

Aug. 25, 1942.

W. S. BOWEN ET AL

2,294,221

SPRAY WHEEL

Filed Feb. 7, 1939

2 Sheets-Sheet 1

Fig. 1

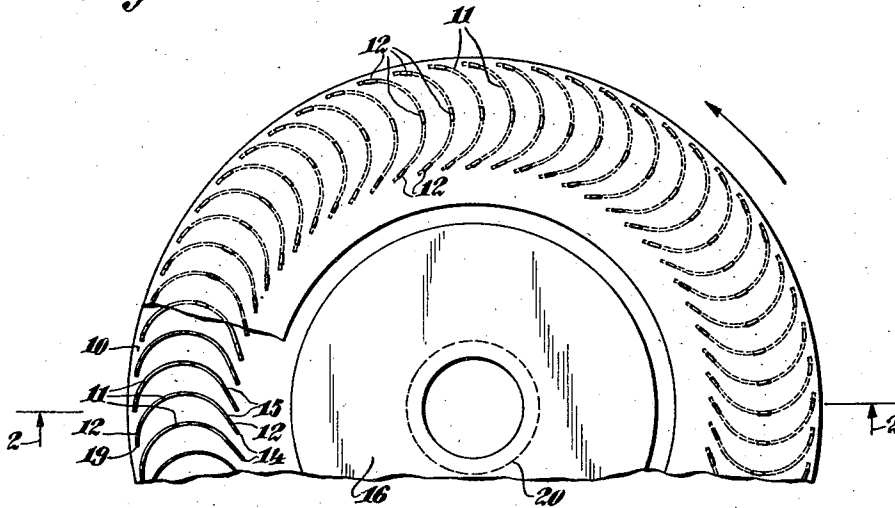


Fig. 2

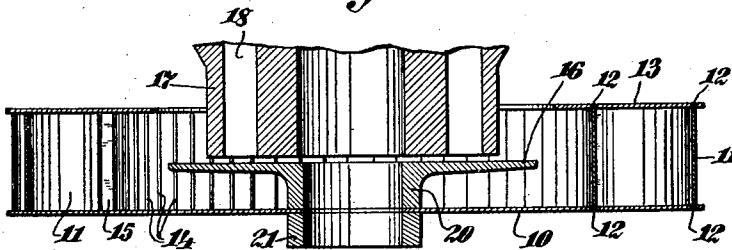
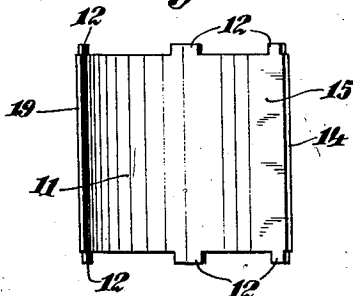


Fig. 3



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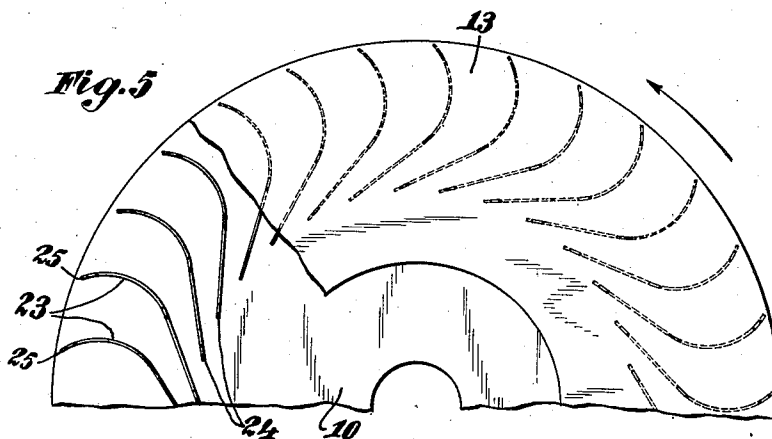
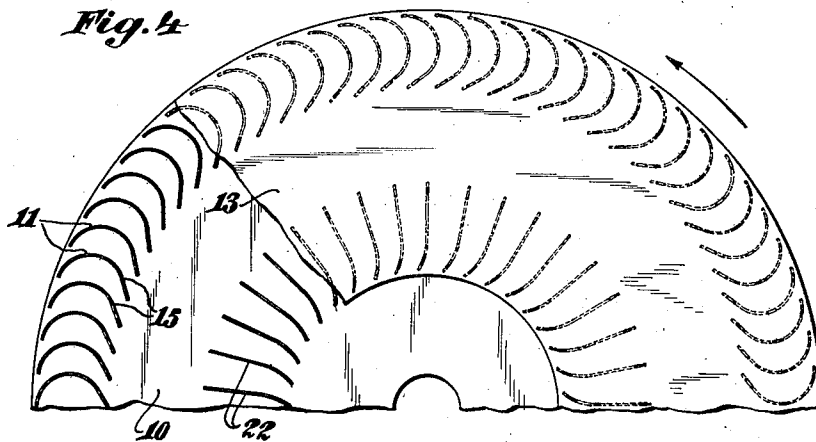
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2,294,221

