May 16, 1939. S. P. MILLER 2,158,334

ABSORBENT ARTICLE SATURATING APPARATUS

Filed Aug. 15, 1936

Fig. 1.

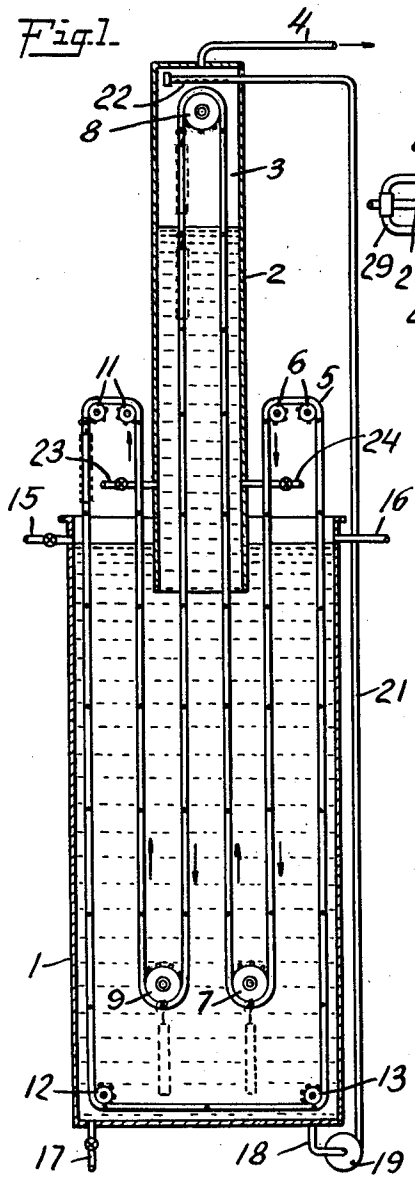


Fig. 2.

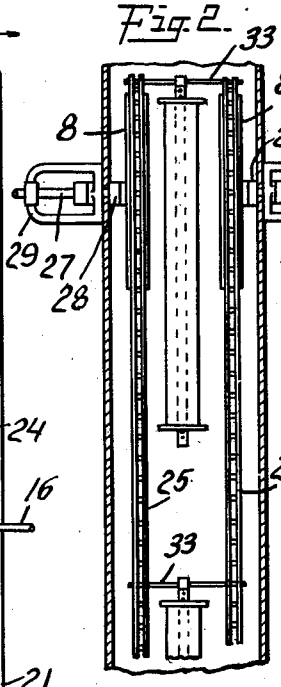


Fig. 6.

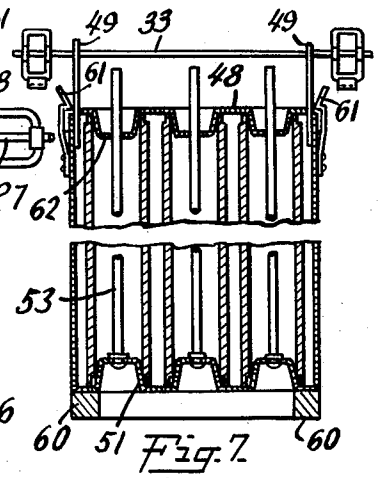


Fig. 7.

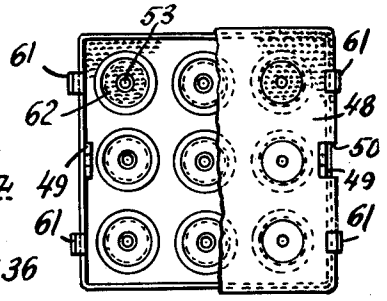


Fig. 3. Fig. 4.

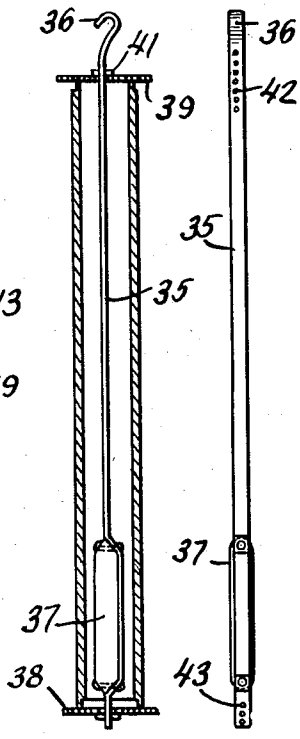


Fig. 8.

