Sept. 15, 1936. W. F. KNEBUSCH ET AL 2,054,087

REAGENT DISTRIBUTOR

Filed Sept. 2, 1933

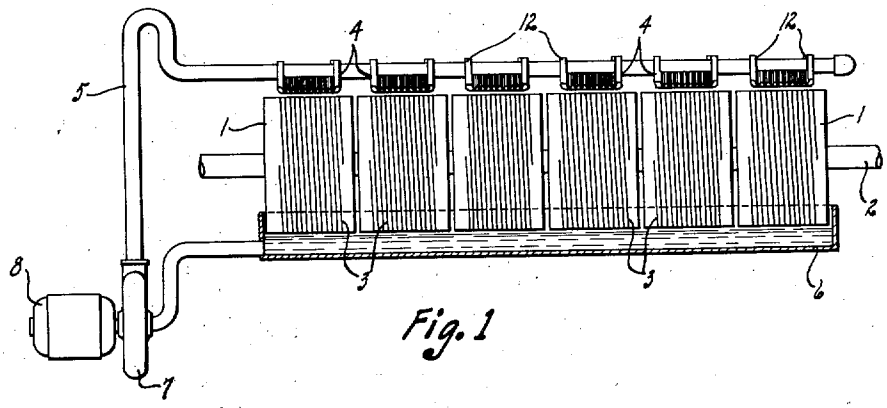


Fig. 1

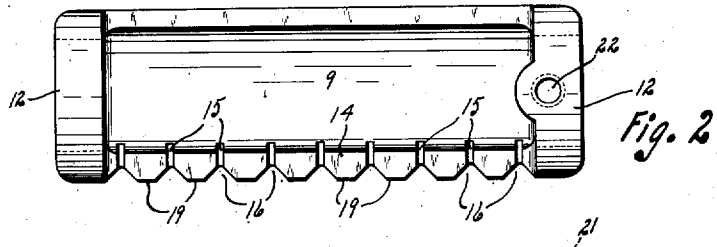


Fig. 2

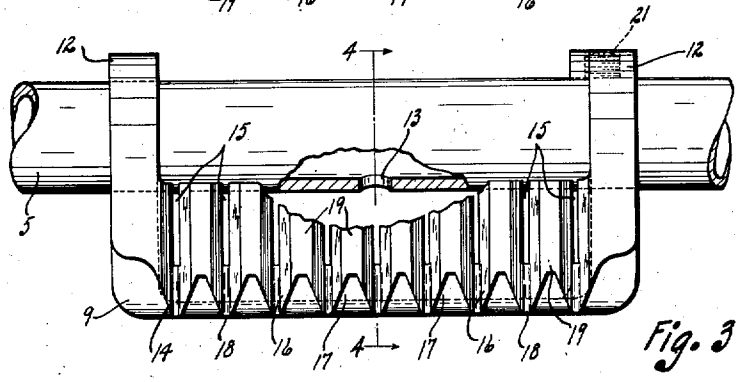


Fig. 3

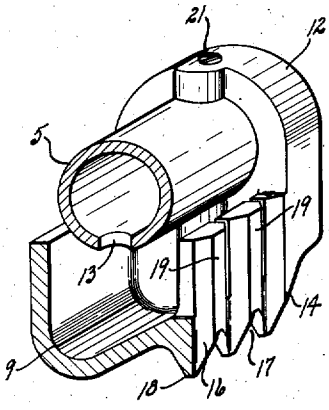


Fig. 4

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REAGENT DISTRIBUTOR

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Application September 2, 1933, Serial No. 688,026

10 Claims. (Cl. 299—58)

This invention relates to a device for distributing liquid in fine streams over a surface which it is desired to treat with such liquid and, more particularly, to a reagent distributor for showering liquid on articles to be so treated, such articles, if desired, being caused to move below and with respect to said reagent distributor. Heretofore, the customary method of distributing the liquid over the article to be subjected thereto was through a pipe having small perforations through which the liquid passed onto the article below. Much difficulty was experienced with this form of distributor due to the fact that the perforations in the pipe were required to be minute in order to get a uniform distribution of the liquid over the article in such manner as to contact with every part of such article. Thorough and intimate contact is desirable in order that no parts of the article will be left untreated, so as to cause lack of uniformity in the finished article or to produce a weak spot which would result in breakage if the article is, for instance, thread or fabric.

This desirability of separating the liquid into fine streams causes difficulty in operation due to the readiness with which fine orifices become plugged up by small particles in the liquid, which cannot always be avoided.

