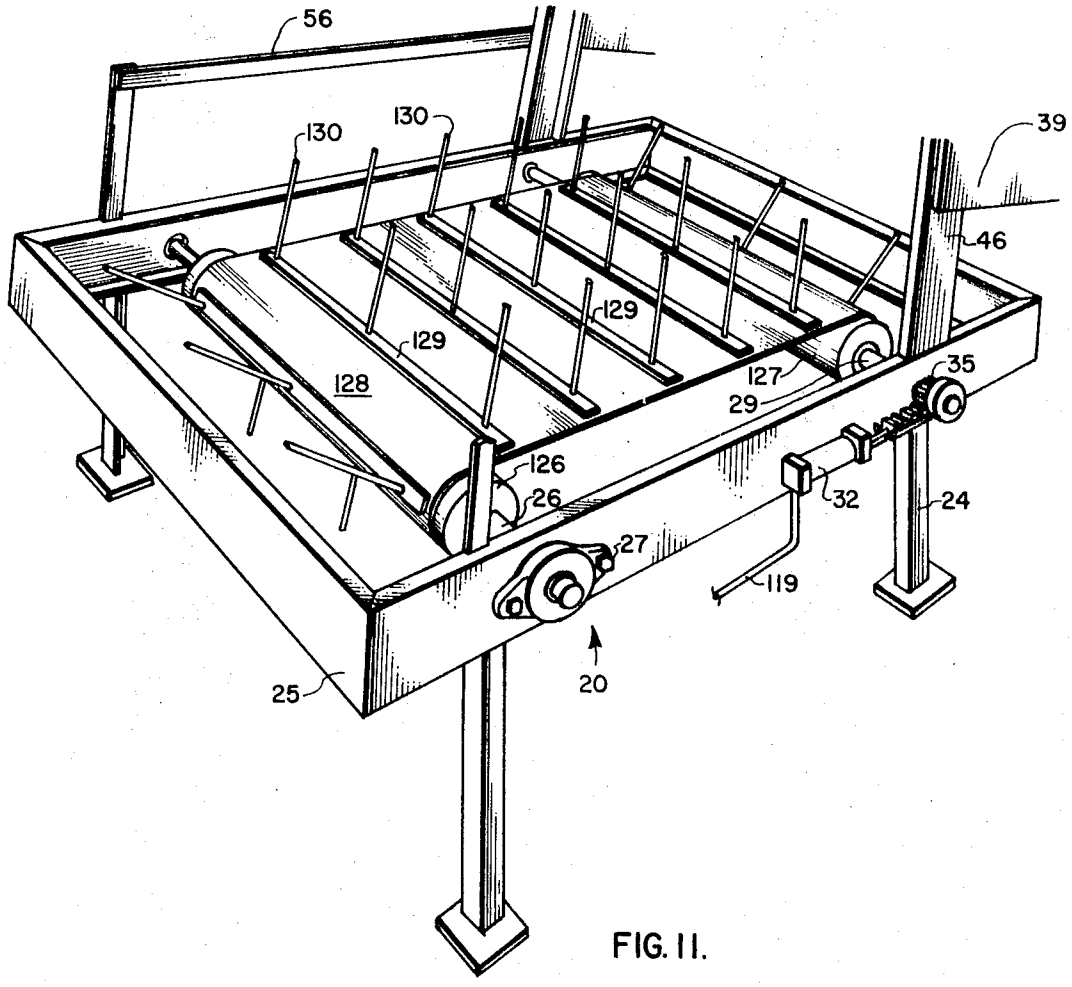


FIG. 11.

