April 29, 1930. K. F. KRANEY 1,756,599

APPARATUS FOR DYEING HAT BODIES AND SIMILAR MATERIALS

Filed Feb. 27, 1929 2 Sheets-Sheet 1

Fig. 1

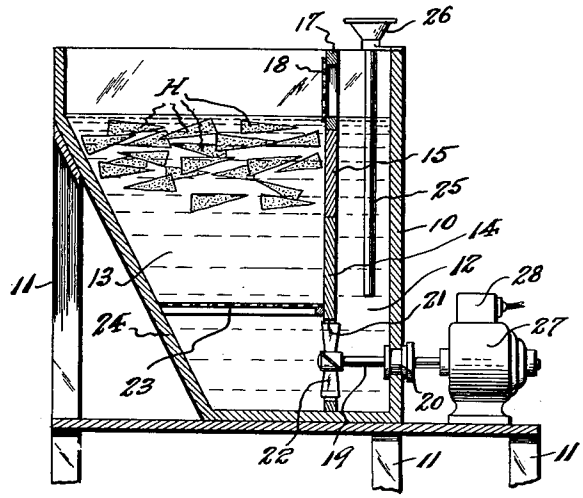


Fig. 2

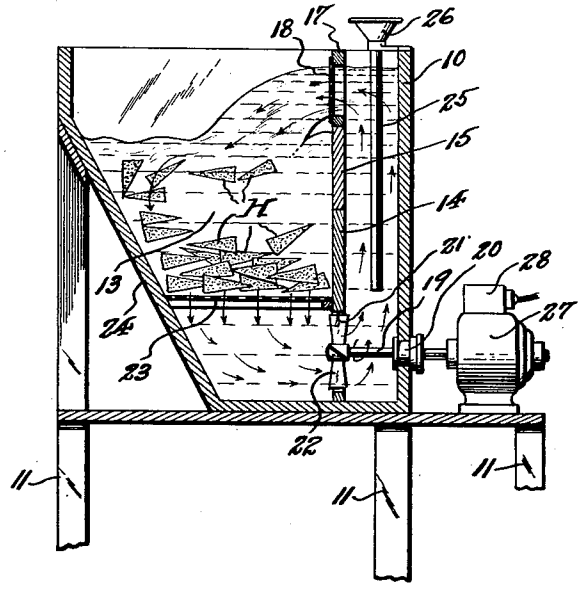
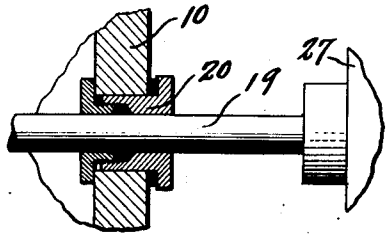


