United States Patent [19]

Buccicone

[11] **3,799,541**

[45] **Mar. 26, 1974**

[54] **VACUUM BELT-TYPE CONVEYOR**

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[73] Assignee: **Bucciconi Engineering Co. Inc.,** Gary, Ind.

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[52] **U.S. Cl.** ..... **271/197,** 198/193, 214/6 DS

[51] **Int. Cl.** **B65h 29/32**

[58] **Field of Search** ..... 271/74, 68, 94–96; 214/6 DS, 8.5 D, 8.5 G; 198/193

[56] **References Cited**

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3,228,682	1/1966	Buccicone	271/74
2,973,960	3/1961	Buccicone	271/74
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Assistant Examiner—Bruce H. Stoner, Jr.
Attorney, Agent, or Firm—Guy A. Greenawalt

[57] **ABSTRACT**

A conveyor designed for piling sheets or similar articles which comprises an elongate rail-like frame which is supported at its end on opposite sides of a piling area, the frame having mounted therein a vacuum box with a relatively flat belt supported for travel on spaced pulleys so that the lower run of the belt advances along the open bottom face of the vacuum box, the belt having normally closed apertures and the frame having means for opening the apertures, as the forward edge of a sheet is fed into engagement with the bottom surface of the belt, so as to hold the sheet on the belt by suction for advance to the piling area where the suction is discontinued and the sheet dropped onto a pile.

20 Claims, 9 Drawing Figures

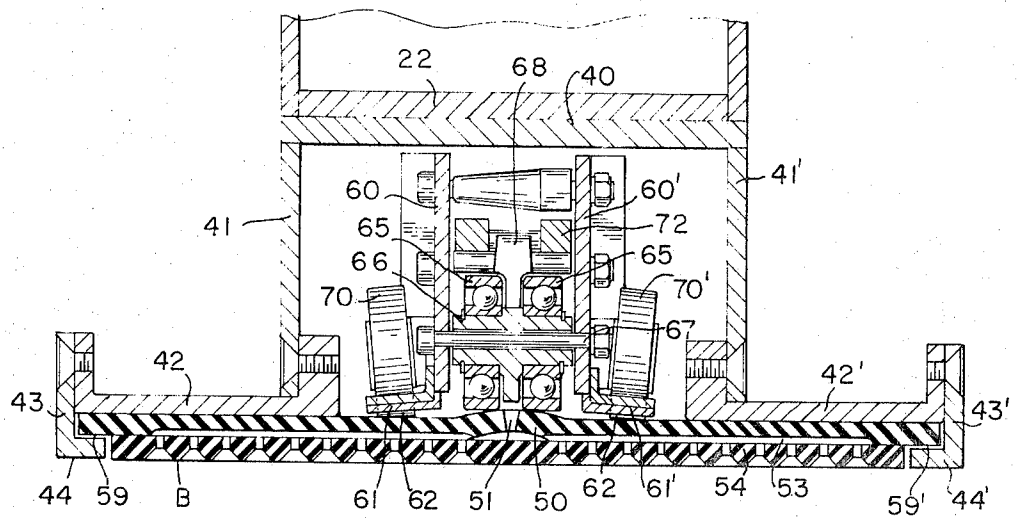
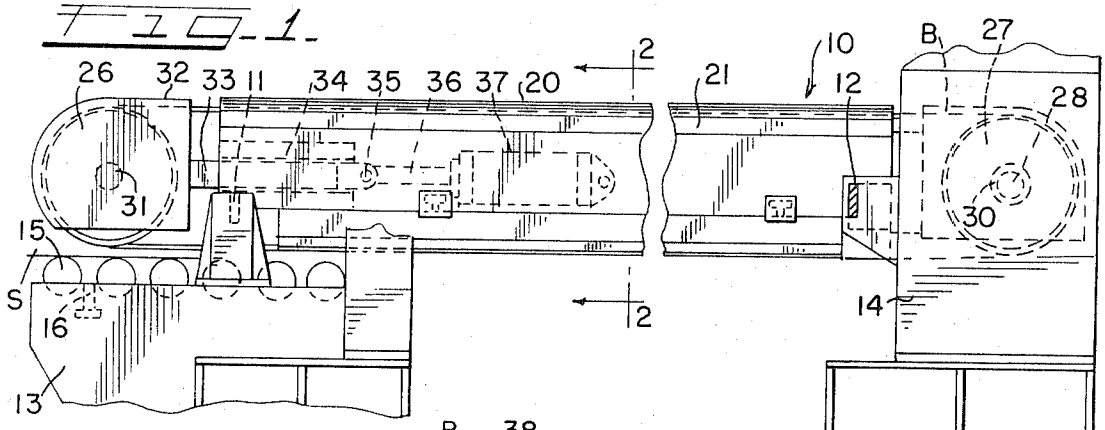


