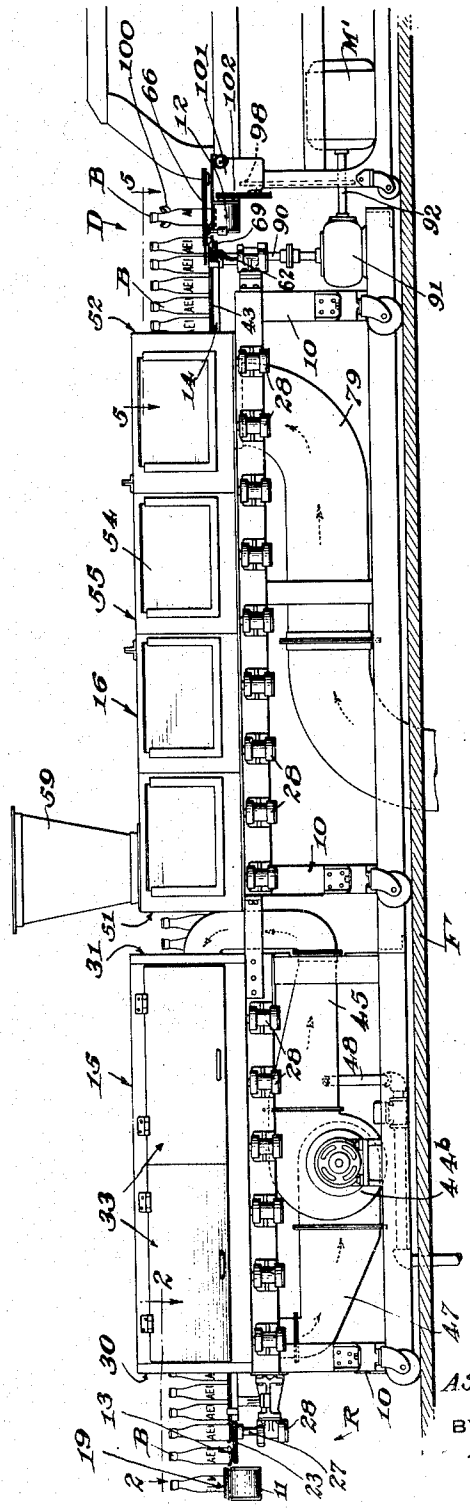
June 2, 1942. A. S. JACKSON ET AL 2,285,336

AUTOMATIC DRYING APPARATUS

Filed Feb. 25, 1939 4 Sheets-Sheet 1

Fig. 1.



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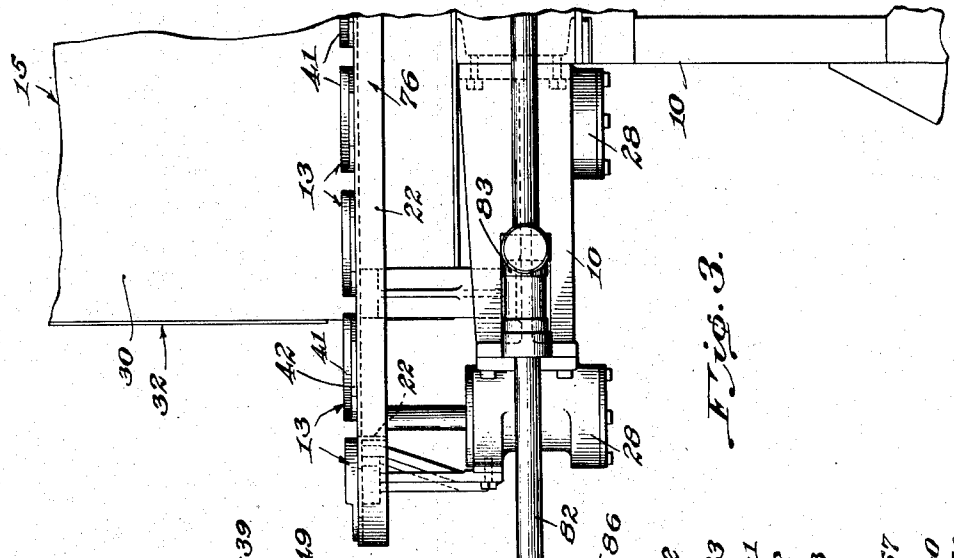


Fig. 3.