Fig. 6



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Fig. 3

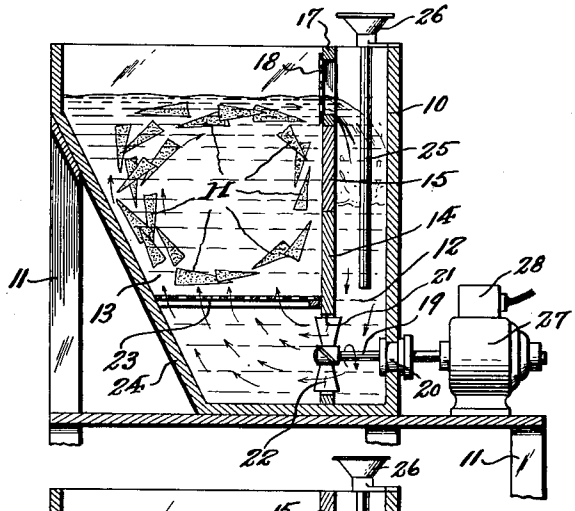


Fig. 5

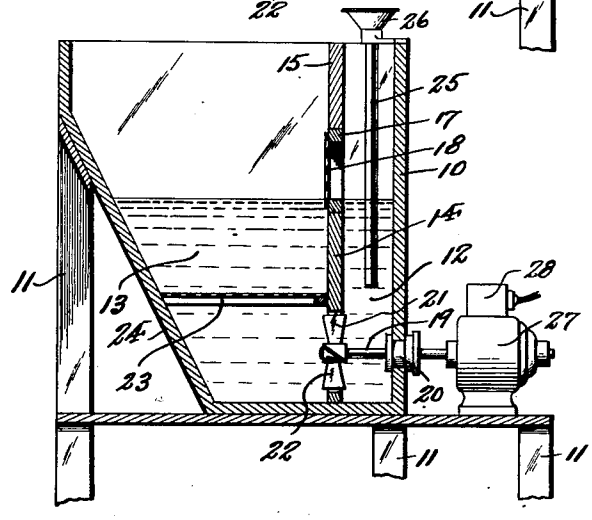
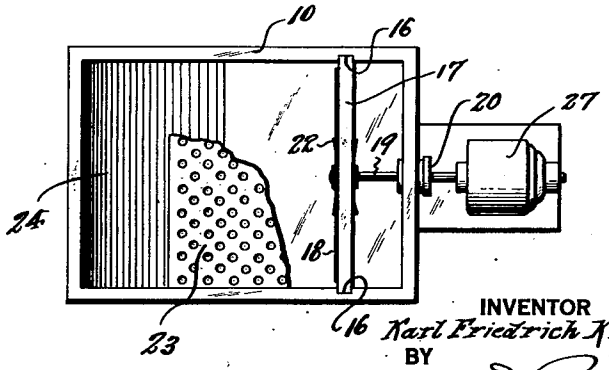


Fig. 4



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UNITED STATES PATENT OFFICE

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APPARATUS FOR DYEING HAT BODIES AND SIMILAR MATERIALS

Application filed February 27, 1929. Serial No. 343,231.

This invention relates to improvements in apparatus for dyeing piece material, such as hat bodies; and the invention has reference, more particularly, to a novel construction of apparatus adapted to circulate a dye solution, in which the piece material is submerged, in such novel manner as to assure agitation of the material in the solution to the end that uniform and thorough application of the dye solution to said material is assured.

In dyeing apparatus as heretofore employed, the material to be dyed is submerged in the dye solution, and may be subjected to alternate suction and pressure, whereby the material, although perhaps somewhat shifted, is not agitated sufficiently to prevent the tendency thereof to pile up or mass together, with the result that material at the center or interior of the pile or mass is not subjected to the dye solution as effectively as are the outer layers of the pile or mass to which the dye solution has easier access, and consequently all portions of the batch of material are not uniformly dyed. This is also true with respect to dyeing apparatus in which the material to be dyed lies in a perforated cylinder, which is submerged and rotated in the dye solution so that said dye solution flows back and forth through the cylinder perforations. The same is also true with respect to the more modern types of dyeing apparatus, comprising a vat having, below the normal dye solution level, a perforate bottom and a perforate side wall or screen dividing the dyeing chamber from the mixing chamber, and which is provided with means for driving the dye solution alternately through the bottom screen and side screen, since the reversing currents of dye solution thus produced do not sufficiently agitate and reposition the pieces of material being dyed, and consequently said pieces of material tend to move as a mass alternately against the bottom and side screens, and consequently uniform access of the dye solution to all individual pieces of material is not obtained. In the latter type of apparatus, it is necessary to manually stir the material from time to time, to adequately shift the pieces of material with relation one to another, so that from time to time inner pieces of the mass are shifted to outer positions and vice versa, to thus assure that all pieces are more or less uniformly subjected to the effects of the dye solution. However, since the pieces of material, especially when the same comprise hat bodies, as submerged and floating in the hot dye solution, become soft and sensitive, it follows that, when thus manually stirred, there is no inconsiderable risk of damaging the same, and not infrequently the material is blemished and sometimes entirely spoiled.

