July 8, 1947 C. H. DOMVILLE, JR., ET AL 2,423,691

STACKING DEVICE

Original Filed Feb. 10, 1944 3 Sheets-Sheet 1

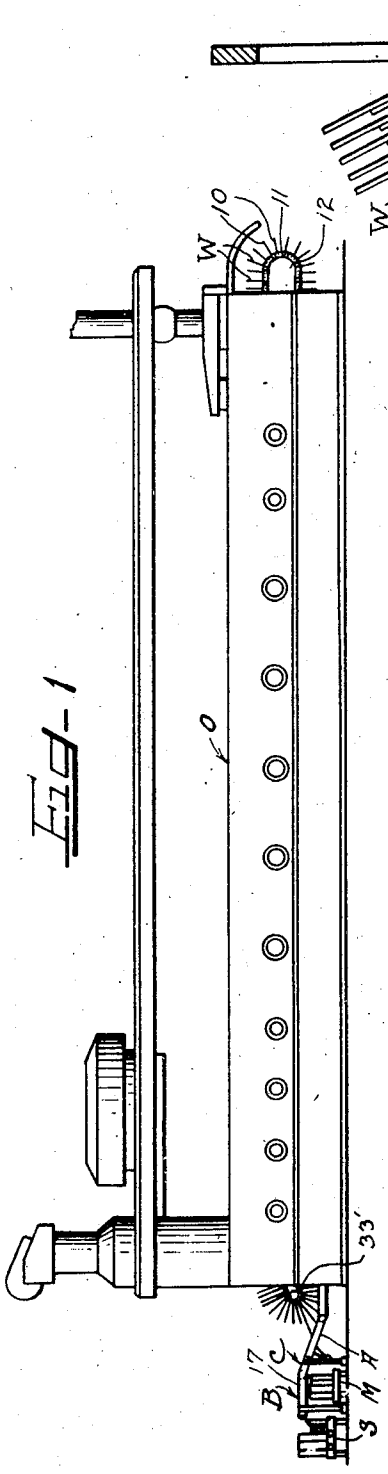


Fig-1

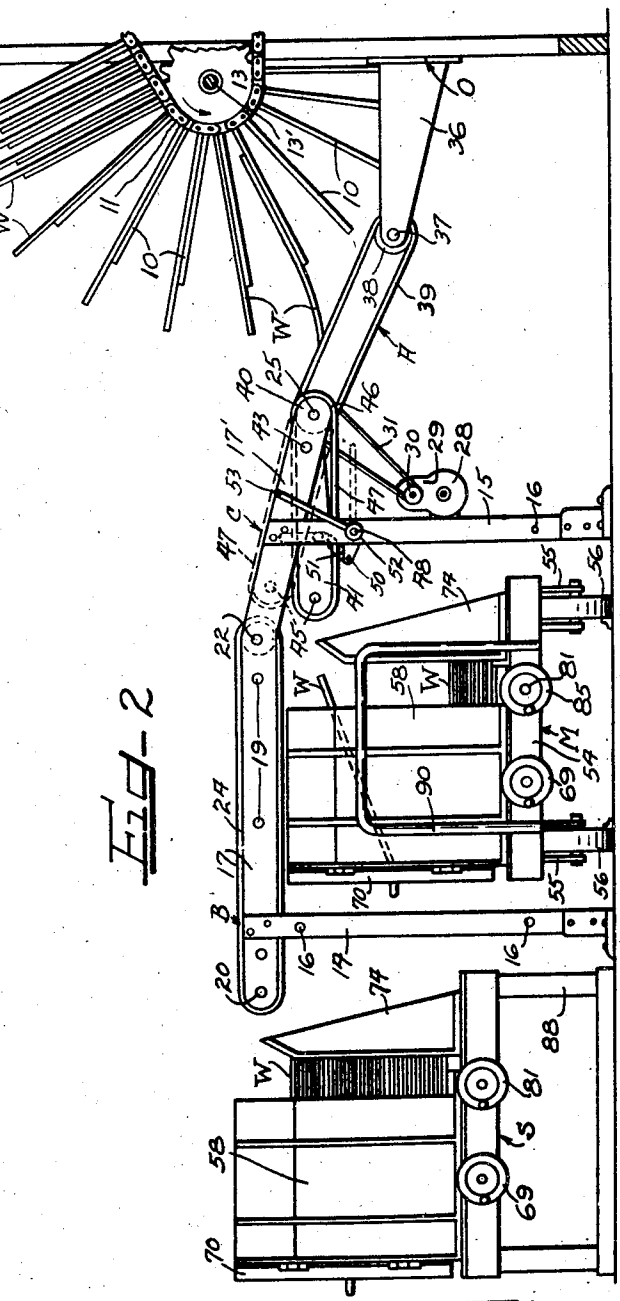


Fig-2

INVENTORS
Charles H. Domville Jr.
Earl E. Gray
By The Firm of Charles H. Hill
Attys