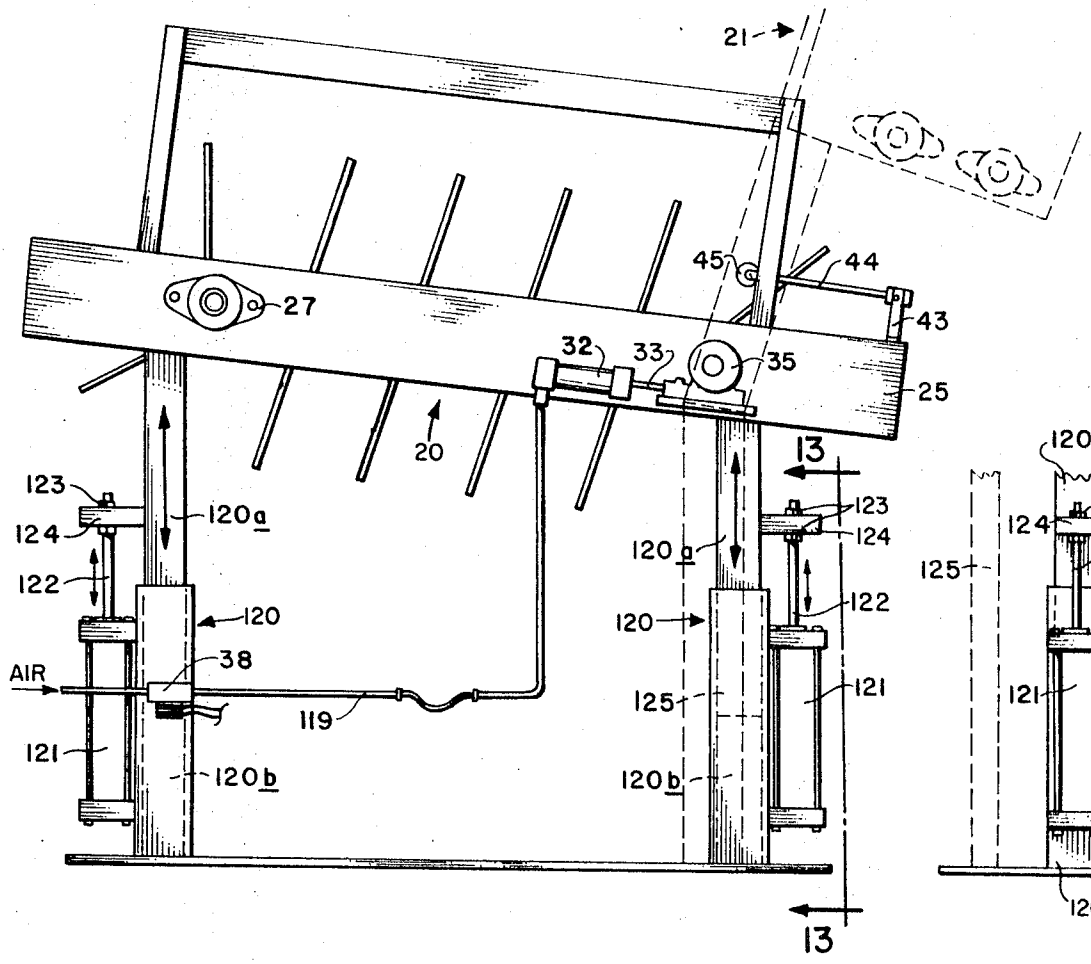

21
45
44
43
27
32
33
35
25
20
13
123
124
120a
122
120
AIR
38
119
121
120b
123
124
120a
122
120
125
121
120b
13

FIG. 12.

120a
123
124
122
125
121
120b

FIG. 13.

ARTICLE SEPARATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates, in general, to an apparatus for separating a single article from a stack of flat articles. More particularly, the invention relates to an apparatus that can be used for separating single bag blanks from a plurality of stacked, gusseted flat bag blanks.

2. Description of the Prior Art

Numerous devices are known for separating small flat articles from a stack of articles such as envelope blanks, paper carton blanks, and information cards. In U.S. Pat. No. 2,797,092, an apparatus for feeding envelope blanks from a stack into a high speed automatic processing machine is described. The device utilizes discs having cutout sectors therein operating in conjunction with a pair of pivotable vacuum arms to initially separate a single envelope blank from the stack of blanks. However, machines of the foregoing type have not found general utility in the separation of fairly large objects such as cardboard box blanks, multiwall paper bag blanks, because the foregoing type devices operate on a continuous basis which has not been found satisfactory for separating large size stiff articles such as cardboard box blanks, and multiwall, gusseted paper bag blanks.

