

SPECIFICATION

TITLE OF THE INVENTION

Paint Spraying Booth

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to a paint spraying booth for collecting, by sucking and trapping, a mist, not adhering to a to-be-coated object but flying, of a paint sprayed to an object, and more particularly to a paint spraying booth in which a paint mist is sucked along with air by an exhaust fan, the mist is trapped and processed inside the paint spraying booth and then air thus cleaned is discharged to the atmosphere.

More specifically, the present invention is directed to a paint spraying booth having a water shower spray nozzle provided therein to trap paint particles by adherence to the dense water mist of the sprayed shower from the nozzle.

2. Description of the Related Art

In the conventional water-cleaned type paint spraying booth for trapping a paint mist by a water shower, the paint mist sucked along with air by an exhaust fan is trapped by the water shower sprayed from a plurality of spray nozzles in order to improve the efficiency of paint mist collection. However, such a paint mist collection in the paint spraying consumes much water is consumed and there take place a spraying sound, sound of the sprayed water shower beating a wall surface, flowing sound of the water, and sound of the sucking sound from the exhaust fan. These kinds of sound are mixed together, and the sound mixture leaks through an inlet opening formed between spraying room and mist processing room of the spraying booth to the spraying room. It will be an endurable one and a big annoyance to the worker in the booth. Therefore, it has been an important problem to control such a noise for an improved working environment.

A typical one of the conventional water-cleaned type paint spraying booths is shown by way of example in FIG. 1. As shown, the paint spraying booth includes mainly a spraying room, an exhaust fan 41 provided at the top thereof, water-flow plates 42, a mist processing room 43, a water nozzle 44, a water bath 45 and a trough 46. As will be seen from FIG. 1, air containing a mist of a paint sprayed from a spray gun, not adhering to an to-be-coated object but flying inside the spraying room, is sucked by the exhaust fan 41. When the air flow is passed through the mist processing room 43, the paint mist is dropped along with shower water sprayed from the water nozzle 44 down into the water bath 45 located on the bottom of the booth and trapped there. The water in the water bath 45 is sucked up by a pump for recirculation to the nozzle 44 as well as to the trough 46 from which the water will overflow down to the water-flow plates 42 provided at the boundary between the spraying and mist processing rooms. Both the water flowing down on the water-flow plates 42 and paint trapped by the shower water in the mist processing room 43 behind the water-flow plates 42 fall into the water bath 45 where they are separated into water and paint, and the paint is collected and disposed as a sludge. On the other hand, the air from which the paint mist has thus been removed is discharged by the exhaust fan 41 to the atmosphere.

Since the flying paint mist is trapped by putting it in contact with the falling water and water shower, the paint spraying booth of the above type will be able to collect the paint mist and purify the air to be discharged to the atmosphere with an improved efficiency by increasing the possibility of the contact, whereby the water-cleaned type paint spraying booth contributes to the prevention of air and environmental pollution.

For effective collection of the paint mist, the atomization of shower water for spraying is adopted frequently in this paint spraying booth. Normally in this case, water is supplied to flow down on the water-flow plates 42 provided on the

partition between the spraying room and mist processing room 43, the flying paint mist is trapped by the water flow and dropped into the water bath 45 on the booth bottom (primary collection). Then the paint mist not captured is passed through the mist processing room 43 behind the water-flow plates 42, trapped by the water shower spray from the nozzle 44 and dropped into the water bath 45.

However, the above conventional water-cleaned type paint spraying booth is not advantageous for the sound of the water shower spraying from the nozzle, sound of the water shower beating the water-flow plates and operating sound from the exhaust fan. More specifically, the water shower sprayed from the nozzle disposed behind the water-flow plates into an air passage in the mist processing room causes a great noise which will be transmitted through an inlet opening under the water-flow plate to the spraying room. Also, the sprayed water shower beats directly the rear surfaces of the water-flow plates and the beating sound is also transmitted to the spraying room. Further, a noise is caused when the air is sucked by the exhaust fan and adds to the above noises. This mixture of the noises coming into the spraying room will be an annoyance to the worker there and cause the environment deterioration.

OBJECT AND SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to overcome the above-mentioned drawbacks of the related art by providing a quieter and environmentally-friendly paint spraying booth capable of minimizing noises generated and transmitted to the spraying room while maintaining the maximum performance of dust collection as the basic function thereof.

The present invention has a first object is to effectively control the sound of water shower spraying in the mist processing room and the sound of the water shower beating the mist processing room wall when spraying water shower in the mist processing room to trap the paint mist contained in the air flow by the sprayed water shower and to clean the air flow for discharge to outside.

