Jan. 28, 1964 E. F. GALLAGHER 3,119,675

SPRAY BOOTH

Filed Nov. 10, 1960 2 Sheets-Sheet 1

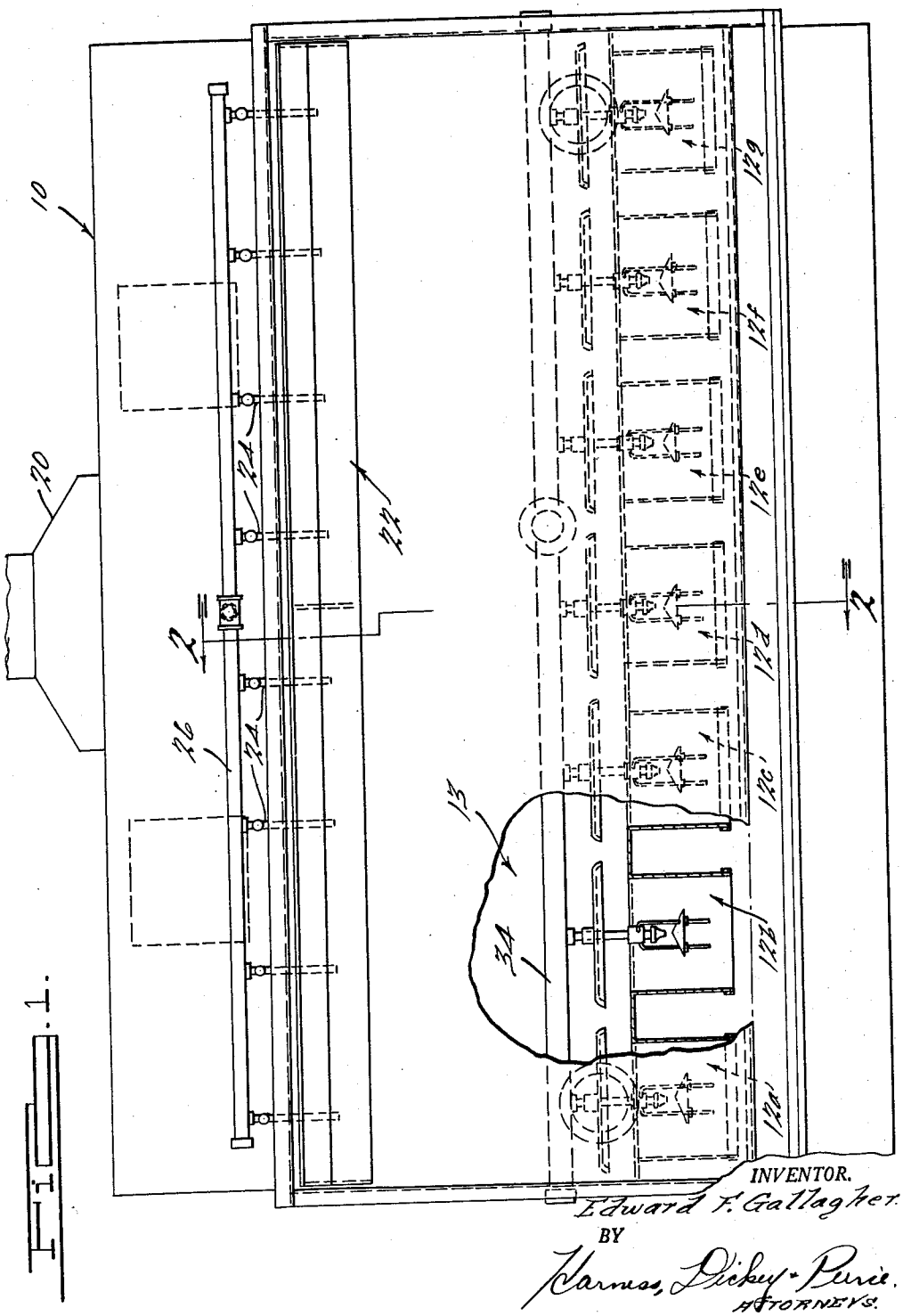


FIG. 1.

INVENTOR.
Edward F. Gallagher
BY
Karmas, Dickey & Purcell
ATTORNEYS.

