

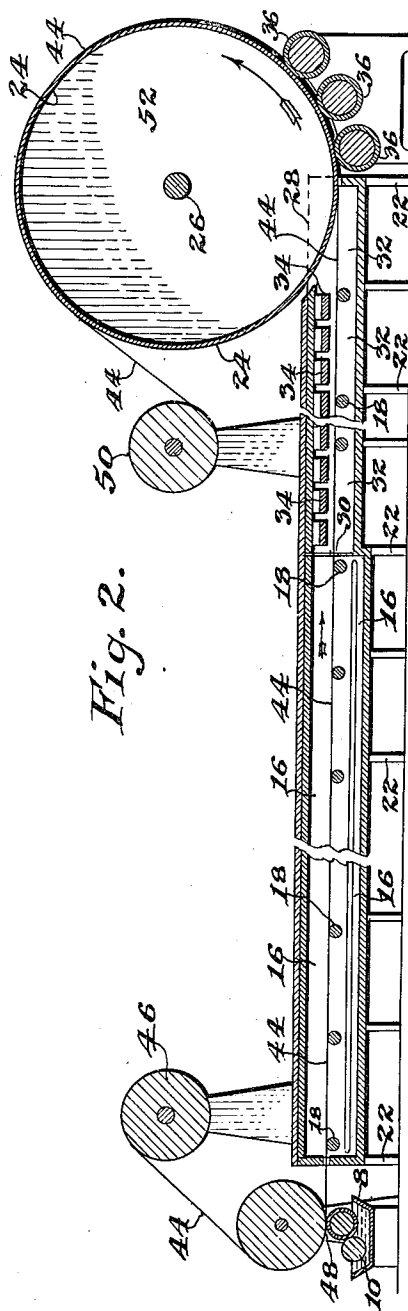
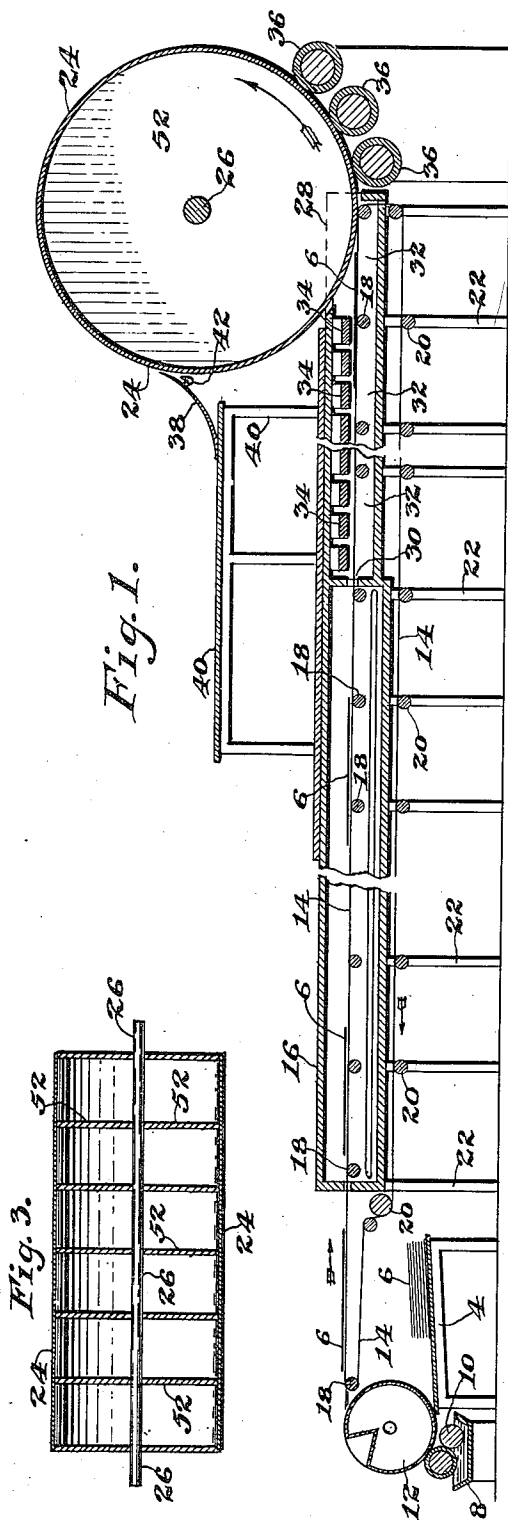
Jan. 13, 1942.

E. A. CORBIN, JR

2,270,038

APPARATUS FOR PROCESSING SHEET MATERIAL

Filed March 4, 1941



ELBERT A. CORBIN JR.
INVENTOR.

