

June 20, 1967

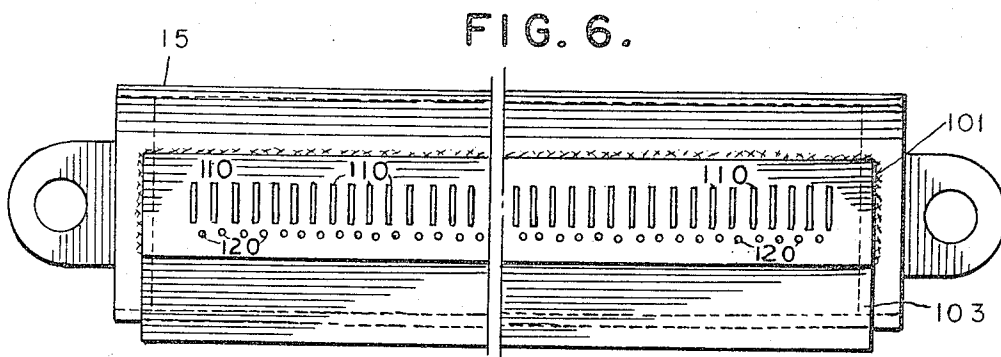
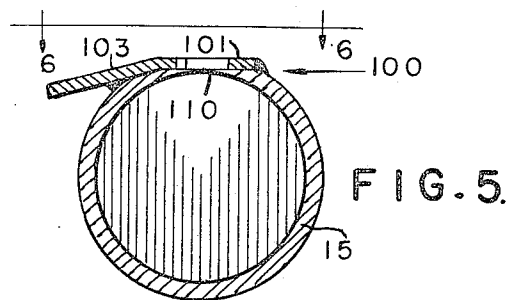
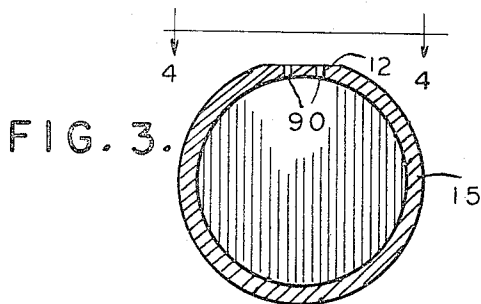
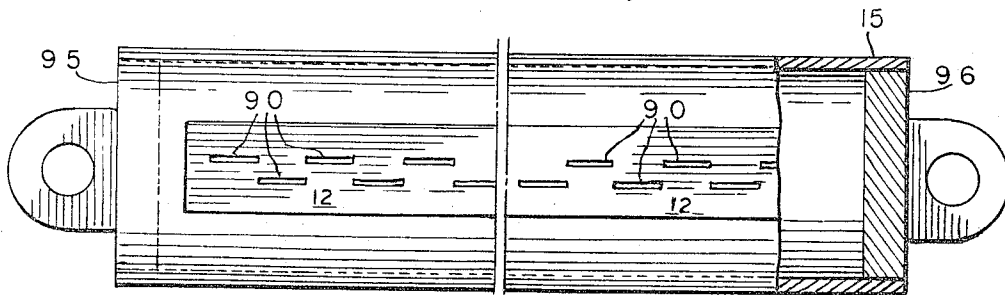
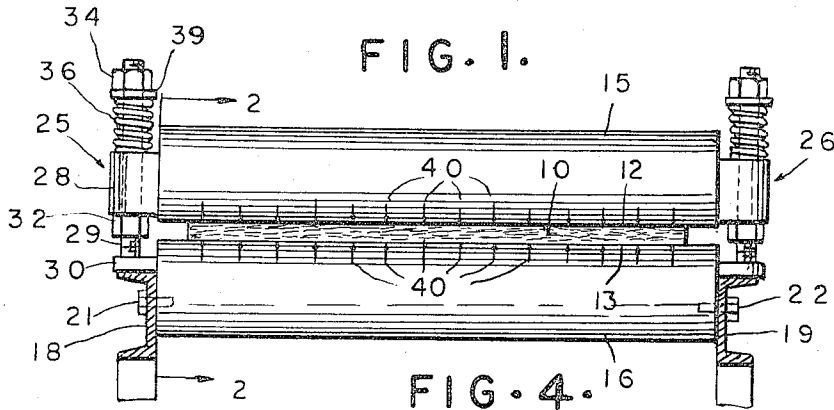
W. H. KILLEEN

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APPARATUS FOR IMPREGNATING A FIBROUS MAT

Filed Feb. 19, 1965

2 Sheets-Sheet 1



INVENTOR.
WALTER H. KILLEEN
BY, *James W. Grace*
ATTORNEY.

