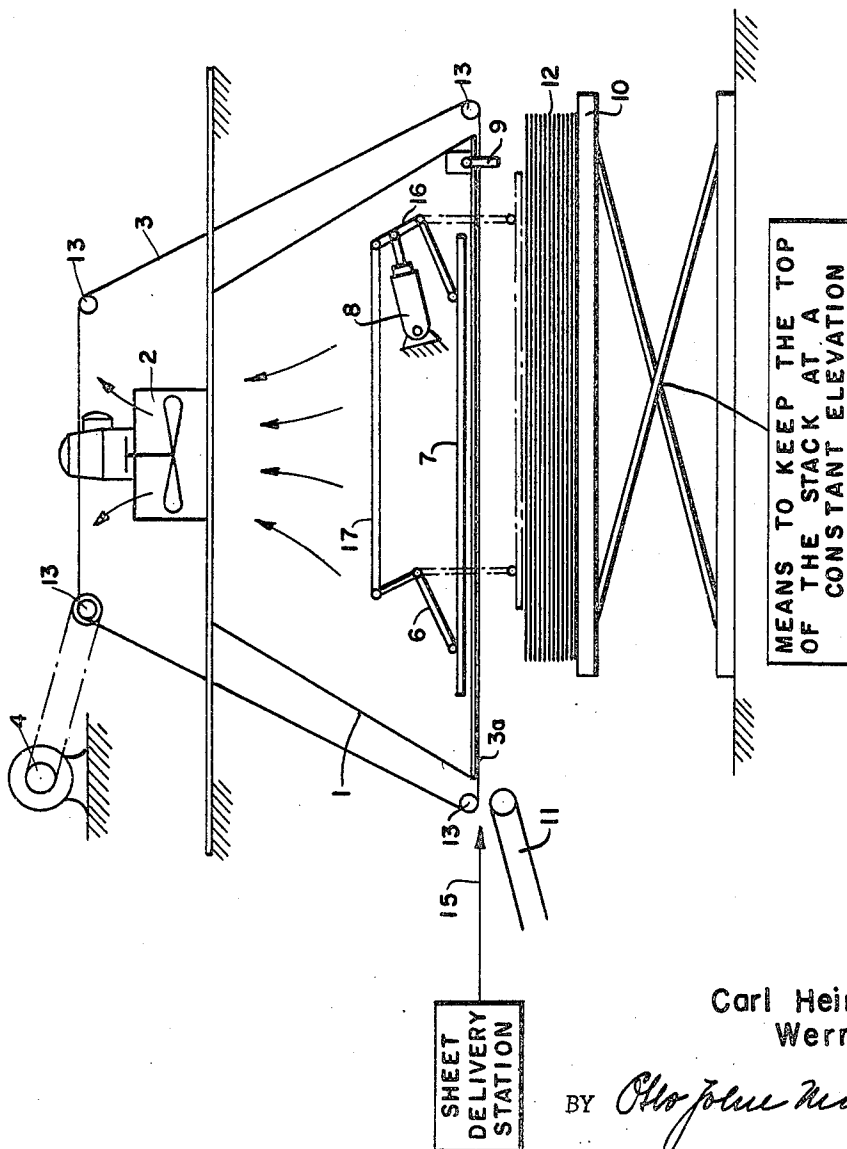
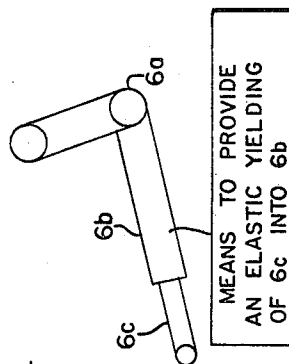


70 CARL-HEINZ MÜLLER ETAL 3,  
PROCESS AND DEVICE FOR DEPOSITING LEAF OR SHEET  
MATERIAL, ESPECIALLY VENEER SHEETS

## MATERIAL, ESPECIALLY VENEER SHEETS

3 Sheets-Sheet 1



—  
—  
—  
—  
—

INVENTOR  
Carl Heinz Müller &  
Werner Kater

BY *Oliver J. Murray*  
ATTORNEY

Jan. 20, 1970

CARL-HEINZ MÜLLER ET AL  
PROCESS AND DEVICE FOR DEPOSITING LEAF OR SHEET  
MATERIAL, ESPECIALLY VENEER SHEETS

3,490,764

Filed July 17, 1967

3 Sheets-Sheet 2

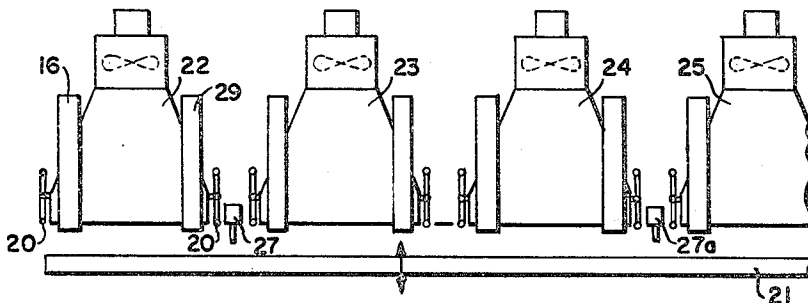


FIG. 3.

