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2,392,032

STRIPPING AND STACKING APPARATUS AND METHOD

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3 Sheets-Sheet 1

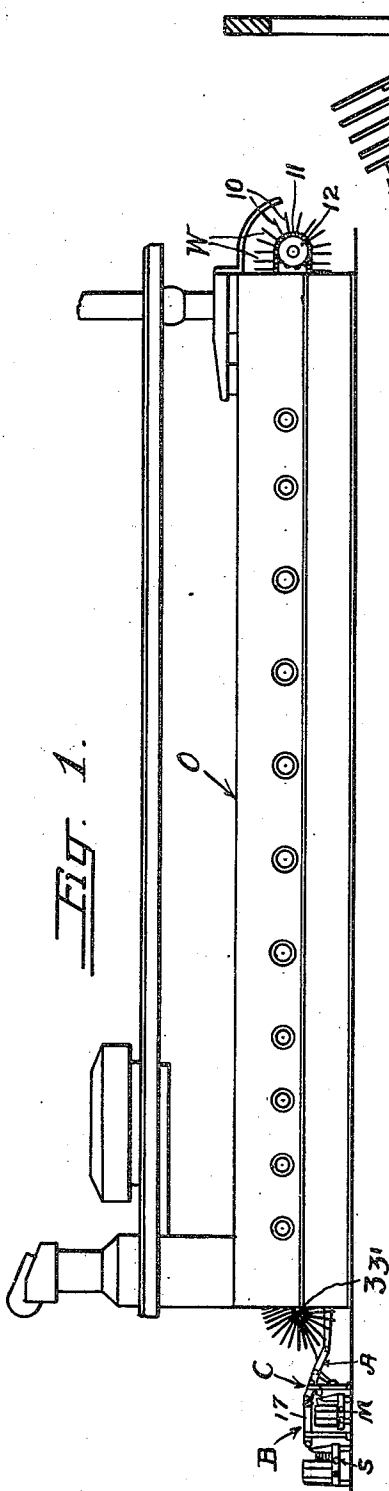
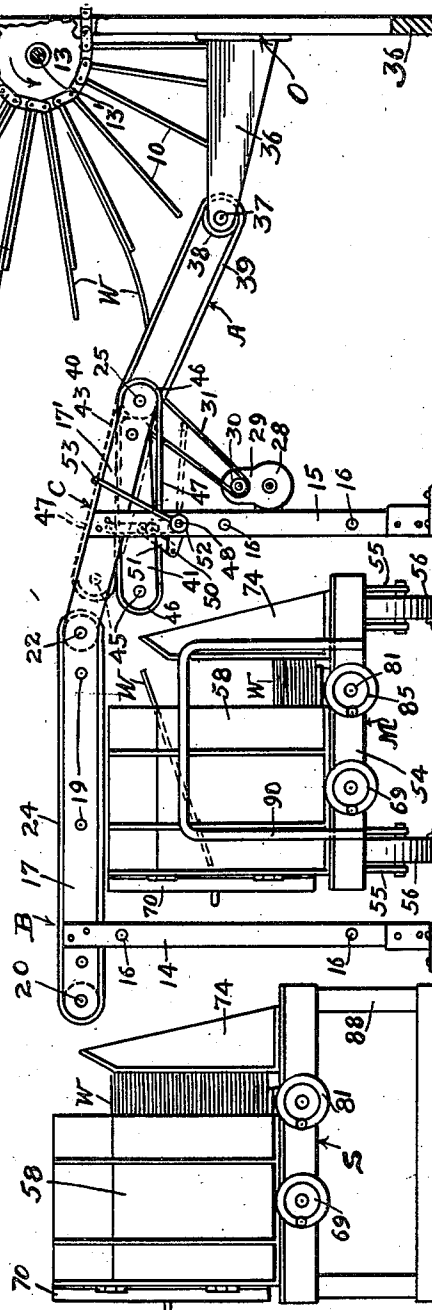


Fig. 2.



