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2,462,297

APPARATUS FOR SATURATING FABRICS

Filed April 9, 1945

2 Sheets-Sheet 1

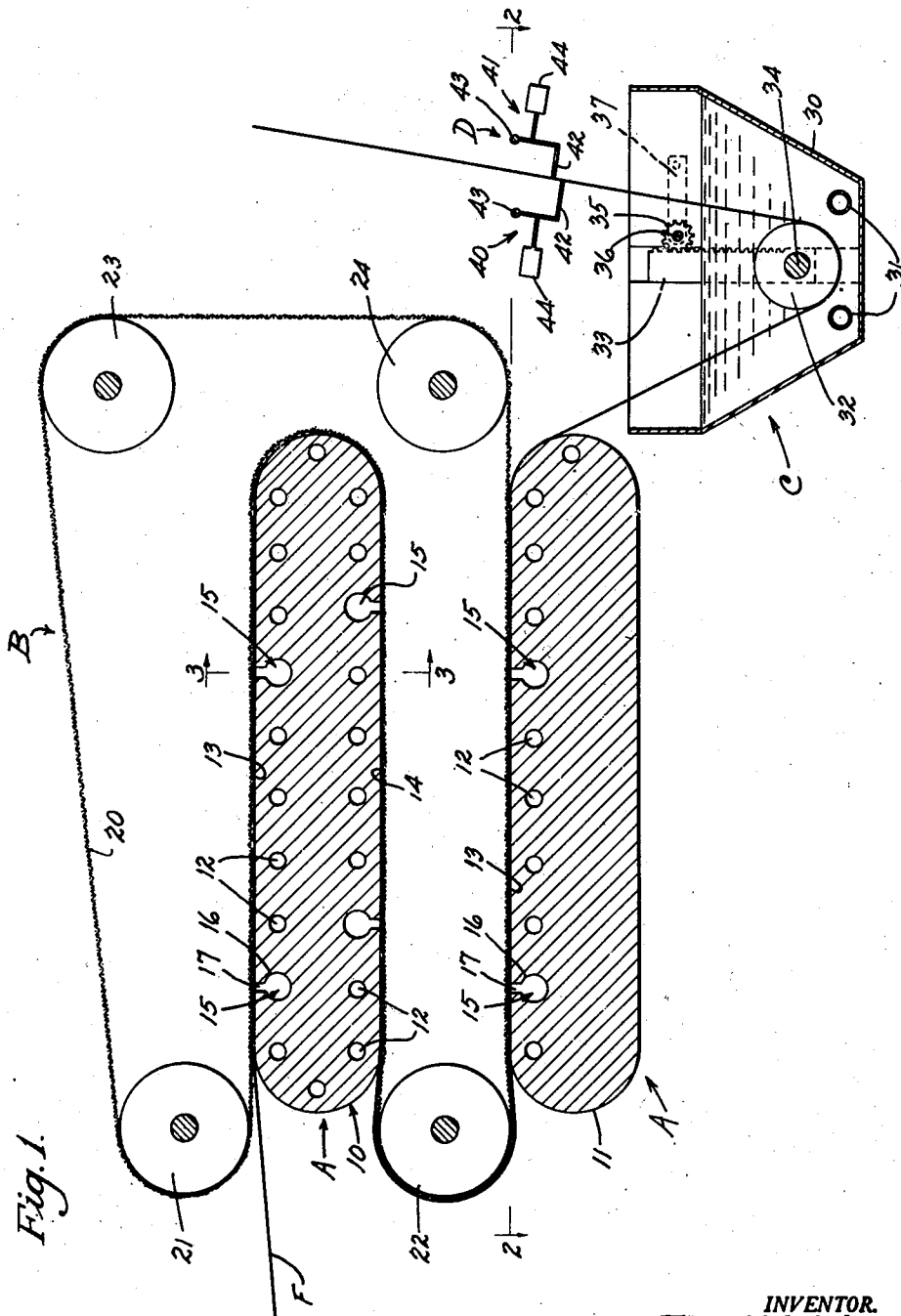


Fig. 1.