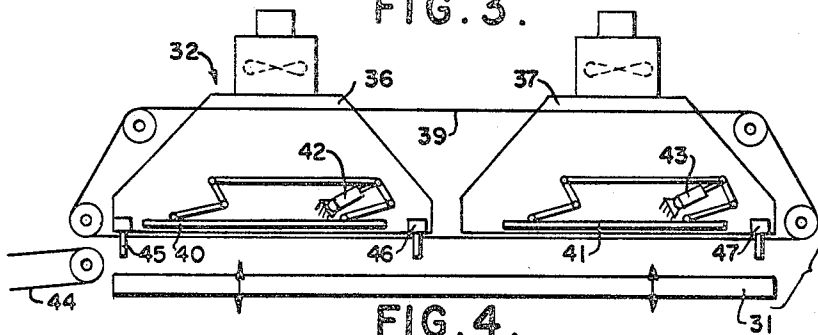


FIG. 4.

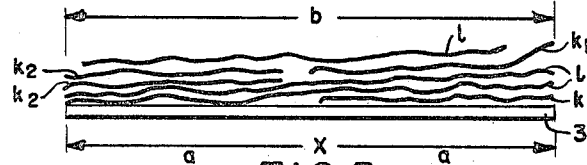


FIG. 5.

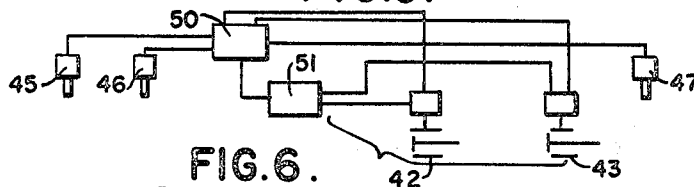


FIG. 6.

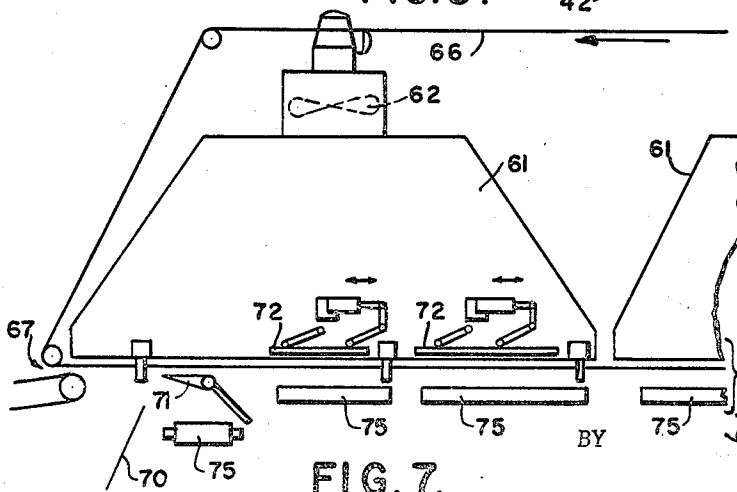


FIG. 7.

INVENTOR  
Carl Heinz Müller &  
Werner Kafer

By: *Otto J. M. M. M.*  
ATTORNEY

Jan. 20, 1970

CARL-HEINZ MÜLLER ETAL  
PROCESS AND DEVICE FOR DEPOSITING LEAF OR SHEET  
MATERIAL, ESPECIALLY VENEER SHEETS

3,490,764

Filed July 17, 1967

3 Sheets-Sheet 3

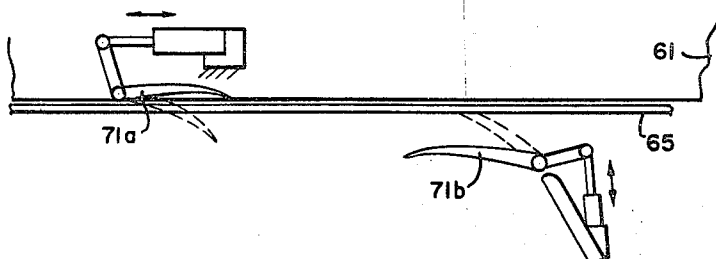


FIG. 8.

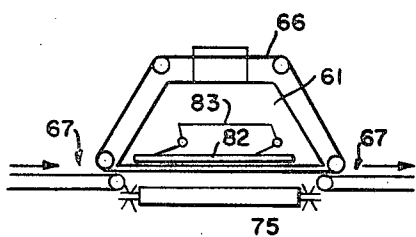


FIG. 9a.

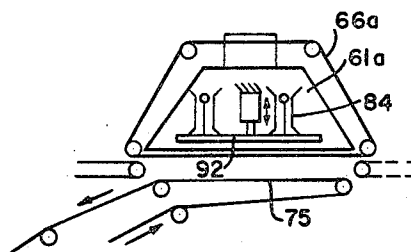


FIG. 9b.