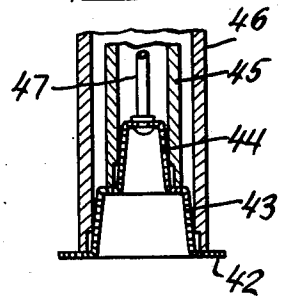
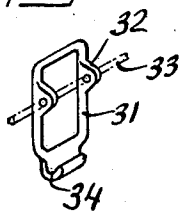


Fig. 5.



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2,158,334

ABSORBENT ARTICLE-SATURATING APPARATUS

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Application August 15, 1936, Serial No. 96,164

3 Claims. (Cl. 91—60)

This invention is directed to apparatus for saturating absorbent articles, and particularly, apparatus for continuously saturating fibrous or other porous conduits employed to conduct and protect underground cables, telephone lines, electric light and other conductors, and for the formation of water pipes, drain pipes, to render them substantially waterproof and resistant to abrasion, corrosion, and conditions encountered above or under ground by fibrous conduits. While, as above stated, the invention is particularly directed to the saturation of fibrous conduits, it is understood that it may be employed to saturate small fibrous or other articles requiring impregnation such as spools, coils, etc., asbestos articles, concrete pipes, etc. This application is a continuation in part of my co-pending application Serial No. 640,653, filed November 1, 1932 (now Patent No. 2,083,731, granted June 15, 1937).

The article to be saturated may, of course, be prepared in any known manner. In the case of fibrous bases for conduits, newsprint and paper pulp, or other fibrous material, may be beaten in the usual paper beaters and the resultant stock screened and then pumped to paper cylinder machines and there formed into wet felts or paper. The wet paper may be wound about a cylindrical or other shaped tube or mandrel to produce a wet conduit of proper thickness. This conduit may be dried in kilns to remove the major portion of its moisture content. The fibrous base may, of course, be prepared in other known manner. Such conduits are made in several sizes, commonly varying from 2 inches to 6 inches or larger in internal diameter, have an average wall thickness of approximately ⅜ of an inch and are usually produced in 5, 6, and 8 foot lengths. The wall thickness of the conduits may, of course, be greater or less than ⅜ of an inch and other dimensions may vary. As they come from the drying kilns, they usually contain from 5 to 8 per cent moisture, although considerably more than 8 per cent moisture may, on occasion, be found present.

The porosity or absorptive characteristics of the walls of fibrous conduits may vary within wide limits from a very dense wall of a density corresponding to hard wood and exceedingly difficult to saturate with low carbon water gas tar pitch or even with other waterproofing material, such as asphalt, to a porous open wall similar in density to that of roofing felt, which will readily absorb bituminous saturants. Samples of present commercial fibrous conduits have been tested and found to vary from substantially less than 1 cc. of voids per gram of tube wall to 2.8 or more cc. of voids per gram of tube wall. To determine the cubic centimeters of voids per gram of tube wall, a small sample of tube wall (say 2″ x 5″) is dried for one hour at 100° C., cooled, dessicated, and thereafter weighed. It is then immersed in kerosene, maintained at a temperature of 25° C., for 18 hours. Thereafter, the sample is removed from the kerosene, drained in vertical position for 30 seconds, and again weighed. The difference in weight represents the kerosene absorbed. This difference in weight in grams divided by the specific gravity of the kerosene, corresponds to the cubic centimeters of kerosene absorbed. This volume in cubic centimeters, divided by the original weight in grams, gives the voids in cubic centimeters per gram.