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Original Filed Feb. 10, 1944 3 Sheets-Sheet 2

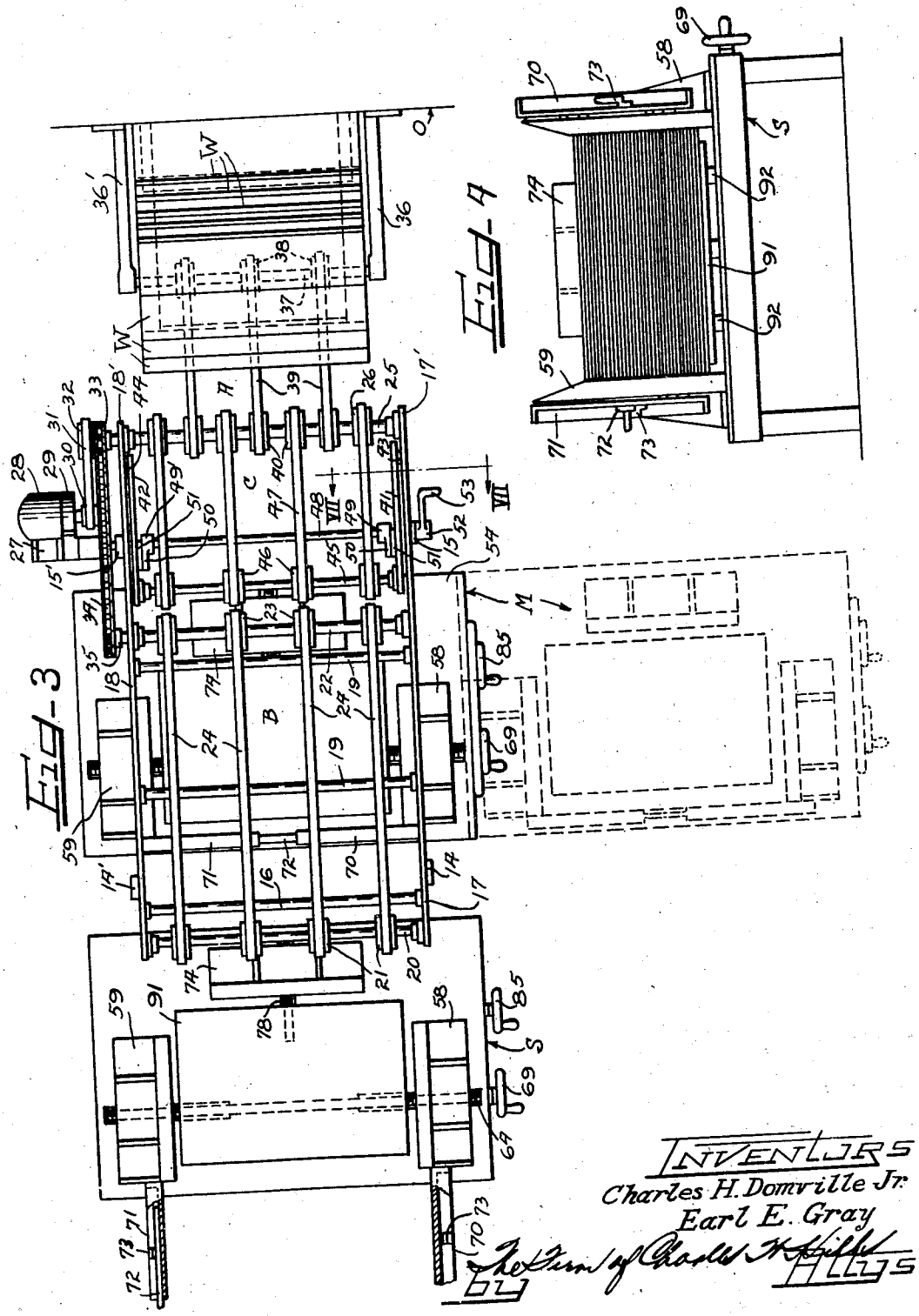


Fig. 3

Fig. 4

INVENTORS
Charles H. Domville Jr.
Earl E. Gray
By Their Attorneys Charles H. Gillis & Co.