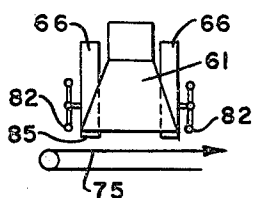


FIG. 10.

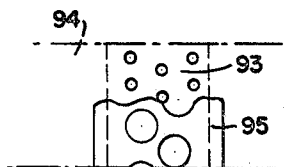


FIG. 11.

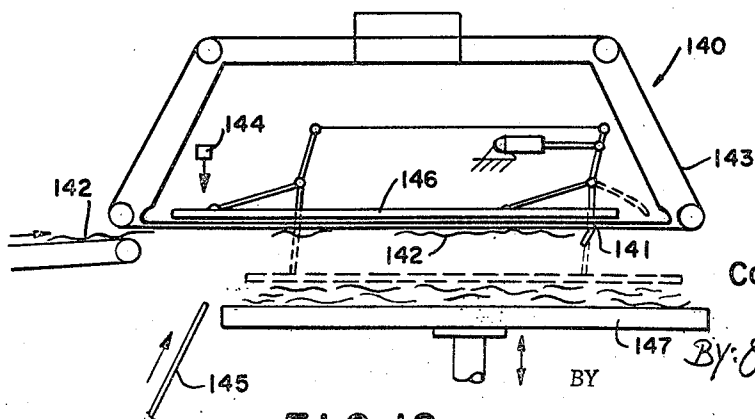


FIG. 12.

INVENTOR  
Carl Heinz Müller &  
Werner Kater

By: *Olaf John Müller*

ATTORNEY

1

2

3,490,764

## PROCESS AND DEVICE FOR DEPOSITING LEAF OR SHEET MATERIAL, ESPECIALLY VENEER SHEETS

Carl-Heinz Müller, Forst uber Holzminden, and Werner Kater, Bevern, Germany, assignors to Carl K. B. Mueller, Forst uber Holzminden, Germany

Filed July 17, 1967, Ser. No. 653,703

Claims priority, application Germany, July 16, 1966,

M 70,263; Feb. 10, 1967, M 72,722, M 72,723

Int. Cl. B65h 29/24, 29/32

U.S. Cl. 271—74

9 Claims

### ABSTRACT OF THE DISCLOSURE

Endless belts pass against the bottom of a suction box and are centrally located in narrow suction openings. The narrow suction openings of the suction box are extended in the direction of motion of the endless belts. Veneer is trapped by the suction against the belts at its outer edges and is moved in the direction of belt motion along the bottom of the box. The bottom of the box contains a sensor which indicates when the veneer has progressed a predetermined distance along the box bottom. When this distance has been traversed by the veneer, it is positioned over a stacking table and a knock-down device is actuated, pushing the veneer from the endless belts onto the stacking table. Veneer that is too narrow is rejected, because the suction is exerted only at laterally spaced locations.

### CROSS REFERENCES TO RELATED APPLICATIONS

This application is entitled to the priority filing date of the corresponding German patent applications Nos. M 70,263, M 72,723, and M 72,722 XI/81e, filed, respectively, on July 16, 1966, Feb. 10, 1967, and Feb. 10, 1967.

### FIELD OF THE INVENTION

Broadly, the invention relates to instruments and mechanical methods: for placing particular articles in a particular manner or with reference to a particular support for stacking or piling articles or materials; adapted to arrange articles in special relation to each other in a pile or stack.

In particular, the invention concerns a device for depositing leaf or sheet or tabular material, especially veneer sheets, from a conveyor belt onto a reception surface set up at a predetermined distance below the conveyor belt, in which the material is held to the lower side of an endless conveying device by means of a vacuum and is released by a pressure lever from the endless conveying device above the reception surface.

### DESCRIPTION OF THE PRIOR ART

The invention proceeds from the realization that in depositing leaf, sheet or tabular material from a conveyor belt under the influence of suction to a reception surface located at a distance below it, it is of decisive importance that on the one hand there be the possibility of holding the sheet or similarly shaped material according to its individual weight with sufficient adhesion to the lower side of the conveyor belt, but that on the other hand the adhesion be so limited that at the desired instant the sheet can be released quickly and safely, and that at the same time care must be taken that after being released by a pressure lever, the sheet or similar material has no opportunity "to glide," i.e., to move aside in an uncontrolled or arbitrary manner before it comes firmly to rest on the reception surface.

It is well known that panels or sheets or leaves of

larger dimensions very easily tend, even in the case of short downward drop, to move to the side under the influence of the dynamic air pressure underneath the extended sheets of material, so that accurate deposition of the sheets onto predetermined places of a reception surface located underneath is almost impossible. Also, many materials possess a certain inherent residual stress which leads to the result that in the course of this gliding motion the sheets have a tendency to roll up on one side or on several sides, making smooth deposition onto the reception surface difficult or impossible.

### SUMMARY OF THE INVENTION

It is a goal of the present invention to create a possibility, on the one hand, of limiting the energy expenditure for holding large and heavy sheets at such a conveyor belt to a minimum, and at the same time to provide for a quick and sure release of the sheets to a reception surface.