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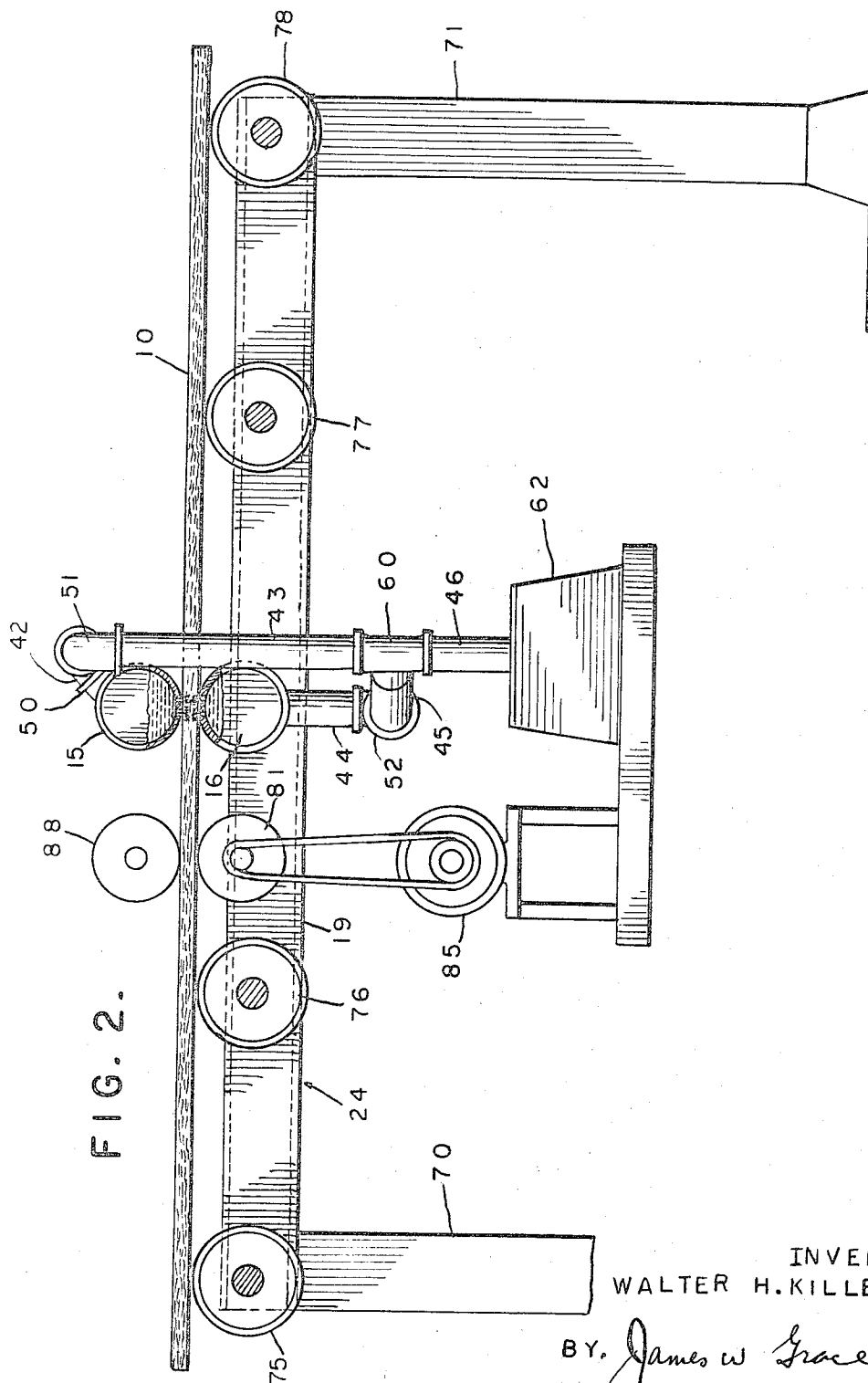
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INVENTOR.
WALTER H. KILLEEN.

BY. *James W. Grace*
ATTORNEY.

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APPARATUS FOR IMPREGNATING A FIBROUS MAT

Walter H. Killeen, New Orleans, La., assignor to The Celotex Corporation, Chicago, Ill., a corporation of Delaware

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4 Claims. (Cl. 118—411)

This invention pertains to an apparatus for impregnating a fibrous mat with a liquid, and more particularly to an apparatus for impregnating a fiberboard with liquid under hydraulic pressure.