BY

Louis Necha

UNITED STATES PATENT OFFICE

2,270,038

APPARATUS FOR PROCESSING SHEET MATERIAL

Elbert A. Corbin, Jr., Lansdowne, Pa., assignor of one-third to Ellwood W. Wolf, Philadelphia, Pa., and one-third to B. C. B. Industries, Inc., a corporation of Delaware

Application March 4, 1941, Serial No. 381,677

6 Claims. (Cl. 91—55)

In the glazing of sheet material it is necessary, among other steps, to subject the surface of the coated material to relatively intense heat to fuse or melt the surface film of the composition with which the sheet material had been previously treated and then to present the fused surface continuously, or in piece-work fashion, to what is known as a polishing surface. It has heretofore been proposed alternately to heat and cool the polishing surface or alternate opposite parts thereof, and, in all events, where heating of the polishing surface was dispensed with, it was still necessary to cool the polishing surface by positive exterior means so as to chill the work applied to the polishing surface in order to permit peeling off of the work from the polishing surface. This cooling of the polishing surface was made necessary by, among other things, the nature of the metal heretofore used in making such polishing surfaces and the dimensions which had to be used. It is therefore one of the main objects of this invention to produce a novel apparatus for and method of glazing sheet material in which the speed and efficiency are greatly increased by the elimination of the cooling step and the means for effecting it.

Similarly it has heretofore been the practice to utilize a continuous process of glazing, namely, that in which a rotary polishing surface is used only in the processing of relatively thin sheets of paper or other material, and it has heretofore been necessary to use flat polishing surfaces in fixed presses or the like for the treatment of relatively thick sheet material such as card board, for instance, all of which was due to the fact that polishing drums heretofore available could not be built in practical and operative dimensions. It is therefore another object of my invention to produce a novel apparatus which is equally practical in the processing of thin sheet material such as paper, or relatively thick sheet material such as the more or less rigid and inflexible card board and similar products.

The full nature and advantage of my novel construction will be more clearly understood from the following specification and the accompanying drawing in which:

Fig. 1 represents, very diagrammatically, an apparatus embodying my invention and shown adapted for the treatment of sheet piece-work.

Fig. 2 represents a view similar to Fig. 1 illustrating the adaptation of the apparatus for handling continuous sheet or roll type of work.

Fig. 3 represents a longitudinal section of the

drum shown in Figs. 1 and 2 and forming part of the invention.

Referring to the drawing in which like reference characters indicate like parts, 4 designates a work platform on which the sheets 6 to be glazed are stacked. 8 designates a trough containing the coating liquid and 10 and 12 represent conventional coating apparatus between and around which the sheets 6 are passed before they are delivered to the endless belt 14. The endless belt 14, traveling in the direction of the arrows, enters the drying chamber 16 through which it travels over the rollers 18 and from which it emerges to return over the rollers 20. It will thus be seen that the belt 14 travels endlessly in and out of the drying chamber 16. The drying chamber 16 is supported by any suitable framework 22. Near the distal end of the drying chamber 16 is a drum 24 which is rotatable on the shaft 26. As shown in dotted lines at 28 the cylindrical drum 24 projects somewhat into the adjacent end of the drying chamber 16 so as to bring the circumference of the drum 24 into the closest possible position with respect to the sheet material 6 traveling through the drying chamber. In advance of the drum 24 the drying chamber 16 is restricted as at 30 to form an oven compartment 32 which is provided with the heating elements 34 under which the belt 14 and the sheet material 6 must pass prior to reaching the drum 24. The compartment 32 is known in the trade as a "flash" oven and the heating elements 34 are adapted to develop relatively intense heat in the present instance of about 400° F. 36 designates idle pressure rolls which are adapted to act on the sheet material adhering to the surface of the roll as the latter travels in the direction of the arrow. 38 designates a guard skirt which is carried by the work-receiving table 40 and the free edge of which is in close proximity to the circumference of the drum 24. 42 designates any suitable or conventional apparatus for creating an air blast through the very narrow space between the free edge of the guard 38 and the circumference of the drum 24, this free air serving to peel the work off from the surface of the drum as well as for assisting in cooling the portion of the drum from which the work has been peeled before the rotation of the drum is completed and new work sheets are applied to the surface of the drum.

In Fig. 2 I have shown substantially the same arrangement except that in this case the sheet material to be treated is in the form of a con-

tinuous roll 44 which is fed from the roll 46 to be coated at 48. The sheet material 44 passes through the drying chamber 16 and the flash oven 32 passes between the drum 24 and the pressure rollers 36 after which it is wound on the take-up roll 50. Where the work is in the form of a continuous roll, the guard skirt 38 and the air blast 42, or, for that matter, any other form of mechanism for removing the work from the drum is dispensed with.

