

June 18, 1946.

F. C. CARDER  
COMBINATION PREHEATER AND STEAM SHOWER  
FOR CORRUGATING AND LIKE MACHINES  
Filed June 6, 1944

2,402,237

2 Sheets-Sheet 1

Fig. 1

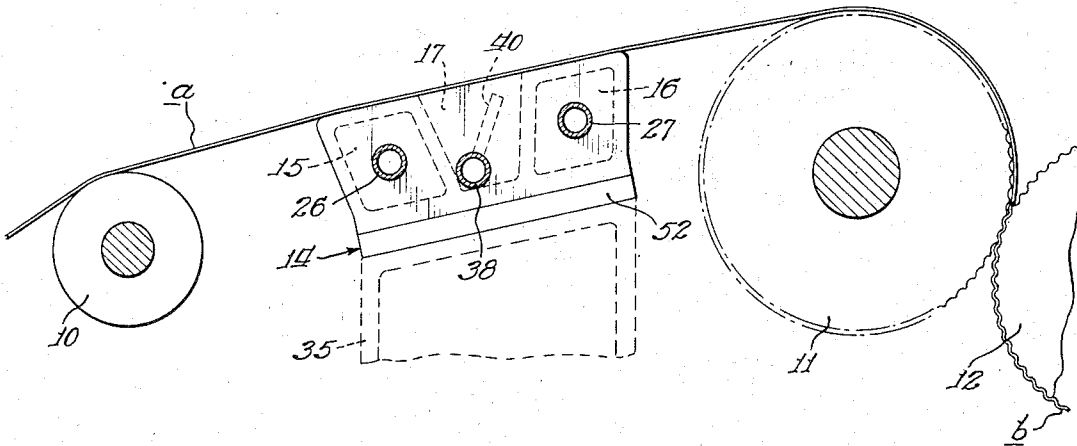
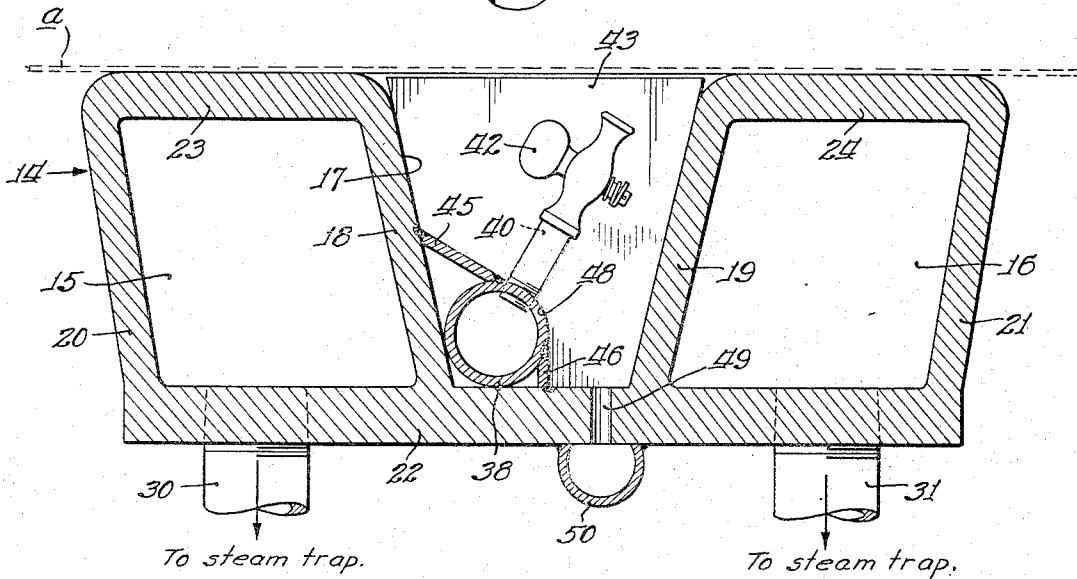