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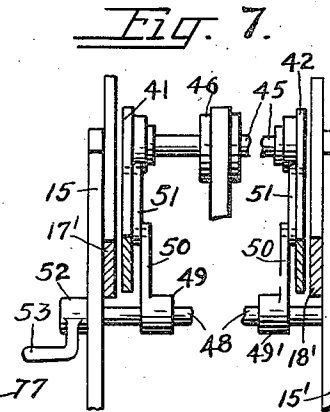
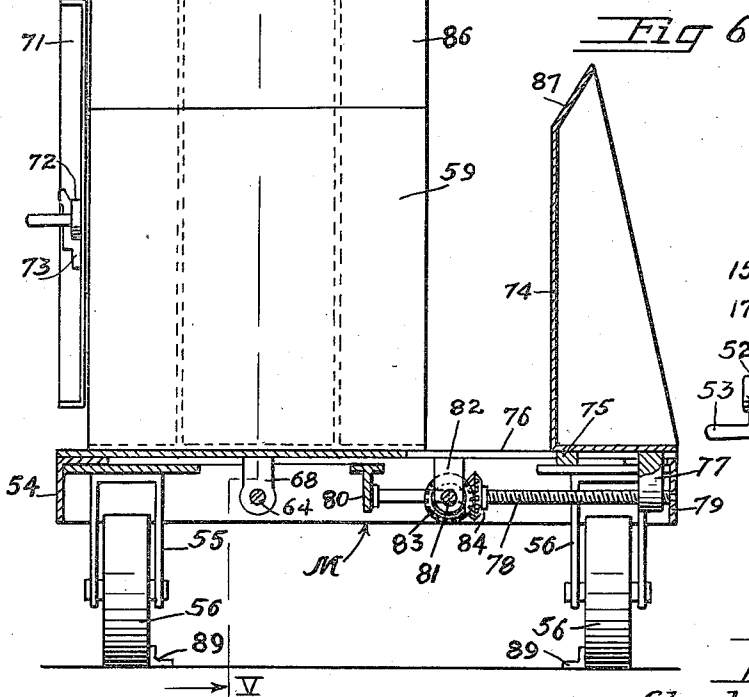
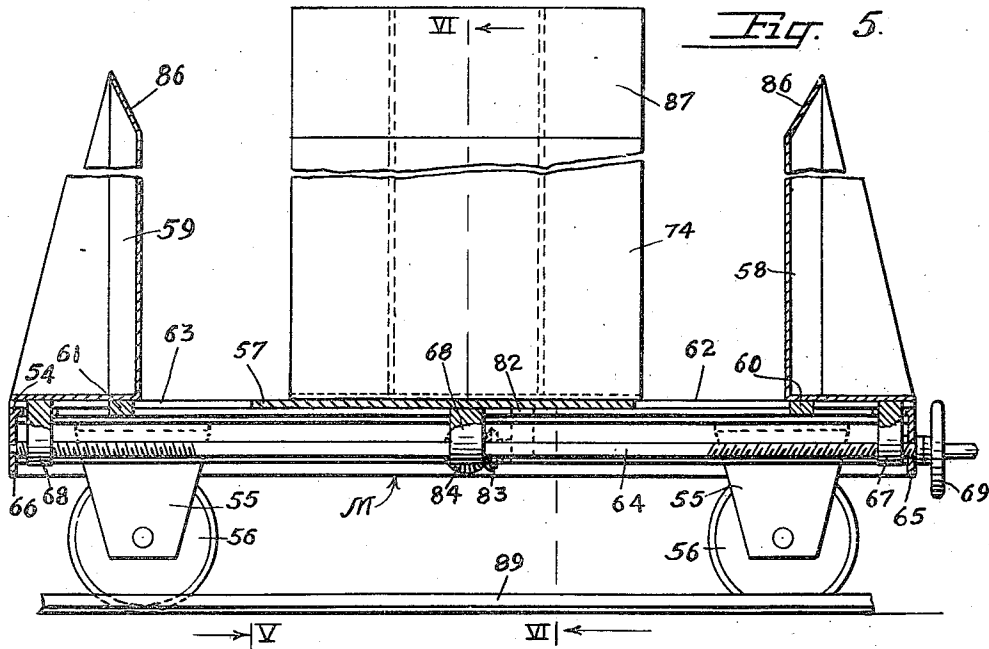
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,392,032

STRIPPING AND STACKING APPARATUS
AND METHOD

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Application February 10, 1944, Serial No. 521,800

8 Claims. (Cl. 271—69)

Our invention relates to a novel method and apparatus adapted particularly for stripping sheets or plates from a structure such as an endless conveyor and capable of stacking the stripped sheets or plates in one or more receiving structures. For example, in Albright Patent 2,129,634 issued September 30, 1938, an oven structure is shown through which metal sheets or plates are carried to be dried after being enameled, varnished, lacquered or otherwise coated, and our invention was designed more particularly for use in connection with such oven structure to strip the plates from the end of the oven conveyor and to arrange them in one or more stacks for further processing or transport.