Therefore there exists a need for an article separating device which will handle large stiff objects and rapidly separate the objects for conveying in single file for further processing.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an apparatus which will rapidly separate single flat articles from a stack of articles.

Another object of the present invention is to provide an article separating device which will automatically feed articles single file to a work station.

Still another object of the present invention is to provide an article separating apparatus capable of separating single flat articles having a wide variety of sizes from a stack of articles.

The foregoing, and other arrangements, objects, and advantages of the invention as may appear hereinafter, are in general realized in an apparatus for separating stacked flat articles which includes means to advance a plurality of flat articles. Means are also provided to bend outwardly a portion of the front article. Other means are provided to engage the outwardly bent portion of the front article to separate the front article from the stack. Other means are provided to advance the separated articles in single file.

In one embodiment of the apparatus for separating stacked, flat articles a conveyor assembly is provided which includes a link chain or belt device for conveying a plurality of edge stacked flat articles. A pneumatic power source is connected to the chain or belt conveyor and is coupled to a solenoid valve supplying power to the pneumatic power source. A switch contactable by the front article is provided to actuate the solenoid valve whereby the edge stacked flat articles are periodically advanced to a separator assembly. A separator assembly is provided which includes a pivotable mounted suction arm device together with a movable restraining finger device. A pair of interconnected rotatably mounted discs having open sectors therein are provided. A clutch-brake device is attached to one of the discs to periodically actuate the pair of discs to bend forward the upper portion of the front article in the stack. An assembly is also provided which includes a plurality of sector wheels mounted on a rotatable shaft. Oppositely mounted wheels engage the sector wheels. A plurality of continuously rotating forwarding wheels are mounted to engage a second set of wheels mounted therebelow to forward the single articles on in a generally horizontal path.

The method aspects of the present invention for separating stacked, flat articles may be carried out by the steps of forwarding a plurality of stacked, flat articles and then bending outwardly the top portion of the front article; then engaging the top portion of the front article and separating the front article from the remainder of the stack.

The present invention provides numerous advantages not found in devices for separating flat articles used heretofore. The present device may be loaded with a large stack of flat articles and left unattended for long periods of time. The device automatically forwards the stacked articles, then cleanly separates the individual articles and moves the article to the next work station. The device only requires low pressure air and electrical power sources for actuation of its moving parts. A particular advantage of the device is that it is readily adjustable to accommodate articles having a wide range of sizes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of an article separating apparatus constructed in accordance with the present invention;

FIG. 2 is a left-hand side view of the article separating apparatus of FIG. 1;

FIG. 3 is a rear elevational view of the article separating apparatus of FIG. 1;

FIG. 4 is an enlarged cross-sectional view of a portion of the apparatus of FIG. 1 taken along the line 4–4;

FIG. 5 is a perspective elevational view of the first separator disc and the vacuum arm;

FIG. 5A is an enlarged elevational view of the bag holding finger and associated components;

FIG. 6 is an enlarged elevational view of the clutch-brake mechanism for the sector wheels drive assembly;

FIG. 7 is a perspective elevational view showing the separator device components in the initial rest position;

FIG. 7A is a view similar to FIG. 7 showing the separator components in the first stage of separating the articles;

FIG. 7B is a view similar to FIG. 7 showing the components of the separator assembly in the second or middle stage of separating an article;

FIG. 7C is a view similar to FIG. 7 showing the article separating apparatus with the components in the position immediately following the separation of an article from the stack;

FIG. 8 is a schematic diagram of the electrical system for the article separating apparatus;

FIG. 9 is a schematic diagram of the pneumatic system for the article separating apparatus;

FIG. 10 is an enlarged side view of the switch assembly mounted on the rear of the shaft of the second separator disc;

FIG. 10A is a right-hand end view of the assembly of FIG. 10;

FIG. 11 is a perspective elevational view of another embodiment for the conveyor assembly portion of the article separating apparatus;

FIG. 12 is a side elevational view of still another embodiment for the conveyor assembly portion of the article separating apparatus, and

FIG. 13 is a side view of a portion of the apparatus of FIG. 12 taken along the line 13–13.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The article separating apparatus of the present invention may be described in reference to three assemblies. As seem more clearly in FIG. 2 a conveyor assembly, designated generally by the numeral 20, is provided to move forward a plurality of flat articles such as multiwall bag blanks 21. A separator assembly, designated generally by the numeral 22, is mounted on the separator assembly above the forward end of the multiwall bag blanks 21. A forwarding or advancing assembly, designated generally by the numeral 23, is mounted on the separator assembly immediately ahead of the upper portion of the bag blanks.