Fig. 3



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2 Sheets-Sheet 2

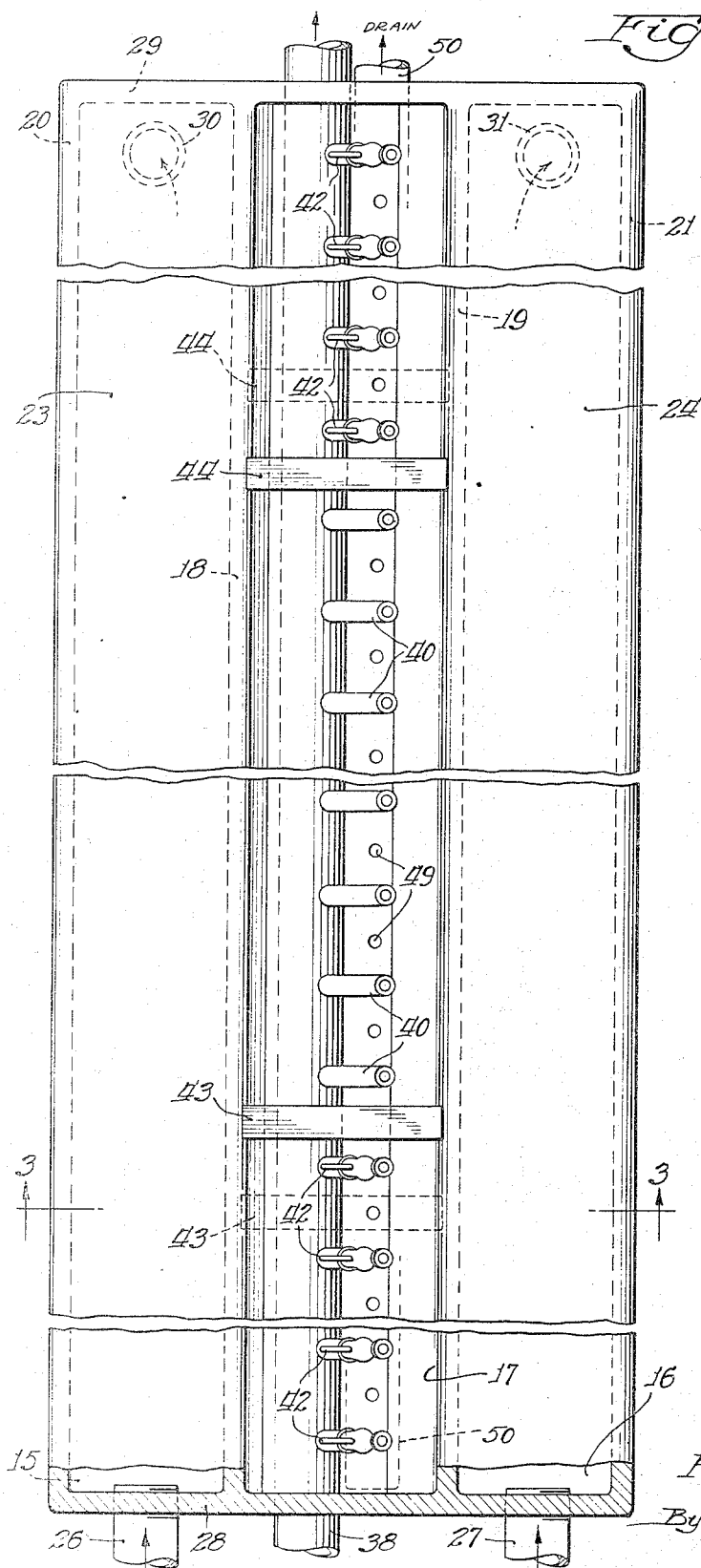


Fig. 2

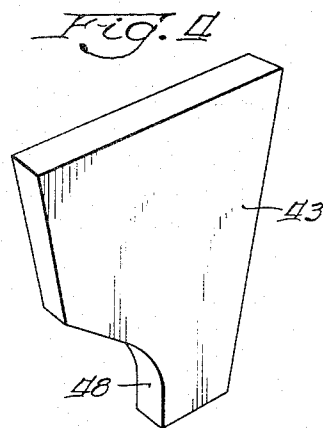


Fig. 4

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## UNITED STATES PATENT OFFICE

2,402,237

COMBINATION PREHEATER AND STEAM  
SHOWER FOR CORRUGATING AND LIKE  
MACHINESFrank C. Carder, Rock Island, Ill., assignor to  
Container Corporation of America, Chicago,  
Ill., a corporation of Delaware

Application June 6, 1944, Serial No. 538,934

2 Claims. (Cl. 91-18)

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This invention relates, in general, to apparatus for conditioning fibrous sheet material, such as fiberboard, paperboard, or like material, to prepare the same for a corrugating or like operation thereon, and has particular relation to a combination preheater and steam shower for corrugating and like machines.