It has been conventional to impregnate or saturate fiberboards or fibrous mats with various liquids by immersing the fibrous mat in a vat or tank containing the liquid. The fluid saturation may be accomplished by totally immersing precut sheets of fiberboards or mats in the saturating liquid or by conveying a continuous mat through a long tank containing liquid until the liquid flows into the mat.

In the process of saturating precut sheets of fiberboards, complicated hoists and mechanical means for handling the fiberboard are required. In addition, the operations of handling the fiberboard in separate sheets for dipping into a tank increase the operational time beyond reasonable economic limits.

The prior art apparatus for liquid saturation of a continuous mat comprises a long tank to receive the continuous mat. This apparatus adds to plant costs in that the tank occupies an excessive amount of plant space. For example, in actual production a continuous mat of 1/2 inch fiberboard can be conveyed through a tank at the rate of 44 lineal feet per minute. Because it has required about 3 minutes of immersion to saturate the mat, a tank approximately 132 feet long is required.

Furthermore, in certain applications flammable volatiles are used in saturating the fiberboard. Under these conditions, the use of long open tanks of flammable liquids results in a definitely dangerous condition fraught with perils of explosion or fire. In addition the use of an open vat or tank for highly volatile liquids results in loss of such liquids to the atmosphere.

It is an object of the present invention to provide a novel apparatus for impregnating a fibrous mat with a liquid under hydraulic pressure with great simplicity and at reduced cost.

It is yet another object of the present invention to provide a novel apparatus for impregnating a fibrous mat with a liquid under hydraulic pressure while yet avoiding undue loss of volatile liquid to the atmosphere.

It is yet another object of the present invention to provide a novel apparatus for impregnating a fibrous mat with a flammable liquid under hydraulic pressure while reducing the hazards of possible explosion or fire.

The present invention comprises a pair of spaced aligned liquid applicators in the form of pipes having flat perforated facing surfaces between which the mat to be impregnated is continuously conveyed. At least one of the pipes is mechanically biased against a surface of the mat so as to provide a seal at each outer mat surface to prevent loss of hydraulic pressure. The liquid to impregnate the mat is forced under hydraulic pressure into the pipes and flows through the perforations into the top and bottom surfaces of the mat to saturate the mat.

These and other objects and advantages of the present invention will become more apparent upon reading the specification in conjunction with the accompanying drawings, in which like minerals refer to like elements and in which:

FIGURE 1 is an end elevational view showing an embodiment of the apparatus of the present invention;

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FIGURE 2 is a simplified side elevational view of the apparatus, partly in cross-section, taken along lines 2—2 of FIGURE 1;

FIGURE 3 is a detailed view of a part of the apparatus of the invention of FIGURE 1;

FIGURE 4 is a plan view of the part of the apparatus taken along lines 4—4 of FIGURE 3, and

FIGURE 5 is a detailed view of an alternative part of the apparatus of the invention of FIGURE 1, and

FIGURE 6 is a plan view of the alternative part taken along lines 6—6 of FIGURE 5.

For a more detailed discussion of the apparatus of the invention, reference may now be made to the figures in the accompanying drawings and particularly FIGURE 1 thereof.

FIGURE 1 shows a fiberboard 10 which is to be impregnated with liquid by means of the apparatus of the invention. The fiberboard 10 is made in the form of a dried mat of cellulosic fibers on a modified Fourdrinier or cylinder machine in a continuous sheet in thicknesses of 3/8 inch to 1 inch. The sheet is dried and carried on a conveyor (shown in FIGURE 2) to the impregnating apparatus. The fiberboard 10, as it enters the impregnating apparatus, is an unwoven mat of entangled fibers having sufficient strength to be handled without disruption. Fiberboard 10 is conventionally manufactured by well known processes and, per se, does not form a part of the invention. It should be realized also that the fiberboard 10, while preferably made of cellulosic fibers; such as wood pulp, bagasse, straw or other suitable vegetable fibers, could also be made of other synthetic fibers of organic or inorganic origin.

Fiberboard 10 is conveyed between facing surfaces 12 and 13 of spaced aligned liquid applicators or pipes 15 and 16 respectively. As will be discussed hereinafter, if pipes 15 and 16 are of circular internal cross-section, the facing surfaces 12 and 13 are ground or planed to present flat areas against which the top and bottom surfaces of fiberboard 10 bear as the fiberboard 10 is conveyed through the apparatus. The flat surfaces of pipes 15 and 16 have perforations or slots opening to the interior of the pipes to permit the liquid to be hydraulically forced therethrough into the fiberboard 10.

