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(54) Nick breaking and scrapping press

(57) An apparatus for removing stacks of cards from lifts of die-cut sheets includes a lift support positioned to support a lift of die-cut sheets and an array of vibratory hammers mounted for movement toward the lift support to remove the stacks of cards from the lift.

EP 1 184 143 A2

Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to the field of apparatus for separating paper or cardboard articles, such as cards, puzzles, and the like, from die-cut sheets, and more particularly to an apparatus for separating stacks of cards and the like from lifts of die-cut sheets.

DESCRIPTION OF THE PRIOR ART

[0002] During the manufacture of greeting cards and the like, multiple card designs are printed on large sheets of card stock. Then the individual cards are cut from the large sheet using a die-cut press. The individual cards are retained in the large sheet by small pieces of uncut paper called nicks. At the end of the die-cut press, a large number, typically one hundred fifty or more, sheets are assembled into a stack, which is referred to in the industry as a lift.

[0003] It is necessary to remove the individual cards from the rest of the sheet, which is called scrap. Currently, a worker manually removes the cards from the scrap by beating on the cards with a hammer to break the nicks and push the cards through the sheet.

[0004] The current manual method for breaking cards from scrap is expensive in terms of labor costs. Additionally, the manual breaking of cards from scrap is hard physical work and may subject a worker to risk of injury. It is an object of the present invention to provide an automated system for breaking cards from scrap that overcomes the shortcomings of the prior art.

SUMMARY OF THE INVENTION

[0005] The present invention provides an apparatus for removing stacks of articles, such as cards, from lifts of die-cut sheets. The apparatus of the present invention includes a lift support positioned to support a lift of die-cut sheets and at least one vibratory hammer mounted for movement toward the lift support to remove a stack of articles from the lift. Preferably, the apparatus of the present invention includes an array of hammer assemblies, in which each vibratory hammer is moved toward the lift support by an actuator supported by a hammer support carriage. Preferably, each of the vibratory hammers is individually actuated to move toward the lift support.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

Figure 1 is a side elevation view of an apparatus according to the present invention.

Figure 2 is a section view taken along line 2-2 of Figure 1.

Figure 3 is a plan view of a lift and female die according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0007] Referring now to the drawings, and first to Figures 1 and 2, an apparatus according to the present invention is designated generally by the numeral 11. Apparatus 11 includes a table-like support structure 13 that may be positioned preferably near a die-cut press. Support structure 13 supports a horizontal female die 15 and a pair of horizontally spaced apart support rails 17.

[0008] Female die 15 is adapted to support a lift 19 of die-cut sheets. Typically, a lift 19 is a stack of one hundred fifty to two hundred individual die-cut sheets. As best shown in Figure 3, a sheet of lift 19 includes a plurality of die-cut cards 21. The cards are printed with text and graphic information in a large printing press and are then processed with a die-cut press. The die-cut press cuts through and around most of the periphery of the cards, but leaves nicks that retain the cards in the non-card portion of the sheet, which is referred to as scrap 23. As will be explained in detail hereinafter, apparatus 11 of the present invention is adapted to remove stacks of cards 21 from scrap 23.

[0009] Referring still to Figure 3, female die 15 includes a plurality of windows 25 positioned to correspond with cards 21. Windows 25 are slightly larger than cards 21 so that stacks of cards may pass therethrough. In the embodiment shown, female die 15 is made from a sheet of plywood, or the like, to fit a particular layout of cards on a sheet. Alternatively, the female die may be configurable for different card and sheet layouts. Appropriate guides or stops (neither shown) may be provided to aid in registering lift 19 with female die 15. Another function of female die 15 is to maintain the scrapped cards in a neat stack. Guides (not shown) may be attached to the lower side of female die 15 to ensure that multiple stacks of cards are stable and do not topple.

[0010] A set of horizontally extending spaced apart finger bars 26 is supported for horizontal movement with respect to female die 15. Finger bars 26 are attached to a moveable fingerboard 28 and pass through a bar 30 positioned adjacent female die 15. Prior to placing a lift 19 on female die 15, finger bars 26 are moved, either manually or automatically, over female die 15. The lift is then placed on finger bars 26. Finger bars 26 prevent sagging of the lift and protect female die from damage during loading of the lift. Finger bars 26 are then retracted to allow lift 19 to settle onto female die 19, as shown in Figure 1.