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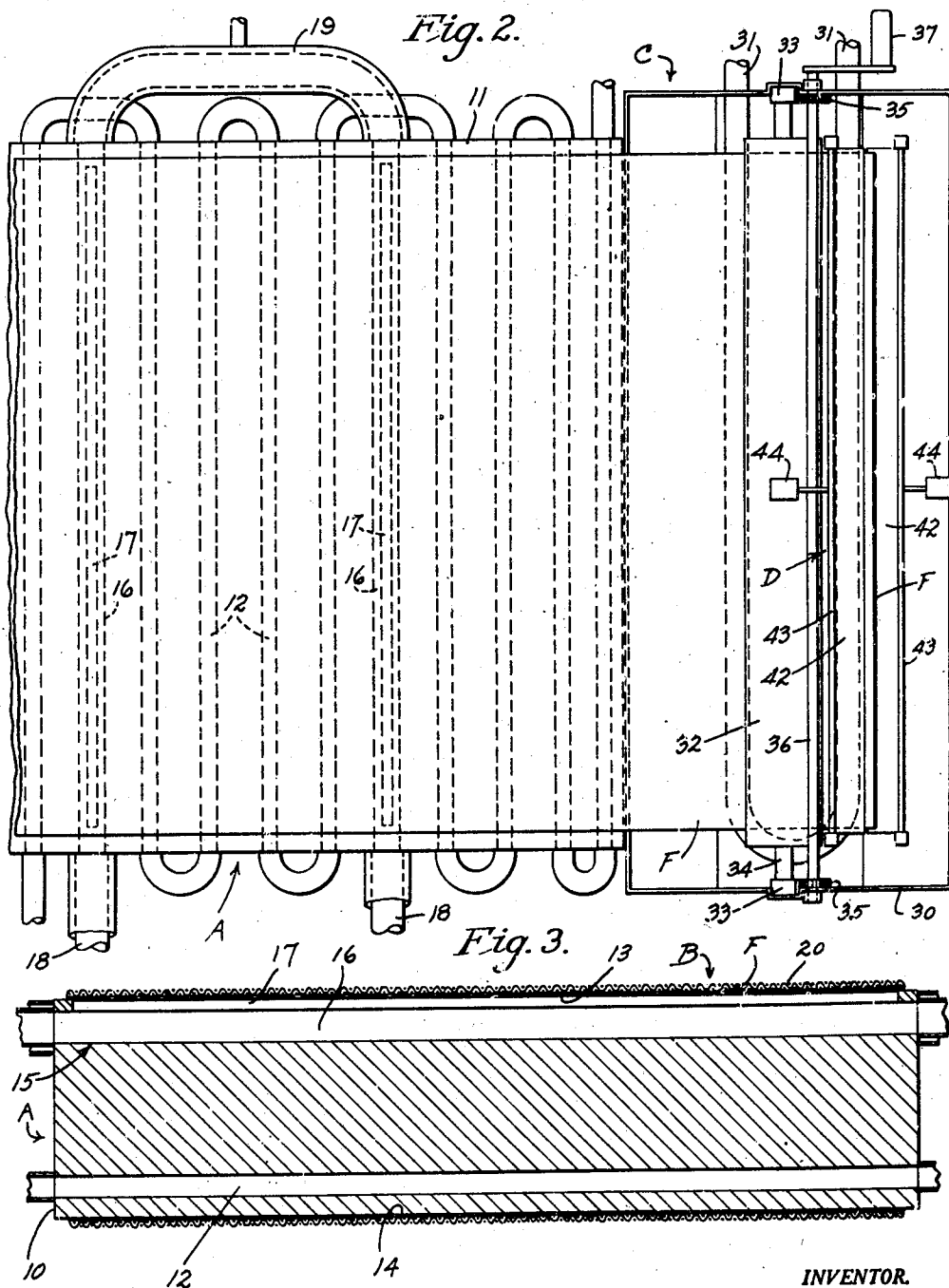
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2 Sheets-Sheet 2



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APPARATUS FOR SATURATING FABRICS

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5 Claims. (Cl. 91—18)

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This invention relates to fabric saturation and deals more particularly with a novel method and means for impregnating absorbent fabrics, such as felt and other flocculent materials.