CONVEYOR ASSEMBLY

As seen in FIGS. 1—4 the conveyor assembly includes four spaced apart support legs 24. A generally rectangular support frame 25 is mounted on the upper ends of the four support legs. A rearward shaft 26 is rotatably mounted in bearing blocks 27–27 attached to the sides of the frame 25. A forward shaft 29 is rotatably mounted in bearing blocks 30–30 attached to the frame 25 at its forward end. A pair of forward sprockets 28*a*–28*a* are mounted on the shaft 29 and are connected to rearward sprockets 28–28 mounted on shaft 26 by means of individual chain drives 31–31. A reversible air cylinder 32 is mounted on the left-hand side of the frame 25. The air cylinder is provided with a rod 33 having a rack 34 provided on the end thereof. A matching tooth gear 35 (see FIG. 9) engages the rack 34 and is fixed to the forward shaft 29 to rotate the same upon movement of the rod 33 by the air cylinder. An electric limit switch 36, seen more clearly in FIGS. 2 and 4, is connected by leads 37 to a solenoid air valve 38 which controls the air flow to air cylinder 32.

A plurality of support fingers 39 are attached at their lower ends to the chain drive 31 to support the bag blanks 21 as they are moved forward on the conveyor assembly. These fingers prevent the full weight of the bags 21 from being exerted against the discs hereinafter described and also prevent the bags from folding and collapsing on the conveyor assembly. As seen in FIGS. 3 and 4, a pair of upwardly extending rods 40–40 have their bases attached to the frame 25 whereby they may be moved up or down. Each shaft carries at its upper end a pair of rollers 41–41 which bear on the outer face of the front or forwardmost bag blank 42. As seen more clearly in FIGS. 2, 4, 7A and 7B, a pair of brackets 43–43 are mounted at the forward end of frame 25 and slidably support rods 44–44 having a wheel 45 rotatably mounted on the forward ends thereof. The position of this wheel is adjusted so that the switch 36 is actuated when bags are removed from the stack of bag blanks 21.

SEPARATOR ASSEMBLY

As seen more clearly in FIGS. 1, 2, and 3 a pair of slightly inclined support arms 46–46 have their lower ends affixed to the support frame 25 on each side thereof adjacent the forward end. A crossmember 47 extends between the upper ends of the support arms 46–46.

A first rotating disc 48 is fixedly mounted on shaft 49 which is carried by bearing block 50 attached to crossmember 47. The disc is provided with a cutout portion 48*a*. As seen in FIG. 3 a pulley 51 is attached to the rear end of shaft 49 and is connected by belt 52 to pulley 53 mounted on shaft 54. Shaft 54 is rotatably mounted in bearing block 50 and is coupled directly to the second rotating disc 55, as can be seen more clearly in FIG. 10. A forward pulley 57 is fixedly mounted on the end of shaft 54. An electric motor 58 and a gear reducer 58*a* are mounted atop a clutch-brake device and coupled thereto by means of pulleys 60–60 connected by belt 61. A pulley 62 on the forward side of clutch-brake device 59 is connected by belt 63 to the pulley 57 to provide power for the rotation of the two discs 48 and 55.

An air cylinder 64 is mounted atop crossmember 47 and has the outer end of a rod 65 extending therefrom. The rod 65 is connected to a pivot arm 66 which carries on its end a vacuum arm 67. A soft rubber suction cup 68 extends transversely from the lower end of the vacuum arm 67. As seen more clearly in FIGS. 2 and 5A a bracket 69 is fixed to the underside of crossmember 47 and has mounted thereon air cylinder 70 which has an electrical solenoid air valve 109 mounted on the rear thereof. The air cylinder 70 has a rod 71 projecting therefrom which is coupled to a clevis joint 72 carrying the pivotally mounted bag holding finger 73. As seen in FIG. 5A when actuated by the air cylinder 70 the finger 73 releases the upper edge of the bag blanks 21 to permit bending out of the upper left-hand corner of the front bag 42 at the proper time.