A feature of the invention is the manner in which a receiving conveyor operates to strip plates or sheets from a rack or finger equipped conveyor carrying the plates in upright positions between the fingers along the upper run of the conveyor. In accordance with the invention this receiving conveyor is positioned to receive the plates from the fingers as the fingers swing from the upper to the lower runs of the conveyor. The receiving conveyor is driven at such a speed that it will pull the plates out from between the fingers before the plates can contact an adjacent finger. The plates are successively stripped with the leading ends of the plates initially contacting the receiving conveyor, whereupon this conveyor pulls the plates completely off of the fingers.

An important object is to so position a carrier relative to the end of a rack or finger-carrying conveyor to strip sheets or plates from the racks or fingers without permitting the sheets or plates to be dragged over each other or along a previous finger.

An important object of the invention is to strip racked plates from a conveyor by pulling the plates out of the conveyor as they assume downwardly inclined positions at the end of the conveyor run so that the racks move away from the pulled plates and the plates "float" off of the racks.

A specific object of the invention is to rapidly strip coated metal sheets from conveyor racks without damaging the coating.

Other and further objects of our invention will become apparent to those skilled in the art from the following detailed description of the drawings which disclose a practical and efficient embodiment of our invention.

On the drawings:

Figure 1 is a side elevation of an oven structure from which treated plates are to be delivered to the stacking apparatus;

Figure 2 is an enlarged side elevation of the stacking apparatus and the discharge end of the oven structure;

Figure 3 is a plan view of the stacking apparatus showing in dotted lines one of the receiver structures pulled out for unloading;

Figure 4 is an end elevation of one of the receiving structures;

Figure 5 is an enlarged longitudinal section on plane V—V of Figure 6, of the movable receiving structure;

Figure 6 is a section on line VI—VI of Figure 5; and

Figure 7 is an enlarged section on plane VII—VII of Figure 3.

The oven O may be of the same construction and operation as the oven disclosed in Patent No. 2,129,634 hereinbefore referred to. The plates W are coated and set in between racks or fingers 10 secured to a conveyor chain 11, to lean on a finger 15 so that the coated faces thereof are out of contact with the fingers. The plates are conveyed through the oven to be dried. The conveyor chain 11 is supported and driven by sprocket gears 12 and 13.

Figure 2 shows the discharge end of the oven structure and the stripping and stacking apparatus for receiving and stacking the plates or sheets. The supporting frame works for the conveyor mechanism of the stacking apparatus comprises front side legs 14 and 15 and the rear legs 14' and 15'. The front and rear legs are connected together by cross-bars 16. The conveyor structure is mounted on top of the frame and comprises the inner non-shiftable or stationary portion A, the outer non-shiftable or stationary portion B and the intermediate shiftable or movable portion C. Secured to the upper ends of the front legs 14 and 15 is a side wall 17 and on the rear legs 14' and 15' is mounted a side wall 18 parallel with the front side wall 17. These side walls are connected by cross-rods 19. The outer portions of the side walls are substantially horizontal but the inner portions 17' and 18' of the walls slope downwardly as clearly shown in Figure 2.

Between the outer ends of the side walls 17 and 18 extends a shaft 20 which is journaled in the side walls and carries a number of belt-pulleys 21. At the inner ends of the outer portions of the side walls extends a shaft 22 which is journaled in the side walls and carries a number of pulleys 23, the opposed pulleys 21 and 23 carrying the conveyor belts 24. Between the inner ends of the side wall portions 17' and 18' extends a shaft 25, journaled in the walls and carrying a number of belt-pulleys 26. On a bracket 27 extending from the rear leg 15' is mounted an electric motor 28 which, through reduction gearing 29, drives a pulley 30 connected by belt 31 with a pulley 32 on the rear end of the shaft 25. This shaft also supports a sprocket wheel 33 connected by the chain belt 34 with a sprocket wheel 35 on the rear end of the shaft 22. The motor thus rotates the shafts 25 and 22 and the shaft 20 is rotated by the belts 24.