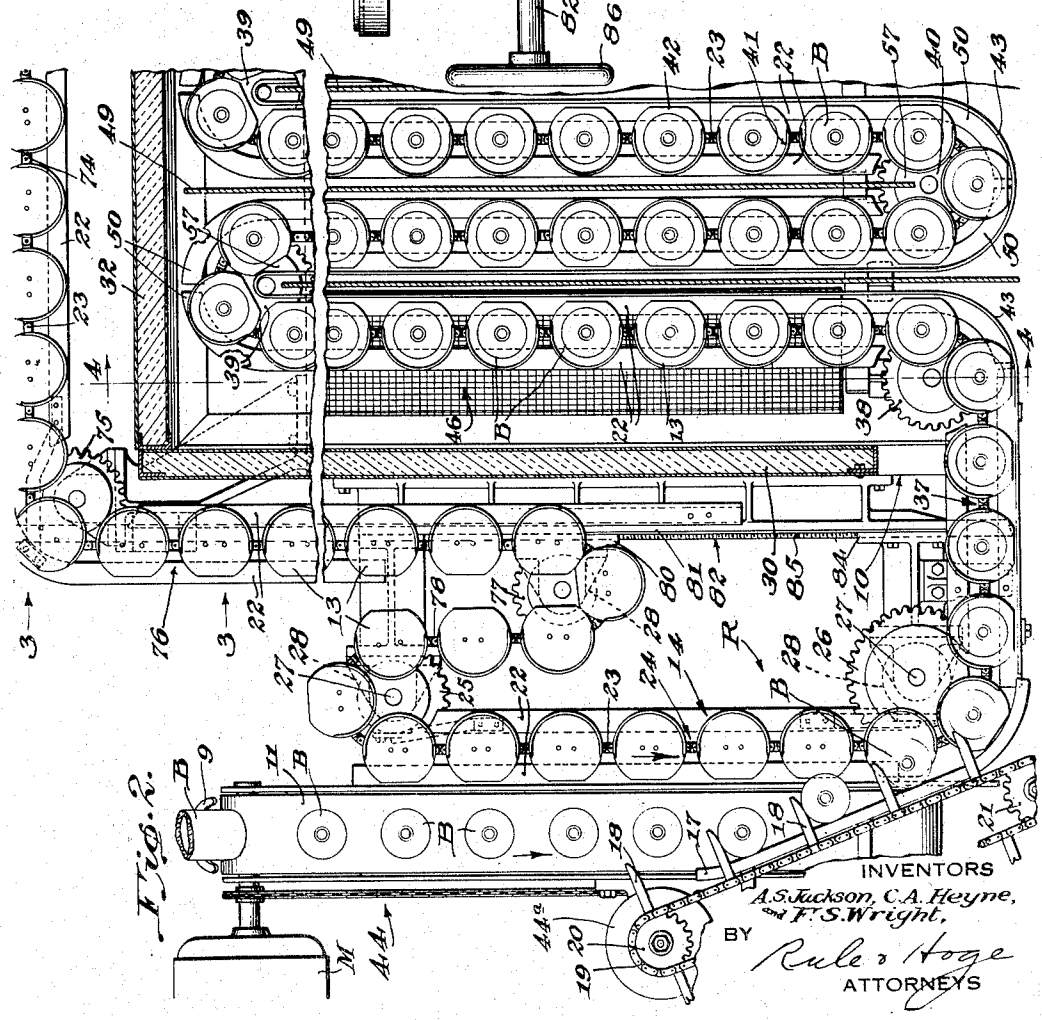


Fig. 2.