[0011] Referring again to Figures 1 and 2, rails 17 support a hammer support carriage, designated generally by the numeral 31. Hammer support carriage 31 includes a hammer support plate 33 positioned between roller supports 35. Roller supports 35 include rollers that engage longitudinally extending grooves formed in sup-

port rails 17 so that hammer support carriage 31 may be moved, manually or automatically, longitudinally back and forth along rails 17.

[0012] Hammer support plate 35 supports an array of hammer assemblies 41. Each hammer assembly 41 includes a pneumatic linear actuator 43 and a pneumatic vibratory hammer 45. Both pneumatic linear actuators and pneumatic vibratory hammers are generally well known in the art. Pneumatic linear actuators 43 are adapted to extend and retract under the influence of air supplied through appropriate ducting (not shown for purposes of clarity of illustration). Similarly, vibratory hammers 45 are supplied with air through appropriate ducting (not shown for purposes of clarity of illustration) to provide rapid, short stroke, reciprocating blows through a hammer tip 47. An example of a vibratory hammer that may be used according to the present invention is the Model AH-15 Auto Hammer® available from Danair, Inc. of Visalia, California. The Model AH-15 Auto Hammer® operates at 50-125 psi and consumes 2-4 cubic feet per minute (CFM) of air to provide a hammer stroke rate of over one thousand blows per minute.

[0013] Hammer assemblies 41 are positioned on hammer support plate 33 such that they may be actuated to move through lift 19 to remove stacks of cards 21. Preferably, hammer assemblies 41 are supplied with air and actuated in groups. The groups or hammer assemblies 41 may be actuated sequentially or in multiple groups, depending upon the available supply of air.

[0014] Hammer support carriage 31 is moveable, either manually or automatically, longitudinally along rails 17 from the position shown in Figure 1 directly above lift 19 and female die 15 to a position (not shown)toward end 52 of rails 17, in which a lift 19 may be placed upon female die 15. Stops 51 are provided at the ends of support rail 17 to limit the rightward travel of support carriage 31.

[0015] Apparatus 11 includes a wheeled pallet 53 that is supported below female die 15 by a scissors jack arrangement 55. Jack is movable up and down by a suitable mechanism, as is well known in the art. Pallet 53 is adapted to catch multiple stacks of cards removed by the action of vibratory hammer assemblies 45. Pallet 53 is initially supported by jack 55 closely below female die 15. Jack 55 is lowered after each cycle of hammer assemblies 45 to make room for another stack of cards. After a selected number of cycles, jack 55 is operated to lower pallet 53 to the floor, where pallet 53 may be wheeled away and another pallet may be wheeled into position.

[0016] In operation, hammer assemblies 43 are all actuated to their retracted position and hammer support carriage is moved to the leftward end 52 of support rails 17 while finger bars 26 are moved over female die 15. Then, a lift 19 is positioned upon finger bars 26. Finger bars 26 are then retracted to allow lift 19 to rest on female die 15 and hammer support carriage is moved back to the position shown in Figure 1, and preferably locked in place by pneumatic cylinders (not shown). Jack 55 is actuated to raise pallet 53 to a position immediately beneath female die 15. Preferably, lift 19 is clamped to female die 15 by horizontal bars actuated by pneumatic cylinders (neither shown). Then, hammer assemblies 43 are appropriately actuated, either simultaneously, or sequentially, to remove stacks of cards 21 from the scrap. When all cards have been removed, hammer assemblies 43 are actuated to the retracted position and hammer support carriage 31 is retracted. The scrap is removed, finger bars 26 are extended, and jack 55 is lowered. Apparatus 11 is then ready for another cycle.

[0017] From the foregoing, it may be seen that the apparatus of the present invention provides an automated system for dividing stacks of cards from the die cut scrap matrix automatically. The apparatus of the present invention separates cards from scrap more efficiently than the prior art manual method with reduced labor costs.

[0018] The present invention has been illustrated and described with respect to a presently preferred embodiment. Those skilled in the art will recognize alternative embodiments, given the benefit of the foregoing disclosure. Accordingly, the present description is intended for purposes of illustration rather than limitation.