It is the principal object of the present invention to provide a novel construction of apparatus for dyeing piece material, such as hat bodies, having means for so causing, directing and controlling the circulation of a dye solution, that the hat bodies are constantly subjected to a very effective agitation or shifting movement with relation one to another within the solution, whereby the same cannot remain in a mass or pile, but are shifted about so as to frequently change position in relation one to another, thus permitting the dye solution to uniformly and efficiently apply itself to each individual hat body to produce uniform dyeing of the batch, and also avoiding any necessity for manual stirring of the batch with attendant risk of blemishing or damaging the hat bodies.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:—

Figure 1 shows a vertical longitudinal section of a dye tub, made according to and embodying the principles of this invention, but with the dye solution circulating means inactive; Figure 2 is a similar view, showing the operation of the dye solution circulating means when causing circulation in one direction; Figure 3 is a similar view, showing the operation of the dye solution circulating means when causing circulation in the opposite direction; Figure 4 is a top view of the dye tub, showing the bottom screen, partly

broken away; Figure 5 is a vertical section of the tub with the side screen adjusted to reduce capacity of the tub; and Figure 6 is an enlarged fragmentary view showing the stuffing box for the propeller shaft, whereby a leak proof entrance of the latter into the tub interior is provided.

Similar characters of reference are employed in all of the hereinabove described views, to indicate corresponding parts.

The novel apparatus for dyeing piece material made according to the present invention, comprises a vat or tub 10, which may be supported on a frame-work including standards 11, or otherwise mounted. Within the interior of the tub or vat 10 is disposed a transverse partition, which subdivides said interior to provide therein a dye mixing chamber 12 and a dyeing chamber 13. The main body 14 of said partition extends upwardly from the bottom of the tub or vat and is suitably fixed therein. Above said main body portion 14 of the partition and aligned therewith, is a removable panel 15, which slides in guide grooves 16 provided in the interior faces of the side walls of said vat or tub 10; and also removably engaged in said guide grooves 16 is a perforate side screen member, comprising a suitable frame 17 to which is affixed a perforate plate or mesh screen 18. Extending through the rear wall of the vat or tub 10 is a drive shaft 19, the said rear wall being provided with a liquid tight bearing, in the form of a stuffing box 20, for supporting said shaft 19. Formed in said main body 14 of the partition is an opening 21 concentric to the shaft 19, and fixed on said shaft and rotatable in said opening 21 is a propeller device 22. Arranged in the lower portion of said dyeing chamber 13, and above said propeller 22 is a perforate bottom screen 23, which may be made of perforate sheet material, wire mesh, or in any other suitable manner. The front wall 24 of said vat or tub 10, which opposes the partition, comprising the body 14, panel 15 and side screen 18, and which is opposite the propeller 22, is upwardly and outwardly inclined or obliquely disposed, as shown in the drawings.

If desired, there may be provided in connection with the mixing chamber 12 a depending intake pipe 25, which terminates above the propeller but adjacent thereto. The upper end of said intake pipe may be furnished with a funnel-like mouth 26. A dye material or solution, to be mixed with a predetermined amount of water with which the tub is supplied, may be introduced through the intake pipe 25 so as to be deposited in the water adjacent to the propeller, so that rotation of the latter may serve to thoroughly mix the dye material with and through the water content of the tub. The propeller 22, through its shaft 19, may be driven by an electric motor 27, or by any other desired source of power through any convenient form of transmission mechanism. It is desirable, however, that the application of power to the propeller be so arranged that the rotation of the latter may be periodically reversed, whereby the same is caused to alternately turn in opposite directions. When a prime mover of electric motor type is employed, the reversing drive may be accomplished by reversing the rotation of the motor from time to time through any suitable form of reversing switch mechanism, diagrammatically indicated at 28.

The reference character H indicates piece material in the form of conical hat bodies. A predetermined number of said hat bodies H, forming a batch to be dyed, is deposited in the water with which the tub or vat is supplied, and the dye material, in suitable form, is supplied to form with the water content of the tub or vat a dyeing solution. When a maximum batch of hat bodies H is desired to be dyed, the panel 15 of the partition is arranged next to the main body 14, and the side screen 18 is disposed at the extreme top of the partition, as shown in Figures 1 to 3 inclusive. The normal level of the solution in the vat or tub should then be disposed approximately at the bottom margin of the side screen 18, which in operation should always project above the normal fluid level of the dye solution.