In order to overcome the aforementioned difficulty encountered with perforated pipes, the present invention contemplates the provision of a liquid-distributing means in which the use of small orifices is avoided, these latter being replaced by larger orifices of a size which cannot readily become obstructed by solid particles of a size likely to find their way into the liquid. The size of the stream discharged may be controlled by regulating the flow of liquid to the reservoir or vessel with which the orifices communicate. Thus, a fine stream can be discharged from a large orifice by limiting the supply of liquid to the associated vessel. At the same time, it is requisite that the streams so discharged from these orifices be kept separate from one another in order that the liquid will be discharged in an even shower or spray, to wash the treated article uniformly. This necessitates some means of preventing the separate streams from merging with one another which they will do if not controlled. In the present invention this is brought about by providing a substantially vertical channel from the orifice toward a projecting discharging point, this latter preferably taking the form of a tapered element which discharges the stream of liquid onto the article to be treated.

A reservoir having perforations large enough not to become clogged under a given set of operating conditions and associated with a structure having vertical grooves leading away from the orifices and toward tapered discharge points fulfills the requirements of a structure embodying the invention.

In a more particular aspect, the invention may be embodied in a device including a weir notch constituted by an opening in the side wall of a vessel containing liquid and having any desired shape, such as that of a circle or of a rectangular slot. A number of such openings is provided in an approximately horizontal line so that the size of the stream discharged can be controlled by regulating the level of liquid in the vessel. Each opening discharges into a substantially vertical channel running toward a projecting discharge point from which the liquid discharges onto the work. A specific example of such a structure is described below in which the trough or reservoir is damned by a gate which is pierced with spaced slots adapted to emit liquid from the trough and to discharge the same into a series of vertical grooves communicating with the slots and running toward projecting discharge points spaced apart from one another so as to deliver a series of distinct streams of liquid which do not merge with one another.

Briefly, it is an object of the invention to provide means for distributing liquid in fine evenly spaced streams without the use of small orifices which are subject to clogging. Another object of the invention is to provide an apparatus for distributing liquid in which the discharge orifices are of the nature of individual weir notches, the size of the stream discharged being controllable independently of the size of the orifice, and these orifices having associated means for maintaining the separate identity of the streams and directing them substantially vertically to the work.

In the accompanying drawing forming a part of the specification, there is illustrated one such form of the invention having the described characteristics, wherein Fig. 1 is a front elevation of a portion of a processing machine showing the improved liquid distributors in place; Fig. 2 is a top plan view of the distributor; Fig. 3 is a corresponding front elevation of the distributor in place on the feed pipe; and Fig. 4 is a perspective view of a section taken along the line 4—4 of Fig. 3.

While the invention is adapted for use in connection with any process in which it is desirable

or necessary to treat an article with a liquid in such manner as to insure thorough and intimate contact of the liquid with all portions of the article, it may be applied to the treatment of threads or like articles which may require to be washed or otherwise treated, such as natural threads or artificial threads. For example, the invention finds valuable application in the treatment of artificial threads subsequent to spinning, in the so-called "wet process". As examples of methods in which the thread is so treated, there may be mentioned the viscose and cuprammonium processes of manufacturing artificial silk thread. In each of these, the thread is washed with various liquids to accomplish the production of a thread which is free from undesired chemicals, the various steps, as applied to viscose thread, including washing, desulphurizing, bleaching, scouring, drying and the like. Of course, some of these steps may be omitted or other steps may be added but, whatever the kind and number of the operations performed upon the thread, the present apparatus will be found useful in distributing the liquid uniformly in fine streams without danger of stoppage.

Apparatus has been devised on which such liquid processing treatments are continuously applied to the thread. The thread is generally continuously temporarily stored in a plurality of turns, and such processing treatments applied to the thread while in this form. The invention finds application in applying the processing treatments on such forms of apparatus. A form of apparatus in which artificial silk thread is thus temporarily stored on a series of thread-storage devices, which may take the form of reels, on each of which a different processing treatment is applied to the thread, is described in British Patent No. 413,413. For convenience, but in no sense of limitation, the invention will be described in connection with the continuous treatment of artificial silk thread while continuously stored on reels according to the methods outlined in the above British patent.

Referring to Fig. 1 of the drawing, a number of reels are shown each of which carries a thread which travels along the reel in approximately helical form until it leaves the reel and passes to a succeeding reel and so on until the thread is finished, a different processing treatment being applied to the thread on each of the various reels of the series. Above each of the illustrated reels is provided means for continuously discharging liquid onto the reel and thread below in a continuous and uniform manner. As illustrated, the reels 1 are mounted on a common shaft 2 for rotation. The various threads 3 come from the spinning bath or from a preceding reel and proceed to wind along each reel 1 in approximately helical form, due to the operation of the reel, which may be of the type described in British Patent No. 413,414. During the time that it takes the thread to complete its travel along the reel in an axial direction, the particular liquid which it is desired to apply, such as water sulphide liquor, bleach, etc., is rained down on the reel and thread from the distributor 4. The liquid is supplied to the distributors through the pipe or manifold 5 and is collected in the trough 6 from which it flows to a pump 7 operated by a motor 8 and is returned to the distributors 4 to be again showered over the reels until it is spent or has collected too many impurities for further use.