Claims

1. Apparatus for removing stacks of articles from a lift of die-cut sheets, which comprises:

   a lift support positioned to support a lift of die-cut sheets; and,
   at least one vibratory hammer mounted for movement toward said lift support to remove a stack of articles from said lift.

2. The apparatus as claimed in claim 1, including a plurality of vibratory hammers mounted for movement toward said lift support to remove a plurality of stacks of articles from said lift.

3. The apparatus as claimed in claim 1 or 2, including:

   a hammer support positioned in spaced apart relation to said lift support;
   an actuator connected between said hammer support and said vibratory hammer to move said vibratory hammer toward said lift support.

4. The apparatus as claimed in claim 3, including:

   a plurality of actuators connected to said hammer support;
   a vibratory hammer connected to each of said actuators for movement toward said lift support.

5. The apparatus as claimed in claim 3 or 4, wherein said lift support is positioned horizontally and said hammer support is positioned above said lift support.

6. The apparatus as claimed in claim 3, 4 or 5, wherein said hammer support is movable horizontally with respect to said lift support.

7. The apparatus as claimed in any one of claims 1-6, wherein said lift support includes a female die, said female die including at least one opening for the passage of a stack of articles therethrough.

8. The apparatus as claimed in any one of claims 1-7, including a pallet supported for vertical movement beneath said lift support.

9. The apparatus as claimed in any one of claims 1-8, wherein said articles comprise cards.

10. Apparatus for removing stacks of cards from a lift of die-cut sheets, which comprises:

a horizontal lift support positioned to support a lift of die-cut sheets;
a hammer array support positioned above said lift support; and,
an array of hammer assemblies carried by said hammer array support, each said hammer assembly including an actuator connected to said hammer array support and a vibratory hammer connected to an actuator, each said actuator being actuated to move a vibratory hammer toward said lift support to remove a stack of cards from said lift.

11. The apparatus as claimed in claim 10, wherein said hammer array support is mounted for horizontal movement with respect to said lift support.

12. The apparatus as claimed in claim 10 or 11, wherein said lift support includes a female die, said female die including at least one opening for the passage of a stack of cards therethrough.

13. The apparatus as claimed in claim 12, including a pallet supported for vertical movement beneath said female die.

14. An apparatus for removing stacks of cards from a lift of die-cut sheets, which comprises:

a support frame including a horizontal table structure and a pair of horizontally spaced apart support rails position above said table structure;
a lift support mounted to said table structure to support a lift;
a hammer array support horizontally movably mounted to said support rails for movement between a first position directly above said lift support and a second position horizontally spaced apart from said first position;
an array of hammer assemblies carried by said hammer array support, each of said hammer assemblies including an actuator connected to said hammer array support and a vibratory hammer connected to an actuator, each said actuator being actuated to move a vibratory hammer toward said lift support to remove a stack of cards from said lift.

15. The apparatus as claimed in claim 14, wherein said lift support includes a female die, said female die including at least one opening for the passage of a stack of cards therethrough.

16. The apparatus as claimed in claim 15, including a pallet supported for vertical movement beneath said female die.

17. The apparatus as claimed in claim 15 or 16, wherein said lift support includes a set of retractable fingers positioned above said female die.

