

Aug. 26, 1941.

F. PALEWICK ET AL

2,253,529

APPARATUS FOR HANDLING SHEET MATERIAL

Filed June 8, 1939

3 Sheets-Sheet 1

Fig. 2.

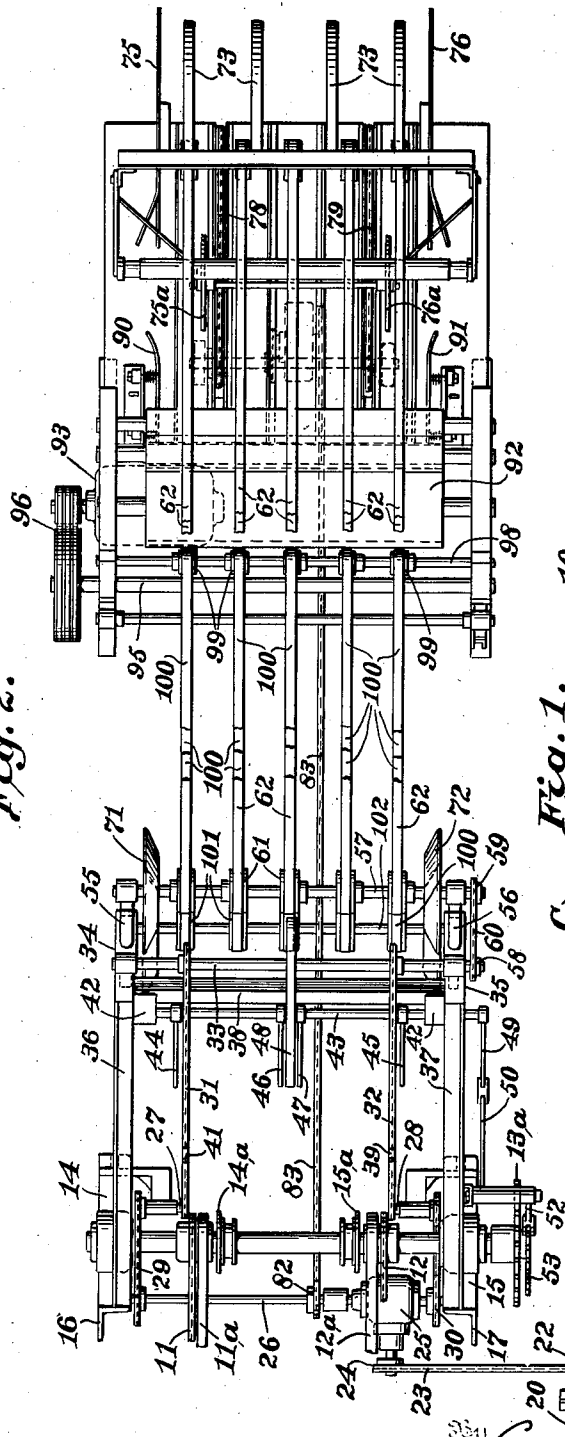
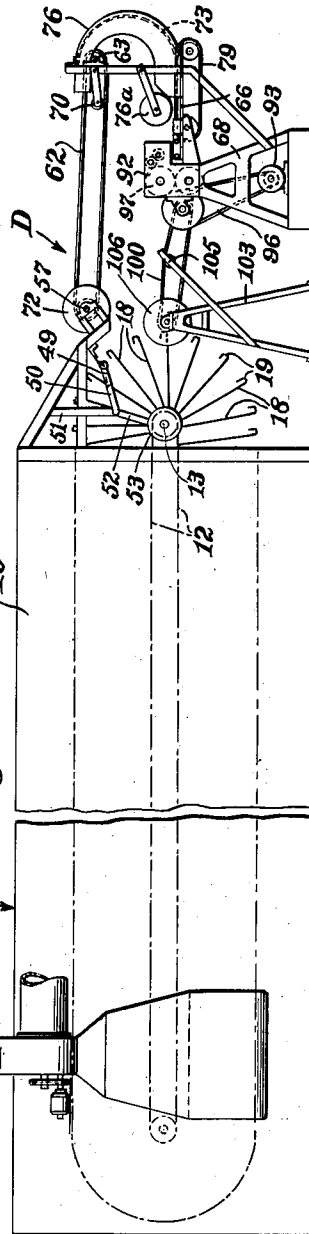


Fig. 1.