Jan. 28, 1964 E. F. GALLAGHER 3,119,675

SPRAY BOOTH

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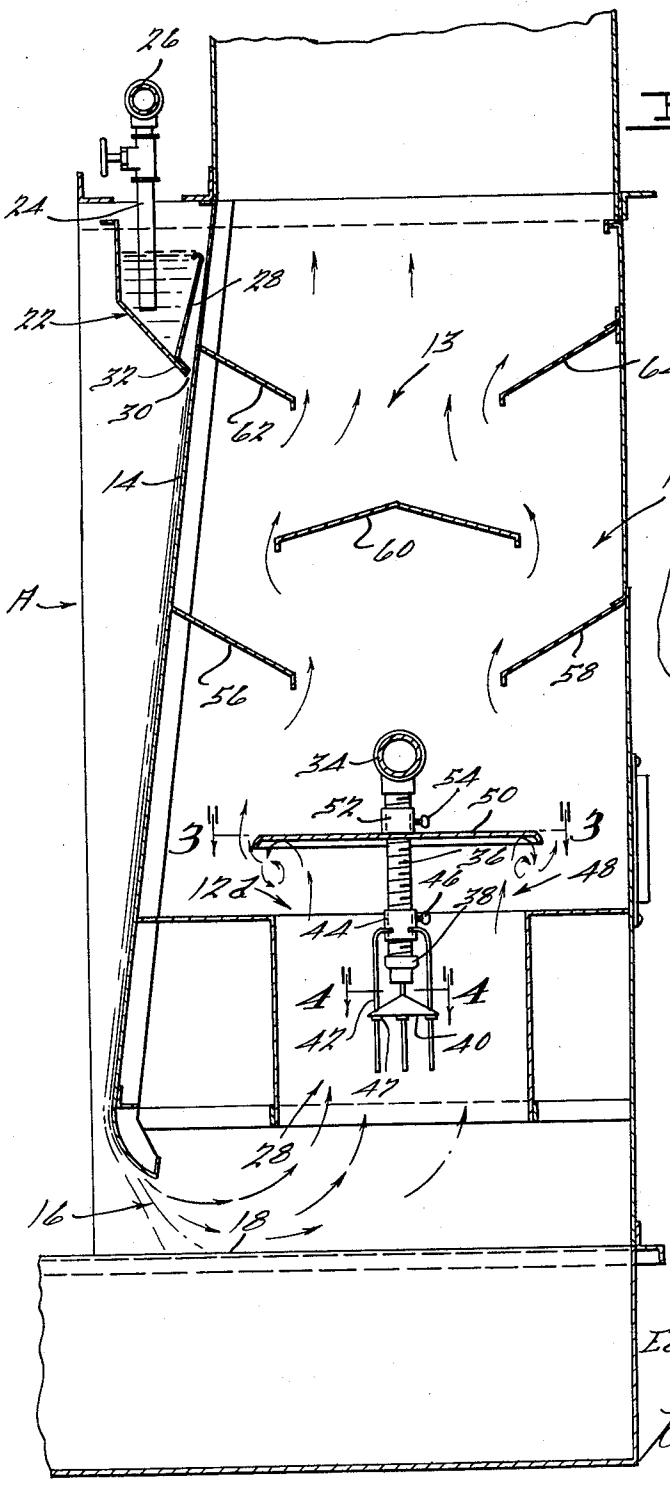


Fig. 2.

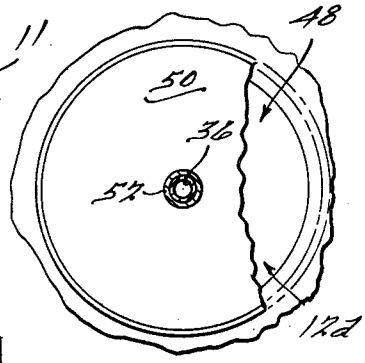


Fig. 3.

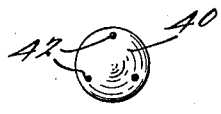


Fig. 4.

INVENTOR.
Edward F. Gallagher
BY
Harness, Dickey & Pierce,
ATTORNEYS

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SPRAY BOOTH

Edward F. Gallagher, Detroit, Mich., assignor to Gallagher-Kaiser Corporation, Detroit, Mich., a corporation of Michigan

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This invention relates to spray booths and especially to a spray booth having a novel construction for removing spray particles from the air.

In general, objects to be sprayed by paint or some other fluid are located between the spray operator and a spray booth. In large operations, it is common for several spray operators to be spraying simultaneously along the length of a single spray booth. The purpose of the spray booth is to remove the paint spray from the air in order that the excess paint entering the air can be recovered and that physical injury to the spray operators due to inhalation of the paint spray be prevented. As the paint spray is directed towards the object and hence towards the spray booth, the excess in the air is drawn into the booth by a vacuum created by an exhaust fan associated with the booth. The spray is initially drawn through a sheet of flowing water where a good portion of the particles are washed from the air into a collector trough or tank. The remaining paint particles are drawn into an exhaust chamber where more of the particles are removed by washing with a spray of water. The air and paint particles remaining therein are drawn through the chamber and exhausted to the atmosphere.