FIG. 1



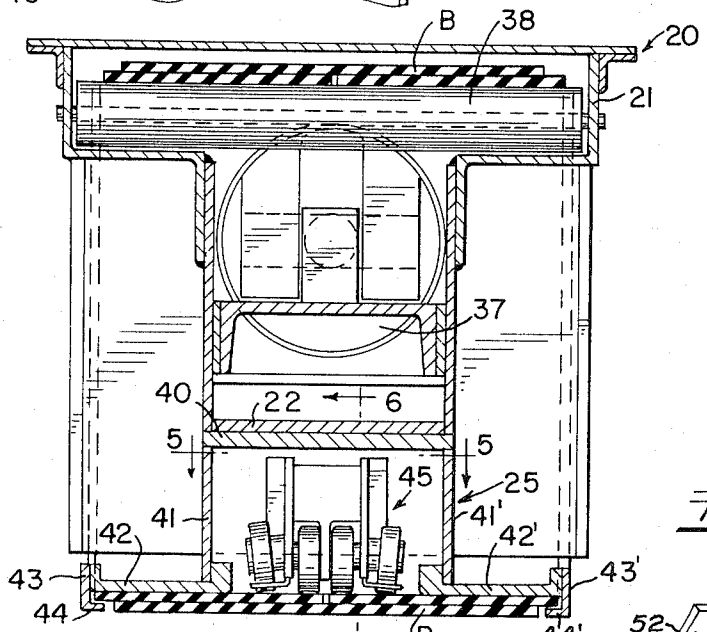
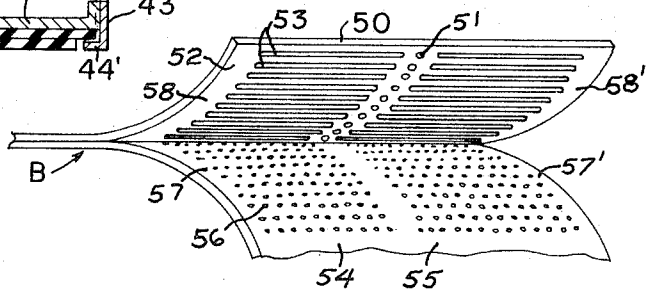