SPRAY WHEEL

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Application February 7, 1939, Serial No. 255,000

5 Claims. (Cl. 299—63)

The present invention relates to spray wheels by means of which a liquid may be atomized or dispersed within a treating chamber and the invention embodies, more particularly, an improved form of spray wheel by means of which liquids may be treated more effectively and more uniformly than can now be done with the spray wheels commonly available.

It is a present common practice to provide spray wheels having the feed mechanism at the center of the wheel in order that the material to be sprayed may be delivered, under centrifugal force, to vanes which are arranged about the periphery of the wheel to subject the liquid to effective atomization or dispersion as it moves outwardly under centrifugal force and into the treating chamber. The present invention provides certain novel improvements on the wheel mechanism by means of which the material is fed uniformly to the vanes of the wheel so that all portions of all of the vanes function uniformly in dispersing the material. The invention contemplates further a vane design by means of which the velocity of the dispersed material, as it leaves the spray wheel, is increased materially over the peripheral velocity of the wheel. In this connection the improvements of the present invention further include a vane design by means of which free entrance of the material to the vanes is afforded.

The present invention further contemplates providing a wheel design by means of which vibrations and irregularities in a wheel structure may be absorbed by the wheel without giving rise to objectionable and deleterious stresses during operation.

In addition to the foregoing objects, a further object of the invention contemplates the provision of a structure by means of which the material passing through the spray wheel may be protected from the action of a treating medium which is frequently used in the operation of wheels of this character.

Further objects of the invention will be apparent as it is described in greater detail in connection with the accompanying drawings, in which:

Figure 1 is a plan view, partly broken away, to illustrate the vane design, the view showing a spray wheel constructed in accordance with the present invention;

Figure 2 is a view in section taken on line 2—2 of Figure 1, looking in the direction of the arrows; and

Figure 3 is a detail enlarged view of one of the

vanes of the wheel illustrated in Figures 1 and 2.

Figure 4 is a segmental plan view showing a modified form of spray wheel.

Figure 5 is a similar view showing a further modification of spray wheel in which the vane construction has been changed.

Referring to the above drawings, the invention will be seen as being embodied in a spray wheel having a bottom plate 10 which is preferably formed of sheet steel in order that the wheel may have the flexibility hereinafter referred to. Upon the bottom plate 10 is mounted a plurality of vanes 11 which are curved as illustrated in Figure 1, and are preferably formed with top and bottom lugs 12 which are received within suitable openings in the bottom plate or disc 10 and a top disc 13. The lugs are preferably spot welded at the position illustrated in the drawings in order that the top and bottom discs, as well the vanes, may constitute an integral assembly. The positioning of the vanes, of course, determines the direction of rotation of the wheel, as indicated by the arrow in the drawings.

It will be observed that the vanes 11 are formed, adjacent their inner edges 14, with straight portions 15 which are positioned in planes lying substantially 60° to radii passing through the inner and outer edges of the respective vanes. This straight portion provides free entrance of the material into the vanes from the central feed mechanism described hereinafter. It will also be seen that the vanes are positioned between the top and bottom discs in such fashion that their inner and outer edges lie in a common radius extending through the axis of the wheel. By providing the straight portion, together with the curved portion lying behind the radius, the centrifugal force of the outwardly moving fluid produces a velocity thereof which is added to the velocity of rotation of the wheel so that the material leaves the wheel at a higher velocity than the peripheral velocity of the wheel.

Adjacent the center of the wheel, a dispersing disc or plate 16 is provided which is located beneath a feed head 17 within which an annular feed passage 18 is formed. The feed passage 18 delivers material to the upper surface of the dispersing disc 16, the action of which disc is to direct the material outwardly under centrifugal force in order that it may be delivered uniformly to the vanes 11. In order to utilize the entire atomizing or outer edges 19 of each of the vanes 11, the disc 16 is spaced half-way between the plates of the top and bottom discs 13 and 10, respectively. In this fashion as the

material moves outwardly under centrifugal force in a substantially flat sheet or spray from the dispersing disc 16, it strikes the vanes 11 in approximately the same plane and gradually spreads out on these vanes so that it eventually reaches the dispersing edges 19 and is uniformly distributed thereover. This, it is to be noted, avoids the crowding or packing due to the concentration of the material which would result if it were dispersed along the surface of the bottom disc 10. With the positioning of the dispersing disc 16 as above described, the film thickness of the material being sprayed, at the dispersing edge 19, is greatly improved and uniform operation results.