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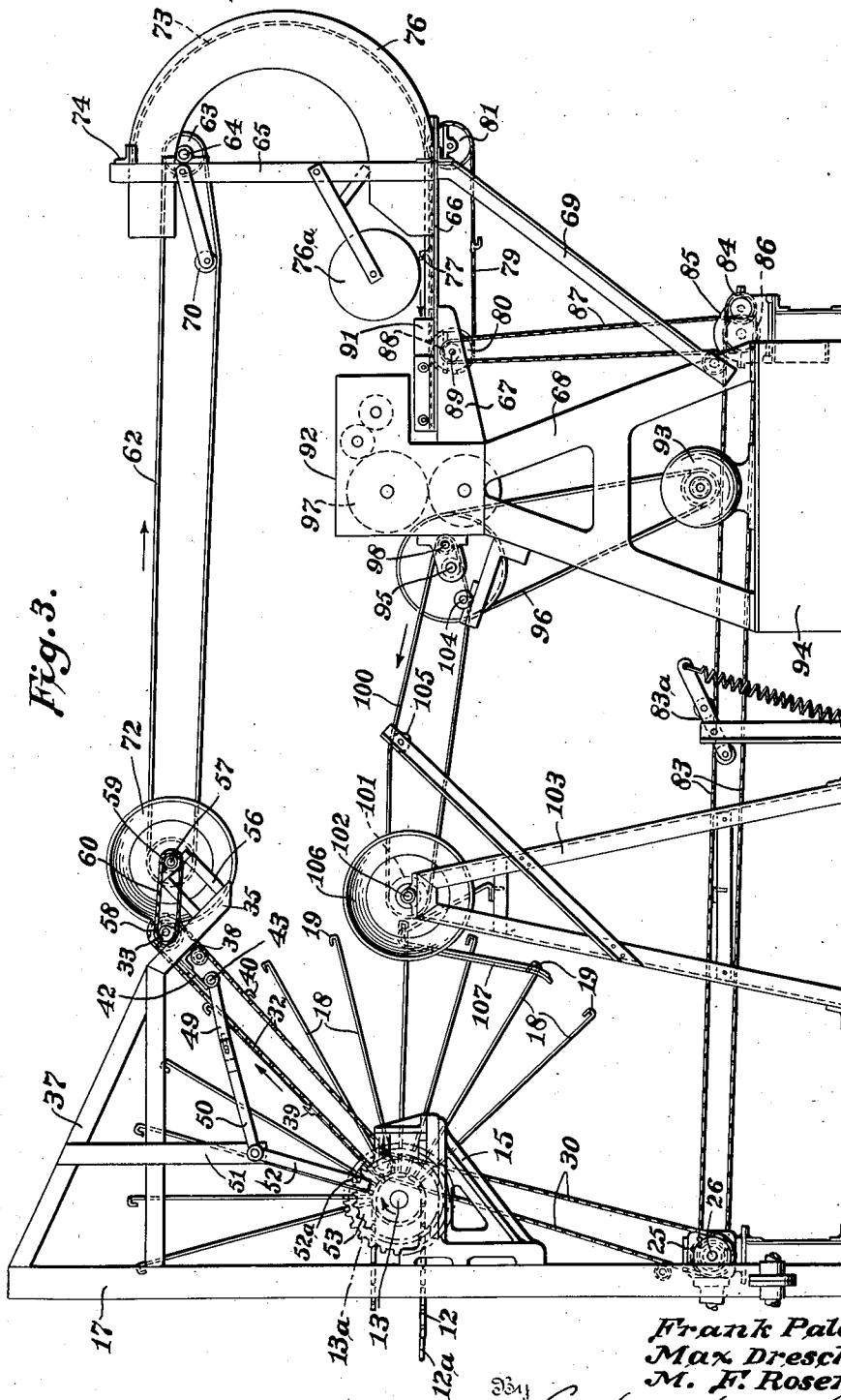
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3 Sheets-Sheet 2