As seen in FIGS. 10 and 10A shaft 54 extends out behind pulley 53 and has mounted thereon a plurality of spaced apart cams 74*a*, 74*b*, and 74*c*. Each cam is provided with a respective cutout portion 75*a*, 75*b*, and 75*c* which actuates the respective arms 76*a*, 76*b*, and 76*c* of the electrical limit switches 77*a*, 77*b*, and 77*c* mounted above the shaft 54 on bracket 78.

ADVANCING ASSEMBLY

A pair of spaced apart, forwardly extending support brackets 79–79 are attached to the support arms 46–46 below their upper ends. An upper rearward shaft 80 is mounted by bearing blocks 81 between brackets 79–79. A plurality of separator segment wheels 82 are fixedly mounted on the shaft 80. A lower rearward shaft 83 is mounted beneath shaft 80 between bearing blocks 84–84. A plurality of wheels 85 having flat rims are fixedly mounted on shaft 83 for rotation therewith. The wheels 85 are mounted directly below the separator segment wheels 82, which also have flat rims, for contact therewith upon rotation of the shaft 80 carrying the separator segment wheels. An upper forward shaft 86 is mounted between support brackets 79–79 by means of bearing blocks 87–87. A plurality of wheels 88 having flat rims are fixedly mounted on shaft 86. A lower forward shaft 89 is carried by bearing blocks 90 mounted on brackets 79–79. A plurality of wheels 91 having flat rims are affixed to the shaft 89 and engage the wheels 88 mounted on upper forward shaft 86. A drive sprocket 92 is affixed to the left-hand end of shaft 86 and connects this shaft to shaft 80 by means of chain drive 93 and drive sprocket 94 located on clutch 96.

A segment wheel clutch assembly, designated generally by the numeral 95, is connected to the end of shaft 80, as can be seen more clearly in FIG. 6. The segment wheel clutch assembly includes a single revolution type clutch 96 mounted on the outer left-hand end of shaft 80. An electrical solenoid 97 lifts finger 98 to permit the single revolution clutch 96 to drive the shaft 80 through one complete revolution before being stopped.

As seen more clearly in FIGS. 1 and 3 an electric motor 99 is coupled to shaft 86 by means of gear reducer box 100. Thus, the upper wheels 88 and lower contacting wheels 91 are continuously driven by means of motor 99. Separator segment wheels 82 and matching wheels 85 are intermittently driven through one revolution at a time when actuated through the segment clutch assembly 95.

OPERATION

In operation a supply of stacked, flat articles, such as the bag blanks 21 shown in the drawings, are placed on the conveyor assembly and moved into position against the rear face of rotating discs 48 and 55. Referring now to FIGS. 7 through 7C and 8 the sequence of operation of the various components of the article separating assembly will be described. The electrical components of the apparatus are energized by closing switch or switches 101 which energize through starters, the disc drive motor 58, vacuum pump motor 102 (not shown in other FIGS.), and the separator drive electric motor 99. The forwarding sets of rollers or wheels 88 and 91 are set in continuous motion and the discs 48 and 55 remain in the rest position in FIG. 7 since the clutch-brake assembly 59 which drives discs 48 and 55 through pulleys 62 and 57, and belt 63 is disengaged on initial startup. Limit switch 104 is positioned on whatever conveyor assembly (not shown) or other machine that the article separating apparatus is feeding. This switch may be actuated by either the movement of the conveyor assembly or by a single article moving away from the separating apparatus. Switch 104 (DPST) closes control relay 105, time delay relay 106, and time delay relay 107 which actuates four-way air valve solenoid 108 energizing air cylinder 64 to swing vacuum arm 67 into the out or open position. Since the vacuum pump continuously applies vacuum to the arm 67, movement of the arm bends back the upper edge of the outer-