When a batch of hat bodies and the desired dye solution have been deposited in the tub or vat 10, the operation of the apparatus is as follows:—

The propeller 22 is first caused to turn in one direction, for example as in Figure 2, whereby a suction effect is produced relative to the dyeing chamber 13. The suction of the propeller, thus operated, draws away the dye water from the bottom of the dye chamber 13 through the bottom screen 23, while at the same time forcing the dye water upwardly through the mixing chamber 12, and then discharging the same through the side screen 18 into the top of the dyeing chamber 13 above the fluid level of the dye solution therein. As a result of this operation, the dye water is caused to circulate downwardly through the dyeing chamber 13, thus producing a descending current which tends to draw the hat bodies H toward the bottom screen 23. Within a short time the hat bodies, influenced by the descending current of dye water, tend to accumulate and come to rest on the bottom screen 23, and thereby prevent the dye water from passing directly through the screen, but instead forces such dye water to work itself through the material of the hat bodies being dyed, to thereby give the hat bodies color. The dye water, which is discharged during such circulation into the tub or vat through the side screen 18, will

pour down upon the surface of the water in the dyeing chamber 13, so that any hat bodies which may be floating on or beneath the surface of the dye water will receive the effects of the dye carried by the dye water discharged through the side screen 18, and will be moved in a general downward direction along the inclined wall 24 of the dyeing chamber 13, whereby the same will descend until they come to rest and accumulate on the bottom screen 23. This phase of the operation is illustrated more particularly in Figure 2 of the drawings.

After the apparatus has been working for a sufficient length of time in the above described manner, the rotation of the propeller is reversed, with the result that the direction of the circulation of the dye water is also reversed, and consequently the current or stream of the latter will be thereupon forced upwardly through the bottom screen 23 of the dyeing chamber 13, whereby the level of the dye water in the dyeing chamber 13 is raised, causing the same to discharge from the top of the dyeing chamber 13, through the side screen 18, back into the mixing chamber 12. The effect of this reversing of the current is to drive the hat bodies H away from the bottom screen 23, while at the same time more or less scattering the same and separating them one from another. Since the current or stream forced by the propeller toward the dyeing chamber 13 is directed towards the opposing oblique wall 24 of the dyeing chamber, the stream is deflected upwardly by the angle of this wall, and thus, is turned upward and through the bottom screen. The drive of the ascending current or stream is more vigorous adjacent to the oblique wall 24, and consequently a whirling current within the dyeing chamber 13 is produced, the same rising along the oblique wall 24 toward the upper level of the dye water and descending along the partition 14—15. The effect of this whirling stream or current is to carry along the hat bodies with whirling movement tending to separate the same one from another and to break up the pile thereof which had accumulated on the bottom screen 23 during the first phase of the operation. In this way the hat bodies are thoroughly agitated and shifted about with relation one to the other without any necessity for stirring by means of hand manipulated paddles or other implements, and a more thorough intermixing of the hat bodies is attained, than is possible to be accomplished by hand stirring performed by the most skilled workmen. This phase of the operation is illustrated in Figure 3 of the drawings.

After a period of operation in the manner immediately above described, the propeller is again reversed in its movement so as to cause the circulation of the dye water to take place as first described, to wit, downwardly through the bottom screen, upwardly through the mixing chamber 12 and back into the top of the dyeing chamber, through the side screen 18, whereupon the hat bodies are again caused to settle and accumulate on the bottom screen 23, so that the dye water is more or less forcefully sucked therethrough. However, since the hat bodies being dyed have taken up relatively entirely different positions, due to the agitation thereof by the current operating under the second phase of the operation, when again the same accumulate on the bottom screen 23 they are differently placed with respect to each other, and, therefore, differently worked on by the dye water than in the first case. Since the reversing of the current or circulation of the dye waters occurs alternately numberless times during the dyeing of a batch of hat bodies, and since the amount of dye contained in the water may be continually restored and kept in well mixed solution in the dye water, assurance that every individual hat body will be penetrated by sufficient quantity of dye stuff is certain, and the dyeing will be regular and uniform with respect to each and every individual hat body.

It will be obvious, from the above description, that the hat bodies being dyed during the operations described are thoroughly agitated and adequately subjected to the effects of the dye solution, so that with the apparatus of this invention not only completely sized hats can be dyed but also hats which are only half sized may be dyed without any risk of injury to the hat body, since there is no necessity for using hand actuated implements for stirring and agitating the hat bodies while in the dye solution.

It will be understood that the alternated directional current circulation of the dye water may be attained in various ways, either by hand actuated means or by power driven means, so long as the relation of the side screen 18 above normal fluid level of the dye water within the tub or vat is provided. It will also be understood that power driven devices other than the described propeller may be employed to control the directional movement of the circulated dye water, and consequently, as to the broader aspects of this invention, I do not limit myself solely to employment of the propeller type of circulating means.