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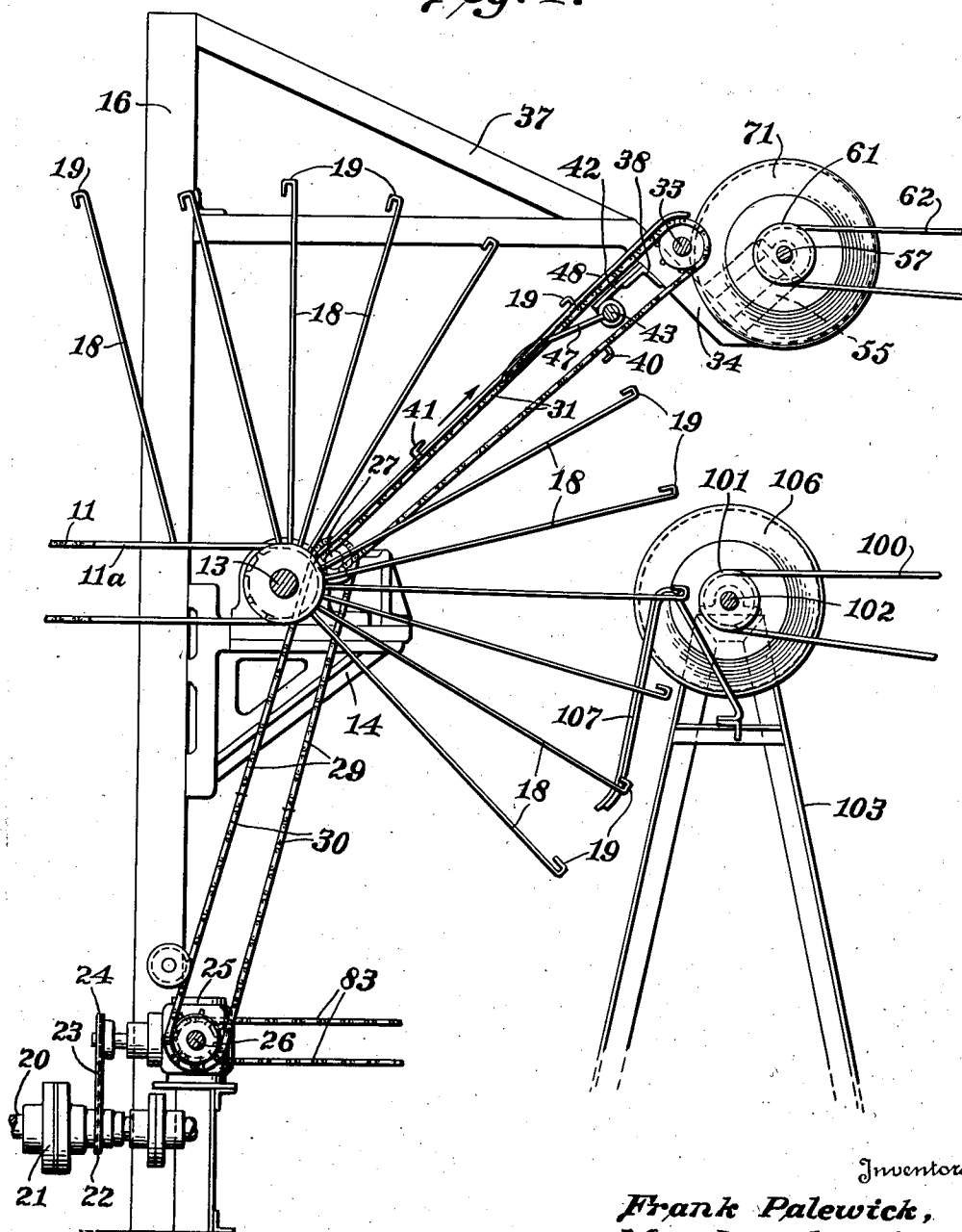
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3 Sheets-Sheet 3

Fig. 4.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR HANDLING SHEET MATERIAL

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Application June 8, 1939, Serial No. 278,160

6 Claims. (Cl. 91—55)

This invention relates to apparatus for handling sheet material, such as tin plate as used in the manufacture of container closures, and has as a purpose to provide such apparatus in conjunction with a drying oven whereby to automatically remove dried sheets from one portion of an endless carrier which is disposed in the oven, coat the removed sheets, and return them automatically to another portion of the carrier.

In the manufacture of crown caps, for example, sheets of tin plate are provided with the required printing and then are passed through an oven to dry the ink. The oven consists of a casing or tunnel in which is disposed an endless carrier having top and bottom runs with frames or wickets adapted to support the plates on edge and the wickets may be active both on the top and bottom runs. Ordinarily the printed sheets are fed in between the wickets on the top run and they may be stripped from the carrier at the end of this run or they may continue back to the feeding end, there to be stripped, on the lower run. The stripped sheets are ordinarily then passed to a coating mechanism which applies a layer of varnish or like over the printing. The coated sheets must then be passed through another drying oven similar to the first.