As shown in Fig. 3 the drum 24 of Figs. 1 and 2 is provided with internally disposed and spaced disc supports 52 the purpose of which will be more clearly explained hereinafter.

The length of the cylindrical drum 24 and the coating rolls 12 and 18, as well as the width of the drying chamber 16, can be varied according to the width of the sheets 6 or the continuous roll 44.

In order to eliminate the necessity of heating or cooling the drum 24 I have discovered that best results are obtained if the drum 24 is made of non-ferrous material having a high coefficient of heat conduction and heat radiation, and I have further found that for best results the drum 24 should be of a relatively narrow cross-sectional thickness. In actual practice I have found a thickness of from one-quarter to one-half an inch to be satisfactory and I have also found that aluminum or an aluminum alloy combines the requisite lightness and rigidity and that it also lends itself to the production of a highly polished surface. Also aluminum or an aluminum alloy has the requisite coefficient of conductivity and radiation so that, when the sheet material, be it in a single piece or in the form of a continuous roll, comes into contact with the drum the fused surface thereof immediately adheres to the polished surface of the drum and the drum immediately conducts the major portion of the heat thus chilling the fused surface and hardening it while it is in contact with the polished surface thus giving the fused coating on the sheet material the polished glaze which is required. It will be noted that the pressure rolls 36 are placed immediately adjacent the end of the flash oven so that pressure is applied to the sheet material being treated while the coated surface thereof is still in the fused state. Also it will be seen that the portion of the drum to which the sheet material first adheres is projected into the flash oven so that it is provided with just the right amount of heat to prevent chilling of the fused material before the pressure of the rolls 36 has been applied. After the sheet material has passed the rolls 36 and continuously traveled with the movement of the drum, the cooling effect takes place and, due to the high conductivity of the metal and its relatively thin cross-sectional thickness, the work is chilled down to 100° F. to 120° F. by the time it reaches the take-off point or the point at which the work is separated from the drum. At this temperature the work separates easily and the glazed surface has sufficiently hardened so as not to suffer any deterioration. In this connection I have also found that in order to achieve a balance between the heating and cooling factors, and that in order to afford a sufficient dwell consistent with efficient speed of operation, the drum 24 should be of about seven feet in diameter and that its rate of rotation should be about 10 R. P. M. To make a drum having a diameter of about seven feet and a length of from three to six feet, or possibly more, from ferrous metal it would

be necessary to make it of much heavier construction which interferes with the factors of conductivity just mentioned. For certain types of work I have found it necessary to make a drum of relatively less cross-sectional thickness and, in that event, I provide the drum with the reinforcing disc supports 52 which impart to the shell of the drum the requisite rigidity and which also act as heat conductors further to increase the rate of cooling of the drum. Where support is required but where additional cooling is not needed, the supports 52 can be made of a material having a low coefficient of conductivity such as wood, Bakelite, or the like.

In apparatus of this character heretofore known the piece sheet material 6 was subjected to the action of a vacuum roll immediately in advance of the drum or other means were employed for causing the sheet piece material 6 to be deflected from the belt and to adhere to the surface of the drum. This was particularly the case when the belt 18 or 44 traveled on a level near the top of the drum. By reversing the position of the belt and causing it to travel at a point tangent with the lowermost point of the drum, I present the fused, coated surface of the sheet material directly to the polished surface of the drum thereby eliminating the necessity of any feeding devices. Furthermore, by the arrangement of the belt with relation to the drum, and by making the drum of a relatively large diameter, my construction is adapted for the practical handling of relatively rigid and inflexible or thick sheet material such as card board or the like which can be made to take the curve of a circle having a relatively large diameter, all of which could not be done if the drum had a relatively small diameter.

It will be seen that by means of my novel apparatus and method I melt or fuse only the very thin film of coating on the surface of the sheet material and this can be done almost instantaneously by the relatively intense heat of the elements 34 in the flash oven 32, and, while the coating is still in the fused or melted state, it is presented to the polished surface of the drum 24 and subjected to the action of the rollers 36 so that it may be smoothed out while still melted or at least relatively plastic in consistency. This is a very important point since it eliminates the necessity of heating the polishing surface and then cooling it, all of which represents waste in terms of energy radiation as well as in the time consumed. The amount of heat absorbed by the drum from contact with the melted coating surfaces to maintain the drum at a relatively low temperature at which it is possible to peel the work off the polishing surface and which temperature is at the same time sufficient to prevent a too sudden chilling of the fused coating which, if permitted, would interfere with the proper glazing. In other words, in order to achieve perfect glazing the coating of the sheet material must be subjected to the desired pressure while still in the fused state and, if the drum 24 were allowed to cool off completely, the first contact of the sheet material with the cooled surface of the drum would result in chilling the coating and thus hardening it before the sheet material has reached the rollers 36.