As the saturant for the conduits, coal tar pitch, water gas tar pitch, asphalt, cutback pitches, blended pitches, or other waterproofing material may be used. A coal tar pitch having a melting point of from 140 to 180° F. is particularly suitable for saturation of fibrous conduits. Pitch of a melting point as high as 225° F. may be used in special cases, e. g., where conduits are to be exposed to temperatures which would soften the lower melting point pitches. Preferred pitches having melting points of from 140° to 180° F. or higher will have a "free carbon" content of from 5 to 9 per cent, but pitches of higher "free carbon" content up to from 15 to 25 per cent, or even higher may be used to give commercially satisfactory saturation under favorable conditions, e. g., in saturating articles having comparatively open wall structure.

Preferably, coal tar pitch made by a vacuum distillation process, such for example as disclosed in Patent No. 1,759,816 granted May 20, 1930, or other processes minimizing decomposition of the tar undergoing distillation, is employed as the saturant. Pitches made by a low temperature vacuum distillation process are characterized by low "free carbon" content as compared with pitches made by higher temperature processes from the same tar, and I have found that such pitches are particularly suitable as the saturant for fibrous conduits.

The saturants hereinabove referred to are of greater specific gravity than the fibrous conduits. Hence, if the fibrous conduits were immersed in such saturants and left free they would tend to float. If attached to a conveyor at only one point, or if passed through the saturant loose in baskets or buckets, such articles, because of their buoyancy, would tend to swing out of position, which would interfere with the smooth progress of the

conduits through the saturant and might also result in abrasion and other damage to the conduits. The apparatus of this invention is designed to overcome the buoyant effect of the saturant on the conduits and to maintain them in substantially fixed spaced relation to each other during their passage through the saturant.

In accordance with this invention, holders for the conduits or other articles to be saturated are suspended from a conveyor for carrying the articles through the saturant, and are designed to overcome the buoyancy of the articles in the saturant. Also, the holders are constructed and arranged to prevent relative movement of the conduits with respect to the holders. In the apparatus of my invention, the conduits are maintained in a free-swinging vertical position, singly or in groups as they are moved through the saturant, the holders preventing their buoyancy from moving them out of the vertical position, and also preventing movement of the conduit or conduits within the holder.

In the preferred embodiment illustrated in the drawing, the invention is shown incorporated in the production of fibrous conduits saturated with bituminous material and the description herein will be confined to the present illustrated embodiment of the invention. It will be understood, however, that the novel features and improvements are susceptible to other applications, such, for example, to apparatus for saturating buoyant articles generally. Hence, the scope of this invention is not confined to the specific embodiment herein described.

In the drawing, in which like reference numerals designate like parts:

Fig. 1 is a vertical section through saturating apparatus embodying this invention;

Fig. 2 shows an elevation of a conduit holder embodying this invention and shows the mounting for the sprockets over which the conveyor chains pass;

Fig. 3 shows an elevation of one of the conduit holders, the conduit being shown in vertical section;

Fig. 4 is a front elevation of a conduit holder embodying this invention;

Fig. 5 is a perspective view of a length of the conveyor chain, the length shown carrying a pin from which a conduit holder may be suspended;

Fig. 6 is a fragmentary view showing a vertical section through a basket of conduits suspended from the conveyor chain;

Fig. 7 is a plan view, partly in elevation, the cover of the basket being broken away to show more clearly the arrangement of conduits within the basket; and

Fig. 8 is a fragmentary vertical section through a modified form of holder for conduits, the holder of Fig. 8 being designed to support a plurality of conduits in nested relation.

In the drawing, reference numeral 1 indicates a container which is relatively deep, 50 or 60 feet or deeper. A shallow container such as shown in Fig. 1 of my co-pending application Serial No. 640,653 may be used, instead of the deep container. A tank 2 is disposed within container 1, this tank being of a height to accommodate a barometric column of saturant therein with an evacuated space 3 above the saturant. The top of tank 2 communicates with a vacuum pump by means of pipe 4.