The described operations entail considerable manual handling with attendant danger of scratching or otherwise injuring the printed surfaces. Moreover, the plant requirements are large.

In accordance with the present invention manual handling is reduced to a minimum and one drying apparatus is made to serve both for drying the ink and the subsequently applied varnish or other coating. Our invention, in accordance with the specific description to be hereinafter made, requires but a single drying oven with carrier apparatus having active upper and lower runs. At the foot end of the carrier we provide means for automatically stripping the dried printed sheets from the foot end of the top run, passing them to a coating machine, and then automatically returning them to the head end of the lower run.

Without further general discussion we shall proceed to describe the illustrative embodiment of the invention shown in the accompanying drawings.

In these drawings:

Figure 1 is an elevation of the new apparatus shown in operative relation to a drying oven.

Figure 2 is a plan view of the sheet handling

apparatus, parts being removed or broken away to reveal others.

Figure 3 is an elevation of the sheet handling apparatus, considerably enlarged as compared to Figure 1, and

Figure 4 shows in further enlargement and in longitudinal section certain apparatus shown at the left of Figure 3.

Referring to the drawings, in Figure 1 reference character A designates a coating device here assumed to be a printing press, B a conveyor which receives the printed sheets from the press, C an oven into which the printed sheets are charged by conveyor B, and D the sheet handling apparatus of the present invention.

The oven comprises a casing or tunnel 10 lengthwise of which extends a conveyor comprising endless chains 11 and 12 and a foot shaft 13, with drive sprocket 13a, mounted in bearings supported on brackets 14 and 15 which are secured to upright frame members 16 and 17 of the tunnel structure. Secured on shaft 13 by means of split collars is a pair of steel discs 14a and 15a. The chains carry frames or wickets 18 which are substantially upright on the upper conveyor run and pass around the foot shaft 13 in substantially radial relation, to a depending relation on the lower run. At their extremities the frames or wickets 18 have each two or more hook formations 19 which are in trailing relation to the wickets. Reference numerals 11a and 12a designate the usual oven chain wire frame carrying blocks. The sheets are deposited on conveyor B, printed side up and are inserted between the wickets at the head end of the carrier to travel on edge along the upper run. The printed surfaces are faced forwardly and the sheets incline upwardly and rearwardly to be supported by a following wicket. The tunnel 10 is heated in any usual manner and is of sufficient length so that when the printed sheets reach the foot end of the carrier the ink is dry.

Reference numeral 20 designates an existing drive shaft and 21 a coupling whereby rotation of shaft 20 is imparted to a sprocket 22. Sprocket 22 is connected by a chain 23 with a sprocket 24 of a mitre gear box 25 which imparts drive to a suitably journaled shaft 26 which extends transversely with respect to the oven. Through suitable sprockets engaged by chains 29 and 30 shaft 26 drives a pair of shafts 27 and 28. Shafts 27 and 28 are journaled on brackets 14 and 15 respectively and, through sprocket and chain drives of which the chains are shown at 31 and 32, drive a shaft 33 which is journaled on ex-

tensions 34 and 35 of auxiliary frames 36 and 37 secured to the uprights 16 and 17 respectively. Extensions 34 and 35 are braced by a cross angle 38.

The runs of chains 31 and 32 are in common planes and the plane of the upper runs is substantially radial to foot shaft 13 as may be seen from Figures 3 and 4. Each of chains 31 and 32 is a $\frac{3}{8}$ inch pitch by $\frac{1}{2}$ inch wide roller chain and carries a pair of dogs spaced 104 pitches apart. The dogs of chain 32 are designated 39 and 40, Figures 3 and 4. The dog 39 also appears in Figure 2 as does likewise a dog 41 of chain 31. The chains are driven in the direction of the arrows, Figures 3 and 4, which means that the upper runs travel upwardly and outwardly. The dogs have forwardly directed points spaced from the chains.