FIG. 2

FIG. 4



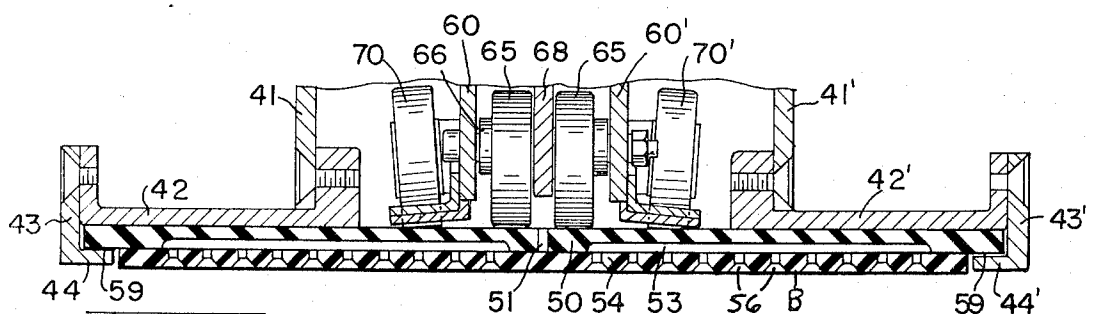


FIG. 3

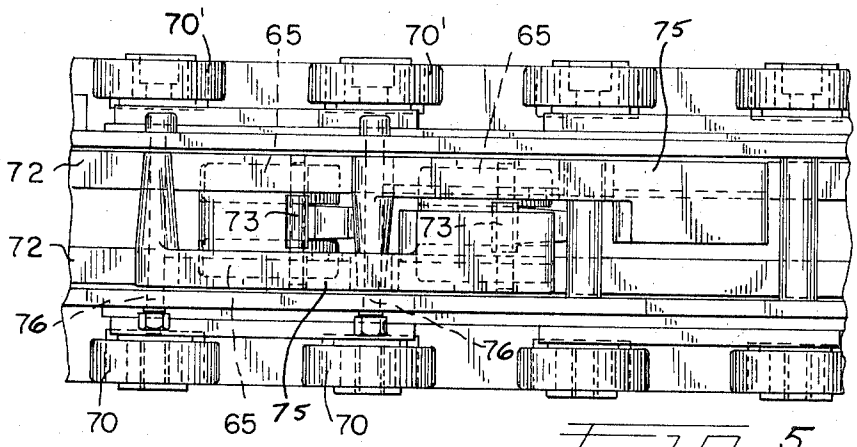


FIG. 5

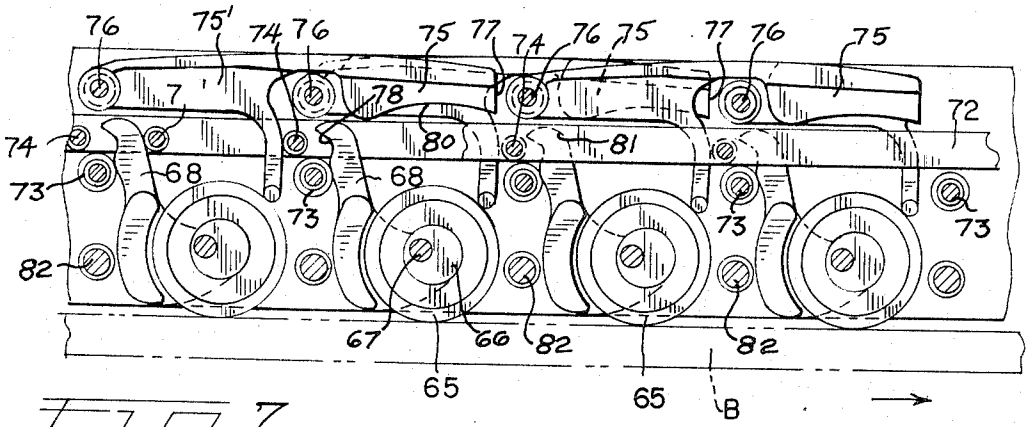


FIG. 7

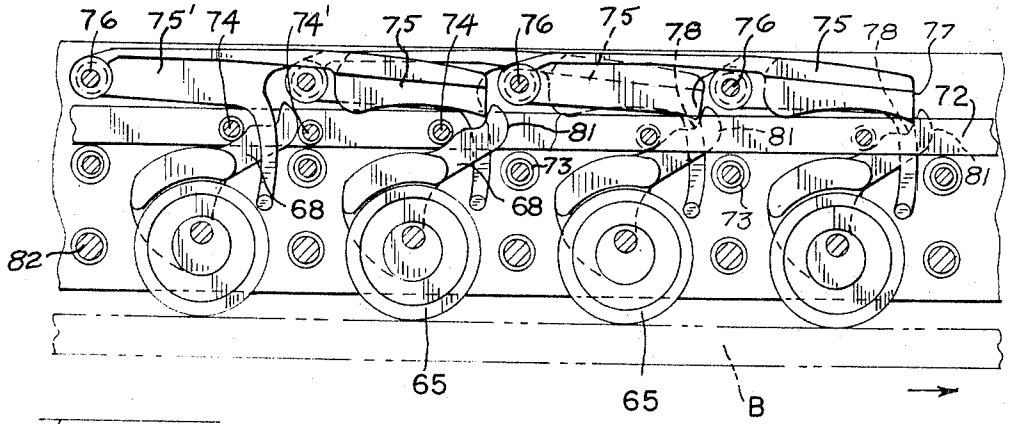


FIG. 6

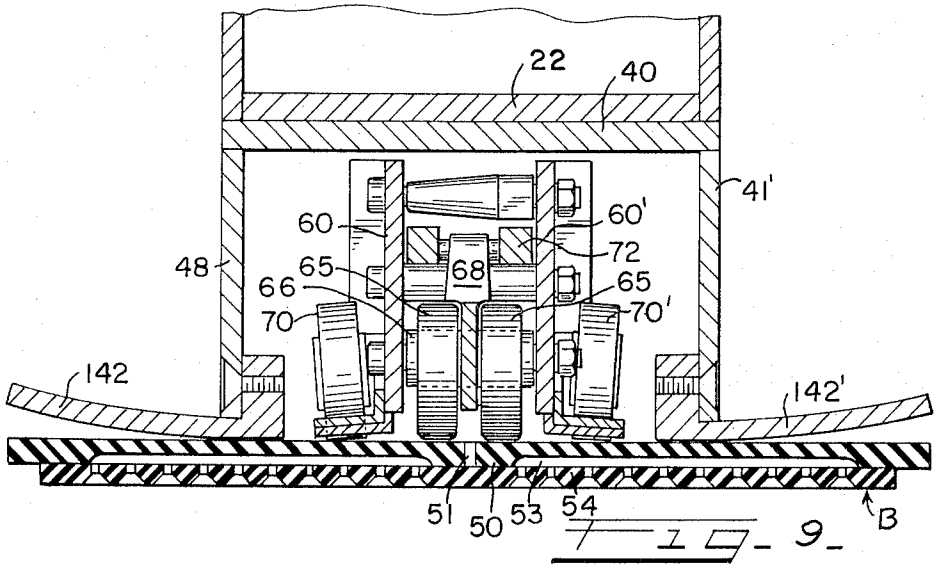

22
40
41'
60
60'
72
48
65
68
66
65
70
70'
142
142'
51
50
53
54
B

FIG. 9

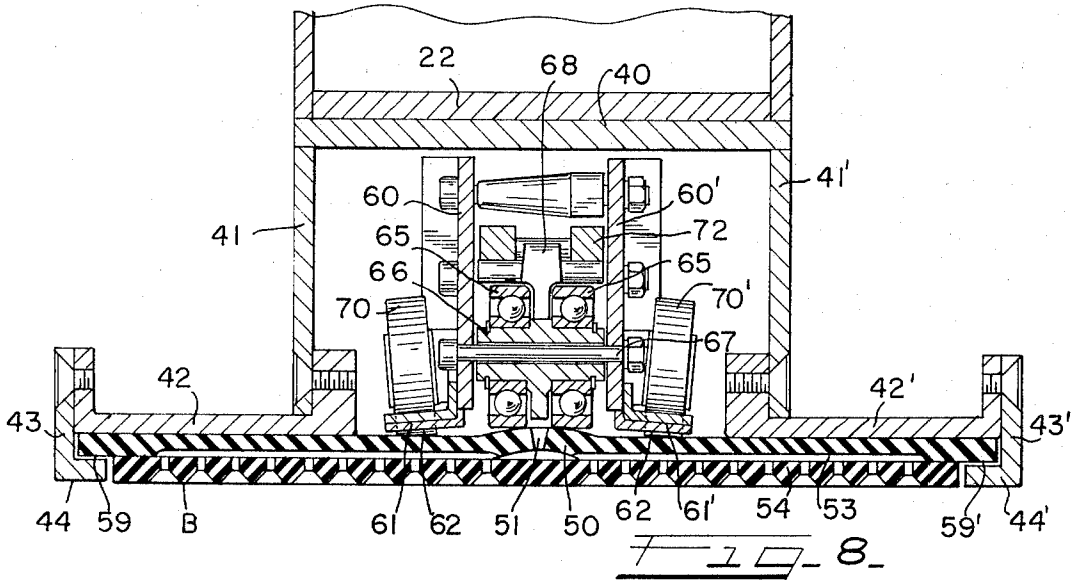

22
68
40
41'
60
60'
41
65
72
66
65
70
70'
67
42
42'
43
43'
44
59
B
61
62
51
50
62
61'
54
53
59'
44'

FIG. 8

VACUUM BELT-TYPE CONVEYOR

This invention relates to article conveyors and is more particularly concerned with improvements in an overhead-type belt conveyor against the bottom face of which articles, such as sheets of metal, plastic, or other material, requiring careful handling, are held by vacuum for advance by the belt.

Conveyor systems have heretofore been developed for handling sheets or similar articles in which the articles are held in engagement with the bottom surface of a traveling belt by suction applied through openings in the belt. Conveyor arrangements of this type are disclosed in U.S. Pat. No. 2,973,960, dated Mar. 7, 1961 and No. 3,228,682, dated Jan. 11, 1966 wherein the bottom run of the traveling belt covers the open face of a suction box and passageways in the belt are automatically opened by displacing portions of the belt as the sheets are engaged with the bottom surface of the belt so that successive sheets are held in engagement with the belt by suction applied through the openings in the belt and the sheets are advanced to a piling area, work station, or the like. In the prior apparatus, there have been some arrangements for restoring the displaced belt portions so as to close the belt openings and cut off the vacuum when the sheet is advanced to a predetermined point, thereby to release the sheet for deposit beneath the conveyor. While conveyors of this type have heretofore been operated successfully, some limitations have been found in the use of the equipment previously designed. Therefore, it is a general object of the present invention to provide a conveyor system in which sheets or similar articles can be supported from the top so that they can be carried over a piling area and dropped, thereby eliminating the sliding of one sheet over another and any possible resulting damage, wherein an improved belt structure is provided with arrangements for controlling the application of the vacuum so as to increase the efficiency of the apparatus, extend its possible use, and render its use more economical.