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AUTOMATIC DRYING APPARATUS

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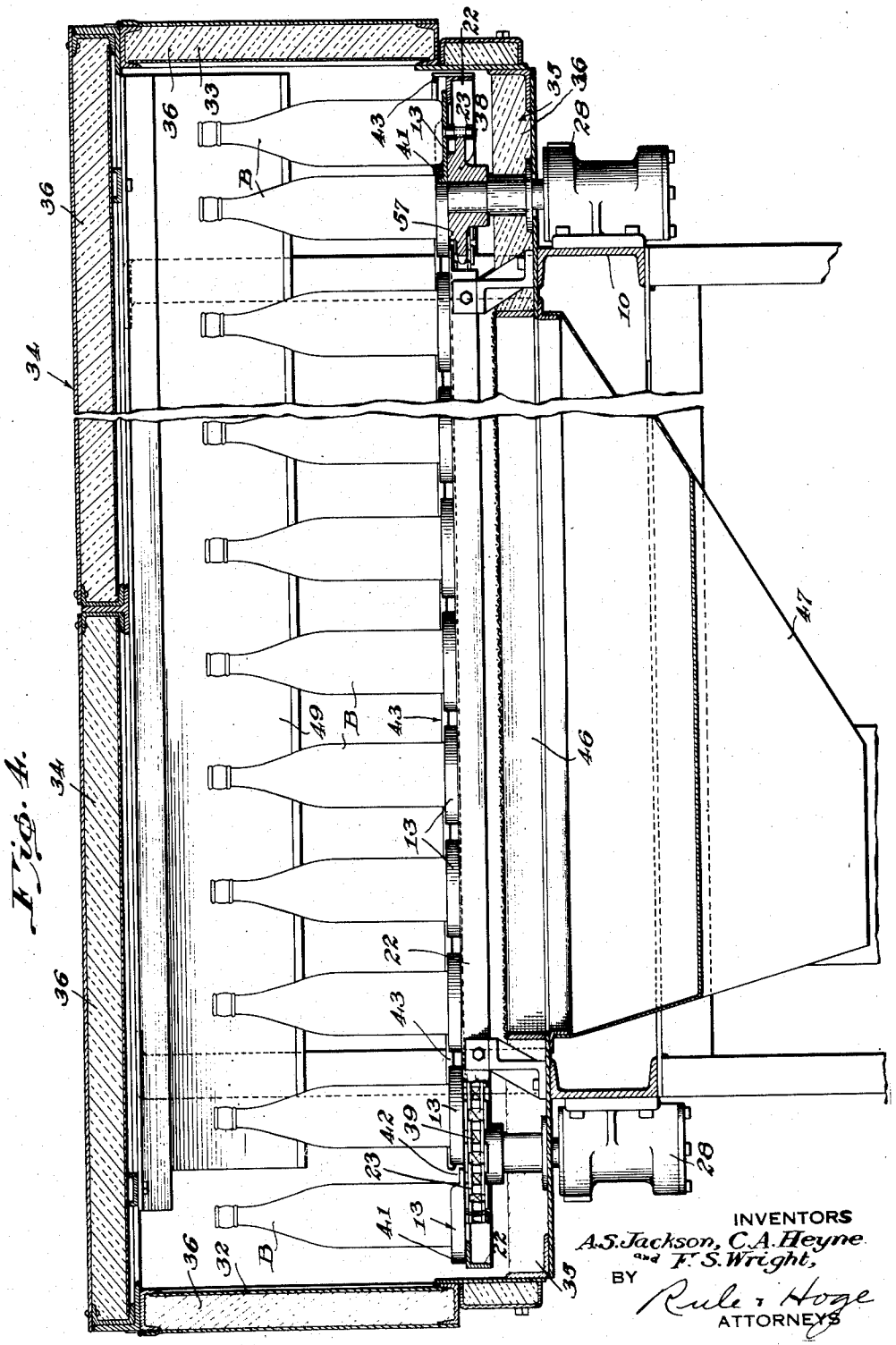


Fig. 4.