Extending from the end wall of the oven structure are brackets 36 and 36' between whose outer

ends extends a shaft 37 journaled in the brackets and supporting pulleys 38, these pulleys being connected by belts 39 with pulleys 40 on the shaft 25, the shaft 37 being thus driven from the shaft 25 which is driven from the motor.

The belts 39 are so positioned at the end of the conveyor 11 to receive the leading ends of the plates W as the fingers or racks 10 swing beyond horizontal positions around the sprocket 13 from the upper to the lower run of the conveyor. The plates are carried by the fingers or racks to downwardly inclined positions and are stripped from the conveyor 11 when at least their leading or outer ends are below the center line of the conveyor. This downwardly inclined position of each plate being stripped provides for the "floating" of the plates out of the conveyor since the stripper belts pull the leading ends of the plates outwardly from the conveyor as the supporting fingers are swinging downwardly and inwardly away from the stripper belts. Thus the fingers move away from the plates being stripped, and dragging of the plates on the fingers is minimized.

The fingers or racks 10 are preferably shorter than the plates W so that the leading ends of the plates are above or out from the ends of the fingers to contact the belts 39 while the fingers clear the belts. The belts can be positioned so that the plates W will slide downwardly by gravity until its leading edge hits the belts 39, whereupon the belts will pull it off of the finger before it can contact the next adjacent finger. Alternately the belts can be positioned so that the leading edge of the plate contacts the belts before any sliding of the plate occurs. In either arrangement the belts 39 are in the path of the leading end of the plate to pull the plate off of the finger.

The speed of the belts is sufficient to pull the plates clear of the next discharging finger or rack so that the pulled plate will not be dragged along a next adjacent finger or rack.

Describing now the arrangement at the intermediate or movable portion C of the carrier assembly, front and rear side plates 41 and 42 are located just inside of and pivoted at their outer ends to the front and rear side walls 17 and 18, respectively, as shown at 43 and 44. At their outer ends the plates 41 and 42 journal a shaft 45 supporting the pulleys 46 which are connected by belts 47 with the pulleys 26 on the shaft 25 which is driven from the motor 28. A distance below the side plates 41 and 42 a shaft 48 extends through and is journaled in the front and rear legs 15 and 15' of the supporting frame structure. This shaft is connected through toggle mechanism with the plates 41 and 42 whereby upon turning of the shaft the plates may be swung into parallelism with the walls 17 and 17' or may be swung downwardly. Referring to Figures 3 and 7, a collar 49 secured to the shaft 48 has a toggle arm 50 extending therefrom which is pivoted at its end to the toggle link 51 pivoted to the wall 41. The collar 49' on the shaft has similar toggle connections with the rear wall 42. On the front end of the shaft 48 is secured a hub 52 from which extends a setting lever 53. Figure 7 shows the two toggle connections extended for holding the walls 41 and 42 parallel with the walls 17 and 17', while Figure 2 shows the lever 53 swung towards the left for breaking of the toggle connections to swing the walls 41 and 42 downwardly. When the toggle connections hold the walls 41 and 42 in their upper position parallel with the walls 17 and 17', the belts 47 will register with the belts 24 on the carrier portion B so that plates or sheets

W conveyed by the belts at the carrier portion A are received by and transmitted by the belts 47 on to the belts 24, but when the walls 41 and 42 are swung down, as shown on Figure 2, this travel of the plates is interrupted and the plates will be discharged from the ends of the belts 47 below the plane of the belts 24.

Although an electric motor 28 has been shown for operating the conveyor belts, it is evident that the main drive shaft 25 could be driven from the shaft 13' which supports the sprocket wheels 13 for the carrier belts 11 in the oven O. In whatever manner the shaft 25 is driven, the speed of the carrier belts should be sufficiently greater than the speed of the oven plate carrier belts 11 so that when the plates W are delivered from the oven to the carrier belts 39, as shown on Figure 2, they will be quickly carried away consecutively by the belts without overlapping.