A conveyor 5 is arranged to travel over sprockets 6 down through the saturant in container 1, about sprocket 7, up through the saturant in container 1 through the liquid seal between the open end of tank 2 and the container 1, through the saturant in tank 2 into the evacuated space 3. The conveyor then passes over sprocket 8 downwardly through the saturant in tank 2 and container 1, about sprocket 9, up through the saturant in container 1, about the sprockets 11, down through the saturant in the container 1, about the sprockets 12, 13, back to the sprockets 6. One of the sprockets may be driven from a suitable source of power to move the conveyor along the path indicated. The conveyor may be provided with baskets or individual fibrous conduits at a point near the sprockets 6, and the saturated conduits may be removed at a point in the vicinity of sprockets 11.

Container 1 is provided with a valve controlled pipe 15 for supplying the saturant thereto. Overflow pipe 16 leads from the container 1 to a suitable disposal point not shown. The base of the container is provided with a valve controlled pipe 17 for removing the saturant in the container whenever desired. A main 18 leads from the base of the container to a pump 19, which is arranged to discharge saturant from the base of the container through pipe 21 into the spray 22 disposed in the evacuated space 3. In operation, saturant may be continuously circulated from container 1 into the tank 2, the saturant being sprayed on the conduits as they pass through the evacuated space 3. The tank 2 may be provided with valve controlled inlets 23, 24 for saturant.

The conveyor 5 for moving conduits through the saturant, as shown in Fig. 2 may involve two chains 25, 26 arranged in spaced relation and disposed to pass over pairs of spaced sprockets, only one of each pair appearing in Fig. 1. Two of such sprockets, 8, 8', disposed in the evacuated space 3 above the level of saturant in tank 2 are shown in Fig. 2. These sprockets are rotatably mounted on stub shafts 27 extending through stuffing boxes 28 in the walls of tank 2 and rotatably mounted in suitable bearings 29. Chains 25, 26 may be composed of usual links employed in chain conveyors. At spaced intervals special links, such as, for example links 31, shown in perspective in Fig. 5, are inserted in both chains. Links 31 have apertured ears 32 extending upwardly at both sides thereof. A pin 33 passes through the apertures in ears 32. This pin extends across the space between the conveyor chains 25, 26 and passes through the ears of the links 31 of both chains. The links are formed at one end with a hooked portion 34 for engagement with a succeeding link of the chain.

One form of container or holder for individual conduits is shown in Figs. 3 and 4. This holder comprises a strap or rod 35 formed at one end with a hook 36 and weighted at the other end, as indicated by the reference numeral 37. Suspended from the weight 37 is a perforated plate or a narrow strap 38 designed to engage the lower end of the conduit, shown in section in Fig. 3. The upper end of the conduit is engaged by a perforated belt, disk or strap 39, which may be locked in position on the rod 35 by a cotter pin 41 passing through one of the series of apertures 42 formed in the rod 35. A like cotter pin passing through one of the series of apertures 43 at the base of rod 35 holds the perforated plate 38 on the strap 35. The plurality of apertures in rod 35 permits accommodation of one and the same holding appliance to different length conduits. In operation, the tube or conduit is passed

over the hooked rod 35 with its lower edge resting on base plate 38. The upper member 39 is then applied and locked in position by cotter pin 41, thus securely holding the tube or conduit in fixed position, i. e., so that relative movement thereof with respect to the strap 35 is prevented.

The holders containing the conduits are suspended from pin 33 at a point in the neighborhood of sprockets 6, Fig. 1, hook 36 engaging pin 33. The conduits are maintained in vertical position with the same end lowermost during the four passes thereof through the saturant in container 1 and the two passes through the saturant in tank 2. The weight 37 minimizes and tends to prevent oscillatory movement of the conduits during their passage through the saturant. Removal of the saturated conduits from the conveyor chain may be accomplished either automatically or manually in the neighborhood of sprockets 11. It will be noted that with the holder of this invention the entire area of the walls of the conduit is in contact with the saturant when the conduit is immersed therein.