One of the main objects of the present invention is to provide a combination preheater and steam shower of simple and improved construction; also an improved preheater and steam shower composed of relatively few parts and adapted effectively and expeditiously to accomplish the preheating and steaming of the sheet in its passage to the corrugating means.

Another object of the invention is to provide in apparatus for conditioning a web of fibrous sheet material, the combination which comprises a steam trough having an open side extending transversely of the sheet and presented to the sheet in its passage to the means for performing the corrugating or like operation on the sheet, and means, more particularly in the form of a pair of end members adapted to be located in a plurality of laterally spaced positions, for adjusting the transversely extending dimension of the trough to adapt same to sheets of different widths while maintaining the interior of the trough in open communication from end to end transversely of the sheet in the different positions of said end members.

Another object of the invention is to provide a preheater and steam shower of the class described in which the elongated surfaces over which the web travels in its movement to the corrugating rolls are substantially coplanar with the web and each other, whereby these surfaces have little frictional retarding effect on the movement of the web; also a preheater and steam shower in which the steam trough is situated between a pair of preheating chambers, with the upper walls of these chambers providing the aforesaid coplanar surfaces and with the open side of the trough separating these surfaces.

Another object of the invention is to provide a preheater and steam shower of the class described having a steam conduit extending through the trough transversely of the sheet and provided with laterally spaced steam outlets for directing steam against the adjacent surface of the sheet; there being condensate drain means cooperating with said conduit, and the portions of the end members adjacent the drain means being shaped to conform therewith to prevent

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the passage of steam from the ends of the trough along the conduit.

Another object of the invention is to provide a preheater and steam shower which is adapted for supplying different combinations of heat and moisture to the sheet ahead of the corrugating action; also apparatus of the class described which is adapted, as and where desired, to supply wet or moist steam against the adjacent surface of the sheet to condition the sheet for the corrugating or like operation.

Further objects and advantages of the invention will become apparent from the following detailed description, taken in connection with the accompanying drawings in which:

Figure 1 is a simplified fragmentary end view of one form of my improved combination preheater and steam shower, showing the same presented to a web of fibrous sheet material in its passage to a pair of corrugating rolls;

Figure 2 is a top plan view of the combination preheater and steam shower partly in section;

Figure 3 is a vertical cross section taken on the line 3-3 of Figure 2; and

Figure 4 is a perspective view of one of the adjustable end members for the steam trough.

Referring to the drawings, the reference character 10 indicates a roll which may, for example, be an overspeed feed roll. The means for performing a corrugating or like operation is shown as comprising a longitudinally fluted roll 11, spaced from the roll 10, and a cooperating longitudinally fluted roll 12 between which and the roll 11 the web of fibrous sheet material *a* is adapted to be corrugated, as well understood in the art.

The combination preheater and steam shower is designated in its entirety at 14, and comprises a pair of preheater chambers 15 and 16, extending transversely beneath the web *a*, and a steam trough 17 intermediate the chambers 15 and 16 and also extending transversely beneath the web *a*. The inner transversely extending side walls 18 and 19 and the outer transversely extending side walls 20 and 21 extend upwardly from the bottom wall 22. The tops of the preheater chambers 15 and 16 are closed by top walls 23 and 24, respectively. The walls 18, 19, 20, 21, 22, 23, and 24 are shown integral or in one piece to simplify the illustration; it being understood that these walls may be formed separately to any desired extent and welded or otherwise secured together.