Heretofore, the conventional method of saturating or impregnating dry felt to obtain a material such as is used in roofing was to immerse the felt in a bath of hot saturant, such as asphalt. Several immersions were necessary to obtain desired impregnation. This conventional method had several faults. It entailed the use of an unduly large amount of saturant; the heat loss in the method was excessively great and, therefore, uneconomical; it was difficult to thread and pass the fabric through the bath; a break in the fabric entailed a considerable loss of yardage thereof; the immersion time for full saturation was unduly long; and because of the latter, the excessive heat tended to char the fibres of the fabric, and, consequently, to weaken the fabric.

Further, all dry felts contain some moisture and in the immersion method of saturating, this moisture is carried into the bath. Since any appreciable amount of such moisture will cause violent foaming when introduced in hot asphalt, the bath will frequently foam over and entail a shut-down to clean up the resultant mess. Again, the great difference in the temperatures of the felt sheet and the hot asphalt in the immersion bath will cause the asphalt to chill upon contact with the sheet and to form an impervious film thereon. It follows then, that before impregnation can occur, this film must be dissipated entailing another wasteful use of time.

Another prior method of saturating felt sheets with asphalt entailed spraying hot asphalt upon one surface of the sheet in an attempt to drive the moisture in said sheet out through the other surface. While the spraying method affords increased efficiency over the immersion method, it is time consuming, costly, and only partly solves the problems involved. Control of impregnation is difficult and an uneven product results.

When saturating flocculent fabrics, the greater proportion of saturant fills the spaces or interstices of the fabric fibres. Therefore, a fabric which is initially filled with saturant, upon cooling, may be considerably undersaturated. This is caused by the great difference in the expansion co-efficients of asphalt and the like and fabrics. The present invention, therefore, contemplates a method for impregnating fabrics in which the above-mentioned faults are obviated and by means of which a fabric can be saturated fully and uniformly throughout its thickness.

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Other objects of the invention are to provide a method for saturating fabrics in which the moisture in the fabric is driven therefrom without foaming and to provide a method in which the impregnation is controlled to produce a uniform product having a desired degree of saturation.

A further object of the invention is to provide a fabric saturation method in which surface filming is obviated by preventing the formation of a cooled crust of asphalt on the material.

A further object of the invention is to provide novel apparatus for carrying out the herein contemplated method for saturating fabrics.

My invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability for economically and efficiently practicing the herein contemplated method.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Fig. 1 is a cross-sectional view, in somewhat diagrammatic form, of preferred apparatus for carrying out the method of the invention.

Fig. 2 is a plan-sectional view as taken on the plane of line 2—2 of Fig. 1.

Fig. 3 is a cross-sectional view as taken on the line 3—3 of Fig. 1 and drawn to an enlarged scale.

The apparatus of the present embodiment for carrying out the method of the invention may comprise essentially: heated saturating means A; means B for conveying a fabric for impregnation by the saturating means A; fabric dipping means C; means D for controlling the degree of saturation of the fabric after leaving the means C; and various other parts, details and structural features.

The saturating means A may comprise a plurality of saturating platens. In this case, two such platens 10 and 11 are provided. Each platen may comprise a cast iron or steel plate or block of suitable size and proportion. Means may be provided to heat the platens. The heating

medium may be superheated steam or the like. When asphalt is the saturant to be used in the method, it is desired to heat the platens to a temperature of about 500° F. I have found that a preferred heating medium is a vapor known as "Dowtherm Vapor," since this vapor boils at 500° F. at atmospheric pressure and at 650° F. at a pressure of 29 pounds. "Dowtherm" is an eutectic mixture of the following organic compounds: diphenyl, 26½%, and diphenyloxide, 73½%. This compound has a low boiling point but has high latent heat and the vapor thereof is particularly suited as a heating medium in the present apparatus. No matter what type of heating medium which I may use, I provide a plurality of cored through holes 12 arranged adjacent to the respective upper and lower surfaces 13 and 14 of said platens. It is evident that a heating medium circulating through the platens in the holes 12 will heat the surfaces 13 and 14 thereof as desired.