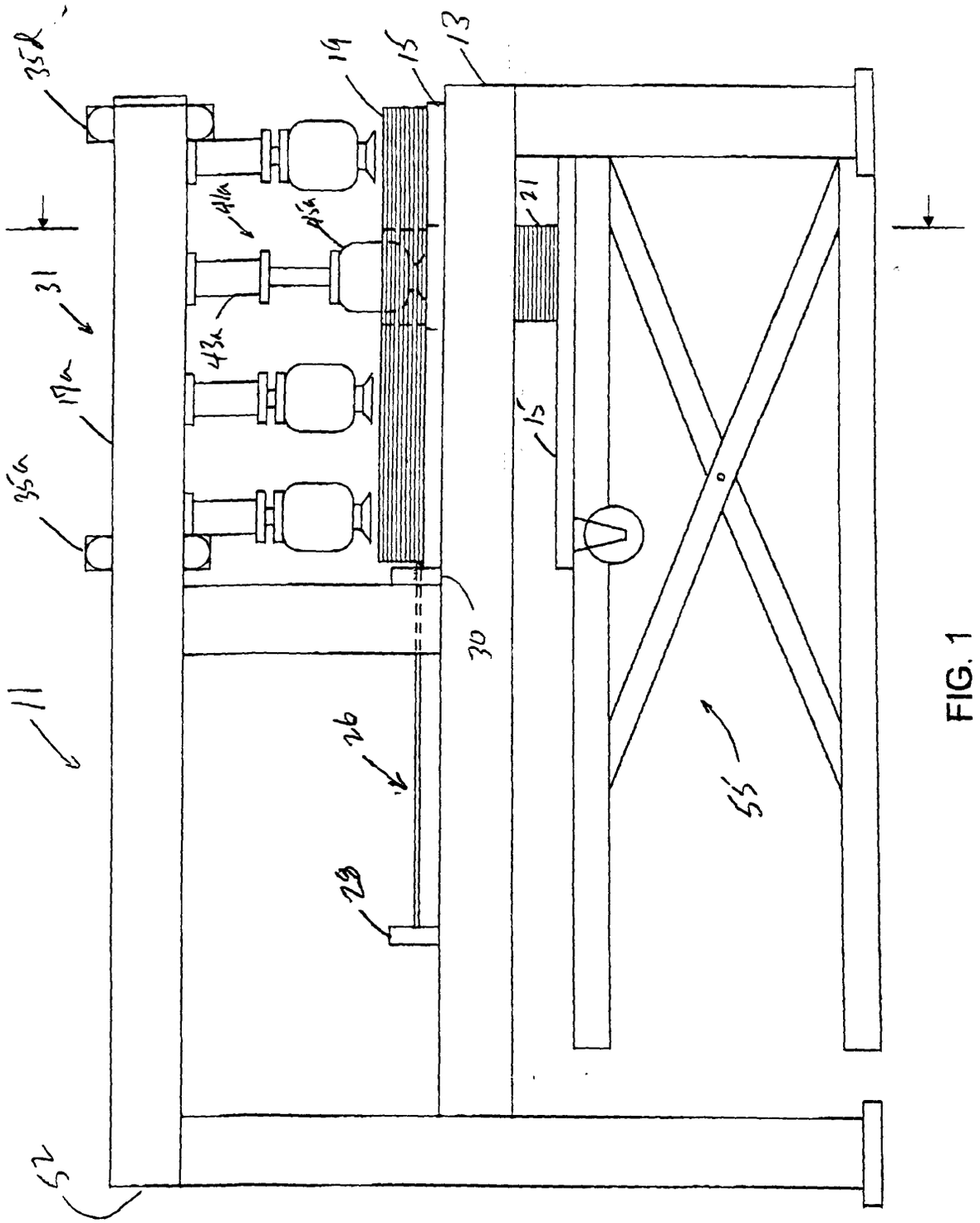
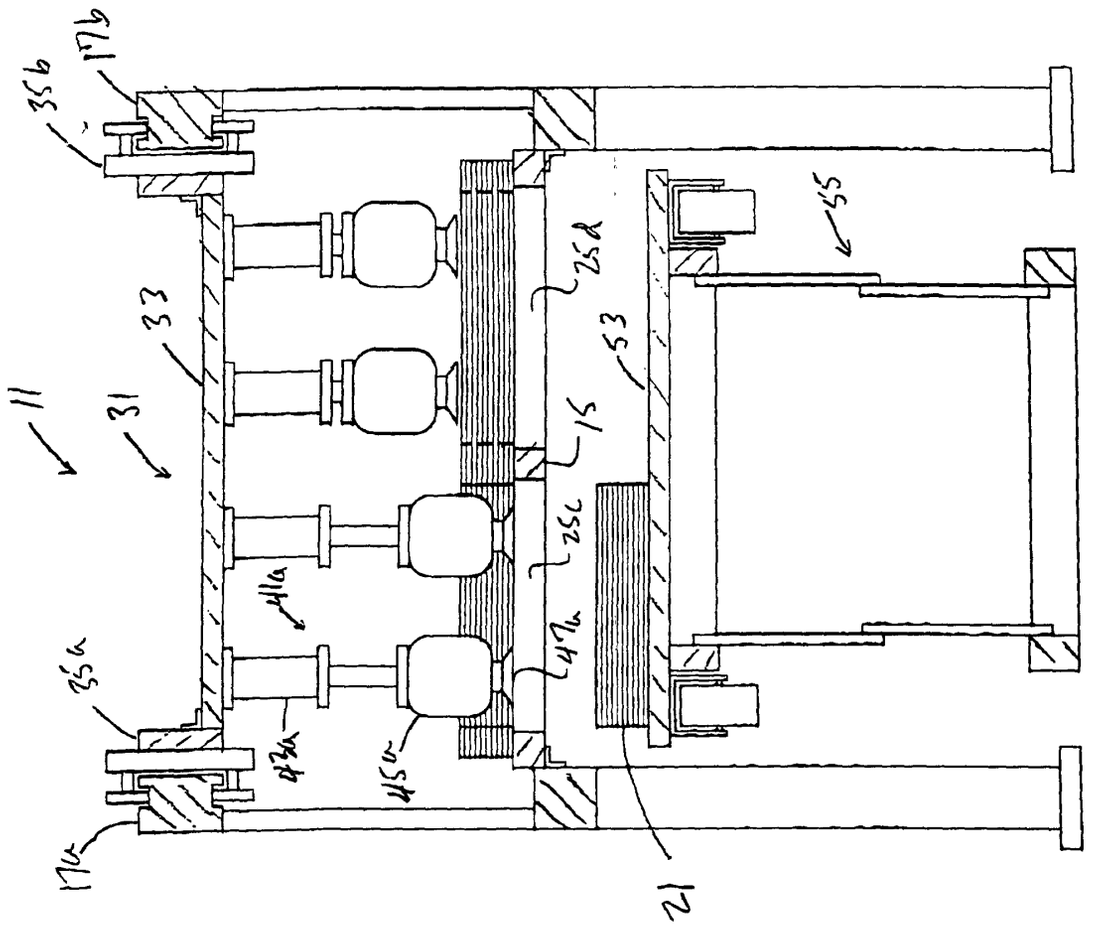