It will be observed that the dispersing disc 16 is formed with a hub or shoulder 20 which serves as one member against which the bottom plate or disc 10 may be secured. The other securing member may be a nut or similar element 21, these members being suitably secured to a central rotating shaft in any manner in accordance with existing practice. It will be seen that the thin flexible bottom disc has very little bearing engagement on the shaft to which the assembly is secured. Since the bottom disc 10 is flexible and secured as above noted, slight unbalanced conditions in the atomizer or spray wheel can be overcome by the natural flexibility of the steel disc at its center. This flexibility is availed of most effectively by providing the securing elements 20 and 21 of relatively small section in order that the disc 10 may be confined no more than necessary.

In the form of the invention shown in Fig. 4, there is shown a modified spray wheel structure in which a series of inner vanes 22 is provided. These vanes not only serve the purpose of strengthening the wheel and securing the top and bottom plates together more effectively, but also serve as a preliminary internal atomizer as well as an air blower or fan. Where the spray wheel is large, the inner vanes greatly improve the dispersion of the liquid over the internal faces of the outer vanes and thus result in a more uniformly atomized material issuing from the outer periphery of the outer vanes. A further advantage resulting from the use of the internal vanes is that the material leaving the outer edges of the vanes has the same rotational speed as the wheel. In practice, the inner edges of the vanes may be leading somewhat to thus cut into the feed as it leaves the central atomizing disc but the vanes will also function in the manner above described if they are straight.

In the form of the invention shown in Figure 5, vanes 23 are provided which are of such formation that the vanes are effectively scavenged during operation of the wheel. It sometimes happens that the vane formation shown in Figs. 1 through 4 results in the gradual filling up of the vanes with solid material by reason of the fact that the outer edges tend to draw out the solids from the solution. As will be seen in Figure 5, the vanes 23 are formed with inner edges 24 which are well in advance of the outer edges of the vane. The outer edges 25 of the vanes 23 are formed with a forward lead by means of which the characteristics described in connection with the construction shown in Figs. 1 through 4 are imparted to the vanes 23. By providing the forward lead of the inner edges of the vane as shown in Fig. 5, the component

of the force of the fluid in a direction parallel to the vane is substantially increased to effect the scavenging action above referred to. It will be observed that in the structure shown, the inner edge of one vane leads the outer edge of the adjacent vane in the direction of rotation of the wheel.

It will be observed that the spray wheel above described possesses many advantages which distinguish it from constructions heretofore available. The wheel is flexible to compensate for any slight unbalance of the structure thereof, and the feed mechanism is such as to utilize, to the fullest extent, the dispersing edges of all of the vanes. Moreover, the structure is such as to provide an increase in the velocity of the material leaving the wheel over the peripheral velocity of the wheel, thus greatly expediting the dispersing operation and the vane structure, such as to facilitate the feeding of the material thereto by reason of the shape of the inner portion of the vanes.

While the invention has been described with reference to the specific structures shown in the drawings, it is not to be limited save as defined by the following claims.

We claim:

1. Dispersing means comprising a plurality of peripherally arranged vanes, a central support, means to secure the vanes to the central support, and an annular series of vanes spaced radially inwardly of the first vanes, the inner edges of the last named vanes being curved forwardly in the direction of rotation and the portions of said inner vanes radially beyond said forwardly curving portions having no forwardly projecting surfaces.

2. Dispersing means comprising a plurality of peripherally arranged vanes, a central support, a top disc, a flexible bottom disc, means to secure the bottom disc to the support, and means to secure the vanes between the discs with the inner edges thereof spaced from the support, the inner edge of each vane leading the outer edge thereof in the direction of rotation.

3. Dispersing means comprising a central support, a flexible disk element secured to the said support, an annular disk element, and a plurality of vanes connecting said elements adjacent their peripheries, the inner edges of said vanes being spaced from said support whereby said annular element and vanes are supported by said flexible disk element with capacity for movement relatively to said support.

4. Dispersing means comprising a central support, a thin flexible disk element secured to the said support with a minimum of bearing engagement therewith, an annular disk element, and a plurality of vanes connecting the said elements adjacent their peripheries whereby the said annular element and vanes are supported by said flexible disk element with capacity for movement relatively to said support.

5. Dispersing means comprising a central support, a flat flexible disk element, means to secure the said element to the support with a minimum of bearing engagement therewith, an annular disk element, and a plurality of vanes connecting the said elements adjacent their peripheries whereby the said annular element and vanes are supported by said flexible disk element with capacity for movement relatively to said support.

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