Each platen, the platen 10 at its upper and lower surfaces, and the plate 11 at its upper surface only, is provided with one or more saturant flow means such as the channels 15. I preferably form each channel as a transverse cored hole 16 and with a relatively narrow slot 17 connecting said cored hole and adjacent surface portions of the platen. I provide inlet and outlet pipe connections 18 and an outer inter-connection 19 for the various channels 15 whereby saturant, from a suitably heated storage source, may be circulated through said channels in an obvious manner. The connections 18 and 19 may be jacketed or otherwise insulated to minimize heat loss. By means of this heated platen, the fabric is heated to approximately the temperature of the saturant. Moreover, since the saturant is very fluent because of its high temperature, it quickly and thoroughly penetrates the substantially as hot fabric without encrusting the fabric.

The means B may comprise a perforate, endless belt conveyor 20, such as woven wire mesh, which is arranged on rollers 21, 22, 23 and 24. I may drive any or all said rollers, but prefer that rollers 21 and 22 be driven, the rollers 23 and 24 being idlers. The belt 20 is trained to engage the top and bottom surfaces 13 and 14 of the platen 10, and the top surface 13 of the platen 11 as best seen in Fig. 1. By this arrangement, a fabric sheet F, of the nature herein set forth, may be introduced between the belt conveyor and the heated surface 13 of platen 10 to be moved by said conveyor in intimate contact with said surface and the other heated surfaces of the platens.

As the fabric sheet passes over the slot 17 of the first channel 15 which it encounters, it picks up saturant from said slot. The amount of saturant which it picks up will depend on the pressure on the saturant as supplied by the mentioned storing means. After passing the first slot, the sheet thus at least partially impregnated, maintains close sliding contact with the heated surface 13 of the platen. Since the temperature of the platen is maintained at or above the temperature of the saturant, plasticity of the saturant in the fabric is retained to obviate chilling thereof. In other words the saturant in the fabric is prevented by the heated platen from cooling off sufficiently to form a crust thereon. Further, the movement of the fabric, under pressure of the conveyor belt, across the surface of the platen, irons the saturant into the fabric.

By the time the fabric passes over the next succeeding slot 17, the saturant previously picked up is ironed into the fabric. This process continues until the fabric leaves the discharge end of the platen 11. By that time, there is substantially uniform application of the saturant through the fabric.

Since the saturant is picked up by one side only of the fabric, any moisture is free to escape from the other side thereof and through the perforations of the belt 20, and at no time comes into contact with the saturant. The previously mentioned faulty foaming is, therefore, prevented. The rate of saturation can be controlled by the speed of movement imparted to the conveyor and can be reasonably high since all affected parts are kept at a desired high heat. Since the saturant and fabric are both maintained hot and the saturant is maintained in a liquid state at all times, penetration into the fabric is rapid.

I further provide the dipping means C through which the fabric, as impregnated by the means A, passes for final saturation. For this purpose, I provide a dip tank 30 for a quantity of saturant, and heat said saturant as by means of pipes 31 through which circulate the heating medium hereinbefore described. The dip tank may be provided with a roller 32 under which the fabric is trained to pass out through the open top of the tank. In order to facilitate threading the fabric around the roller 32 I provide means for raising said roller out of the saturant in which it is immersed. Such means may comprise a gear rack 33 vertically disposed at each end of the tank and having the shaft 34 of said roller 32 journaled therein; a pair of gear pinions 35, meshing with the respective racks and carried by a common shaft 36; and a handle 37 for rotating the shaft 36 to cause vertical movement of the racks, and, consequently, vertical movement of the roller 32. Accordingly, either direction of rotation of the handle, will cause respective raising and lowering of the roller 32.