Another task of the invention consists in taking care that the sheets, after having been pressed off from the conveyor belt, arrive reliably by a predetermined path to a predetermined place of the reception surface without it being possible for them to shift sideways under the influence of the dynamic air pressure present under the sheets.

Another goal of the present invention is to take care that the sheets or similar materials be acted upon in the most protective manner possible when they are pushed downwards from the conveyor belt.

It shall furthermore be brought about by means of the invention that even materials that have a strong tendency to roll up or to flap up on one side, such as corrugated paper or, particularly, veneer sheets which possess an irregular inherent tension, can be transferred reliably, and essentially in flat form, from the conveyor belt to the reception surface.

Another task of the invention is to create a possibility of stacking in common varying sheets of material which, in spite of differing length, supplement each other at least groupwise with respect to a certain dimension in such a way that in spite of different sheet length, the stack will uniformly show the same height increase at all points.

Finally, a task of the invention consists in taking care that very short sheets of material of arbitrarily differing length are collected, before deposition upon the reception surface, into a group of predetermined length and are transferred in common, as a group, to the stack or the reception surface.

For this purpose and for similar purposes, the invention provides for a process for the depositing of leaf or sheet material, particularly veneer sheets, from a conveyor belt onto a reception surface set up at a predetermined distance below the conveyor track, in which process the material is held to the lower side of an endless conveying device by means of a vacuum and is released by a pressure lever from the endless conveying device above the reception surface. The material is sucked to the conveyor belt only in a few closely defined zones, being narrow in comparison to the width of the material, located at opposed intervals and consisting of appropriately narrow suction areas. The narrow conveyor belts are coordinated with the suction areas. The veneer, while being pushed off from the conveyor track, is forcibly conducted to the fixed rest upon the reception surface. Operation in the case of this process requires very small energy expenditure for the generation of the vacuum and the drive of the conveying device. This is achieved due to the fact that the vacuum becomes effective on the material only in areas very narrow in comparison

to the width of the material. It may nevertheless be necessary to work with considerable vacuum at the narrow zones in question. Due to the small amount of air that must be drawn off, this vacuum can be maintained very easily and with small energy expenditure. It is possible to adjust the adhesion force in a simple manner according to the weight of the material in such a way that the sheet is, as a matter of fact, securely held, but the adhesion force only slightly exceeds the weight of the material. Due to this measure care is taken that the major portion of the material sheet is outside of the influence zone of the vacuum, and thus also is not acted upon by any adhesion force. This is not only essential for small energy consumption for generation of the vacuum, but is of enormous importance for release of the sheet from the conveyor belt at the instant of the pushing off. If the vacuum is effective over the entire extent of the sheet, the adhesion force is very great, so that appropriately great forces must be employed to push off the sheet from the conveyor belt against the adhesion force. Moreover, in the case of extensive sheets it takes considerable time until the vacuum behind the sheet has been equalized with atmospheric pressure, so that the adhesion force lingers for a prolonged period of time. On the other hand, in the case of the procedure according to the invention, not only in the adhesion force restricted to the required magnitude due to the defined limits of the vacuum zone, but also a quick stabilization of the pressure in the vacuum zone is brought about as soon as the sheet of material is pushed off from the conveyor belt, since above the major portion of the sheet at its rear side normal atmospheric pressure predominates, from which the stabilization can start to take place.

Another considerable advantage of the procedure according to the invention consists in the fact that pushing the sheet off from the conveyor belt is necessary only at the few closely defined points of the setup in which the vacuum zones are located. The push-off elements to be moved for mechanically pushing the sheet off from the conveyor track are thus few in number, so that the moved mass is small as well, and very quick moving of the push-off elements becomes possible. Here it must be kept in mind that these elements must be accelerated from an at-rest position to the push-off velocity, so that the mass of these parts plays a very considerable part.

The quick acceleration and the small weight of the push-off elements have the additional advantage that the push-off elements can be moved so rapidly that relative motion between the sheets and the downward-moving push-off elements practically cannot occur, although the push-off elements act upon the material only at a few limited points far apart from each other. Thus provision is made for the fact that, due to the quick motion, dynamic air pressure is built up below the sheets. This pressure presses the sheet firmly against the push-off elements so that forcible transmission of the sheets until deposition upon the reception surface is attained with the aid of the push-off elements. Here it has advantageously been provided that the push-off elements do indeed press the sheets down until contact with the reception surface, so that shifting of the sheets and thus a "gliding" cannot take place.

For carrying out the process, the invention provides for an installation with a conveyor track formed by at least one suction box and an endless conveyor device conducted along its lower side, a deposition surface at a predetermined distance below the conveyor belt, a device pushing off the material downwards from the conveyor track and a feeler device coordinated with the conveyor track and reacting to the material when it reaches a predetermined position; in the installation each suction box, continuously connected with a suction source, has on its lower side a small number of suction zones, narrow in comparison to the width of the material and at opposed intervals arranged closely to the longitudinal sides of the

box; appropriately narrow conveyor belts, set up at opposed intervals, pass along the suction zones. Here the push-off device has pushers only at the longitudinal sides of the box.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof.

#### BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 shows in schematic representation a device according to the invention in a sectional view from the side.

FIGURE 2 shows a cross-section of the device according to FIGURE 1.

FIGURE 3 is a frontal view of a variation of the form of construction of the device for depositing different groups of sheets of material, which have differing but supplementary lengths; the depositing is done onto a common reception surface.

FIGURE 4 shows a modified embodiment of the invention.

FIGURE 5 shows the manner in which sheet material of different groups in the case of the form of construction according to Figure 4 is deposited.

FIGURE 6 schematically shows the switching circuits serving to control the device according to FIGURE 4.

FIGURE 7 shows a schematic representation of a side view of the front part of a depositing device which is particularly suitable for the depositing of veneer sheets.

FIGURE 8 shows different forms of construction of push-off devices for short veneer sections; these push-off devices may be employed in the device according to Figure 7.

FIGURES 9a and 9b show different forms of construction of the device according to the invention in use as a switch interpolated in a conveyor belt.

FIGURE 10 shows a frontal view of the device according to FIGURE 9a.

FIGURE 11 shows a part of the lower side of the conveyor in magnified scale.

FIGURE 12 represents a side view of a device according to the invention, which serves at the same time as a collecting facility for material of particularly short lengths.

FIGURE 13 is a detail view of a part of FIGURE 1.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The new device can in the first place serve for the collection of equally long sheets or of sheets differing in length in a certain manner, in stacks. Secondly, the new device can also be employed within a continuous conveyor to reject certain sheets from this conveyor to another conveyor or to a supporting surface; here the device plays the part of a switch.

FIGURES 1 and 2 represent the basic design of the device according to the invention which is suitable for the version of the process according to the invention.

The sheets of material 12 according to FIGURES 1 and 2 may be sheets, panels or foil of any kind. It is assumed that we are dealing with veneer sheets of equal length which are conveyed with the aid of supply conveyor 11 in the direction of arrow 15, for example from a cutter or a veneer drier or a measurement stretch.

The device according to FIGURE 1 has a collecting table 10 which is adjustable in height, especially stepwise for the automatic adaptation to the increase in height of veneer stack 12. By means of table 10, the uppermost surface of the stack can always and automatically be kept at a predetermined distance from the lower side of the conveyor belt, independently of the increasing height of the stack.

A pneumatic depositing device is set up above collecting

table 10. This device consists of a suction box 1 to which suction fan 2 is attached. An endless conveyor device 3 is conducted around suction box 1 via appropriate guide rolls 13, one of which as is indicated at 4, is a driven one. The endless conveyor device 3 is conducted around suction box in such a way that its lower strip 3a runs on the suction side of suction box 1.

It is of importance that endless conveyor device 3 consists of a few, preferably two conveyor belts 3b, 3c, narrow in comparison to the conveying width and moving in the same direction at opposite sides of the width. These conveyor belts can be perforated, running flush with the appropriately narrow suction zone at the lower side of the suction box, or they can be impermeable in which case the narrow suction zones are located directly beside the conveyor belts.

Veneer sheets 14 are pressed against the lower side of conveyor belts 3b, 3c by the section effect of suction box 1, and are securely carried along by them. As mentioned before, the effective suction areas of the suction box are closely limited narrow zones lying in the area of the conveyor belts. It is essential that the areas of attachment at the endless conveyor device and the suction zones lie close together, and that they be very small in comparison to the veneer width and be at a correspondingly large distance from one another. It is expedient that the conveyor belts always be exposed to the suction effect, so that they themselves are also held against the suction surface of the suction box.

In the illustrated example an insert body 5 is provided for the suction box; due to its design, it ensures that the suction effect is restricted to narrow zones in the area of the longitudinal sides of suction box 1.

As a rule, the endless conveyor device is continuously driven. In order to make it possible to deposit veneer sheet 14 on stack 12 in an accurate position, it is necessary that the sheet be released from endless conveyor device 3 in a predetermined position and uniformly over its entire surface; this presents considerable difficulties in the case of extensive sheets or foils, especially for materials with inherent tension as in the case of veneer sheets. The instant of release can be easily established by the sensing of the front edge of the veneer sheet in the known manner with the aid of an impact feeler 9 or a photoelectric feeler.

In order to be sure that the veneer sheet has been released accurately, a mechanical release device is provided which in the represented example, has two elongated release rails 7 which are held in a rest or initial position at the sides of suction box 1 in the immediate vicinity of the endless conveyor devices 3b, 3c above the veneer sheets 14. This release device is controllable by feeler 9. The release rails can be moved essentially parallel to the endless belts with the aid of a release lever system which can be actuated by means of a driving device, for example by pneumatic cylinder 8.