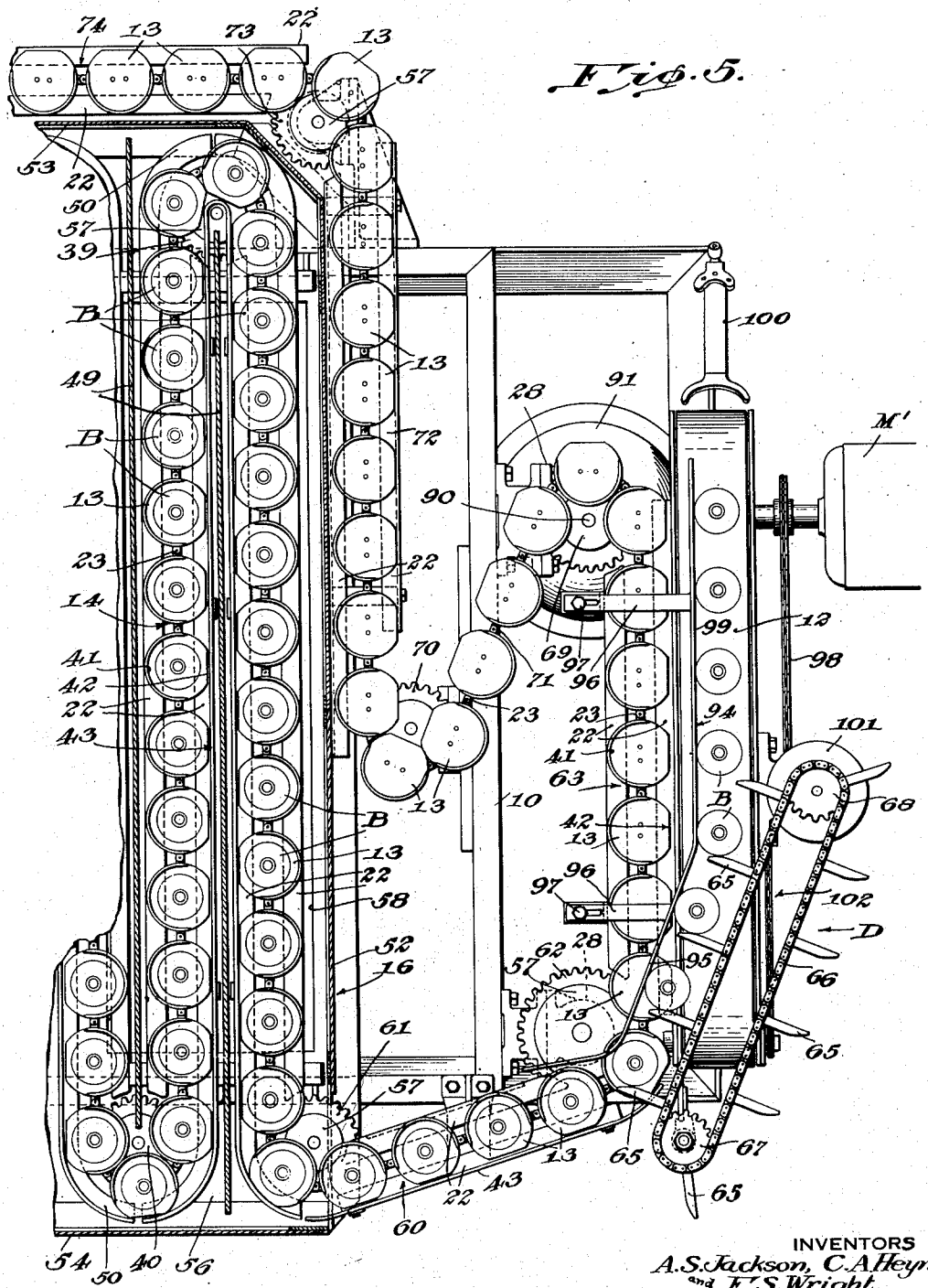
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AUTOMATIC DRYING APPARATUS

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Fig. 5.



