Nov. 11, 1969 M. C. LYMAN 3,477,711

APPARATUS AND METHOD FOR HANDLING LONG SHEETS

Filed April 25, 1967 2 Sheets-Sheet 1

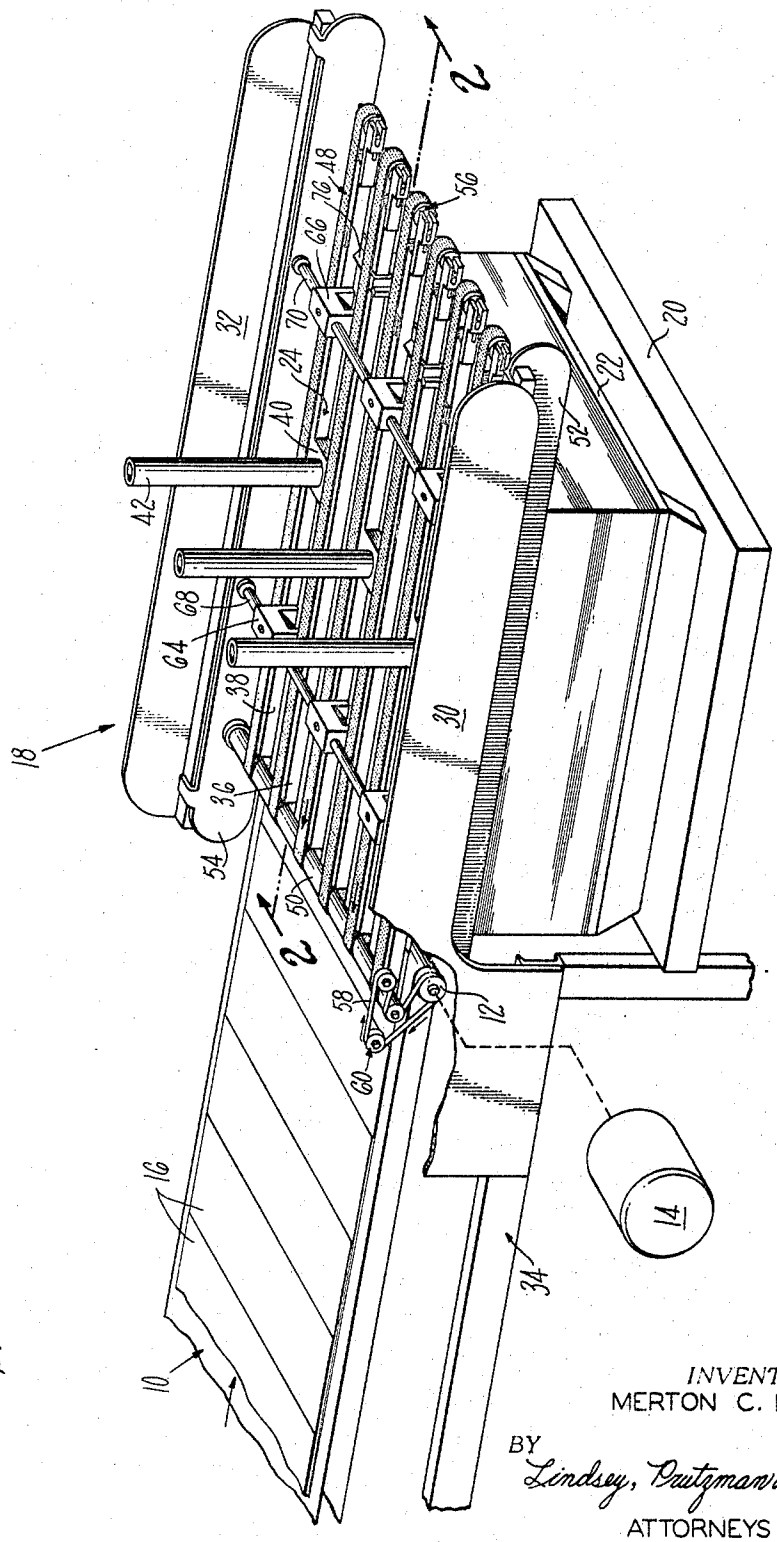


FIG. 1

INVENTOR.
MERTON C. LYMAN

BY Lindsey, Pautzman and Hayes
ATTORNEYS

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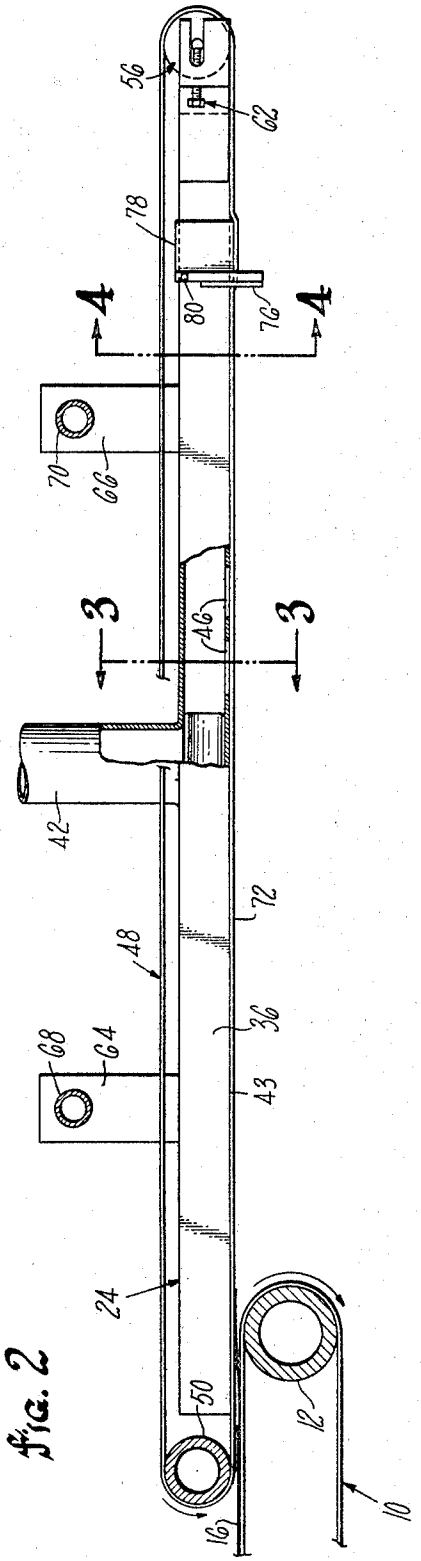


Fig. 2

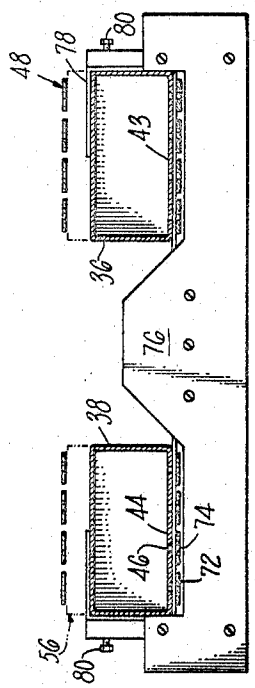


Fig. 4

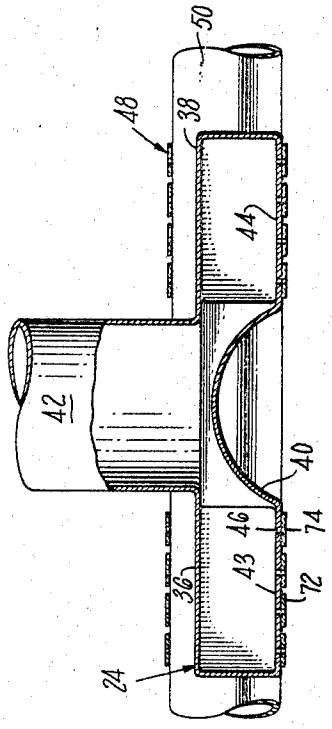


Fig. 3

United States Patent Office 3,477,711
Patented Nov. 11, 1969

3,477,711

APPARATUS AND METHOD FOR HANDLING LONG SHEETS

Merton C. Lyman, Willimantic, Conn., assignor to Cameron Machine Company, Dover, N.J., a corporation of New York

Filed Apr. 25, 1967, Ser. No. 633,555
Int. Cl. B65h 29/32
U.S. Cl. 271—74 9 Claims

ABSTRACT OF THE DISCLOSURE

The apparatus of this invention includes a vacuum box and a continuously traveling endless tape having a lower run coacting with the vacuum box to advance a sheet along a path with the assistance of suction, and a stop terminating the advance of the leading edge of the sheet coterminous with the application of suction to the sheet. A method of delivering sheets in accordance with this invention includes stopping each sheet successively in a suction application zone, disabling the suction application to each arrested sheet during continued feeding of the following sheets, and then releasing in turn each arrested sheet to permit it to fall away from the suction application zone under its own weight.

This invention generally relates to sheet handling equipment and includes as a primary object the provision of an improved apparatus particularly suited for smooth automatic handling of sheet material of extra long length.

Another object of this invention is to provide an improved sheet handling apparatus capable of automatically arresting the advance of a long flexible sheet for precision stacking in a neat accurate pile.