It is a more specific object of the invention to provide in a conveyor system of the type described an endless traveling belt of improved construction which will afford a relatively wide area of support for an article being carried, which is adapted to be supported on spaced end pulleys with its lower run forming a cover for a downwardly opening vacuum box and provided with openings for forming vacuum passageways which are normally closed, with means for automatically opening the vacuum passageways as the article is advanced into engagement with the belt so that the vacuum is effective through the passageways to hold the article on the belt surface.

A still more specific object of the invention is to provide in an overhead vacuum belt conveyor system an improved endless traveling belt which may be fabricated without molding, which enables the use of a design affording a relatively wide area of support for the article being carried, which permits the use of less vacuum, thereby reducing blower requirements, which is more efficient and less costly to operate.

It is another object of the invention to provide in an article conveyor of the type described which is especially designed for handling articles in sheet form, an endless traveling belt which is supported on spaced end pulleys in an elongate frame with its lower run traveling beneath a vacuum chamber, wherein the belt has openings which are normally closed and which are adapted to be opened so as to form vacuum passageways through which suction is applied to an article to hold the article on the conveyor for advancing movement with the belt, and wherein an improved mechanism is provided for automatically controlling the opening of the passageways in timed relation to the movement of the article as it is advanced into engagement with the bottom face of the traveling belt.

It is still another object of the invention to provide an overhead conveyor which comprises an elongate supporting frame, an article carrying belt having a series of openings forming vacuum passageways which are normally closed, the belt being mounted on spaced end pulleys with its lower run traveling beneath the open bottom face of a box-like vacuum chamber and a plurality of pressure applying devices within the chamber which are movable into and out of engagement with the back surface of the belt so as to effect opening and closing of the passageways in the belt together with control mechanism for releasing successive pressure applying devices in timed relation to the advancing movement of the article on the lower run of the belt so as to successively open the passageways in the belt and thereby make the vacuum effective for holding the article on the belt and for automatically closing the same so as to release the article when the article is advanced to a predetermined position.