most or front bag 42 as can be seen in FIG. 7A. Time delay relay 106 is in series with time delay relay 107 and thereby holds open the circuit to four-way valve 109 which actuates air cylinder 70 that causes bag retaining finger 73 to move to the down position and holds back all of the bags behind the forwardmost bag 42, as may be seen more clearly in FIGS. 5A and 7A. Time delay relay 106 is selected to provide a time interval sufficient to permit vacuum arm 67 to pull out the upper left-hand corner of the outermost bag 42 before valve 109 is actuated to move the bag retaining finger 73 to the downward position. As seen in FIG. 5A when bag retaining finger 73 moves to the downward position limit switch 110 is actuated which disengages the brake and engages the clutch in the clutch-brake assembly 59 and starts rotation of discs 48 and 55 as shown in FIG. 7A. The leading edge of the first disc 48 enters behind the front or forwardmost bag 42 and by means of a wire riser 111 pushes the left-hand upper edge of the bag 42 away from the next innermost bag. The second disc 55 is positioned so that its leading edge enters behind the outermost bag 42 after the first disc 48 is substantially interposed between the outermost bag and the second bag. The second disc pushes the right-hand upper edge of the bag forward as shown in FIG. 7B. When the first disc 48 rotates sufficiently to cut in behind the first bag, cam 74*a* energizes limit switch 77*a* which causes two-way air valve 112 to open, thereby releasing the vacuum in arm 67 to disengage the suction cup 68 from the upper left-hand corner of the outermost bag 42. After the time interval determined by the delay factor of time delay relay 107 the solenoid 108 acts to reverse the direction of air cylinder 64 to thereby swing vacuum arm 67 back to the rest position against the now front bag in the stack 21 (as seen in FIG. 7C).

After the trailing edge of the second disc 55 frees the upper edge of bag 42 the cam 74*b* on shaft 54 of disc 55 engages limit switch 77*b* which actuates the solenoid 97 raising the finger 98 thereby actuating single revolution clutch 96. This permits chain drive 93 to engage through the clutch the shaft 80 and to rotate the segment discs 82 carried by the shaft 80. As seen in FIG. 7B the segment wheels 82 turn down to contact the backside of the leading edge of the front bag 42 and press the leading edge of this bag against the lower rollers 85 and thereby pull the bag up and out from the stack as shown in FIG. 7D and in FIG. 4. The rollers 41 permit easy withdrawal of the bag without causing movement of the bags immediately behind the outermost or front bag. Limit switch 77*b* (DPST) has one arm connected to the holding circuit for control relay 105 whereby this circuit is opened so that the clutch-brake assembly 59 can be stopped at the proper time. Discs 48 and 55 continue to rotate until they return to the stop position as shown in FIGS. 1, 2, and 3. The discs are stopped by means of limit switch 77*c* which is actuated by cam 74*c* on shaft 54 of the second disc 55 to disengage the clutch and engage the brake in clutch-brake assembly 59. Time delay relay 107 drops out thus deactivating the four-way air valve solenoid 108 causing the air cylinder 64 to reverse the air flow and to swing the vacuum arm 67 back to the initial position shown in FIG. 7. The closing of this relay also causes the bag retaining finger 73 to move to the up position by reversing the air flow in air cylinder 70. The continuously rotating sets of wheels 88 and 91 receive the bag from the separator segment wheels 82 and propel the bag forward onto a conveyor assembly (not shown) which conveys the bag to whatever operation is required, such as to the head of a sewing machine whereby the bottom or the bottom and the top of the bag may be closed by a line of thread stitching.

The individual bags are removed from the front of the stack 21 and the stack is periodically advanced to keep bags pressed against the discs 48 and 55. Limit switch 36 is actuated as the front bags are removed, thereby energizing the two-way air solenoid valve 38 to supply air to air cylinder 32 to advance the bags by means of rod 33 and gear 35 driving the conveyor assembly. The air cylinder 32 is equipped with automatic reversing ports whereby when the rod 33 is retracted to its minimum position, it is automatically repositioned to its forwardmost position. By means of a one-way clutch mechanism within the drive gear 35 this gear rotates freely on the shaft 29 as the rod 33 is repositioned.