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2,285,336

AUTOMATIC DRYING APPARATUS

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Application February 25, 1939, Serial No. 258,424

1 Claim. (Cl. 34—66)

The present invention relates to drying apparatus and more specifically to automatic drying apparatus designed for use in drying the decorating material which is applied to articles of glassware such as bottles, tumblers and the like in the multi-color decoration thereof.

The principal object of the invention is to provide a fully automatic drying apparatus which may be positioned between a pair of synchronized decorating machines and which will operate to receive bottles or other articles from the machine which applies the first color decoration to the articles; convey the articles through a drying oven in which hot air is circulated around the articles; convey the articles through a cooling chamber in which cold air is circulated around the articles to remove the heat absorbed thereby in the drying oven in order that the articles shall not be too hot for proper decoration by the machine which applies the second color decoration; and finally deliver the dried and cooled articles to the latter machine for decoration thereby.

Another object of the invention is to provide a fully automatic apparatus of the type outlined above in which the articles in passing through the drying oven are efficiently dried, the drying air passing across the surfaces of the articles from both sides thereof. A correlative object of the invention is to provide such an apparatus in which cooling air is also passed across the surfaces of the articles from both sides thereof.

Another object of the invention is to provide a drying apparatus of this character in which provision is made for preventing the articles from coming into contact with each other and for preventing the decorated regions thereof from rubbing against the walls of the drying oven or cooling chamber or against any stationary part of the apparatus.

A still further object of the invention in an apparatus of this nature is to provide a drying apparatus in which the articles undergoing treatment are progressively moved through the drying oven and cooling chamber by the same conveying means, thereby eliminating special transfer or handling equipment at the point at which the transfer is made.

Other objects of the invention, not at this time enumerated, will become readily apparent hereinafter.

In the accompanying drawings:

Fig. 1 is a side elevational view of a drying apparatus constructed according to the principles of the present invention and showing the same operatively positioned between a pair of synchronized decorating machines;

Fig. 2 is a sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary elevational view of that portion of the apparatus indicated by the arrows 3—3 on Fig. 2;

Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 2; and

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 1.

Referring now to Fig. 1, briefly the apparatus involves in its general organization a wheeled frame or carrier 10 adapted to be supported on the floor F or other supporting surface and interposed between a pair of decorating machines the discharge and receiving conveyors for which are shown at 11 and 12 respectively. One decorating machine is designed to apply one component color of a decoration or lettering to the bottles B or other articles undergoing decoration while the other machine is designed to apply a second component color of the decoration or lettering. The articles B are transferred at a receiving station R from the conveyor 11 of the first decorating machine onto a series of pads 13 mounted on a conveyor chain 23 forming part of an endless chain type conveyor assembly 14 which is built into and forms a part of the frame 10 and by means of which the articles move progressively along a tortuous path through a drying oven 15 in which the decorating material or paint applied thereto by the first decorating machine is dried on the articles. Due to the relatively high temperature to which the articles are raised while passing through the drying oven 15, it is necessary to cool the articles before introducing them into the second decorating machine and accordingly, the articles B while still on the conveyor 14 leave the drying oven and enter a cooling chamber 16 through which they are moved along a tortuous path. After leaving the cooling chamber 16, the articles are deposited at a discharging station D onto the conveyor 12 of the second decorating machine preparatory to receiving thereon the second component color of the decoration or lettering to be applied thereto. The empty pads 13 are returned on the conveyor 14 to the receiving station R along the outside of the cooling chamber 16 and drying oven 15. The process is continuous.

Referring now to Fig. 2, the articles B are delivered to the discharge conveyor 11 of the first decorating machine (not shown) by a cradle 9 and proceed along the conveyor in the direction

of the arrow and occupy uniformly spaced positions in alignment thereon. As the articles approach the end of the conveyor 11 they move into engagement with a stationary bar 17 which extends diagonally of the conveyor 11 and by means of which the articles have imparted thereto a lateral component of movement and are shifted laterally on the conveyor 11 toward the conveyor 14 while at the same time continuing to advance on the former conveyor.