Describing now the receiving structures on which the plates are to be delivered and stacked, two such structures M and S are shown. The receiver structure S is stationarily mounted adjacent to the outer end of the conveyor assembly to receive plates from the conveyor belts 24. The receiver M is a movable structure to be located within the conveyor structure supporting frame to receive the plates from the belts 47 when the conveyor intermediate portion C is in its lower position, as shown on Figure 2.

The construction of the movable carrier M is shown on Figures 2, 3, 5 and 6. The structure comprises a rectangular horizontal body frame 54, preferably of metal, from which bearing brackets 55 extend downwardly for journaled supporting wheels 56. A floor plate 57 is secured on top of the body frame 54 and at the ends of this floor plate are mounted guide standards 58 and 59 which are movable longitudinally under guidance of tongues 60 and 61, respectively, engaging in slots 62 and 63, respectively, in the floor plate.

Within the body frame 54 a shaft 64 extends longitudinally and is journaled at its ends in the front and rear flanges 65 and 66 of the body frame. Along its ends this shaft is threaded to receive respectively the threaded blocks 67 and 68 secured to and extending downwardly from the standards 58 and 59, respectively, through the guide slots 62 and 63 in the floor plate 57. At one end of the shaft the threading is left hand and at the other end it is right hand so that when the shaft is turned the standards 58 and 59 will be moved toward or away from each other. A hand wheel 69 is mounted on the front end of the shaft for manipulation thereof.

As shown on Figures 2, 3 and 6, doors 70 and 71 are hinged to the sides of the standards 58 and 59, respectively. When the standards are adjusted relatively by operation of the screw shaft 64, the doors move bodily with the standards, and when the doors are closed they provide with the standards a rectangular space for receiving and aligning plates delivered from the conveyor structure. The doors are held in closed position by a bar 72 pivoted at one end on one of the doors and engageable in end cleats 73 on the doors. When the bar is swung out of the cleats, the doors may be opened for unloading of the plate stack collected on the receiver M.

On the floor plate 57 of the receiving structure M opposite to the doors, a guide standard 74 is mounted for transverse movement on the floor plate under guidance of a tongue 75 extending from the standard through the guide slot 76 in the floor plate. A block 77 extends from

the standard through the guide slot 76 to receive the threaded shaft 78 which is journaled at its outer end in the side flange 79 of the body frame 54 and at its inner end in a cross-wall 80. A longitudinally extending shaft 81 is journaled in the front flange 65 of the body frame 54 and in a bracket 82 extending from the floor plate. This shaft 81 mounts a bevel gear 83 meshing the bevel gear 84 on the screw shaft 78 so that when the shaft 81 is turned by its hand wheel 85 (Fig. 2), the guide standard may be moved inwardly or outwardly transversely on the floor plate 57. By manipulation of the hand wheels 69 and 85 and turning of the screw shafts 64 and 78, the guide standards 58, 59 and 74 can be set to define the length and width of the space into which the particular size of plates or sheets delivered from the oven to the conveyor structure are to be received and stacked in vertical alignment. At their upper ends the standards 58 and 59 are inclined as indicated at 86 and the standard 74 has the inclined upper end 87, these inclined ends guiding the received plates into alignment to form the stacks. The stationary receiver S is constructed like the receiver M except that, instead of having wheels, it is stationarily mounted on a support 88.

The in and out movement of the receiver M is guided by rails 89. It is provided with a hand rail 90 by which it may be readily moved into or out of plate receiving position. Figure 2 shows the receiver M within the supporting frame work for the carrier belt assembly and in position to receive plates from the belts 47 of the intermediate conveyor section C. The stationary receiver S has been filled with plates and is ready for unloading. This is accomplished by opening the doors 70 and 71 and inserting the arms of a pick-up truck under the stack. After removal of the stack of plates, the doors are reclosed and as soon as the receiver M has been filled with plates, the lever 53 is swung to operate the toggle connection to swing the walls 41 and 42 up for registration of the belts 47 with the belts 24 of the carrier section B. The plates received from the belts 39 on the belt 47 will now be delivered to the belts 24 for discharge into the receiver S. The filled receiver M is then pulled out to one side of the carrier structure, as shown by dotted lines in Figure 3, and, after opening of the doors 70 and 71, a pick-up truck will pick up the stack for transport to its destination.