The construction of one form of the distributing device is shown in detail in Figs. 2, 3, and 4, the device including a trough 9 for retaining liquid and upwardly extending end portions 12 which are apertured so as to receive the supply pipe 5. This supply pipe has a number of spaced holes 13 through which liquid is supplied to the troughs. Since the holes 13 may be of comparatively large size, say ¼", they are not subject to stoppage by solids and present no problem in this regard. The front of the trough 9 comprises a gate 14 which extends upwardly to the top of the trough and downwardly below the lower wall thereof, the bottom of the trough being given an upward inclination at the front. The front of this gate is serrated, its wall being pierced by a number of narrow slots 15 terminating below at the front lip of the trough proper and being open at the top. From these slots, which communicate with the vessel portion or trough of the distributor, extend vertical grooves 16, preferably V-shaped, the slots being at the bottoms of these grooves for a portion of the length of the grooves, which themselves extend further in a downward direction. Liquid in the trough 9 flows out through the slots 15 into the vertical grooves 16 and then runs down these grooves to drop onto the reel and thread below.

The individual stream, as it runs down the vertical groove 16 is preferably directed onto the reel in distinct form without merging with adjacent streams in order to preserve the spacing determined by the distance between adjacent slots 15. This may be promoted by cutting away the material between adjacent grooves 16 in the form of horizontal V-cuts 17 so as to intersect the vertical grooves at their lowermost portions and provide a more or less blunt point 18. The course of the liquid then will be from the trough 9 through the slots 15, down the vertical grooves 16 and off the points 18 in separate and distinct streams which do not merge with one another. It is important that the separate identity of the discharging streams be maintained since, if adjacent streams should run together, only one larger stream would be discharged in place of two smaller streams, causing a gap in the curtain of liquid being showered down on the thread. This gap would result in a portion of the thread being treated for a shorter time than other portions and would cause a lack of uniformity in the finished product.

In order to prevent the tendency of the streams to run together, it has been discovered that the slots 15 must be spaced apart a minimum distance, this spacing being preferably not much closer than ⅜", otherwise liquid from adjacent slots might run together across the open cuts 17 and only one stream be delivered for two slots. Of course, the slots may be more widely separated than this but, since it is obviously desirable to deliver as many streams of liquid within the length of a reel as practicable, the least possible distance between slots which will permit delivery of distinct streams from each slot is the preferred construction.

The other dimensions of the distributor may be varied to some extent but a slot 3/64" wide is found to deliver a stream of liquid of the proper width for the illustrated use of the invention. The grooves 16 may be separated by plane surfaces or lands 19 of about the same width as these grooves. The projecting discharge points 18 of the gate, situated below the slots 15 at the lowermost or discharge end of the vertical grooves 16, are preferably blunt but the exact shape thereof can be varied as desired. In brief, the particu-

lar conformation of the distributor will depend to some extent upon the method of manufacture employed and the material used, Bakelite being a suitable material resistant to attack by any of the liquids used in the manufacture of viscose silk, except caustic, and, even with caustic, Bakelite can be used for a reasonable length of time without affecting the accuracy of the distributor to an undesirable extent. Other materials which may be used for the construction are aluminum, stainless steel, aluminum or stainless steel coated with Bakelite varnish, porcelain, glass, etc. The entire article may be molded in one piece.

It is obvious that various means of supporting the distributor in the desired relationship with manifold 5 may be employed. In the embodiment shown, each distributor 4 is supported by being hung from the manifold 5 by the hangers 12 over one of the reels 1 and under one of the holes 13 provided along the length of the manifold. When the distributor is in position to receive liquid through one of these holes 13, it can be fixed in position by means of a set screw 21 threaded into a hole 22 in one of the hangers 12. The liquid which, in the illustrated apparatus, is being circulated through the manifold 5 by means of the pump 7 will then flow through the holes 13 into the trough 9 and will build up against the gate 14 until the capillary attraction of the narrow slots 15 is overcome and the liquid overflows down into the grooves 16 and showers onto the threads 3 on the reels 1. The distributor ordinarily cannot be used to meter the flow due to this capillary action which causes the liquid to pile up in the slots a certain amount, this amount not being a constant quantity which, therefore, cannot be compensated for. Accordingly, the flow may be metered in the manifold, by means of a valve or otherwise, and the input of the troughs thus controlled. For example, the manifold may have a governed head and thus be caused to deliver a constant quantity of liquid into the troughs 9 through the holes 13 which may be made sufficiently large, say ¼'', to avoid clogging, so that the quantity of liquid delivered is controlled directly by the head under which the liquid in the manifold is maintained.