Pipes 15 and 16 are long enough across the machine so as to extend beyond the longitudinal edges of the fiberboard 10. Lower pipe 16 is bolted or otherwise secured to U-shaped frame members 18 and 19 by bolts 21 and 22. Frame members 18 and 19 may also be the upper frame members for the conveyor 24 (shown in FIGURE 2).

Upper pipe 15 is aligned with and spaced from lower pipe 16 by adjustable mountings 25 and 26. For convenience, only mounting 25 will be described with the understanding that mounting 26 is identical, as shown. A piece of metal stock 28, drilled for reception of a threaded rod 29 is welded or otherwise secured to the side of pipe 15. Threaded rod 29 is screwed into a small block 30 which in turn is secured to the upper surface of frame member 18. If desired, threaded rod 29 may be screwed into holes tapped into the upper flange of frame member 18. A nut 32 is mounted on threaded rod 29 between block 30 and the lower edge of metal stock 28. It is apparent that the position and alignment of the lower face 12 of pipe 15 with respect to the upper fixed surface 13 of lower pipe 16. A second nut 34 is adjustably positioned near the top of threaded rod 29 and a spring 36 is placed on threaded rod 29 between metal stock 28 and nut 34. If desired a washer 39 may be inserted between nut 34 and spring 36. The function of the adjustable mountings 25 and 26 is to space the facing surfaces 12 and 13 of pipes 15 and 16 at a distance approximately equal to the thickness of fiber-

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board 10 and also provide for a slight compressive or bias action on the two surfaces of the fiberboard 10 to insure a seal to prevent leakage of the liquid and utilize the full hydraulic pressure of the liquid in saturating the fiberboard. The arrows 40 represent the direction of the flow of liquid through the slots in the facing surfaces 12 and 13 of pipes 15 and 16.

Referring now to FIGURE 2, there is shown a side elevational view of the apparatus with pipes 15 and 16 above and below fiberboard 10. Additional pipes 42-46, elbows 50-53, and a T-joint 60 are connected so as to supply liquid at substantially equal hydraulic pressure to pipes 15 and 16 from a pump 62 (shown only schematically). To permit adjustability for the distance between the flat surfaces 12 and 13 of pipes 15 and 16 certain of the joints or elbows may, if desired, be made of conventional rotatable connectors or an expandable section may be inserted in pipe 43. The pump may be a 40 gallon per minute pump operating at a capacity of 150 p.s.i. or equivalent.

To carry the fiberboard 10 through the saturating area, a conveyor 24 comprising upright legs 70 and 71 and connecting frame member 19 is provided. Idling rollers 75-78 are mounted on frame member 19 as well as a driving wheel 81. The fiberboard is carried by the idling rollers 75-78 and is driven by the driving wheel 81, which is in turn rotated at a suitable line speed by a motor 85 by means of a belt connected to the motor 85 and the driving wheel 81. A pinch roll 88 is mounted above and in alignment with driving wheel 81. Pinch roll 88 forces fiberboard 10 against the surface of driving wheel 81, to provide enough friction to carry fiberboard 10 through the impregnating pipes 15 and 16. The idling rollers 75-78, the driving wheel 81 and the flat surface 13 of pipe 16 are aligned in coplanar relationship so that fiberboard 10 is conveyed without undue flexing. A suitable line speed for this type of fiberboard saturation may be between 42 and 170 linear feet per minute.

FIGURES 3 and 4 show in greater detail one of the pipes 15 and 16. The pipe 15, herein shown, is of circular interior cross-section and has a flat facing surface 12, formed by grinding down a portion of the surface of the pipe. Slots 90 are cut through the flat facing surface 12 of pipe 15. Plugs 95 and 96 are welded in place to close the ends of pipe 15. For illustrative purposes only the following dimensions of pipe 15 are set forth:

	Inches
Outer diameter	4 1/4
Inner diameter	3 3/4
Length	27
Thickness of plug	3/4
Length of slots	1
Width of slots	1/16
Thickness of pipe in area of flat surfaces	1/8

FIGURES 5 and 6 illustrate an alternative variation for pipes 15 and 16. Pipe 15 is cut along line 100 and a guide plate 101 is welded or otherwise secured over the slotted opening in the pipe 15. The plate 101 has a slightly inclined portion 103 to guide the fiberboard 10 over the upper surface of the guide plate 101. In order to provide for a greater flow of impregnating fluid, slots 110 are oriented in a direction parallel to the path of movement of fiberboard 10. In addition to providing greater open area for the fluid, the fiberboard 10 also remains a longer time in contact with the slots to insure adequate impregnation. In this alternative variation the slots are 1/8" wide, 1 inch long and spaced on 5/16" centers. Small holes 120 are drilled so as to lie across the areas between the slots 110.