It is a still further object of the invention to provide an overhead conveyor which comprises an elongate, relatively narrow supporting frame, having a downwardly opening vacuum chamber, an article carrying belt mounted on spaced end pulleys on the frame and having apertures forming vacuum passageways which are closed in the normal condition of the belt, with the belt being mounted so that its lower run is traveling beneath the vacuum chamber, and a plurality of belt engaging rollers mounted in the chamber which are movable into and out of operative position for controlling the opening of the belt apertures or holes so as to hold the article on the belt by suction as it is engaged with the lower face of the bottom run thereof and to release the article when it reaches a predetermined position.

These and other objects and advantages of the invention will be apparent from a consideration of the conveyor apparatus which is shown by way of illustration in the accompanying drawings wherein:

FIG. 1 is a side elevation of a sheet piling apparatus having an overhead conveyor which embodies therein the principal features of the invention, with portions of the apparatus being broken away or omitted;

FIG. 2 is a cross sectional view taken on the line 2—2 of FIG. 1, to an enlarged scale;

FIG. 3 is a cross sectional view showing a portion of FIG. 2 to a still larger scale, the belt control rollers being shown in the position for closing the vacuum passageways in the belts;

FIG. 4 is a fragmentary perspective view showing a portion of the belt structure in partially separated condition;

FIG. 5 is a cross sectional view taken on the line 5—5 of FIG. 2 to an enlarged scale;

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 2, to an enlarged scale;

FIG. 7 is a cross sectional view taken on the same plane as FIG. 6 but with the belt control rollers in posi-

tion for opening of the vacuum passageways in the belts;

FIG. 8 is a cross sectional view similar to FIG. 3 but with the belt control rollers in position for opening the vacuum passageways in the belt; and

FIG. 9 is a cross sectional view similar to FIG. 8 showing a modified form of the apparatus.

Referring first to FIGS. 1 and 2, there is illustrated a portion of a sheet handling apparatus which includes a rail-type overhead vacuum conveyor unit or assembly 10 having embodied therein the principal features of the invention. The apparatus illustrated is adapted for use with any material which can be formed into sheets and which requires careful handling. While it is intended primarily for handling metal sheets such as aluminum, copper, brass, stainless steel, cold rolled steel sheets, etc., it may be used to handle other sheet material such as plastic, glass, wood, etc.

The conveyor rail unit or assemlby 10 is supported at its opposite ends on cross beams 11 and 12 which are in turn supported on end stands 13 and 14. While only one conveyor unit 10 is shown, it will be understood that several could be supported side-by-side on the same cross beams 11 and 12, the number depending upon the width of the sheets or other articles to be handled. A feeding conveyor (not shown) will be provided to deliver the sheets S or other articles to the underside of the conveyor unit 10, the sheets entering the apparatus on a roller bed 15 on the end stand 13. Each sheet S passes over the roller bed 15 and its leading edge engages with the downwardly facing bottom surface of the conveyor unit 10. A photocell or other switch forming device 16 which is actuated by passage of the sheet S is adjustably mounted at the infeed end of the machine and connected into an electrical control circuit (not shown) for operating the mechanism. The apparatus, when employed as a sheet piler, will include an end stop mechanism and a back stop device, neither of which is illustrated, since they form no part of the present invention.

The conveyor unit 10, as illustrated in FIG. 1, comprises a main frame 20 consisting of laterally spaced side plate assemblies 21 and 21' (FIG. 2) which are connected at their lowermost edges by a cross plate 22. The bottom plate 22 is welded or otherwise secured to the bottom margins of the side plate assemblies 21, 21' which are spaced a smaller distance apart than the top marginal portions of the same. A suction box and belt guiding assembly 25 is secured on the lower face of the main frame 20 intermediate the ends thereof and a belt B is supported and guided along its lower run on the lower face of the suction box 25. The belt assembly B is supported at opposite ends of the conveyor frame 20 on pulley formations 26 and 27. The pulley formation 27 which is at the outfeed or discharge end of the conveyor, is mounted on a cross shaft 28 in a shaft housing 30 which is fixed on the end of the frame 20. The shaft 28 is connected to a suitable power drive (not shown). The pulley formation 26 at the infeed end of the conveyor is mounted on a cross shaft 31 in a horizontally movable housing 32. The housing 32 has a mounting sten 33 which is slidably received in a guideway formation 34 in the end of the frame 20 and is pivotally connected at 35 to the piston 36 of a fluid cylinder 37. The cylinder 37 is pivotally connected at its base to the frame 20 so that by controlling the pressure in the cylinder 37 tension in the belt assembly B may be controlled. The top run of the belt B is carried on support rollers 38 journaled between the top portions of the side frame plate assemblies 21 and 21'.

The vacuum box 25 is formed with a top plate 40 and laterally spaced, downwardly extending side plates 41, 41' which terminate at the inner end or sides of channel-shaped guides or supports for the belt B which closes the open bottom face of the box 25. The belt guides are of channel shaped cross section and secured in outwardly directed upwardly opening relation on the bottom margins of plates 41, 41'. Angle members 43, 43' are secured at the outer ends of the belt supporting channels 42, 42' with an inwardly extending flange so as to form guideways 44, 44' for the side edge portions of the belt B. The box 25 is arranged to be slid into place on the bottom plate 22 and secured thereon in the same manner as illustrated and described in U.S. Pat. No. 3,228,682. The box 25 which forms a downwardly opening suction chember has a connection with a vacuum supply line (not shown). In addition box 25 houses an assembly 45 for controlling the passage of air through the belt B,details of which are shown in FIG. 4.