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Fig. 5

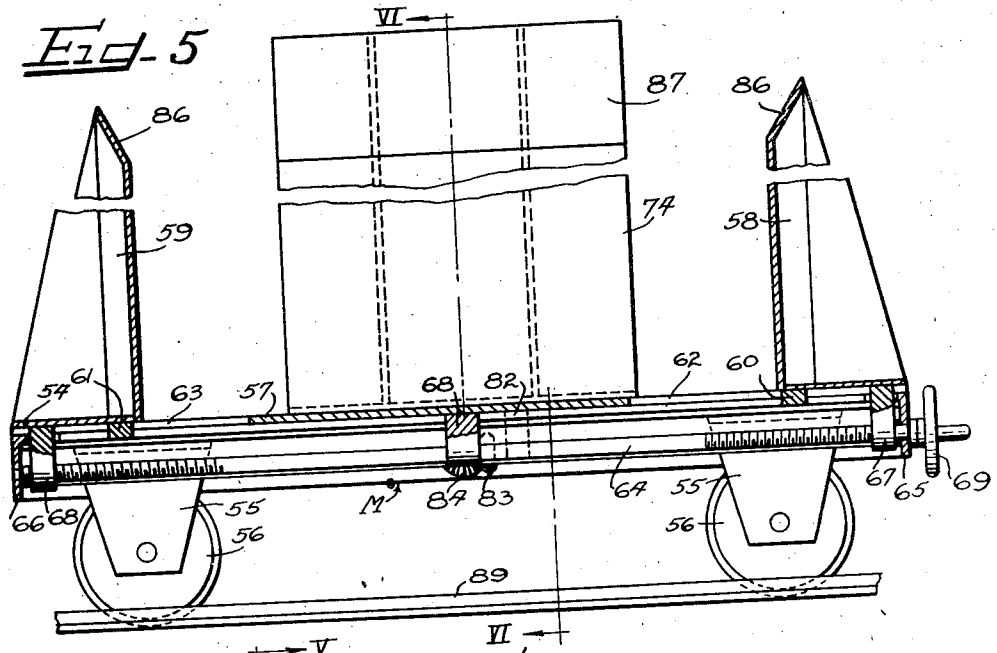


Fig. 6

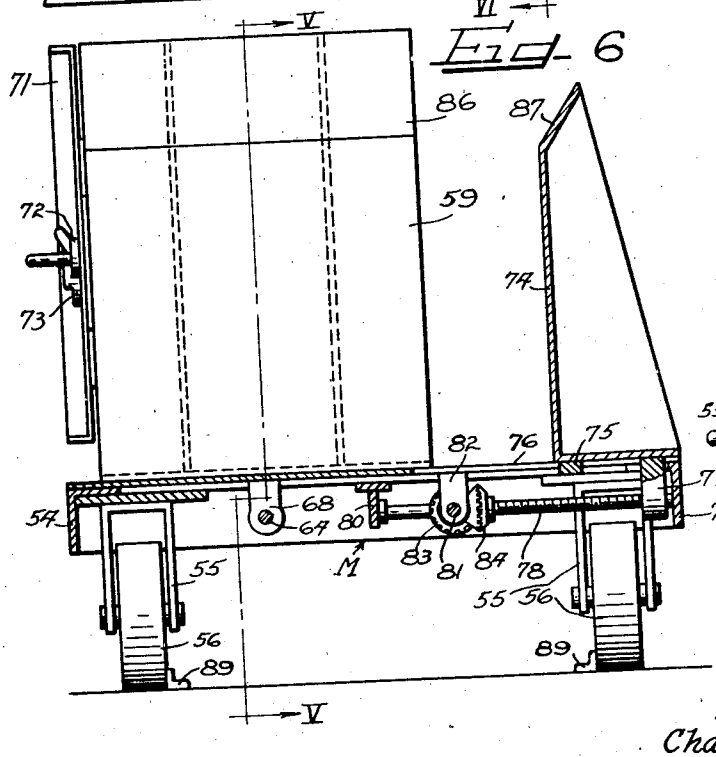
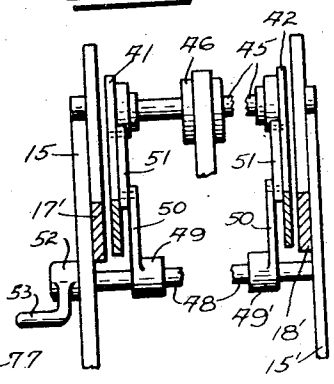


Fig. 7



INVENTORS

Charles H. Domville Jr.