As the fabric leaves the dip tank 30, a large amount of saturant will cling to both of its surfaces and much of this will flow back into the tank. However, since it is desired to control the thickness of the saturant on said fabric surfaces, the means D is provided. For this purpose, I provide vibrating means 40 and 41 arranged on either side of the fabric so that said fabric passes between them. Each means 40 and 41, may comprise a doctor blade 42 pivoted as at 43, and connected to means 44 for vibrating the blade. Any suitable type of vibrating means may be used; one such means may comprise an electric vibrator, known as the "Syntron" type. I only desire that the vibrating means be of a type capable of adjustment to vary the degree and intensity of vibration.

If the doctor blades are maintained stationary and tightly against the fabric as it passes between said blades, practically all of the saturant which the fabric picks up from the dip tank will be scraped off, leaving little or no surface saturation on the fabric sheet. If the doctor blades are slightly vibrated, a relatively thin surface saturant film will be left and the remainder scraped off. It is evident that the greater the length of throw or reciprocating movement of the doctor blades, the thicker will be the surface films upon the fabric. The films left on the surfaces of the fabric by the vibrating blades is sucked into the interstices of the fabric, upon cooling, because of the considerably larger amount of con-

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traction of the saturant than the fabric, upon cooling. The purpose of this surface saturation, by dipping, is to leave on the surface of the fabric sufficient saturant to thoroughly and uniformly impregnate the fabric, when the saturant cools.

In the present specification, including the hereunto appended claims, the word "fabric" shall be taken to have a broad meaning, to wit, to include woven, knit, felted, or matted material.

While I have illustrated and described what I now regard as the preferred embodiment of my invention, the construction is, of course, subject to modifications without departing from the spirit and scope of my invention. I, therefore, do not wish to restrict myself to the particular form of construction illustrated and described, but desire to avail myself of all modifications that may fall within the scope of the appended claims, which are designed for the purpose of carrying out the method herein set forth and such or near variations thereof.

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

1. Apparatus for impregnating absorbent sheets, comprising ironing platen means having a plurality of saturant circulating channels below the surface thereof, said channels having throats opening and terminating at the surface, and means for moving one side of an absorbent sheet in surface engagement with the platen means to pick up saturant from the throats, said platen means having transverse passageway near the top for a circulating heat medium, whereby to iron said saturant into the interstices of the sheet.

2. Apparatus for impregnating absorbent sheets, comprising ironing platen means having a plurality of saturant circulating channels near the top and bottom surfaces thereof provided with throats opening at the top and bottom surfaces and means for moving one side of an absorbent sheet in surface engagement with the platen means to alternately pick up saturant from the throats and iron said saturant into the interstices of the sheet, said platen having transverse passageways for heating mediums, said passageways being arranged in alternate relation to said channels.

3. In apparatus of the character described, a platen having transverse passageways for circulating a heating medium in said platen to heat at least one surface thereof, and means dividing said platen surface into alternate fluid circulating channels and ironing areas, said means comprising transverse passageways connected with a source of fluid supply and disposed near said

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surface, said passageways having transverse throats.

4. Apparatus for impregnating absorbent sheets, comprising ironing platen means having a plurality of saturant circulating channels opening at the surface thereof, and means for moving an absorbent sheet in surface engagement with the platen means to alternately pick up saturant from openings in the channels and iron said saturant into the interstices of the sheet, said platen means including a plurality of the transverse passageways connected to a source to heat at least one surface of said platen means between and in spaced relation to said channel openings, said latter means comprising an endless perforated conveyor belt.

5. In an apparatus of the character referred to, a body having a substantially planar surface provided with spaced transverse throats and with channels near the surface communicating with said throats, said channels being connected to be supplied with a saturant for an absorbent sheet of paper, said planar surface forming between said throats, an ironing area, and said body provided near the planar surface thereof with transverse passageways for a heating medium, and means to pass one side of a sheet of material over said planar area and the throats to wipe the saturant upon said side of the sheet and immediately to iron the saturated area.

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