The belt B comprises a top belt member 50 of relatively strong but flexible rubber or other material having like characteristics, which is devided into two like sections by a line of holes 51 down the longitudinal center thereof. The belt member 50 is otherwise imperforate. On each side of the center line the belt member 50 has, on its outside face 52, a series of lengthwise spaced, transversely extending, shallow grooves 53 which terminate, at one end, short of the side edges of the belt and, at the other end, adjacent the line of holes 51. The grooved outside face of the belt member 50 is covered by a web member 54 of flexible material which is perforated on opposite sides of a center strip 55, the holes being indicated at 56. The strip 55 is imperforate and wide enough to cover the line of holes 51 when the two members 50 and 54 are in flat face-to-face contact. The web member 54 may be, for example, in the form of a loosely woven cotton duck, loose enough to permit air to pass through, and soft enough not to cause any markings on the sheets being handled and with an imperforate center strip portion 55. The cover sheet 54 must flex readily in the lengthwise direction. Crosswise this sheet should have greater stiffness than the belt member 50. The lateral margins 57, 57' of the cover sheet 54 are vulcanized or cemented to the outside margins 58, 58' of the grooved face 52 of the belt member 50. The center area of the belt member 50 must be sufficiently flexible to be drawn upwardly, as shown in FIG. 8, by means of vacuum in the box 25, and thereby open up the holes 51 and also connect the same with the lateral grooves 53 so that suction is applied through the perforations or holes 56 of the cover sheet 54. The cover sheet 54 is of lesser width than the width of the belt member 50 so as to provide recesses or guide grooves 59, 59' on opposite sides or margins of the belt B for co-operation with the guideways 44, 44'. The arrangement provides for suction through the belt cover member 54 for holding thereon the sheet S as it is fed against the bottom face of the belt assembly B.

The control assembly 45 (FIGS. 6 to 9) for opening and closing the vacuum holes or passageways 51 in the belt assembly B is carried on a pair of laterally spaced, longitudinally extending, parallel plate members 60 and 60' (FIG. 8) which have mounted at their lower

ends belt engaging guide members 61, 61', each of the latter having on its lower surface an anti-friction pad or strip 62 which engages the top or inside face of the belt member 50 at points spaced laterally of the line of holes 51. Between the plates 60, 60' there are mounted a series of ball bearing rollers 65 which are arranged in pairs and carried on eccentrics 66. Each eccentric 66 carries a pair of rollers 65 and is mounted on a cross pin 67 extending between the side plates 60, 60' and each includes a radially extending control arm 68 by means of which the eccentric is rotated between two positions. In one rotative position of the eccentric 66, as shown in FIGS. 7 and 8, the pair of rollers 65 are in an upper or raised position (FIG. 8) and the vacuum passageways 51 in the belt assembly B are opened by suction through the box 25. In another rotative position of the eccentric 66, as shown in FIGS. 3 and 6, the rollers 65 will be in a down or lowered position and the vacuum passageways or holes 51 are closed by forcing the belt member 50 into flattened condition with the center portion engaging the imperforate center portion 55, of the belt cover member 54.

In addition to the control rollers 65 belt engaging rollers 70, 70' are provided which are mounted on cross shafts 71 and disposed outboard of the eccentrically mounted rollers 65. The rollers 70 and 70' are mounted with a slight tilt so as to engage the belt member 50 through suitable apertures in the angle members 61, 61' and relieving any tendency of the belt member 50 to stretch outwardly. The eccentric operating arms 68 are moved between the two positions by a longitudinally extending control bar 72 which is supported for horizontal movement on rollers 73. The bar 72 has longitudinally spaced cross pins 74 which are positioned so as to engage the ends of the arms 68 when the bar is shifted to the right as shown in FIG. 6. As the bar 72 is moved to the extreme right position, which is shown in FIG. 6, the pins 74 engage the outer ends of the arms 68 and rotate the cams or eccentrics 66 about the pivots 67 to a position where the rollers 65 are lowered into pressure engagement with the center portions of belt member 50 to close the holes 51 forming the vacuum passageways. In the extreme right position of the bar 72, which is shown in FIG. 6, each pin 74 has moved the associated arm 68 to a position where the end of the arm 68 engages with the end of an associated control link 75. A series of elongate control links or latch bars 75 are swingably mounted on spaced cross pins 76 (FIGS. 5 to 9) above the reciprocably mounted control bar 72 and extend generally parallel thereto in the direction of advance of the sheets which is left to right in FIG. 6 as indicated by the arrows. The link bars 75 each have a forward end abutment edge 77 which is adapted to engage in the notch 78 in the trailing or rear edge of the eccentric or cam arm 68 which controls the raising and lowering of the pair of rollers 65 below the forward end portion of the link, as shown in FIG. 6, so as to latch the arm 68 when the associated rollers 65 are in the down position. Each of the link bars 75 has a bottom surface portion 80 which is in the path of the rounded end 81 of the arm 68 under it and the link will be raised by counterclockwise movement of the arm 68 under it. The eccentrics 66 and the associated control arms 68 will normally swing counterclockwise, as viewed in FIGS. 6 and 7, due to their weight and their eccentric or off balance mounting, and assume the position shown in FIG. 7 with the rollers 73 and the spacer and screw assemblies 82 which connect the plates 41, 41' serving as limit stops for the arms 68. In the position shown in FIG. 7 with the control bar 72 retracted to the left the belt engaging rollers 65 are raised so that suction in the box 25 opens the belt. The first cam operating arm 68, at the left in FIGS. 6 and 7, has its end confined between two pins 74 and 74' on the bar 72 so that when the bar 72 is moved to the left from the position in FIG. 6 to the position in FIG. 7 the arm 68 is rotated counter-clocwise and the end lifts the first latch bar or control link 75' so as to release the next arm 68 for counterclockwise movement and this in turn raises the next latch bar 75 and releases the next succeeding cam arm 68. By proper adjustment of the eccentric cam weights, the timing of successive openings can be made approximately the same as the equivalent belt speed. The control bar 72 is operated by an air cylinder which is responsive to the electric eye or other sensing device 16 which is actuated by the passage of a sheet S as it is fed to the machine.