The above described liquid distributor may be adapted to deliver fine streams of liquid of the order of magnitude delivered through the fine orifices previously employed for spraying liquids but without the disadvantage, inherent in fine orifices, of frequently plugging up due to the lodgment of solid particles in the orifices and consequent interference with the uniformity of application of the wash liquid and necessity for frequently stopping operations in order to clean or replace the distributor. The comparatively large openings comprised within the purview of the present invention, e. g., the slots 15, take the place of the fine orifices previously employed and, due to the fact that they present a larger area, solid particles which may lodge therein cannot stop the discharge of liquid. At the same time, a fine stream may be delivered therefrom by regulating the flow of liquid to the vessel from which they are fed. Where a narrow slot is used, solid particles may lodge therein but obstructions of this nature merely cause the liquid to flow around the particle and liquid continues to be delivered without interruption. In other words, a particle which would completely stop the flow through a circular orifice of the same width as the herein described slots cannot stop the flow through such slots, due to their extended length. At the same time, this length does not affect the volume of the stream being discharged since the slots are vertically disposed.

Another advantage of a construction employing a vertically disposed groove in conjunction with an orifice for the discharge of fine streams of liquid is that the liquid is showered onto the article being treated gently with only such force as is furnished by the gravity drop along the vertical groove. The lower discharge velocity of the streams, thus distributed, results in less disturbance of the treated article, such as lateral displacement of the turns of thread on a processing reel, such displacement being undesirable since adjacent turns tend to cling together when washed into contact by the spray of liquid and consequently the liquid fails to wash these turns so thoroughly. This is a decided improvement over the action of distributors employing fine orifices under a direct head of liquid which forces the streams out with considerable velocity and resulting tendency to displace the turns of thread.

Various modifications of the embodiment herein described and various other embodiments of the invention than the one herein described may be devised without departing from the spirit of the invention. The apparatus described in conjunction with the reagent distributor is purely illustrative and it is obvious that the invention may be employed in conjunction with various other forms of apparatus and/or in a variety of other uses than that described above. It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What we claim is:

1. A distributor for liquid comprising a number of spaced projecting discharge elements, a like number of vertical grooves leading toward said discharge elements, a reservoir, and means for conducting liquid from said reservoir to said vertical grooves.

2. A distributor for liquid comprising a number of spaced projecting discharge elements, a like number of vertical grooves leading toward said discharge elements, a reservoir, and elongated apertures in the side of said reservoir communicating with said vertical grooves.

3. In a distributor for liquid, a gate having vertically disposed slots, vertical grooves communicating with said slots throughout the length of said slots, and horizontally disposed inverted grooves between said vertical grooves forming tapered discharge ends therefor.

4. In a distributor for liquid, a gate having alternate vertically disposed lands and grooves, slots in said grooves for a portion of the length of the grooves, and horizontally disposed inverted V-shaped grooves in said lands forming tapered discharged ends for said vertical grooves.

5. An apparatus for distributing liquid comprising a pipe connected to a reservoir, a series of apertures in said pipe, a series of impervious troughs associated with said pipe, means for fixing each of said troughs below one of said apertures, and means on said troughs for delivering spaced streams of liquid.

6. An apparatus for distributing liquid comprising a conduit communicating with a supply of liquid, discharge means spaced along said conduit, a series of impervious troughs positioned along said conduit, means for fixing each of said troughs in position to receive liquid from one of said spaced discharge means, and means asso-

ciated with said troughs for delivering spaced streams of liquid.

7. An apparatus for distributing liquid comprising a pipe communicating with a supply of liquid, apertures spaced along said pipe, troughs having hangers for slidably supporting the same on said pipe in position to receive liquid from said apertures, and a gate on each of said troughs for delivering spaced streams of liquid therefrom.

8. An apparatus for distributing liquid comprising a pipe communicating with a supply of liquid under a constant head, a series of comparatively large apertures spaced along said pipe, troughs supported below each of said apertures, and a serrated gate on each of said troughs adapted to deliver liquid in fine spaced streams therefrom.

9. A liquid distributor adapted to be associated with a liquid dispensing pipe comprising a trough having formed in the side thereof a series of like vertical grooves communicating throughout the greater part of their length with a series of vertical openings extending through the wall of said trough to the interior thereof.

10. A liquid distributor adapted to be associated with a liquid dispensing pipe comprising a trough having formed in the side thereof a series of vertically disposed open grooves, said grooves terminating at their lower ends in surfaces converging to form spaced liquid discharge points.

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FOSTER HILLIX.

CERTIFICATE OF CORRECTION.

Patent No. 2,054,087. September 15, 1936.

WALTER F. KNEBUSCH, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 22, for "damned" read dammed; page 2, first column, line 19, for "scouring" read souring; line 65, after "water" insert a comma; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3rd day of November, A. D. 1936.

Henry Van Arsdale
Acting Commissioner of Patents.

(Seal)

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