In the represented example, release rails 7 are supported with the aid of angle levers 6, 16, which are connected with each other via a guide rod 17 in such a way that they are synchronously swingable around their pivot bearings 16a, 6a. The release device is thus so constructed that with the aid of the angle arms the rails are moved not only perpendicularly downwards but also simultaneously in the direction of the arrow in the direction of movement of the conveyor. This is of considerable importance in order to avoid relative motion between the rails and the sheets pressed off them during the pressing off operation.

The motion of the rails can also be controlled by a predetermined guide curve.

As is demonstrated in FIGURE 1, the device is so constructed that stack table 10 is always kept at such a level that the uppermost sheet of stack 12 is at such a distance that release rails 7 make contact with the upper side of stack 12 in the lowered or lowest position. This is accomplished by means selected from conventional mechanical

equipment, sensing the spacing from deposit to deposit and by the sensor's output controlling levers x, y by electric motor or hydraulic means. The sensor may be a mechanically operated scale determining the spacing between suction box and stacking by being brought into contact from one to another, or photocell scanning or equivalent other means may be employed instead. It is thus made certain that the sheet is transferred forcibly to the upper side of stack 12. Since the suction box requires only two or a few release elements 7, the mass of the release device to be moved with the aid of activating device 8 is small, so that extremely rapid movements can be obtained at small energy expenditure. The rapid motion of rails 7 during the release process makes certain that the air cushion being formed between the sheet to be pressed off and the stack or reception surface underneath it, presses the sheets firmly against the rails, so that when the rails 7 move, the sheets are guided forcibly and without the possibility of relative shifting.

In order to increase the adhesion between rails 7 and the sheets, it has proved advantageous to cover rails 7 with a layer increasing the adhesion to the veneer sheets, or with other friction elements.

In order to prevent the rails from striking hard against the stack, angle arms 6 and 16 may also be telescopically yielding elements which yield elastically upon impact. This is shown in FIGURE 13. Rod 6c telescopes into tube 6b, while conventional means is provided to make relative motion between them elastic.

As is shown in the form of construction according to FIGURE 3, several equally designed suction boxes 22, 23, 24, 25 can be set up separately along the width of a conveyor, two conveyor belts 26, 29 as well as two release elements 20, 20 being coordinated to each of them. The release elements can be activated all together or in a certain groupwise selection by means of feeler 27 or 27a. The lowerable or raisable stack table is indicated by 21.

As is demonstrated by FIGURE 4, several suction boxes with corresponding release elements can also be set up one behind the other.

It is a special advantage of the new device that each device of arbitrary conveying width and arbitrary length of the depositing station consisting of construction units can in each case be composed of one suction box with corresponding release elements and corresponding conveyor belts, here it is advantageous that the conveyor belts of consecutively set up suction boxes are formed by common conveyor belts.

In the case of the form of construction according to FIGURES 4 to 6, the idea is that several groups of sheets of differing length which are conducted to the depositing station in arbitrary sequence by a supply conveyor 44, are deposited on a common stack according to FIGURE 5; here care must be taken that the long sheets are in each case deposited on a collecting surface 31 in orderly alignment. More than two groups of differing lengths may of course be provided for, as long as the lengths supplement each other to a common maximum length. In the represented example this goal is arrived at with the aid of two suction-box units set up one behind the other. Suction boxes 36, 37 and the devices belonging to them are essentially equally designed and correspond to the forms of construction already previously described. In this case common narrow conveyor belts 39 are provided.

In order to effectuate the common stacking of veneers, care must be taken that independently of the sequence, the veneer sections must be deposited in such a way that the stack according to FIGURE 5 grows uniformly at all points. This is achieved with the aid of supply feeler 45, the two release feelers 46, 47 and a program switch device 21 according to FIGURE 6.

Together with the first release feeler 46, supply feeler 45 forms a length-measurement stretch. If release feeler 46 is activated before supply feeler 45 is released by the

same veneer section, a veneer sheet "l" with the large length "b" is present. Feeler 46 does not respond. The program switch device controls this action. The veneer moves on to the second release feeler 47. Since the length measurement device has measured a long sheet, in length-measurement device 50 a circuit is prepared which prepares the activation of the two pressure-agent cylinders 42 and 43 by release feeler 47. The long sheet l is thus deposited onto the stack by both release devices 40 and 41 in common.

If, on the other hand, supply feeler 45 has already been again released before the first release feeler 46 responds, length measurement device 50 records the presence of a short veneer section "a" and prepares a circuit according to which only one of the two release devices 40, 41 can be activated, and thus only via program switch device 51.

In the represented example, program switch device 51 is constructed in such a way that it alternately blocks one of the release circuits of the two release feelers 46 and 47. In the case of the stack according to FIGURE 5 for example, a short section has at first come in. The length measurement device 50 has thereupon turned on program switch device 51. Program switch device 51 has blocked the circuit of the first release feeler 46. Section "l" passed through to release feeler 47 and was deposited in the rear area of stack table 31. Next followed two long sections "l." Length measurement device 50 deactivated program switch device 51 and prepared the common activation of release devices 40 and 41 by release feeler 47. Both sections have thus passed through to feeler 47 and been deposited in alignment.