Figs. 6 and 7 show one type of mounting for a basket or holder adapted to contain a plurality of conduits. The basket may be perforated or made of suitable mesh material provided with a removable cover 48. The sides of the basket are preferably provided with hooks 49 passing through openings 50 in the cover 48, for swingably supporting the basket on the pins 33 extending between the conveyor chains. The base of the basket is provided with raised portions 51 which are perforated. Cover 48 has projecting portions 62 complemental to portions 51 and arranged to enter into the tops of the conduits. Rods 53 extend from the raised portions 51 through the depressed portions in the cover. One or more such rods may be employed. Latches 61 may be disposed on the sides of the basket to secure the cover in position. The conduits are thus aligned and held in fixed spaced relation in the basket.

As in the case of the individual conduit holders of Figs. 2 and 3, the basket of Fig. 6 is suspended from a pin 33 extending across the space between the conveyor chains and is maintained with the same end lowermost throughout the passage of the conduits in the up and down passes through the saturant. The basket of Fig. 6 is provided with weights 60 at the base thereof for holding it in a vertical position, i. e., preventing swinging movement of the basket as it moves through the saturant. It will be understood that a plurality of such baskets are suspended from pins 33 on the conveyor in spaced relation as indicated in Fig. 1 in the case of holders for individual conduits.

Fig. 8 shows a holder for conduits arranged to receive a plurality of conduits of different diameters in nested relation. The holder of Fig. 8 is constituted of a base plate 42, provided with truncated conical raised portions 43, 44, portion 44 constituting an extension of 43, the diameter of the base of portion 44 being substantially less than the diameter of the top of portion 43. A top plate of like configuration as the base plate 42 may be used to confine the conduits between the two plates. A conduit 45 of relatively small diameter is placed on base plate 42, the truncated conical portion 44 facilitating proper placement of the conduit thereon. Thereafter a conduit 46 of larger diameter may be disposed on the base plate. The conduits are thus mounted with their axes coinciding. A top plate similar to 42 may then be positioned with the raised portions 43, 44 entering into the top portions of the conduits 45, 46 respectively. The plates may be held in fixed position relative to each other by a rod 47, the lower end of which is bolted to base plate 42, and the top of which, as shown in Fig. 3, passes through the top positioning or plate member. The top portion of the rod 47 may be provided with a hook corresponding to hook 36 for engagement with pin 33 to support the conduits on the conveyor and with suitable fastener such as a cotter pin for holding the top plate in fixed relation to the base plate and thereby confine the conduits between the two plates. The base plate 42 may be made of heavy metal to overcome the buoyancy of the conduits or a weight may be secured thereto. Base and top plates are perforated or otherwise so designed as to permit access of saturant to the surfaces of both conduits.

If desired the baskets of Fig. 6 may be modified so that the top and bottom plates are shaped as shown in Fig. 8. Such baskets could be used to impregnate conduits of different diameters simultaneously, the smaller diameter conduits being nested within the larger diameter conduits.

It is to be understood that this invention is not restricted to the present disclosure otherwise than as defined by the appended claims.

What is claimed is:

1. In apparatus for saturating individual porous articles with a saturant of a specific gravity greater than that of the articles so that the articles have a tendency to float in the saturant when immersed therein, a holder including means for engaging opposite end portions of an article to be saturated to maintain the article in substantially fixed relation to the holder, means on the holder for suspending it from a conveyor traveling through the saturant, said holder being weighted to overcome the buoyancy of the article in the saturant.

2. In apparatus for saturating individual fibrous conduits with a bituminous saturant of specific gravity greater than that of the conduits so that the conduits have a tendency to float in the saturant when immersed therein, a holder comprising means for engaging the end portions of each of a plurality of fibrous conduits to maintain the conduits in fixed, spaced relation to each other and to the holder and means on the holder adapted to pivotally suspend it from a conveyor traveling through the saturant, said holder being weighted to overcome the buoyancy of the conduits in the saturant.

3. In apparatus for saturating fibrous conduits with saturant, a conduit holder comprising a base plate involving projecting members of progressively decreasing cross sectional areas, each projecting member being adapted to fit within a conduit so that a plurality of conduits of different diameters can be mounted on said base plate in nested relation with the walls of the conduits maintained out of contact with each other.

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