As each article engages the stationary bar 17, one of a series of fingers 18 which extend laterally and outwardly from an endless chain 19 mounted on sprockets 20 and 21 engages the article and assists the conveyor 11 in propelling the article from the latter in the resultant vectorial direction of movement of the articles after they have engaged the bar 17. The sprocket 20 is driven in timed relationship to the movements of the first decorating machine conveyor 11 and the fingers 18 on the chain 19 are so spaced around the chain that proper coordination between the fingers and articles to accomplish the result just set forth is attained.

The conveyor is driven by means of a motor M having a chain and sprocket connection 44a through a gear box 44' by means of which the chain 19 is driven. The motor M is also employed for driving the first decorating machine.

The endless conveyor chain 23 follows an irregular path of movement, the nature of which will become apparent hereinafter. Generally, the conveyor assembly 14 includes a series of pairs of spaced supporting bars 22 adapted to slidingly support on the upper surfaces thereof the pads 13. The pads 13 are equally spaced on the endless chain 23 which is suspended from the pads and which passes through the spaces provided between the various bars 22.

Still referring to Fig. 2, the endless conveyor chain 23 is provided with a straightaway portion 24 which is coextensive with a part of the conveyor 11 and which occupies a position in close proximity thereto. This straightaway portion 24 exists by virtue of a pair of sprocket wheels 25 and 26 (see also Fig. 1) mounted on vertically extending shafts 27 that are supported by and rotatably journalled in bearing boxes 28 suitably mounted on the frame 10.

The movement of the conveyor chain 23 is timed in synchronism with the movements of the two decorating machines and the pads 13 are so spaced on the conveyor chain 23 that as each article B leaves the conveyor 11 it will move onto one of the pads at the receiving station R, the level of the upper surface of the pads at this station being substantially the level of the upper surface of the conveyor 11. The length of the fingers 18 is such that the articles B are propelled well inwardly of the pads 13 toward the center thereof as shown at the lower left-hand portion of Fig. 2.

The drying oven 15 is of rectangular box-like construction and includes front and rear end walls 30 and 31 (see also Fig. 1), side walls 32 and 33 which are in the form of hinged doors, a top wall 34, and a bottom wall 35 which underlies the conveyor 14. The various walls of the oven 15 are of double wall construction with insulating material 36 between the panels thereof.

The conveyor chain 23 is provided with a straightaway portion 37 (Fig. 2) existing by virtue of the sprocket wheel 26 and a sprocket wheel 38 and along which the pads 13 with the articles B thereon travel as they enter the drying oven 15. The pads 13 enter the drying oven 15 at one forward corner thereof, pass around the sprocket wheel 38 and move transversely of the oven toward the wall 32. Movement of the pads 13 through the oven 15 thereafter is in a tortuous path, a series 39 of sprocket wheels being positioned in alignment just inside the wall 32 and a second and opposed series 40 of sprocket wheels being positioned just inside the wall 33, and around which sprocket wheels the pads 13 pass at each change of direction thereof. It is to be noted that the sprocket wheels 39 are disposed outside of the closed path of movement defined by the chain 23 while the sprocket wheels 40 are disposed inside of this path. The pads 13 and articles B thereon leave the drying oven at the rear end thereof adjacent the corner near the wall 32 as shown in Fig. 1.

The supporting bars 22 of each pair within the drying oven are of different lengths, one bar extending arcuately around an adjacent sprocket as at 50 and terminating in close proximity to the end of a similarly arranged bar 22 of the next adjacent pair thereof. The pads 13 which slide upon and are supported by the bars 22 ride around the axis of each sprocket in making their various changes of direction and are partly supported on the curved ends of the bars 22 and partly supported on the upper surface of the sprocket, a boss 57 being provided on each sprocket for this purpose.