Steam is delivered into the preheater chambers 15 and 16 by steam supply conduits 26 and 27, respectively. These conduits 26 and 27 may enter

the chambers 15 and 16, for example, through the end wall 28 which closes the chambers 15 and 16 at one end of the apparatus, as shown in Figure 2. The opposite ends of the chambers 15 and 16 are closed by an end wall 29. Condensate, or water of condensation, is discharged from the chambers 15 and 16 through drain pipes 30 and 31 opening downwardly from the chambers 15 and 16, respectively, in proximity to the end wall 29, and connected, for example, with steam traps (not shown) for permitting the flow of water but retaining the steam. The bottom surfaces of the chambers 15 and 16 preferably slant downwardly from the steam inlet ends of the chambers to the condensate outlets to drain the condensate to these outlets. The combination preheater and steam shower 14 may be supported on the frame 35, which may be a part of the framework for the corrugating machine.

The inner transversely extending walls 18 and 19 preferably slant apart or diverge upwardly as shown in Figures 1 and 3, and, with the bottom wall 22 and end walls 28 and 29, form the steam trough 17. The open top of this trough 17 and the upper surfaces of the top walls 23 and 24 are presented to the lower surface of the web or sheet *a* in its movement from the roll 10 to the corrugating rolls 11 and 12.

A steam conduit 38 extends along the bottom of the trough 17 transversely of the sheet *a* and has a plurality of laterally spaced steam outlets directed diagonally upward from the conduit 38 for directing or showering steam upwardly against the bottom side of the sheet *a* as it passes over the combination preheater and steam shower 14 from the roll 10 to the corrugating rolls 11 and 12. The steam outlets 40, along the center or intermediate portion of the trough 17 in the direction of its transversely extending dimension, which portion of the trough will be covered by the narrowest sheet or web *a* with which the apparatus is used, are shown in Figure 2 in the form of permanently open steam discharge tubes or nozzles. The laterally spaced steam outlets or nozzles at the opposite ends of these first mentioned outlets 40 are equipped with pet cocks or valves 42.

The opposite ends of the trough 17 are closed by a pair of end members or dams 43 and 44. For the purpose of adjusting the transversely extending dimension of the trough 17 to adapt the same to sheets or webs *a* of different widths, the end members 43 and 44 are adapted to be located in a plurality of laterally spaced positions. In Figure 2 these end members 43 and 44 are shown in full lines placed for positioning adjacent the opposite edges of the narrowest web or sheet *a* with which the apparatus is to be used. In this case the end members 43 and 44 are positioned beyond the opposite ends of the laterally spaced permanently open steam outlets 40 and between the end outlets 40 and the adjacent valved or controllable steam outlets 42. When the web or sheet *a* is wider, the end members 43 and 44 may be removed and manually placed at or near the edges of the wider sheet *a*, for example in the positions shown in dotted lines in Figure 2 or in position outwardly of any of the outer steam outlets 42.

By placing the end members 43 and 44 in their different laterally spaced positions the dimension of the trough 17, which extends transversely beneath the web *a*, is thus adjusted to adapt the trough to webs *a* of different widths, and this is accomplished while maintaining, in the various

different adjustments, the interior of the trough in open communication from end to end transversely of the web *a*. This prevents any unduly localized steaming action on the bottom of the web *a* in the event of clogging or failure of any of the upwardly directed steam outlets such as might result, for example, if the trough 17 were divided into a plurality of separate steam chambers with a nozzle or outlet in each chamber. A better and more uniform treatment of the web *a* is thus at all times assured, because if any one steam nozzle or outlet fails, the portion of the web *a* which moves adjacent the same will be steamed by the steam from the other outlets or nozzles.

The steam conduit 38, which is shown as disposed not only at the bottom of the trough 17 but adjacent the wall 18, is preferably provided with condensate drain members 45 and 46 which extend transversely along the bottom of the trough 17 from end to end thereof in a direction transversely of the web *a*. These drain members 45 and 46 are welded or otherwise secured, as shown, to the wall 18, pipe or conduit 38 and bottom wall 22. As shown in Figure 4, the lower portions of the end members 43 and 44 are shaped, at 48, to conform to the drain members 45 and 46, thereby assuring closing of the ends of the trough 17 against the escape of steam out along the outside of the conduit 38.