One disadvantage of the construction of many of the spray booths currently used is that in the second washing a plurality of nozzles, having relatively small apertures are used. These apertures are susceptible to clogging from the paint spray particles, thus requiring frequent maintenance. Another disadvantage of spray booths currently used is that the air, and hence paint particles, is drawn into the booth at a greater volumetric rate at the center portion of the booth, or at the location of the exhaust fan, than at the end portions or the portions further removed from the exhaust fan. Thus, the paint spray particles in the air are not removed with equal effectiveness along the length of the paint spray booth.

A spray booth embodying the features of this invention eliminates both of the above named disadvantages. Therefore, it is an object of this invention to provide a novel construction of a spray booth for the removal of spray particles for which infrequent maintenance is required.

It is an object of this invention to provide a spray booth for the removal of spray particles in which air and spray particles are drawn into the booth at a substantially uniform volumetric rate along the length of the spray booth.

Other objects, features and advantages of the present invention will become apparent from the subsequent description and the appended claims taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a front elevational view of a spray booth containing the features of the present invention;

FIGURE 2 is a sectional view showing the internal construction of the spray booth shown in FIGURE 1 and taken along the line 2—2 thereof;

FIGURE 3 is a view taken along the line 3—3 in FIGURE 2; and

FIGURE 4 is a view taken along the line 4—4 in FIGURE 2.

Looking now to FIGURE 1, a paint spray booth **10** is constructed of a plurality of cylindrically shaped wash chambers **12***a*–**12***g*, each of which is connected to a common plenum chamber **13** (see FIGURE 2). In using a spray booth as shown in FIGURE 1, several operators can

be located along the length of the booth and can be simultaneously spraying. Assuming now that objects are to be sprayed with paint, the paint spray is generally directed toward an inclined front face **14** of the booth **10** as shown by the arrow A in FIGURE 2. The air and paint particles are drawn by a vacuum into each of the wash chambers **12***a*–**12***g* through a common intake aperture **16** defined by the lower extremity of the front face **14** and a collector trough **18** and extending the length of the booth **10**. The vacuum is created in the plenum chamber **13** and the wash chambers **12***a*–**12***g* by the removal of air from the chamber **13** by an exhaust fan or other exhaust means (not shown) through a centrally located exhaust duct **20**. Note that the air drawn into the booth **10** can pass into the plenum chamber **13**, and thence be exhausted, only by way of one or more of the wash chambers **12***a*–**12***g*. The air mixed with the paint spray particles passing through the intake aperture **16** is initially washed by a sheet of water flowing over the aperture **16**. The sheet of water is obtained from a flood gutter **22** which extends the length of the spray booth **10** and which is supplied with water by a plurality of nozzles **24** connected to a header **26**. Water from the flood gutter **22** flows over a back plate **28** and is directed down the inclined front face **14** by means of a guide opening **30** defined by a lip portion **32** on flood gutter **22** and the front face **14**. The water then flows across the intake aperture **16**, and into the sump or collector trough **18**. The paint washed into the collector trough **18** can be subsequently recovered and reused.

While a good portion of the paint is washed into the collector trough **18** by this initial washing action, some escapes and is drawn into the wash chambers **12***a*–**12***g*, where a second washing operation occurs. Since the construction and operation of each of the wash and spray chambers **12***a*–**12***g* is similar, only the construction and operation of the central wash chamber **12***d* will be described (FIGURES 2 and 3). The air and paint particles in the wash chamber **12***d* are washed by water supplied by a common header **34** to a pipe **36** and discharged through a nozzle **38**; the stream of water from nozzle **38** is directed towards and is deflected radially outwardly by a generally conically-shaped deflector plate **40** (FIGURE 4) so as to cover the passage through the wash chamber **12***d* with a spray of water (FIGURE 2). The plate **40** is held at a distance from the nozzle **38** by means of a plurality of legs **42** fixed to a collar **44** which is secured to the pipe **36**. The legs **42** are of a relatively small diameter and hence offer negligible impedance to the spray of deflected water. The deflection pattern of the water from the deflection plate **40** can be changed by adjusting the distance between the deflector plate **40** and the nozzle **38** by setting the position of the collar **44**, with a set screw **46** along the length of a pipe **36**. Additional adjustability is provided by means of fasteners **47** by which the deflector plate **40** can be selectably positioned along the length of the legs **42**. The paint spray particles caught by the water spray in the wash chamber **12***d* are washed into the sump or collector trough **18**.