In the use of the apparatus the sheets are fed onto the entrance roller assembly 15 and across the control member 16 which is operative in an electrical circuit for actuating the air cylinder which shifts the control bar 72. The movement of the bar 72 to the right in FIG. 6 releases the first set of belt engaging rollers 65 so as to allow suction to draw the center of the belt member 50 upwardly a sufficient distance to open the belt passageways 51, as shown in FIG. 8, thereby allowing suction to be applied to the advancing margin of the sheet S. The latching bars 75 are then operated to release the successive control arms 68 and these release the successive pairs of rollers 65 for movement to a position to open the vacuum passageways in the belt assembly B according to the advancing movement of the sheet. When the trailing end of the sheet passes the control member 16 the circuit is actuated to move the control bar 72 to the right from its position in FIG. 7 and close the vacuum passageways in the belt assembly By by cutting off the vacuum to the sheet S and allowing the sheet S to be released and drop onto the pile between the two end supports 13 and 14.

In handling some types of sheet materials it is not necessary to provide the side marginal guides 43, 43' which are shown in FIG. 8. In an alternative arrangement, which is shown in FIG. 9, the belt engaging members 142 and 142' at the bottom edges of the side plates 41 and 41' are in the form of flexible or hinged plates extending on an outward and upward curve, as shown, so that the side margins of the belt assembly B may flex to some degree upwardly out of the horizontal plane.

I claim:

1. A traveling conveyor unit for sheet material or the like comprising an elongate frame, an endless belt assembly of substantial width, spaced end supports on said frame for carrying said belt assembly with the lower face of the lower run thereof forming a sheet supporting and carrying surface, means forming a vacuum chamber above the lower run of said belt assembly and having a bottom opening which is closed by said belt assembly, said belt assembly comprising an inner belt member which has a perforated, longitudinal center portion flanked by imperforate portions and an outer cover member having side marginal portions connected to side marginal portions of said inner belt member, said outer cover member having an imperforate, longitudinal center portion which is positioned to overlie the

perforated, longitudinal center portion of said inner belt member and which is flanked by perforated side portions so that when the longitudinal center portions of the inner and outer belt members are in face-to-face engagement the belt assembly forms an imperforate closure for said vacuum chamber, and means within said vacuum chamber for normally holding said longitudinal center portion of said inner belt member in face engagement with the corresponding portion of said belt outer cover member which means is releasable to permit the longitudinal center portion of said inner belt member to be drawn out of engagement with the corresponding portion of said belt outer cover member thereby to provide passageways for application of vacuum through the belt members.

2. A traveling conveyor unit as set forth in claim **1** wherein said belt assembly has an outer cover member with side marginal portions sealed to side marginal portions of said inner belt member.

3. A traveling conveyor unit as set forth in claim **1** wherein said belt assembly has an outer cover member which is in the form of a fabric with an imperforate longitudinal center portion.

4. A traveling conveyor unit as set forth in claim **1** wherein said belt assembly has an inner belt member with a longitudinal center portion in which there is a line of relatively small holes forming vacuum passageways.

5. A traveling conveyor unit as set forth in claim **1** wherein said frame has belt side guides adjacent the bottom face of said vacuum chamber with inwardly facing guide channels for receiving the side edges of the belt assembly and said outer belt member has its side edges disposed inwardly of the side edges of the outer belt member so that the side edges of the belt assembly are received within said guide channels.

6. A traveling conveyor unit as set forth in claim **1** wherein said means for holding the center portions of said inner and outer belt members together comprises a plurality of pairs of rollers, said rollers being mounted for movement into and out of operative position, means for latching said rollers in belt holding, operative position and means responsive to advancing movement of a sheet to release said latching means so as to enable said rollers to move to an inoperative position where the vacuum is effective through said belt assembly to hold the sheet on the surface thereof.