Returning now to Fig. 2, each pad 13 is formed with an upstanding rim 41 at the periphery thereof which extends around the pad through an arc of slightly more than one hundred and eighty degrees. The periphery of the pad directly opposite the rim 41 is cut away as at 42 to provide a flat side. In the straightaway portion 24 of the conveyor 14, the flat sides of the pads occupy a position in close proximity to the side of the conveyor 11 in order to provide sufficient surface area for the articles B to move onto the pads preparatory to entering the oven 15.

A tortuous guard rail 43 extends alongside the conveyor chain 23 in the straightaway portion 37 thereof and follows the tortuous path of travel of the pads through the drying oven. The flat sides 42 of the pads 13 face toward this guard rail during movement of the pads through the oven 15. As the pads 13 change direction in the vicinity of the side wall 32, the articles B are prevented from sliding off of the pads due to centrifugal force by means of the arcuate rims 41. As the pads change direction in the vicinity of the side wall 33, the guard rail 43 performs this function.

Referring now to Figs. 1 and 4, means is provided for circulating heated air through the drying oven 15 in a direction counter to the general direction of travel of the articles. Toward this end, a blower 44b positioned on the framework 10 beneath the oven 15 has its outlet side connected through a heat insulated conduit 45 with the rear end of the oven. A screened opening 46 in the bottom wall 35 adjacent the forward end thereof is connected through a return conduit 47 with the inlet side of the blower 44. Air passing through the conduit 45 is heated by means of a gas burner construction 48.

A series of baffle plates 49 is suspended from the top wall 34 of the drying oven 15 (see Figs. 2 and 4) and are staggered in such a manner that the upper portions of the articles B in progressing through the oven pass around the ends of these baffle plates. The height of the baffle

plates 49 is considerably less than the height of the oven 15 and thus air entering the oven from the conduit 45 may pass under the baffles unobstructed in the lower regions of the oven, but in the upper regions thereof the air is caused to follow a tortuous path counter to the path of movement of the articles.

Referring now to Figs. 1 and 5, the cooling chamber 16 is generally of rectangular construction and is very similar to the construction of the drying oven 15. However, the front and rear end walls 51 and 52, the side walls 53 and 54, the top wall 55 and bottom wall 56 are of sheet metal of single thickness and no insulation is provided therefor.

The pads 13, after leaving the drying oven 15 and carrying the articles which have attained a relatively high temperature therein, enter the cooling chamber 16 at the forward corner thereof near the side wall 53 and are caused to follow a tortuous path therethrough, leaving the chamber 16 at the rear corner thereof near the side wall 54.

It is deemed unnecessary to describe in detail the construction of that portion of the conveyor assembly 14 which is disposed within the cooling chamber 16 inasmuch as this construction is substantially identical with that portion thereof which is disposed within the drying oven. Likewise, the baffle construction of the cooling chamber is similar to that of the drying oven. For these reasons similar reference characters to those employed in describing the heating oven are employed to designate the internal construction of the cooling chamber assembly.

Referring now to Fig. 1, means is provided for circulating cooling air through the cooling chamber 16. Toward this end, a wind conduit 79 communicates through an opening 58 in the bottom wall 56 near the rear end of the chamber. Cooling air thus introduced to the interior of the chamber 16 passes out of the chamber through a stack 59 mounted on the top wall 55 near the front end of the chamber.

Referring again to Fig. 5, the pads 13 and articles B thereon leave the cooling chamber 16 at one rear corner thereof near the side wall 54 and move into a straightaway portion 60 existing by virtue of a pair of sprocket wheels 61 and 62. After passing around the sprocket wheel 62, the pads and articles enter upon a straightaway portion 63 which is coextensive with a portion of the receiving conveyor 12 of the second decorating machine and which exists by virtue of the sprocket wheel 62 and a sprocket wheel 69.