In the use of the apparatus of this invention, it may at times be desirable to work batches of hat bodies or other piece material, smaller than those which the full capacity of the tub or vat will normally accomodate. In such case, it is desirable to employ a smaller volume of dye water. To permit of this, the apparatus is so constructed and arranged, as to enable the operator to quickly reduce the capacity of the tub, and this is also a novel feature of this invention. To this end I pro-

vide the movable panel 15 in connection with the partition 14, and so arrange the same that it is interchangeable in position with the side screen 18. In other words the panel 15 and side screen 18 may be removed, and then the side screen may be replaced next to the main partition body 14, and the panel 15 replaced above the side screen 18, the parts then occupying the positions and relations shown in Figure 4 of the drawings. When thus arranged the normal dye water level within the tub 10 may be brought down to the lower margin of the redisposed side screen, thereby greatly reducing the volume of dye water necessary to be provided for small batch dyeing. Otherwise, in operation of the apparatus, as thus adjusted, the circulation of the dye water and consequent agitation and deposit of the hat bodies takes place in the same manner as already described.

As various changes, other than those already referred to, could be made in the above described construction of dyeing apparatus, and many widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:—

1. In an apparatus for dyeing aggregate piece material, such as a plurality of hat bodies, a tub, a vertical partition extending upwardly through said tub from its bottom to subdivide the interior thereof to provide a mixing chamber and a dyeing chamber, a perforate bottom screen in the lower end of said dyeing chamber spaced above the bottom of said tub, a perforate side screen between the upper end of said dyeing chamber and said mixing chamber, said side screen forming a part of said vertical partition extending above the normal fluid level of the dye solution with which the tub is supplied, and means below the bottom screen and between said dyeing chamber and said mixing chamber for alternately circulating the dye solution in opposite directions through the bottom and side screens and between said dyeing chamber and mixing chamber, so that the piece material is alternately massed on said bottom screen subject to the flow of the dye solution therethrough and then whirled about the interior of said dyeing chamber to break up the mass and shift about the individual pieces into new relative positions.

2. In an apparatus as defined in claim 1, in which the dye solution circulating means comprises a rotary propeller, and means to alternately drive said propeller in opposite directions.

3. In an apparatus as defined in claim 1, in which the wall of said dyeing chamber opposed to said dye solution circulating means is disposed at an upwardly and outwardly directed angle whereby when the dye solution is forced upwardly through said dyeing chamber a whirling current is produced within the latter above said bottom screen adapted to agitate and shift about the individual pieces of material to thoroughly intermix the same.

4. In an apparatus as defined in claim 1, in which the subdividing partition includes a movable panel normally disposed beneath said side screen but which may be interchangeably positioned relative to said perforate side screen to permit the latter to be operatively disposed at a lower elevation, to thereby reduce the dye solution capacity of the tub and its dyeing chamber when it is desired to operate on comparatively small batches of piece material.

5. In an apparatus for dyeing aggregate piece material, such as a plurality of hat bodies, a tub, a vertical partition extending upwardly through said tub from its bottom to subdivide the interior thereof to provide a mixing chamber and a dyeing chamber; said partition including at its upper end a movable panel and perforate side screen, the latter being normally above the former to project beyond the fluid level of dye solution when the tub is supplied with said solution for full capacity operation, but interchangeable therewith to dispose the same below the panel to thereby reduce the dye solution content of the tub for less than full capacity operation; a perforate bottom screen in the lower end of said dyeing chamber spaced above the bottom of said tub; a rotary propeller mounted in said partition between said mixing chamber and said dyeing chamber and below the level of said bottom screen of the latter; means for rotating said propeller alternately in opposite directions; and said dyeing chamber having in opposition to said propeller an upwardly and outwardly inclined wall, whereby when the dye solution is forced upwardly through said dyeing chamber a whirling current is produced within the latter above said bottom screen adapted to agitate and shift about the individual pieces of material to thoroughly intermix the same.

In testimony that I claim the invention set forth above I have hereunto set my hand this fifth day of February, 1929.

KARL FRIEDRICH KRANEY.