A further object of this invention is to provide an improved long sheet handling apparatus providing reliable performance on a continuous production basis under rugged operating conditions while requiring only a minimum number of moving parts and being virtually free of service requirements.

Still another object of this invention is to provide an improved long sheet handling apparatus which is readily in corporated in both new and existing equipment to provide added flexibility in having sheet material of varying size.

A further object of this invention is to provide an improved method of delivering long flexible sheet material.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application which will be indicated in the appended claims.

In the drawings:

FIG. 1 is an isometric view, partly in section and partly broken away, of a sheet handling apparatus embodying this invention;

FIG. 2 is an enlarged longitudinal section view, partly broken away, generally taken along line 2—2 of FIG. 1;

FIG. 3 is an enlarged transverse section view, partly broken away, generally taken along line 3—3 of FIG. 2; and

FIG. 4 is an enlarged transverse section view, partly broken away, generally taken along line 4—4 of FIG. 2.

With reference to FIG. 1, a conveyor **10** of a machine incorporating this invention is shown having a feed roll **12** driven by an electric motor **14** which is desirably connected to a suitable variable speed drive, not shown, to provide a variation in the speed of delivered sheets **16**, such as paper sheets, to a carrier apparatus **18** of this invention.

While the carrier apparatus **18** is usable with printing presses, sheeters and similar sheet handling equipment, it is particularly suited to provide smooth automatic handling of long paper sheets of lengths in the order of about 80 inches for delivery, e.g., to a platform **20** where the sheets **16** are to be stacked on a skid **22** in a neat accurate pile. It will be understood that suitable provision can be made for vibrating and automatically adjusting the stack at a constant level, if desired, for ensuring a high degree of jogged alignment of the sheets **16** as they are being stacked for subsequent removal.

For facile handling of normally troublesome extra long sheet material, the carrier apparatus **18** incorporates a rugged, dependable carrier unit having a minimal number of moving parts while providing significantly imroved handling of such sheets with the assistance of a suction force.

Specifically, a plurality of elongated H shaped vacuum boxes such as at **24** are shown mounted side by side between opposite side panels **30**, **32** of a stationary frame **34**. Considering only one of the vacuum boxes **24** (each of the vacuum boxes being of substantially identical construction), a pair of legs **36**, **38** formed of rectangular tubing are provided with an interconnecting bridge **40** establishing communication between the legs **36**, **38** and an upright suction head **42** which is connected to a suitable vacuum source, not shown. The legs **36** and **38** each have a flat bottom face **43** and **44** wherein a series of slots such as at **46** are formed throughout the length of the vacuum box **24**.

A plurality of narrow endless carrier tapes **48** are supported at the upstream end of the vacuum boxes on a common tape roll **50**, shown journaled for rotation on a pair of elongated support members **52**, **54** respectively fixed to side panels **30**, **32** of the frame **34**, and extend longitudinally about the vacuum boxes **24** to pass over a plurality of free wheeling roller assemblies such as at **56** individually mounted on the downstream end of the legs **36**, **38** of each vacuum box **24**.

While in FIG. 1 only one carrier tape **48** is shown associated with each vacuum box leg **36**, **38**, the latter may be provided with a plurality of such tapes as clearly illustrated in FIGS. 3 and 4.

In the specific illustrated embodiment, the tape roll **50** is driven off the powered feed roll **12** of the conveyor **10** by an endless drive belt **58** supported by an adjustable tensioner device **60** adapted to be suitably mounted on the frame **34** in accordance with conventional techniques for ensuring that each carrier tape **48** will be driven in synchronism with the conveyor **10**. Properly controlled tension on the carrier tapes **48** is maintained by suitable tape tightening devices **62** for adjusting the tension of the tapes **48** passing over the individual roller assemblies **56**.

To provide maximum flexibility in handling sheets of different size while at the same time ensuring quick and easy set up and disassembly, the above described carrier unit is preferably formed as an integral arrangement of parts which can be readily installed on the frame **34**. The vacuum boxes **24** are each secured to a pair of support mounts **64**, **66** for suspension below a pair of transversely extending rods **68**, **70** fixed at their opposite ends to the previously noted side support members **52**, **54**. The support mounts **64**, **66** are carried on the rods **68**, **70** and adapted to be secured in laterally adjusted position thereon for suitably positioning the vacuum boxes in relation to one another. If desired, the carrier tapes **48** can then be installed and the entire carrier unit can be readily

positioned and secured on the frame **34** so that the lower run **72** of each carrier tape **48** is disposed adjacent to and just above the downstream end of the conveyor **10**.