As the plates are discharged from the respective conveyor belts they will pass over the upper end of the guide standards 74 and against the doors 70 and 71, the engagement of the plates with the inclined ends 86 of the standards 58 and 59 and the inclined end 87 of the standard 74 will cause them to move down accurately into alignment between the standards and the doors to build up the stacks. As soon as one receiver is filled, the lever 53 is manipulated for adjustment of the conveyor structure for delivery of the plates to the other receiver. Referring to Figure 4, a board 91 with spacers or cleats 92 thereon may be placed in the receivers, before filling thereof, to receive the plates, the pick-up arms of a pick-up truck being then inserted below the board to remove it with the stack from the receiver.

The stacking device or structure just described is covered in our copending application Serial No. 584,738 filed November 23, 1944, which forms a division of the present application.

It will, of course, be understood that various

details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. The method of stripping sheet material from a conveyor carrying the sheet material between upright fingers thereof which comprises successively swinging the sheet material and fingers from upright position to downwardly inclined position, successively contacting the leading ends of the downwardly inclined sheet material with a traveling member, and pulling said sheet material on said traveling member out of the path of the fingers and away from the next adjacent sheet material while at the same time swinging the supporting fingers away from the faces of sheet material being pulled therefrom so that dragging contact between the faces of the sheet material and the supporting fingers is substantially avoided while there is relative movement between the sheet material and the fingers as the sheet material is pulled therefrom by the traveling member.

2. The method of stripping racked material from a conveyor carrying the material along an upper run thereof between upright fingers which comprises swinging the material on said fingers from upright position to downwardly inclined position, successively pulling the leading ends of the downwardly inclined material along an upwardly inclined path as the fingers move away from the material to separate the material from the conveyor with only the trailing edge of the material resting on the fingers thereby avoiding dragging the faces of the material on the fingers and thus avoiding damage to the respective surfaces of the material where they carry relatively delicate coatings.

3. The method of stripping sheet material from a rack conveyor carrying the material in upright position along an upper run thereof and swinging the material at the end of said run around a horizontal axis which comprises positioning the traveling conveyor in the path of said material as the material is swung to downwardly inclined position for engaging the leading ends of the material and rapidly pulling the material off of the racks while the racks are moving away from the material and at such a speed that the action of the air against the lower faces of the sheet material causes the respective faces of the sheet material to remain away from the racks while moving therefrom and limits contact between the racks and material being stripped to the respective trailing edges of the sheet material, whereby the material is floated away from the conveyor and dragging of the rack-opposing surfaces of the material upon the racks is avoided.

4. In the method of stripping upright racked work such as newly coated sheets from a traveling conveyor having work supporting members moving along an upper run and swinging about a horizontal axis to a lower run at the end of the upper run, the steps of successively engaging the outer edges of the racked sheets with a diagonally upwardly traveling surface moving away from the downwardly sloping plane assumed by the work as it is carried about said horizontal axis toward the lower run of said conveyor, carrying the engaged edge of each sheet diagonally upwardly and outwardly on said traveling surface and thereby effecting a progressively increasing spaced relation between the major area of the sheet and its

supporting member while the opposite edge of the sheet moves downwardly with and relative to the supporting member until the sheet lies flat upon the traveling surface, and moving the traveling surface at such a speed relative to the speed of travel of the supporting members that transfer of the sheets as aforesaid is effected without slipping the coated surfaces of the sheets relative to either the supporting members or the traveling surface but rapidly enough to avoid contact of any sheet by a following supporting member or sheet of material, whereby scratching or scraping of the coated surface of the sheets in the course of stripping is effectually avoided.