Earl E. Gray

By Firm of Charles H. Hill Attys

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2,423,691

UNITED STATES PATENT OFFICE

2,423,691

STACKING DEVICE

Charles H. Domville, Jr., Glen Ellyn, and Earl E. Gray, Chicago, Ill., assignors to Caspers Tin Plate Company, Chicago, Ill., a corporation of Illinois

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9 Claims. (Cl. 271—86)

1

This application is a division of our application Serial No. 521,800, filed February 10, 1944.

Our invention relates to stacking devices adapted particularly for receiving sheets or plates from transfer structure such as an endless conveyor to which the sheets or plates are fed from apparatus in which they were coated or otherwise treated. For example, in our pending application referred to an oven structure such as is disclosed in Albright Patent 2,129,634 dated September 30, 1938, is shown through which metal sheets or plates are carried to be dried after being enameled, varnished, lacquered or otherwise coated, together with conveyor mechanism for stripping the sheets or plates from the oven conveyor, and our invention was designed more particularly for use in connection with such oven structure and conveyor mechanism to receive the sheets or plates and to arrange them in one or more stacks for further processing or transport.

An important object of the invention is to provide a stacking device which is readily and accurately adjustable to receive sheets of different sizes.

A further object is to provide a stacking device having adjustable side and end walls to define receiving space corresponding with the size of the sheets to be received and uniformly alined in stacked relation.

Another object is to provide a stacking device in which one wall structure is in the form of doors normally held closed during a stacking operation but readily opened for removal of the stack of sheets.

Still another object is to provide doors hinged to the adjustable side walls of the stacking device to be swung and locked to form the back wall structure against which the sheets are received from the conveyor structure, and which doors when unlocked and opened permit ready removal of the stacked sheets on to a truck or other carrier for transport.

Another object is to provide simple and efficient mechanism for effective adjustment of the walls for the desired stacking space.

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 conveyor apparatus;

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

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

Figure 4 is an end elevation of one of the stacking devices;

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

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 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 the conveyor and stacking devices for receiving and stacking the plates or sheets. The supporting frame works for the conveyor mechanism 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 journalled 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 journalled 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, journalled 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 extend a shaft 37 journalled 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 horizontal 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 journaled 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 journalled 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 stacking structure on which the plates are to be delivered and stacked, two such structures or devices M and S are shown. The structure S is stationarily mounted adjacent to the outer end of the conveyor assembly to receive plates from the conveyor belts 24. The structure 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 stacker 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 journalling supporting wheels 56. A floor plate 57 is secured on top of the body frame 54 and provides a base. At the ends of this floor plate are mounted guide standards 58 and 59 providing opposed upright end walls which are slidably 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 journalled 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. When the doors are closed they form a back wall for the device and provide with the standards a rectangular space for receiving and aligning plates delivered from the conveyor structure. The doors are held in aligned closed position by means accommodating shifting of the upright wall standards 58 and 59 without stressing the doors. Herein such means comprises 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 stacker M.

On the floor plate 57 of the structure M opposite to the doors, a guide standard 74 provides a front wall and is mounted for transverse sliding 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 journalled 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 journalled 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 front wall guide standard 74 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 or flared ends guiding the received plates into alignment to form the stacks. In order to facilitate the delivery thereover of sheets in a substantially horizontal plane from the associated conveyor structure, the front wall standard 74 is preferably lower than the end and back wall structures. The stationary stacker S is constructed like the stacker M except that, instead of having wheels, it is stationarily mounted on a support 88.

This 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 stacker 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 stacker 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 stacker 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 stacker 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 stacker is filled, the lever 53 is manipulated for adjustment of the conveyor structure for delivery of the plates to the other stacker. Referring to Figure 4, a board 91 with spacers or cleats 92 thereon may be placed in the stackers, 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 stacker.

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. A stacking device comprising a base, opposed upright walls slidable on said base, means for moving said walls toward and away from each other, a door hinged on each upright wall, and means holding said doors in aligned relation to form a back wall between said upright walls, said means accommodating shifting of the upright walls without stressing the doors.