An adjustable bar 94 has a portion 95 extending diagonally of the straightaway portion 63 in the path of movement of the articles on the latter. As the articles engage the stationary adjustable bar 94 in the diagonal portion 95 thereof, they are shifted outwardly on the pads 13 toward the conveyor 12. Simultaneously, a series of fingers 65 that extend laterally from an endless chain 66 mounted on sprockets 67 and 68 engage the articles and assist in propelling the latter from the pads 13 onto the conveyor 12. The flat sides 42 of the pads 13 occupy positions in close proximity to the side of the conveyor 12, thus providing ample supporting surface for the articles during the transfer.

The bar 94 is supported from a pair of brackets 96 which are adjustable on the frame by means of stud and slot connections 97.

The chain 66 is driven in timed relationship to the movements of the second decorating machine conveyor 12 as will be set forth later and the fingers 65 are so spaced around the chain that proper coordination between the fingers and articles to effect the transfer is attained.

A portion 99 of the bar 94 extends along the conveyor 12 longitudinally thereof for the purpose of aligning the articles on the latter for proper cooperation with a cradle 100 by means of which the articles are received in the second decorating machine.

The power drive for the conveyor chain 23 is effected through the sprocket wheel 69 as will be described in detail hereinafter. Because of this fact and in order to insure adequate tractional contact between the chain 23 and the sprocket wheel which drives it, a sprocket wheel 70 is situated adjacent the medial region of the wall 52 near the bottom thereof and cooperates with the sprocket wheel 69 in forming a straightaway portion 71. The pads 13 pass around the sprocket wheel 70 and successively enter a straightaway portion 72 extending alongside the wall 52 and existing by virtue of the sprocket wheels 70 and 73, a straightaway portion 74 extending alongside the walls 53 and 32 and existing by virtue of sprocket wheels 73 and 75 (Fig. 2), a straightaway portion 76 alongside the wall 30 existing by virtue of the sprocket wheels 75 and 77, and a straightaway portion 78 existing by virtue of the sprocket wheels 77 and 25. After the pads 13 pass around the sprocket wheel 25, they enter the straightaway portion 24 preparatory to receiving the next series of articles B thereon.

In Figs. 2 and 3 a chain tightening device is shown. The bearing box 28 for the sprocket wheel 77 is mounted on a slide member 80 which is horizontally shiftable in a guideway 81. An elongated rod 82 extends alongside the wall 30 of the drying oven 15 and is journalled in bearings 83 and 84 secured to the frame 10. A portion of the rod 82 is threaded as at 85 and this threaded portion thereof extends through the slide member 80 in threaded engagement therewith. A hand wheel 86 on the rod 82 permits manual turning of the latter to shift the slide member 80 in one direction or the other to tighten or loosen the conveyor chain 23 as the case may be.

Referring to Figs. 1 and 5, the sprocket wheel 69 is driven from a shaft 90 which passes upwardly through the bearing box 28 from a gear box 91 having a connection through a shaft 92 with a motor M' which is synchronized with the motor M and which constitutes the driving mechanism for the second decorating machine. A chain and sprocket mechanism 98 connects the motor M' to a gear box 101 from which driving power is supplied to the conveyor 12 by means of a chain and sprocket mechanism 102. The sprocket 68 and consequently the chain 66 is driven from the gear box 101. Since the motors M and M' are synchronized, it will be seen that the two conveyors 11 and 12, together with the propeller chains 19 and 66 are driven in timed relationship.

From the above description it is thought that the construction, operation and advantages of the herein described drying apparatus will be readily apparent.

Modifications may be resorted to within the spirit and scope of the appended claim.

We claim:

A drying and cooling apparatus comprising a horizontal frame, a drying oven and a cooling chamber mounted end to end on the frame in

longitudinal series, a horizontal series of pads adapted to support thereon respective articles to be treated, means for moving the pads horizontally successively in a serpentine path through the drying oven and cooling chamber from an article receiving zone to an article discharging zone, and for returning the pads from the article discharging zone to the article receiving zone outside of the drying oven and cooling chamber.

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