7. A traveling conveyor unit as set forth in claim **1** wherein said means for holding the center portions of said belt members together comprises longitudinally spaced members mounted for movement into and out of pressing engagement with the top surface of said inner belt member when it is traversing the lower run thereof so as to close the openings in said inner belt member, means for latching said belt pressing members in operative position and means responsive to sheet movement for releasing said belt pressing members so as to permit opening of said belt members for passage of vacuum.

8. A traveling conveyor unit as set forth in claim **1** wherein said means for holding the center portions of said belt members together comprises eccentrically mounted, pressure applying members which are movable into a position to press the center portion of said inner belt member into engagement with said outer belt member when said belt members are traversing the lower run thereof so as to close the openings in said inner belt member, means to latch said belt pressing members in belt pressing position and means to release said latch means so as to enable said belt pressing members to retract to a position where vacuum passageways through the belt members are open.

9. In a conveyor unit for advancing sheet material having an endless traveling belt assembly mounted on end supports and a vacuum box with a downwardly opening face across which the lowermost run of the belt assembly passes so as to serve as a closure for said vacuum box, said belt assembly having inner and outer belt members disposed with their outer and inner faces, respectively in laterally extending, overlying, face-to-face relation, said belt members having separable portions and having openings in said separable portions which are adapted to form vacuum passageways through said belt members when said portions of the belt members are separated to thereby hold a sheet on the outermost face of the outer belt member by vacuum pull for travel therewith, movable means disposed in spaced relation in said vacuum box for engaging said inner belt member and normally holding said inner and outer traveling belt members in face engaging relation thereby to close said vacuum passageways, releasable means for latching said belt engaging means in the position to close said passageways and means for releasing said latching means so as to open said passageways upon predetermined movement of a sheet along the bottom face of said vacuum box.

10. In a conveyor unit as set forth in claim **9** wherein said belt engaging means comprises pairs of rollers supported in longitudinally spaced realtion with the rollers of each pair spaced transversely so as to engage the inner belt member of said belt assembly on opposite sides of the portions of the belt to be separated in opening the vacuum passageways.

11. In a conveyor unit as set forth in claim **9** wherein said belt engaging means comprises longitudinally spaced pairs of eccentrically mounted rollers with the rollers of each pair thereof laterally spaced and disposed so as to engage the innermost face of the inner belt member of the belt assembly on opposite sides of the portions of the belt members to be separated so as to open said vacuum passageways and wherein said means for latching said belt engaging means in the position to close said vacuum passageways comprises pivotally mounted latch arms having an abutment forming portion adapted to be positioned for enagement with a portion of the eccentric mounting means for said rollers.

12. In a conveyor unit as set forth in claim **11** wherein said means for latching said belt engaging means comprises a reciprocable bar member having cam members thereon for engaging the eccentric mounting means for said rollers so as to lower said rollers into pressure engagement with said belt assembly and close the vacuum passageways, said rollers being mounted so that upon the eccentric mounting means being freed for movement by retraction of said bar member the weight distribution and pressure of the belt assembly on the rollers will automatically urge the rollers to a position which will open the vacuum passageways in the belt assembly in response to vacuum pull.

13. A belt assembly for use on a traveling belt conveyor unit where the belt assembly is carried on spaced end supports with a bottom run forming a closure for the open bottom face of a vacuum chamber, said belt

assembly comprising an inner base member having a longitudinal center portion which is perforated and side portions which are imperforate and an outer cover member having a longitudinal center portion which is imperforate and which is positioned to overlie the perforated center portion of said inner member with adjoining portions on either side thereof which are perforated, side marginal portions of said belt members being connected and the center portion of said inner belt member being sufficiently flexible to permit it to be separated by vacuum pull on the innermost face and provide vacuum passageways through the perforated portions of the belt assembly.

14. A belt assembly as set forth in claim **13** wherein said inner belt member has a center portion which includes a line of spaced apertures and said outer belt member has portions on either side of the imperforate center portion which include spaced apertures.

15. A belt assembly as set forth in claim **13** wherein said inner belt member has a center portion with a line of apertures and side portions with longitudinally spaced shallow transverse grooves in the outermost face thereof which confronts the innermost face of the outer cover member.

16. A belt assembly as set forth in claim **15** wherein said outer cover member has side portions which are in the form of a perforate fabric material.

17. A belt assembly as set forth in claim **13** wherein said outer cover member is in the form of a fabric sheet material with an imperforate center portion.

18. A belt assembly as set forth in claim **13** wherein said inner belt member is relatively flexible and said outer belt member has substantial rigidity in a transverse direction.

19. A belt assembly as set forth in claim **13** wherein said belt assembly is relatively flexible in the longitudinal direction and wherein said belt assembly has a substantial degree of rigidity in the transverse direction.

20. A belt assembly as set forth in claim **13** wherein said belt assembly has a substantial degree of flexibility in the longitudinal direction and a substantial degree of rigidity in the transverse direction, with the side edges of the outer cover member terminating short of the corresponding edges of the inner base member so as to form guide recesses along the side edge margins of the belt assembly.

* * * * *