For a further explanation of the operation of the solenoid valves which control the pneumatic system, i.e., the bag retaining lever air cylinder, the pivot arm, vacuum arm mechanism and the bag feeding advance mechanism, reference is now made to FIG. 9 of the drawings. The solenoid valve 109 which controls the air supply to air cylinder 70 operating the bag retaining lever 73 is a two-way solenoid valve whereby air flowing in may be directed through line 114 to the forward portion of the cylinder 70 to cause the bag retaining finger 73 to be lifted. When the solenoid is moved to the other position air flows through line 115 to the rear portion of the cylinder causing the finger to be depressed and contact the bags. As the valve in solenoid 109 changes position air contained in one side of the piston is exhausted either through line 114 or line 115.

Air through supply line 113 is directed by solenoid valve 108 to the air cylinder 64 which actuates the pivot arm 66 and vacuum arm 67. Solenoid 108 is a two-way solenoid valve whereby air may be supplied through line 116 to the forward portion of air cylinder 64 to move the vacuum arm 67 into the normal or closed position whereby the vacuum cup 68 contacts the face of the outermost bag. On actuation of the valve the air flow is switched from line 116 to line 117, and line 116 is then opened to exhaust whereby air flows to the rear portion of the air cylinder 64 to pivot arm 66 and vacuum arm 67 into the out or open position to fold back the upper left-hand corner of the outermost bag blank. Air through supply line 113 is also connected to solenoid valve 112 which controls air supply into the vacuum arm 67 to overcome the vacuum applied by the pump (not shown) and to thereby release the vacuum and detach the cup 68 from the face of the forwardmost bag. Solenoid valve 112 is a one-way valve which supplies air pressure to overpower the vacuum through line 118.

The air through supply line 113 is also fed to solenoid valve 38 which is a one-way valve supplying air through line 119 to air cylinder 32 which motivates the bag advance mechanism. As seen the air cylinder 32 has innerpilots at both ends and is supplied with the necessary connections to provide for automatic reciprocation of the rod 33 when the rod has reached the limit of its travel. Thus no reversing solenoid air valves are required since the air cylinder is provided with the reversing features.

ALTERNATE CONSTRUCTIONS

Referring now to FIG. 11 of the drawings there is depicted an alternate embodiment of the conveyor assembly 20 wherein the rearward shaft 26 is provided with a cylindrical roller 126. The forward shaft 29 is also provided with a like roller 127. These rollers carry an endless belt 128 which supports and conveys the stacked, flat articles. The belt 128 has a plurality of support straps 129 on its upper surface attached by brads or adhesive or other suitable means. Each of the straps 129 is provided with a plurality of upstanding fingers 130 which serve the same purpose as do the fingers 39 described hereinbefore. This type of conveyor mechanism may be preferred to that shown in FIGS. 1, 2, and 3 since it provides a broader base for the articles to be fed to the apparatus and thus may more readily accommodate different size articles.

In the embodiment shown in FIG. 12 the article feeder or conveyor assembly 20 is provided with legs 120 of variable length. Each of the legs has an upper portion 120*a* slidably received within a lower portion 120*b*. The leg portions are telescopically connected and make sliding contact with each other to permit upward and downward movement to raise and lower the level of the bed or frame 25 of the conveyor assembly. Each leg is provided with a hydraulic actuator 121 having a shaft 122 projecting from the upper end thereof. The shaft has its upper end connected by means of bolts 123 to a

bracket 124 which is welded to the upper portion of the leg 128a. It is to be understood that the legs directly behind those shown in FIG. 12 are similarly equipped with sliding sections and hydraulic actuators. The hydraulic actuators are connected to a common power source and are used to adjust the height of the frame and conveyor assembly 20 to compensate for different widths of whatever type articles are being fed to the article separating apparatus. As shown in dotted outlines in FIGS. 12 and 13 the separator assembly 21 is supported on separate legs 125 independent of the conveyor assembly. This permits the height of the bed of the conveyor assembly to be raised or lowered while maintaining the separator assembly at a fixed height to adjust for the different heights of articles being fed by the conveyor assembly. This insures that the separating discs are properly positioned on the face of the front article and that the article is properly positioned for pickup by the segment wheels 82 for withdrawal from the stack of flat articles. While the alternate embodiment for the separating apparatus is shown as being actuated by hydraulic mechanisms it is understood that screw elevator mechanisms or other suitable equivalent, may be used to raise and lower the bed of the conveyor. Further, it is understood that instead of adjusting the conveyor assembly it may be more appropriate and convenient to adjust the height of the separator and forwarding assemblies.