It is now customary in the trade to place the coated sheet material between polishing plates and then to put the polishing plates and the sheet material between heated plates of a press and then apply heat and pressure for a period

of three to four minutes so that the heat may penetrate through the polishing plates to the sheet material to be treated. This is an unduly long cycle for efficient operation and, furthermore, when the press is opened and the work is removed, the polishing plates and the sheet material itself are, and will for quite some time be, too hot to handle so that they must be put in a refrigerating room or allowed to stand and cool off while duplicate polishing plates are assembled and used. This greatly increases the labor as well as the capital investment and sufficient equipment to permit continuous operation. By my invention, with the drum 24 just warm enough not to cause undue chilling, and with the coating fused just before it is pressed against the drum, no appreciable time dwell is necessary and continuous operation is possible with a single piece of equipment. The temperature developed in the oven 32 by the heating elements 34 should be regulated in accordance with the plasticity of the coating material or its "wetness," but I have found that 400° F. to 450° F. will be satisfactory for most purposes.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An apparatus for processing sheet material comprising means for applying a coating to said sheet material, a drying chamber through which said coated sheet material is adapted to travel for drying said coating, an oven chamber communicating with said drying chamber, heating elements in the top of said oven chamber for radiating relatively intense heat on said sheet material to fuse said coating, a rotary drum having a polished surface and projecting into said oven chamber whereby the polished surface of said drum is tangent with the plane of said sheet material, and pressure rolls immediately adjacent the end of said oven chamber and coacting with said drum.

2. An apparatus for processing sheet material comprising means for applying a coating to said sheet material, a drying chamber through which said coated sheet material is adapted to travel for drying said coating, an oven chamber communicating with said drying chamber, heating elements in the top of said oven chamber for radiating relatively intense heat on said sheet material to fuse said coating, a non-ferrous rotary drum having a polished surface and projecting into said oven chamber whereby the polished surface of said drum is tangent with the plane of said sheet material, and pressure rolls immediately adjacent the end of said oven chamber and coacting with said drum.

3. An apparatus for processing sheet material comprising means for applying a coating to said sheet material, a drying chamber through which said coated sheet material is adapted to travel

for drying said coating, an oven chamber communicating with said drying chamber, heating elements in the top of said oven chamber for radiating relatively intense heat on said sheet material to fuse said coating, a rotary drum of a relatively large diameter and relatively small cross sectional thickness having a polished surface and projecting into said oven chamber whereby the polished surface of said drum is tangent with the plane of said sheet material, and pressure rolls immediately adjacent the end of said oven chamber and coacting with said drum.

4. An apparatus for processing sheet material comprising means for applying a coating to said sheet material, a drying chamber through which said coated sheet material is adapted to travel for drying said coating, an oven chamber communicating with said drying chamber, heating elements in the top of said oven chamber for radiating relatively intense heat on said sheet material to fuse said coating, a rotary aluminum drum having a polished surface and projecting into said oven chamber whereby the polished surface of said drum is tangent with the plane of said sheet material, and pressure rolls immediately adjacent the end of said oven chamber and coacting with said drum.

5. An apparatus for processing sheet material comprising means for applying a coating to said sheet material, a drying chamber through which said coated sheet material is adapted to travel for drying said coating, an oven chamber communicating with said drying chamber, heating elements in the top of said oven chamber for radiating relatively intense heat on said sheet material to fuse said coating, a rotary aluminum alloy drum having a polished surface and projecting into said oven chamber whereby the polished surface of said drum is tangent with the plane of said sheet material, and pressure rolls immediately adjacent the end of said oven chamber and coacting with said drum.

6. An apparatus for processing sheet material comprising means for applying a coating to said sheet material, a drying chamber through which said coated sheet material is adapted to travel for drying said coating, an oven chamber communicating with said drying chamber, heating elements in the top of said oven chamber for radiating relatively intense heat on said sheet material to fuse said coating, a cylindrical drum of a small cross sectional thickness relative to its diameter and projecting into said oven chamber whereby the surface of said drum is disposed in the path of the travel of said sheet material, pressure rolls coacting with said drum and spaced webs disposed within said drum at an angle to the longitudinal axis thereof.

E. A. CORBIN, JR.