Journalled on brackets as at 42, secured to the undersides of extensions 34 and 35, is a rock shaft 43 on which are fixed fingers 44 and 45 which normally extend downwardly alongside the upper runs of chains 31 and 32 and somewhat below the tops of the latter. Centrally shaft 43 carries a pair of similarly disposed fingers 46 and 47 which extend alongside a fixed guide strip 48. All of the fingers are preferably somewhat upwardly bowed as seen by reference to the finger 47, Figure 4. An arm 49 is fixed to shaft 43 and has a pin and slot connection with one arm 50 of a bell crank lever which is pivoted on a fixed member 51 of auxiliary frame member 37 and whose other arm 52 has an abutment 52a engageable by the teeth of a gear 53 fixed on shaft 13.

In the operation of the machine, as thus far described, shaft 20, which is driven at four revolutions per sheet, causes the conveyor constituted by chains 31 and 32 to be driven at a speed suitably related to the speed of shaft 13. As a given wicket 18 begins to move around the shaft 13 the sheet therebehind will tilt forwardly against it and will be lifted above blocks 11a and 12a by the discs 14a and 15a. As the wicket, with the sheet thereon comes into the plane of the top runs of the chains 31 and 32, the sheet is laid against the chains, which lie just outside the lateral edges of the wickets. The sheet, thus disposed, is engaged by the chain dogs and quickly moved upwardly so as to be out of the way by the time the next sheet arrives in position to be gripped by the succeeding dogs. As the sheet moves upwardly a tooth of gear 53 engages the abutment 52a of arm 52 of the bell crank lever so that shaft 43 is rocked in a clockwise direction causing the fingers thereon to be tilted upwardly thus engaging the upper portion of the sheet which is on the conveyor chain and tilting it upwardly so that it will be sure to clear the hooks 19. Guide strip 48 serves to support the middle portion of the sheet during its removal.

Journalled on brackets 55 and 56 supported at the ends of frame extension 34 and 35 is a shaft 57 parallel to shaft 33 and driven from the latter through sprockets 58 and 59 and a chain 60. Fixed on shaft 57 are a number of pulleys 61 engaged in end loops of belts 62 whose other end loops are engaged by pulleys 63 on a shaft 64 which is journalled in bearings carried by uprights as at 65, Figure 3, these uprights being secured to and extending above a horizontal table plate 66 which is supported by an extension 67 of a frame 68 and by a strut 69. A tension roller

70 carried by arms pivoted to the uprights as at 65 rests on the lower runs of straps 62. Sheets discharged by chain conveyor 31, 32 fall on the top runs of straps 62, being properly guided thereto by two bevel faced discs 71 and 72 fixed on shaft 57. At the foot end of straps 62 is arranged a chute in the form of a loop comprising arcuate metal bars 73 having their upper ends secured to a cross angle 74 spaced above belts 62 and their lower ends secured to table plate 66. Sheets discharged by belts 62 strike the arcuate chute members 73 and slide to inverted position on table plate 66, being laterally guided by guards 75 and 76 and held down by fiber discs 75a and 76a. At this point the rear edge of the sheet is engaged by dogs as at 77 traveling in slots in the table plate 66 and secured to chains 78 and 79 mounted on sprockets as at 80 and 81. Chains 78 and 79 are driven in synchronism with the oven conveyor in the following manner: A sprocket 82 fixed on shaft 26 is connected by means of a chain 83 with a sprocket 84 of a speed reducer 85 (ratio 3:2:1) having an output sprocket 86 connected by a chain 87 with a sprocket 88 fixed on a shaft 89 to which the driving sprockets for chains 78 and 79 are likewise fixed. These chains are $\frac{1}{2}$ inch pitch by $\frac{1}{2}$ inch wide roller chains and the dogs as at 79 are spaced 60 pitches apart on each chain. Chain 83 is engaged by a tensioner 83a.

When a sheet is engaged by the dogs of chains 78 and 79 it is pushed between yielding guide plates and brakes 90 and 91, Figures 2 and 3, to a coating machine 92 here indicated as being of the roller type.

A motor 93 mounted on a base 94 which supports the frame 68 drives the coater drive shaft 95 through V-belt 96. Reference numeral 97 designates the applicator roll of the coater.

A shaft 98 on the coater frame is driven from shaft 95 and has fixed thereon a number of pulleys 99 which engage end loops of endless belts 100 whose other end loops are engaged with pulleys 101 on a shaft 102 journalled at the top of a frame 103. The lower runs of belts 100 are engaged by idlers on a shaft 104 in order to clear shaft 95. The upper runs of straps 100 are upwardly deflected by idlers as at 105 so that the upper runs are more or less horizontal between the idlers 105 and pulleys 101.