Note that the nozzle **38** is of a relatively large diameter with a fine spray of water being provided by the deflector plate **40**. This is in contrast to the present practice of obtaining a fine spray by the use of a plurality of nozzles of small diameter. As mentioned previously, the nozzles of small diameter are susceptible to clogging by particles of paint spray and hence require frequent maintenance. It can be readily appreciated that in the construction as shown in the figures and as discussed above, clogging of the nozzle **38** is highly improbable, thus eliminating the maintenance problem.

A mixture of air, water particles and the remaining paint spray particles is then drawn towards a restricting

aperture 48 leading into the plenum chamber 13 and provided by locating a generally circular plate 50 at a selectable distance above the passage through the wash chamber 12*d*. The plate 50 covers an area slightly greater than the cross-sectional area of the passage through the wash chamber 12*d* and has a collar portion 52 by which it is adjustably secured to the pipe 36 by means of a set screw 54. By varying the distance between the plate 40 and wash chamber 12*d*, the restriction of the aperture 48 can be selected to provide the maximum amount of turbulence of the mixture of the water particles, air and paint spray particles. The turbulent flow through the restricting aperture 48 is effective in causing much of the remaining paint spray particles to be washed back into the wash chamber 12*d* and thence into the sump or collector tank 18. By changing the distance between the plate 50 and the passage through the wash chamber 12*d* the restriction to air flow and hence the volumetric rate of air flow through chamber 12*d* can be controlled. In a similar manner the volumetric rate of air flow through the other wash chamber can be adjustably controlled. Thus the adjustability feature associated with each of the restricting apertures individual to the wash chambers 12*a*–12*g* serves a second function in that the restricting apertures can be individually adjusted to compensate for the unequal distances between the exhaust duct 14 and each of the wash chambers 12*a*–12*g* and thereby provide an equal volumetric rate of air flow through each of the wash chambers 12*a*–12*g*. In the embodiment shown in the figures the height of each plate 50, individual to each of the plurality of wash chambers 12*a*–12*g* is adjusted to provide a greater resistance to air flow through the center wash chamber 12*d* and a progressively decreasing resistance to air flow through the wash chambers 12*c* and 12*e*, 12*b* and 12*f*, 12*a* and 12*g*. In the illustrated embodiment air is drawn through each of the wash chambers 12*a*–12*g* at a rate of 2000–2500 c.f.m.

One of the advantages of the adjustability feature discussed above is that the exhaust fan (not shown) can be driven by a motor of minimum horsepower and adjustments can be made to provide maximum turbulence. Thus a cost savings is realized since the motor size can be kept to a minimum.

Any remaining paint spray particles passing through the restricting aperture 48 are susceptible to being caught by a plurality of deflectors 56, 58, 60, 62 and 64 which are located along the length of the plenum chamber 13 in a maze-like arrangement. The air is then drawn into the exhaust duct 20 of the plenum chamber 13 and thence exhausted to the atmosphere.

While it will be apparent that the preferred embodiment of the invention disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. Apparatus for removing particles from a gaseous atmosphere comprising an enclosed plenum chamber and a wash chamber having a through passageway of reduced section relative to said plenum chamber for communicating said plenum chamber with the gaseous atmosphere, said passageway having an inlet in communication with the gaseous atmosphere and an outlet in communication with said plenum chamber, wash means operatively connected with said chamber for providing a spray of washing fluid within said chamber between said inlet and said outlet with said spray substantially covering said passageway and flowing towards said inlet, means for drawing a portion of the gaseous atmosphere to be cleaned into said inlet, through said passageway, through said outlet and through said plenum chamber and also for drawing a portion of said spray out said outlet, flow restriction means located at said outlet and being selectably adjustable for selectably restricting the flow of the portion of the gaseous atmosphere and said portion of said spray through said outlet and for causing turbulence of the portion of the gaseous atmosphere and said portion of said spray as they are drawn through said outlet, said restriction means comprising a plate located proximate to and overlaying said outlet and adjustment means for supporting said plate for selectable movement towards and away from said outlet, and deflector means comprising a maze of deflectors disposed in said plenum chamber above said flow restriction means for deflecting the portion of the gaseous atmosphere and said portion of said spray drawn through said outlet.

2. The apparatus of claim 1 with said wash means comprising a nozzle located in said wash chamber having a large diameter for supplying washing fluid, a deflecting plate selectably located at a desired distance from said nozzle for deflecting the washing fluid therefrom radially outwardly, and means for supporting said deflecting plate within said chamber for selectable movement towards and away from said nozzle.

3. The apparatus of claim 1 including a plurality of said wash chambers located side by side in parallel and in communication with said plenum chamber.

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