Next follow again three short sections. Therefore release again occurred via the program switch device. In the case of the first of the three short sections, program switch installation 51 released the front release feeler 46. The section was deposited in front. In the case of the next section the release circuit of the front release feeler 46 was blocked, in the case of the third one free again, etc. In this manner a uniform increase of the stack is made certain. The above-described device can be employed not only for veneer strips but also for other sheet, leaf, or tabular materials; however, the handling of veneers is, as is well known, very difficult. Especially here, the advantages of the new device are of particular significance.

FIGURE 7 shows the employment of the device according to the invention in a sorting device for veneer sheets and veneer strips. The materials are delivered from a cutter or the like by means of supply conveyor 67. Several suction box units 61 can be set up consecutively; here, common conveyor belts of particularly narrow construction 66 are coordinated with them. Very particularly narrow veneer sheets as they come about during peeling are not held sufficiently by the vacuum in the small suction zones of suction box 61, but drop down after leaving supply conveyor 67; rejector 70 directs these veneer strips into a collecting point. Furthermore veneer strips occur during peeling which are larger than the above-mentioned strips, but do not have sufficient length to be cut to predetermined measures. These strips are securely held by the vacuum at conveyor belts 66. But since it is difficult to combine them into stacks, they are rejected by rejector 71 from conveyor belts 66 onto a conveyor belt 75. Here rejector 71 plays the part of a switch. FIGURE 8 shows two possibilities for the design of such rejectors 71a and 71b. In one case the rejector is installed on the rear side of conveyor belt 65, and in the other case on the front side of conveyor belt 65. In both cases the rejector at rest position runs parallel to the conveyor. The rejection position of rejection elements 71a and 71b is represented in each instance by a dotted line. The swiveling of the rejectors can be activated by an air-pressure cylinder. In the rejection position the rejector penetrates the plane of the conveyor and runs obliquely

to it, so that in practice the veneer clinging to conveyor 65 is peeled off and is rejected obliquely downwards.

The rejector is adjacent to one or several collecting points, which are indicated by tables 75. Pressing-off rails 72 are coordinated with each table 75 in the area of the suction box. These devices work in the same manner as described before.

FIGURES 9a and 9b as well as FIGURE 10 demonstrate the employment of the devices according to the invention purely as switches. Here a unit of suction box 61, conveyor belts 66 and release elements 82, 83 are interpolated into a conveyor indicated by conveyor belts 67. Underneath the unit a conveyor 75 running diagonally to conveyor 67 is indicated as reception surface, as is represented in FIGURE 10 in frontal view. If a sheet is rejected from conveyor 67 and is to be accepted by conveyor 75, pressing-off elements are activated. If a rejection is not to take place, the sheets are conveyed from the first conveyor 67 via unit 61 to the second conveyor path 67. Conveyor belts 76 serve here as a connection link. In FIGURE 9b the arrangement is similar; however guides 84 serve here to guide release elements 92, and reception conveyor 75 does not run diagonally to the supply conveyor but runs toward it.

FIGURE 11 demonstrates a preferred form of construction of the suction zones of the suction boxes. Here 94 is the lower side of a suction box which has, in a closely limited zone, openings 93 for the suction air. This zone 93 is covered by a narrow conveyor belt 95 which in turn also has openings, which are preferably larger than the openings at the bottom of the suction box in zone 93. In this manner sealing of the suction zone is made certain with the aid of the conveyor belt, but at the same time it is also made certain that a sufficient suction effect is always present at the lower side of conveyor belt 95.

As indicated above in connection with FIGURE 7, it is difficult to deposit the narrow sheets which cannot be stacked alone, but which are certainly still held at conveyor belts 66 by the suction zones. FIGURE 12 demonstrates a possibility, by means of the device according to the invention, of collecting these narrow sheets in groups of predetermined length and then of depositing them upon a reception surface 147 as a group. This is again shown by the example of veneer strips. These are conveyed by the supply conveyor and are designated by 142. Excessively narrow sections drop off from conveyor belts 143 of the suction box 140, since the suction effect is not sufficient for their adhesion. They are brought by rejector 145 to a collection point not shown. On the other hand, longer strips are conveyed further by belts 143, until they come in contact with detainer 141. The vacuum takes care that the veneer strips adhere almost flatly to the lower side of belts 143. The vacuum is however not so strong that the veneer strips are pressed entirely flat. Thus the possibility is created that the subsequent veneer strips come to a halt at the rear edge of the veneer strips, lying edge by edge, as collected under the suction box. At a predetermined distance from stopper 141 is incorporated a sensor 144, for example an optical feeler, which is designed in such a way that during the passage of short strips, thus during short periods, it does not respond, but only when a veneer strip comes to lie constantly in the light ray of feeler 144. This is the case when the group pressing against stopper 141 attains a predetermined length. At this instant feeler 144 responds and releases the activation device for release rails 146, which press off the group as a whole downwards to the rest surface 147. At the same time stopper 141 is coupled with press-off rails 146 with regard to motion in such a way that when the release rails 146 are lowered, it swings out of the path of the conveyor so that the short strips get safely away from the stopper. Rails 146 can be moved so rapidly that the arrangement of the strips in the form of a group is maintained until rails 146 by their down-

ward motion and at the same time in the conveying direction deposit the groups under forcible guidance upon depositing surface 147.