Sheets delivered from the coater 92 to the upper runs of straps 100 and suitably guided between bevel faced discs as 106 are discharged onto successive wickets and are eased in position on the wickets as the latter descend by means of guide fingers as at 107. The sheets, supported in the hooked ends of the wickets, are now carried through the oven along the lower run of the conveyor and are stripped at the front end of the oven in any desired manner.

As previously explained the printed surfaces of the sheets are forward on the upper run of the oven conveyor and consequently these surfaces are engaged by the conveyor 31, 32 and by belts 62. However, as the ink is dry at this time the printing is not damaged. Due to the guiding action of arcuate bars 73 of the chute the sheets are delivered to table plate 66 printed side up so that this side will be acted on by the applicator roll 97 of the coater 92. Proper drive of the latter with reference to the feed conveyor constituted by chains 78 and 79 insures proper

delivery of the coated sheets, coated side up, between the wickets.

Changes may, of course, be made in the form and arrangement of the described parts and consequently we do not limit ourselves in these respects except as in the following claims. In the claims the lower run of the oven conveyor is considered as having its head end at the foot end of the upper run.

We claim:

1. The combination with sheet drying apparatus comprising an endless conveyor having opposed runs and including means for supporting and propelling sheets of material in edge relation to the lines of the runs, of sheet coating mechanism, means acting to automatically remove dried sheets from the foot end of one of said runs and deliver them to said coating mechanism, and conveyor means acting automatically to deliver the coated sheets from the coating mechanism to the head end of the other of said runs.

2. The combination with sheet drying apparatus comprising an endless conveyor having opposed runs and including means for supporting and propelling sheets of material in edge relation to the lines of the runs, of sheet coating mechanism, means acting to automatically remove dried sheets from the foot end of one of said runs and deliver them to said coating mechanism, said last-named means including an endless conveyor having a run in the path of movement of said sheets at said foot end, said last-named conveyor being adapted to engage the dried sheets successively and move them edgewise from the first conveyor, means for tilting the sheet to clear it from the first conveyor as it is moved edgewise by the second conveyor, and conveyor means acting automatically to deliver the coated sheets from the coating mechanism to the head end of the other of said runs.

3. The combination with sheet drying apparatus comprising an endless conveyor having opposed runs and including means for supporting and propelling sheets of material in edge relation to the lines of the runs, of sheet coating mechanism, means acting to automatically remove dried sheets from the foot end of one of said runs and deliver them to said coating mechanism, said last-named means including means for inverting the sheets, and conveyor means acting automatically to deliver the coated sheets from the coating mechanism to the head end of the other of said runs.

4. The combination with sheet drying apparatus comprising an endless conveyor having opposed runs and including means for supporting and propelling sheets of material in edge relation to the lines of the runs, of sheet coating mechanism, means acting to automatically remove dried sheets from the foot end of one of said runs and deliver them to said coating mechanism, said last-named means including a chute in the form of a loop for inverting the sheets, and conveyor means acting automatically to deliver the coated sheets from the coating mechanism to the head end of the other of said runs.

5. The combination with sheet drying apparatus comprising an endless conveyor having top and bottom runs and active wickets on both runs for propelling the sheets in edge relation to the runs, of sheet coating mechanism at the foot end of said conveyor, means acting to automatically remove dried sheets from said top run and to deliver them to the coating mechanism, said means including a second endless conveyor arranged at the foot end of the first and having a run against which sheets are successively layed by the wickets of said top run for removal from the wickets of said top run, means for tilting the sheets away from the wickets as the sheets are removed from the latter, and conveyor means acting automatically to deliver the coated sheets from the coating mechanism to the wickets of said bottom run.

6. The combination with sheet drying apparatus comprising an endless conveyor having top and bottom runs and active wickets on both runs for propelling the sheets in edge relation to the runs, of sheet coating mechanism at the foot end of said conveyor, means acting to automatically remove dried sheets from said top run, and to deliver them to the coating mechanism, said means including a second endless conveyor arranged at the foot end of the first and having a run against which sheets are successively layed by the wickets of said top run for removal from the wickets of said top run, fingers extending along said run of said second conveyor, means for tilting said fingers to cause them to engage and tilt the sheets away from the wickets as the sheets are removed from the latter, and conveyor means acting automatically to deliver the coated sheets from the coating mechanism to the wickets of said bottom run.

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