The bottom of the steam trough 17 has a drain outlet 49 opening downwardly therethrough for the discharge of condensate or water of condensation from the trough 17 into a drain 50. This drain 50 may be in the form of one half or other suitable portion of a pipe, and preferably has a fall or slant from one end to the other to provide for proper draining of the condensate from the trough. The inner surface of the bottom of the trough 17 may, of course, be slanted or sloped to drain the condensate to the outlet 50. Heat insulating material may be provided at 52.

The upper surfaces of the top walls 23 and 24 of the preheater chambers 15 and 16 are preferably flat and coplanar with the web *a* and with each other, whereby these surfaces have little frictional retarding effect on the movement of the web *a*. The upper corners of the chambers 15 and 16, which extend transversely beneath the web *a*, are preferably rounded, as shown, although this may vary. The upper marginal edges of the end members 43 and 44 are also flat, and are disposed substantially coplanar with or just slightly beneath the coplanar upper surfaces of the top walls 23 and 24. In use, the combination preheater and steam shower is positioned with the upper coplanar surfaces of the top walls 23 and 24 about  $\frac{1}{8}$  of an inch above the line or path of travel of the web *a* to assure proper contact of the heaters with the web *a*, although this may vary.

In operation, the tension on the web *a* as it passes or is fed to the corrugating rolls 11 and 12 holds the web firmly against the coplanar top surfaces of the top walls 23 and 24 and the web closes the top of the trough 17; the ends of the trough being closed at the opposite edges of the web *a* by the end members 43 and 44 which are spaced apart according to the width of the web. The steam from the outlets or nozzles 40, and also from the nozzles 42 where the web *a* is of a width to include certain of these latter nozzles, is directed or showered on the bottom of the web and permeates the web to render it more pliable

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and to enable it to retain its corrugated form when it is corrugated, as shown at *b* in Figure 1. It is understood that the valves or pet cocks 42 of the steam outlets or nozzles, outwardly of the end members 43 and 44 and not covered by the web *a*, are closed to prevent the escape of steam.

By using separate steam for the shower pipe 38 from that used in the preheater chambers or boxes 15 and 16 I am able and contemplate, within the scope of the present invention, the use of wet and moist steam as the shower from the pipe 38. This is more effective in heating and conditioning the web *a* than would be accomplished by the heat of convection from the steam bath itself. The apparatus of the present invention, in addition to being adapted for supplying wet or moist steam from the shower outlet, is also adapted for supplying different combinations of heat and moisture to the sheet ahead of the corrugating action and in accordance with the different heat and moisture requirements of different corrugating media.

I do not intend to be limited to the precise details or to the precise adaptation of the invention shown and described, as variations in the details and other adaptations of the invention are contemplated within the scope of the appended claims.

I claim:

1. In apparatus for conditioning a sheet of fibrous material as said sheet travels substantially in a plane between two rolls prior to being corrugated, the combination which comprises an elongated, open-top vessel extending transversely of said sheet and having front and rear walls extending substantially to the lower surface of

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said sheet, heated members having transversely elongated surfaces extending forwardly from said front wall and rearwardly from said rear wall, said surfaces being substantially coplanar with said sheet and each other, a plurality of transversely spaced means for admitting steam to said vessel, means for selectively closing a plurality of said steam-admitting means at each end of said vessel, and a pair of movable end members conforming substantially to the internal cross-section of said vessel and extending upwardly substantially to the plane of said sheet, said end members being adapted to be placed in a plurality of laterally spaced positions, whereby the effective length of said vessel can be adjusted to sheets of various widths.

2. In apparatus for conditioning a sheet of fibrous material prior to being corrugated, the combination which comprises an elongated, open-top vessel extending transversely of said sheet and having front and back walls extending substantially to the lower surface of said sheet, a plurality of transversely spaced means for admitting steam to said vessel, means for selectively closing a plurality of said steam-admitting means at each end of said vessel, and a pair of removable end members conforming substantially to the internal cross-section of said vessel and extending substantially to the plane of said sheet, said end members being adapted to be selectively placed in a plurality of laterally spaced positions between the positions of said steam-admitting means, whereby the effective length of said vessel can be adjusted to sheets of various widths.

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