2. A stacking device comprising a base, upright end walls on said base, front and back side walls on said base, adjusting means on said base for relative shifting of said end walls to determine the distance therebetween for the size of sheets to be received, adjusting means on said base for effecting relative movement of said front and back side walls on said base to determine the distance therebetween for the size of sheets to be received, and manually operable control means for said adjusting means located adjacent each other at one side of said base.

3. A stacking device comprising a platform, opposed upright end walls slidably mounted on said platform, means on said platform for moving said end walls toward or away from each other, a back wall structure comprising wall portions extending inwardly from said end walls, a front wall slidably mounted on said platform and means on said platform for moving said front wall toward and away from said back wall structure, said walls defining an open top chamber the size of which can be varied by setting of said walls to snugly receive different sized plates or sheets for alinement thereof into a stack, said back wall portions being hinged to said end walls for opening thereof for removal of the stack from the platform.

4. A stacking structure comprising a platform, opposed upright end walls slidably mounted on said platform, screw rod means rotatably mounted under said platform and having threaded engagement with said upright end walls for setting thereof toward and away from each other, doors hinged on said end walls and cooperating to provide a back wall, an upright front wall slidable on said platform, and screw rod means under said platform for setting said front wall toward and away from said doors, said walls and said doors defining an open top chamber the size of which can be varied to snugly receive different sized

sheets or plates, and manually operable control means for said screw rod means located adjacent each other at one side of said platform.

5. A receiving device comprising a base, upstanding opposed walls on said base, means for moving said walls toward and away from each other to vary the space therebetween, a third wall on said base cooperating therewith to form a third side of a restricted area on the base, means for shifting said third wall on the base to cooperate with the spaced opposed upstanding walls to vary the size of the restricted area, and means carried by the spaced opposed upstanding walls for defining a fourth side to said restricted area, said means accommodating movement of said spaced opposed upstanding walls and being openable for sidewise access into said restricted area.

6. A stacking device comprising, in combination, opposed members adjustably movable toward and away from each other for increasing or decreasing the space therebetween, a door structure carried by said members and cooperating therewith to define an area to receive a stack of sheets of a size for which the spacing between said members has been adjusted, means at the bottom of said area for supporting the stack, said door structure being openable for removal of the stack, and means for holding said door structure closed until released to open the door, said last mentioned means being constructed and arranged to accommodate adjustment shifting of said members.

7. A stacking device comprising a base, opposed upright wall members slidable on said base, means for moving said wall members toward and away from the other, a door member hinged on each of said wall members, means holding said door members in substantial alignment in their plane to form a cooperating wall between said wall members, said holding means permitting free relative movement of said door members in their plane to accommodate shifting of said wall members on said base, and manually operable control means on said base for effecting relative movement of said wall members.

8. In combination in a stacking device of the character described, a base, opposed upright wall members spaced apart above said base and adapted to receive a stack of sheets therebetween, said wall members being relatively movabe to vary the spacing therebetween to accommodate sheets of varying size, a pair of door members respectively carried by said upright wall members and adapted for hingedly swinging open on the wall members and hingedly swinging closed into substantially co-planar alignment, means for securing said doors in such co-planar alignment to afford a wall between said wall members for controlling the stacking of the sheets, said door members being relatively movable toward and away from one another at their adjacent edges in the adjustment of said wall members to vary the spacing between the wall members.

9. In combination in a stacking device of the character described, a base, opposed upright wall members spaced apart above said base and adapted to receive a stack of sheets therebetween, said wall members being relatively movable to vary the spacing therebetween to accommodate sheets of varying size, a pair of door members respectively carried by said upright wall members and adapted for hingedly swinging open on the wall members and hingedly swinging closed into substantially co-planar alignment, means for securing said doors in such co-planar alignment to afford a wall between said wall members for controlling the stacking of the sheets, said door members being relatively movable toward and away from one another at their adjacent edges in the adjustment of said wall members to vary the spacing between the wall members, a wall member located in spaced relation to said door members on the opposite side of said first mentioned wall members and movable toward and away from the door members to vary the spacing therebetween, means carried by said base for moving said first mentioned wall members, means independently operable for adjustably moving said last mentioned wall member, and manually operable control means for said adjusting means located adjacent each other at one side of said base.

CHAS. H. DOMVILLE, JR.
EARL E. GRAY.

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