The mechanical features of the novel impregnating apparatus having been described, its operation may be characterized as follows:

Fiberboard 10 is conveyed by means of conveyor 68 upon idling rollers 75-78. Specifically, fiberboard 10 is propelled at a line speed of between about 42 to 170

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linear feet per minute by means of driving wheel 81 against the upper surface of which fiberboard 10 is frictionally held by pinch roll 88. Fiberboard 10 is conveyed past but in slight frictional engagement with the flat areas 12 and 13 of spaced pipes 15 and 16. Because of the function of adjustable mountings 25 and 26 the flat areas 12 and 13 of pipes 15 and 16 are held relatively tightly against the major surfaces of fiberboard 10 so as to form a hydraulic seal. The liquid with which fiberboard 10 is to be impregnated or saturated is pumped through pump 62 into the connecting pipes 42-46 and their attendant elbows and joints into pipes 15 and 16. From thence the liquid is forced by hydraulic pressure into fiberboard 10.

Since the amount of pressure required to completely saturate fiberboard 10 may be varied depending upon the viscosity of the impregnating liquid, it is not felt necessary to set forth specific relationships between the hydraulic pressure and the viscosity of the liquids. These characteristics may be determined either from suitable handbooks or are readily ascertainable by those familiar with this art.

In summary, the novel apparatus of the invention provides for the impregnation or saturation of a fiberboard with a liquid under hydraulic pressure. This specific apparatus eliminates the dangers and hazards involved in previous means of impregnating fiberboards. Specifically, it eliminates the long open tanks or vats which have heretofore been used. In particular also it reduces the hazard of fire and explosion when highly volatile inflammable liquids are used in the saturation process. In addition, it greatly reduces the floor space necessary under prior art usages.

While a specific embodiment of the present invention has been herein disclosed, changes, rearrangements, and modifications 85 will occur to those skilled in the art, and it is intended that such changes, rearrangements, and modifications be included in the scope of the following claims.

I claim:

1. An apparatus for continuously impregnating a fibrous mat of between 3/8 inch to 1 inch in thickness having opposite major surface areas with a liquid comprising a pair of aligned liquid applicators, each of said applicators having a perforated flat area with the flat area of one of said applicators being in spaced parallel relation to the flat area of the other of said applicators, stop means for fixing the minimum spacing between said flat areas, yieldable biasing means connected to at least one of said applicators and adapted to maintain a fixed minimum distance between said flat areas of said applicators for maintaining a hydraulic seal between said flat areas and said major surfaces of said mat, when said mat is inserted between said flat areas, and common liquid supply means connected to said liquid applicators for supplying said applicators with said liquid under sufficient and equal hydraulic pressure to impregnate said mat.

2. An apparatus for impregnating a fibrous mat as set forth in claim 1, in which said perforations in said flat areas are in the form of elongated slots having their major axes in the direction of the longitudinal axes of said liquid applicators, said slots being further arranged in at least two groups with the slots in each group having their major axes aligned and the aligned slots of one group being spaced from and alternating with the aligned slots of said other of said groups.

3. An apparatus for impregnating a fibrous mat as set forth in claim 1, in which said perforations in said flat areas are in the form of elongated slots arranged in parallel relationship oriented with the major axes transverse to the longitudinal direction of said liquid applicators.

4. An apparatus for continuously impregnating a fibrous mat of between 3/8 inch and 1 inch in thickness having opposite major surface areas with a liquid comprising a pair of aligned liquid applicators, each of said applicators having a perforated flat area, with the flat area of

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one of said applicators being in spaced parallel relation to the flat area of the other of said applicators, stop means for fixing the minimum spacing between said flat areas, yieldable biasing means connected to at least one of said applicators for maintaining a hydraulic seal between said flat areas and said major surfaces of said mat when said mat is inserted between said flat areas, common liquid supply means connected to said liquid applicators for supplying said applicators with said liquid under sufficient and equal hydraulic pressure to impregnate said mat, and conveyor means connected to said applicators for carrying said mat into engagement with said applicators, said conveyor having idler rollers, and a driving wheel so arranged that a tangent to the periphery of said idler rollers, and said driving wheel is coplanar with said flat surface of one of said applicators.

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CHARLES A. WILLMUTH, *Primary Examiner.*J. P. MCINTOSH, *Assistant Examiner.*