In the specific illustrated embodiment, the sheets **16** are shown being successively delivered from the conveyor **10** to the carrier apparatus **18** in head over tail lapping condition, and each carrier tape **48** is shown as being of perforated construction formed by a spaced series of holes **74** throughout the length of the tape. As each sheet **16** enters the carrier apparatus **18**, the sheet's leading edge is lifted into engagement with the lower run **72** of the continuously traveling carrier tapes **48** by a suction force applied through the holes **74** of the tapes **48** and through the slots **46** of the vacuum boxes **24**, thereby removing any air cushion above the sheet **16** and advancing it along a path defined by the tapes **48** in synchronism with the conveyor **10**.

Proper transfer of each sheet **16** from the carrier tapes **48** to a cooperating sheet handling element such as the illustrated stacking skid **22** is effected by a series of stop plates or doctor blades **76** shown for illustrative purposes as corresponding in number to the vacuum boxes **24**. Each doctor blade **76** extends across the lower run **72** of each of its associated carrier tapes **48** and is mounted on a bracket **78** suitably fitted on the vacuum box legs **36, 38** for adjustment longitudinally thereof in accordance with the length of the sheets **16** which are being handled. Screws **80** are provided on opposite sides of the bracket **78** for clamping it into locking engagement with outside walls of the vacuum box legs **36, 38**.

As each sheet **16** is carried forwardly, its leading edge is automatically stopped against the abutment provided by the doctor blades **76**, causing slippage between the arrested sheet **16** and the tapes **48** while the following overlapped sheet continues to advance until it in turn engages the doctor blades **76**. This renders the suction holding force applied to the preceding arrested sheet inoperable and effects a suction release within a zone of suction application provided by the vacuum boxes **24**, thereby permitting the sheets **16** to successively drop under the force of gravity into a neatly stacked pile.

By virtue of the above-described structure, a carrier apparatus is provided which is simple in operation, requires relatively few moving parts and is virtually service free to provide efficient automatic handling of extra long sheets of different size. In addition, the long sheet handling apparatus of this invention is quick and easy to set up for use with both new and existing sheet handling equipment for providing a significantly improved method of handling long sheet material.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above-described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. In a sheet handling apparatus including a frame and suction means supported thereon, a sheet arresting device comprising a carrier supported on the frame for continuous movement along a path including a suction application zone, the carrier coacting with the suction means in the suction application zone for applying a suction force to a sheet to advance it along the path in timed relation to the carrier, and an abutment disposed in the path within said suction application zone and engageable with a leading edge of the sheet for automatically stopping the sheet in the suction application zone while permitting continued uninterrupted movement of the carrier.

2. The device of claim **1** wherein the abutment terminates the advance of a leading edge of the sheet coterminous with the application of the suction force to the sheet.

3. The device of claim **1** wherein the carrier is positioned below the suction means such that a suction force is applied to lift the sheet into engagement with the carrier.

4. The device of claim **1** wherein the carrier comprises a continuously traveling endless tape mounted on the frame and having a lower run extending below the suction means which acts to remove any air cushion between the sheet and the lower run of the endless tape to effect engagement therebetween for advancing the sheet is timed relation to movement of the endless tape.

5. The device of claim **1** further including adjustment means for selectively positioning the abutment relative to said suction application zone in fixed relation to the frame.

6. The device of claim **1** wherein feeding means is positioned downstream of the carrier and operable in synchronism therewith for delivering a plurality of sheets thereto in head over tail lapping condition, and wherein the carrier comprises an endless tape at least in part positioned below the suction means whereby a suction force is applied to remove any air cushion between the endless tape and a leading end portion of each sheet for advancing it with the endless tape such that upon operation of the stop the suction force is rendered ineffective by the following sheet overlapping the preceding arrested sheet, causing its release from the endless tape.

7. The device of claim **6** further including stacking means positioned below the endless tape for receiving the released sheets in a stacked pile.

8. A method of delivering and stacking a plurality of sheets comprising the steps of feeding each sheet along a generally horizontal path with the assistance of a suction force applied to an upper surface of the sheet in a suction application zone within the path, providing a stop at a predetermined location in the path within the suction application zone, stopping the movement of a leading edge of each sheet at said predetermined location in the path within the suction application zone by engaging the leading edge of each sheet with the stop, continuing to apply suction force to said leading edge of each arrested sheet and feeding following sheets to said predetermined location in the path, and then releasing each arrested sheet in turn to fall under its own weight into a stacking device.

9. The method of claim **8** wherein the sheets are being fed during the feeding step in head over tail lapping condition, and wherein a further step is included of successively disabling the suction force applied to each stopped sheet responsive to its being overlapped by a following sheet whereby the application of suction to each arrested sheet is rendered inoperable to permit its release.

References Cited

UNITED STATES PATENTS

2,772,880 12/1956 Garrett ..... 271—74

EDWARD A. SROKA, Primary Examiner