FIG. 1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33
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17a
17b
25a
25c
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53
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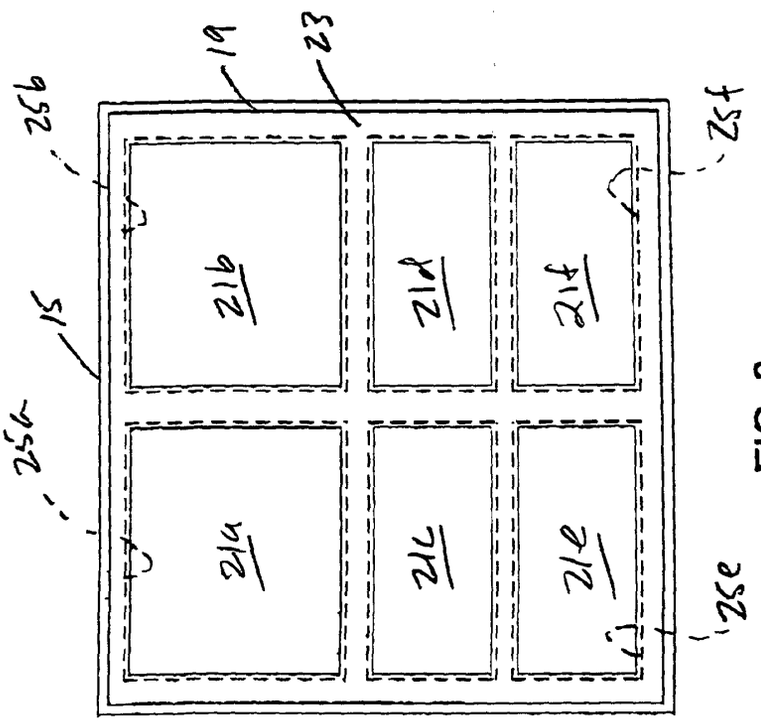
41a
43a
45a
47a
21

FIG. 2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21a
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21f

FIG. 3