While in the above text the invention is chiefly described in connection with veneers, it can of course also be employed for other sheet panel or tabular materials, such as glass, paper, sheet metal, and similar materials. Since veneer is a particularly difficult material to handle, the invention is of particular significance in this case. Similar advantages of special kinds are also present in case of the handling of materials tending to roll up, for example, corrugated paper.

It should be understood, of course, that the foregoing disclosure relates to only preferred embodiments of the invention and that it is intended to cover all changes and modifications of the examples of the invention herein chosen for the purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. An apparatus for stacking sheet material, such as veneer board, plywood sheets and similar material comprising a sheet delivery station; a sheet pick-up station; a stacking table mounted underneath said pick-up station and spaced therefrom; said pick-up station including suction means to grasp the sheets from said delivery station and to suspend and forward them above said stacking table, means to position each suspended sheet in succession correctly for stacking on said stacking table and means to deposit positioned and suspended sheets in a stack upon said stacking table, said means to deposit comprising strip-shaped pushers and crank-shaped arms supporting said pushers and mounted at the longitudinal sides of said suction means, means to move said arms and to impart to said pushers a motion in both the direction of forwarding of said sheets and in the direction perpendicular to the stacking table, said means to deposit pressing against said sheets on their journey from the suction means to the top of the stack.

2. An apparatus as claimed in claim 1, further comprising means to raise and lower said stacking table to maintain the top of the stack on the stacking table at constant distance from sheets on the suction means, said crank-shaped arms comprising telescopic means to elastically vary their length.

3. An apparatus as claimed in claim 1, further comprising a pressure-agent cylinder, the arms guiding the release pusher being synchronously swingable by said cylinder.

4. An apparatus as claimed in claim 1, further comprising rejection means for pressing off sheets of material of short lengths set up at the longitudinal sides of the suction boxes and swingable between a position parallel to the sheet delivery station and a rejection position in which the rejection elements intersect the plane of the pick-up station at an acute angle.

5. An apparatus according to claim 1, further comprising a plurality of said pushers arranged one behind the other in the direction of forwarding of said sheets, a length-feeler means sensing the length of material, and a program control means which reacts to the deposition of only short sheets of material and is designed in such

a way that when the length-feeler means registers short sheets of material, it lets the pushers always become effective in a predetermined sequence in such a way that, independently of the sequence of the longer and shorter sheets of material in the conveyor, the longer sheets are always pushed off the conveyor by all pushers together, whereas the shorter sheets are always pushed off onto the common stack alternately by only one of the pushers arranged one behind the other.

6. An apparatus as claimed in claim 5, said length-feeler means having a release feeler for each of said pushers arranged one behind the other, the last of said pushers in the forwarding direction being always activable for short and long sheets, while the activation of the release feeler of the preceding pushers is controllable by the program control means.

7. An apparatus as claimed in claim 1 for the group-wise deposition of very short sheets of material, said means to position comprising a stopper (141), the apparatus further comprising a group length feeler means (144) to actuate said means to deposit when short sheets are suspended over a predetermined group length in succession correctly for stacking.

8. An apparatus for stacking sheet material as claimed in claim 1, said sheet delivery station including means to forward sheet material from said sheet delivery station to said sheet pick-up station; said sheet pick-up station comprising at least one suction box mounted spaced above said stacking table and having a bottom area at least equivalent to and parallel to said stacking table; one pair of endless belts spaced from each other and from said stacking table, one above each opposite edge of said stacking table and running parallel to and flush with the bottom side of said suction box between said suction box and said stacking table; the bottom of said suction box being perforated in the areas adjoining said endless belts; means to run said endless belt; suction means to evacuate said suction box; baffle means to guide the suction toward the contact areas of said endless belts with said bottom of said suction box.

9. A method of stacking sheet material, such as veneer sheets, from a conveyor upon a receiving surface at a predetermined distance underneath the conveyor, comprising the steps of: holding the material at the lower side of an endless conveyor by a vacuum; pressing the sheet material off from said conveyor above the receiving surface, said step of pressing including the step of forcibly guiding the sheets to firm deposition upon the receiving surface by moving a push-off rail simultaneously downward and forward, the forward movement preventing relative movement between sheet material and rail.

#### References Cited

##### UNITED STATES PATENTS

|           |         |         |        |
|-----------|---------|---------|--------|
| 1,648,115 | 11/1927 | Dickman | 271—33 |
| 2,257,785 | 10/1941 | Carter  | 271—33 |
| 3,224,757 | 12/1965 | Parke   | 271—74 |
| 3,406,966 | 10/1968 | Walton  | 271—74 |
| 3,227,275 | 1/1966  | Cody    | 271—74 |
| 3,334,895 | 8/1967  | Daniels | 271—88 |

RICHARD E. AEGERTER, Primary Examiner