5. In combination with a conveyor carrying spaced upright fingers along an upper run thereof and swinging said fingers down around a horizontal axis at the end of said run, an unloader for said conveyor including a stripper positioned at the end of said conveyor at a level below said upper run and out of the path of said fingers but arranged to receive the leading edges of sheet material carried by the respective fingers as the material and the supporting fingers assume a downward inclination, and means for driving said stripper at a speed sufficient to pull each piece of sheet material from the fingers before the next adjacent finger contacts the pulled material, the speed of swinging movement of the fingers supporting the pieces of sheet material being pulled therefrom being such that as the fingers recede the outer portions of the fingers swing away from the respective pieces of sheet material and only the rear edges of the pieces of sheet material continue to have contact with the fingers while there is relative movement between the respective fingers and the material as the latter moves with the stripper away from the fingers, whereby to avoid dragging of the finger-opposing surfaces of the pieces of sheet material upon the fingers while in stripping relative motion.

6. In combination in apparatus of the character described, including a work conveyor having supporting members for advancing work pieces in upstanding racked relation along an upper run thereof and for swinging the work pieces about a horizontal axis to a downwardly inclined position at the end of said run, a stripper conveyor so positioned adjacent to said end of the upper run as to successively receive the leading ends of the work pieces after the work pieces have attained the downwardly inclined position, said stripper conveyor being adapted to swing the respective engaged downwardly inclined work pieces upwardly and away from the respective supporting members while said members swing downwardly and rearwardly away from the work pieces, and means for driving said stripper conveyor at such a speed relative to said work conveyor as to carry the engaged ends of the respective work pieces along therewith and effect separation of the work pieces from the supporting members while the trailing ends of the respective work pieces move downwardly in the swinging movement of the respective members until the work pieces are respectively disposed on the stripper conveyor and moved onward for delivery before the next adjacent advancing member can contact the newly stripped work piece, whereby to substantially avoid relative dragging or slipping movement of the areas of the work pieces intermediate their ends and the supporting members or the stripper conveyor and assuring that by the time the work pieces come to rest fully upon the stripper con-

veyor their onward momentum will equal that of the stripper conveyor.

7. In combination in apparatus of the character described including a work conveyor having fingers for advancing work pieces in upstanding racked relation along an upper run of the work conveyor and for swinging the work pieces to downwardly inclined position at the end of said upper run, a stripper conveyor so positioned adjacent to said end of the upper run as to successively receive the leading ends of the downwardly inclined work pieces, and means for driving said stripper conveyor at such a speed relative to said work conveyor as to pull each work piece by its leading end to swing the work piece away from the respective supporting finger with a swinging separation action and withdraw the trailing end of the work piece before the next adjacent finger can contact the work piece but after the work piece has attained the momentum of the stripper conveyor so that relative dragging or slipping contact between the face of the work piece and either the work conveyor fingers or the stripper conveyor is avoided.

8. In combination with a treating conveyor for handling coated plates through a treating oven or the like while supporting the plates edgewise in a substantially upright position and having upstanding supporting members thereon against which the plates are leaningly supported in the treating run of the treating conveyor, said members swinging down and in reverse about a horizontal axis at the end of the treating run of the treating conveyor, a stripping conveyor mounted on an upwardly inclined plane and traveling upwardly therealong from a position below the downwardly swinging plates on the supporting members and with its upper end located substantially beyond the treating conveyor, the inclined surface of the stripping conveyor being so disposed with relation to the path of swinging movement of the plate-supporting members as to engage the leading edges of the treated plates successively as the plates are carried by the downwardly swinging supporting members into a downwardly inclined position wherein the respective leading edges of the inclined plates rest against the stripping conveyor, and means for driving the stripping conveyor at such a speed relative to the treating conveyor that the leading edge of each successive plate is carried upwardly and outwardly by the stripping conveyor to swing the plate away from the associated supporting member while the plate fulcrums at its leading edge on the stripper conveyor and at its trailing edge on the supporting member and the supporting member swings away from the plate until the stripping conveyor has advanced the plate to such an extent that it entirely leaves the supporting member and is carried wholly by the stripping conveyor, the relationship being such that relative sliding motion between the face of the plate and the stripping conveyor and the supporting member is prevented because all engagement between the plate being stripped and the stripping conveyor and the supporting member is at the edges of the plate until the plate has attained the full momentum of the stripping conveyor, whereby scratching or marring of the treated surface of the plate while transferring from the treating conveyor to the stripping conveyor is effectually avoided.

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