It is understood that the article separating device of the present invention may be used to feed other flat materials such as box blanks, envelopes, or any flat article that can be readily conveyed by this type of apparatus and it is not necessarily limited to the handling of bag blanks.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof, and in the light thereof, other modifications will be apparent to those skilled in the art. Therefore, the present invention is to be limited only by the scope of the appended claims.

I claim:

1. In an apparatus for separating stacked flat articles the combination comprising:
- a. a conveyor assembly for supporting and intermittently advancing a plurality of stacked flat articles;
- b. an intermittently operating separator assembly for separating the front article from said plurality of stacked flat articles;
- c. a continuously operating advancing assembly to move said front article away from said plurality of stacked flat articles, said separator assembly including:
- d. a movable restraining finger durce for holding back said stacked flat articles.
- e. a pivotally mounted suction arm device for folding outward one corner of said front article;
- f. a pair of interconnected intermittently rotating discs mounted above said stacked flat articles to bend outwardly the upper part of said front article;
- g. a clutch-brake device attached to one of said discs to periodically actuate the discs;
- h. power means to drive said clutch-brake device;
- i. a segment wheel device rotatably mounted forward of said pair of discs to engage the upper part of said front article and withdraw said article from said stack; and
- j. power means to drive said segment wheel device.

2. In the apparatus of claim 1 wherein at least one of said rotating discs is provided with a projection on the front face thereof adapted to further bend outwardly the upper part of said front article.

3. In the apparatus of claim 1 wherein said suction arm device is provided with means to overcome the vacuum to release said front article.

4. In the apparatus of claim 1 wherein said power means to drive said segment wheel device includes a one revolution clutch assembly whereby said segment wheel device may be periodically actuated for one revolution and then stopped.

5. In an apparatus for separating stacked flat articles the combination comprising:
- a. a conveyor assembly for supporting and intermittently advancing a plurality of stacked flat articles;
- b. an intermittently operating separator assembly for separating the front article from said plurality of stacked flat articles;
- c. a continuously operating advancing assembly to move said front article away from said plurality of stacked flat articles, said separator assembly including:
- d. a pivotally mounted suction arm device for folding outwardly one corner only of said front article;
- e. a pair of interconnected intermittently rotating discs mounted above said stacked flat articles to bend outwardly the entire upper part of said front article;
- f. means connected to said discs to periodically actuate the same;
- g. power means to actuate said last name means;
- h. means forward of said pair of discs to engage the upper part of said front article and withdraw said article from said stack; and
- i. power means to drive said last-named means.

6. The apparatus of claim 5 in which one of said discs engages said one corner of said front article prior to engagement of said article by the other of said discs.

7. The structure of claim 5 and in which one of said discs engages said one corner of said front article and increases the size of the portion of the upper edge of the front article bent forwardly from the remainder of said stacked articles and the other disc subsequently engages the upper edge of the front article and completes the separation of the upper edge of said front article from the remainder of said stacked articles.

8. The structure of claim 5 and including means engageable with said front article intermediate the upper and lower edges thereof throughout the time said front article is completely removed from said stack.

9. The structure of claim 5 and including advancing means engageable with said front article after it has been separated from said stack for advancing said article, and guiding means forwardly of said stack intermediate the upper and lower ends thereof over which said front article is drawn by said advancing means.

10. The apparatus of claim 9 and in which said guiding means bends said front article as it is advanced by said advancing means.

11. The apparatus of claim 9 and in which said guiding means comprise rollers.

12. The structure of claim 9 and in which the lower edge of said front article is moved upwardly upon engagement of the upper part of the front article by said advancing means.

13. The structure of claim 5 and in which said suction arm device is pivotally supported on an upright generally vertical axis parallel to the plane of the articles.