The present invention has also a second object to attenuate the sound developed when the air flow is sucked by an exhaust fan in the mist processing room.

To achieve the above objects, the present invention provides a paint spraying booth comprising a spraying room and an air tunnel formed in a mist processing room, communicating with each other through an inlet opening defined at the boundary between them and on the bottom of the paint spraying booth, and in which a paint mist developed as result of spraying a paint to an object in the spraying room is collected, through the inlet opening, by an exhaust fan provided in the air tunnel to suck air from the spraying room into the air tunnel for discharge to outside, the paint mist in the air flow thus sucked into the air tunnel is trapped by water shower sprayed from a spray nozzle provided in an air passage defined for the sucked-in air by the air tunnel, and air thus cleaned is discharged by the exhaust fan to outside, wherein; said air tunnel, defining an air passage having said water shower spray nozzle provided therein, is provided with a guide plate having a wall isolated from a water flow plate facing the spraying room; and the air passage in the air tunnel is inclined with respect to the lower inlet opening to provide a bent air passage communicating with the lower inlet opening.

In the above paint spraying booth, since the sound of water shower spraying will not go directly to the lower inlet opening, the sound impinges on the wall surface of the air tunnel and is further attenuated in the bent air tunnel before arriving at the spraying room through the inlet opening. The spraying direction of the spray nozzle as a noise source is generally parallel to the wall surface of the air tunnel. This parallel geometry and the bending of the air tunnel attenuates the noise and blocks the noise against direct going to the spraying room.

Further, the water shower is sprayed widely with the center of the sprayed

water shower being directed against air flow containing a paint mist to beat the obliquely front wall surface of the air tunnel. Since the wall surface of the inclined air tunnel is formed separately from the water-flow plates facing the spraying room, however, the sound of the water shower beating the wall surface will not arrive directly at the inlet opening as above. The air tunnel communicating with the inlet opening is inclined with respect to the inlet opening and the air passage is bent so that the sound of the water shower beating the wall surface can be attenuated more effectively.

Also the above object is attained by providing a shield plate before the intake side of the exhaust fan to define an air detour around it against noise developed when

air is sucked by an exhaust fan and in order to prevent the sound from the exhaust fan from going directly to an inlet opening defined at the boundary between the spraying room and the mist processing room. The sound passing via the air detour around the shield plate is gradually controlled while being transmitted through the bent air tunnel in the mist processing room, whereby it is possible to considerably attenuated the noise when it arrives at the inlet opening.

These objects and other objects, features, and advantages of the present invention will become more apparent from the following detailed description of the preferred embodiments of the present invention when taken in conjunction with the accompanying drawings. It should be noted that the present invention is not limited to the embodiments, but can freely be modified without departing from the scope and spirit thereof defined in the claims given later.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

FIG. 1 is a sectional view of the conventional ordinary water-cleaned type paint spraying booth, showing main components of the booth;

FIG. 2 is a sectional view of an embodiment of the paint spraying booth according to the present invention, showing main components of the booth; and

FIG. 3 explains the construction of the air tunnel provided in the paint spraying booth in FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The paint spraying booth according to the present invention includes a spraying room (not shown) formed from right and left lateral side walls and top and rear walls made of a metal. The spraying room is open only at the front side thereof. In the spraying room, a worker sprays a paint to an object by using a spray gun.

FIG. 2 is a sectional view, from a lateral side, of the paint spraying booth according to the present invention. In FIG. 2, a spray gun generally indicates

the location of a worker and thus that of the spraying room. As shown, there is provided on the bottom of the paint spraying booth a water bath 1 consisting of a front bath 1A and rear bath 1B which communicates with each other.

The paint spraying booth according to the present invention includes also a mist processing room 3 having an exhaust fan 4 provided at the top thereof to suck air containing a paint mist from the spraying room. At the front of the mist processing room, a trough 5 is provided at a height. A water-flow plate 6 is provided extending downward below the trough 5. The paint mist flying in the spraying room is trapped by water flowing over the trough 5 (primary collection) and falling on an upper water-flow plate 6A and lower water-flow plate 6B, made separately for the convenience of manufacture and maintenance. As will be seen from FIG. 2, the lower water-flow plate 6B is turned at the lower end 6C thereof toward the mist processing room 3. An opening is defined between the lower end 6C of the water-flow plate 6 and the water bath 1. The opening is an air inlet 7 through which the air flow containing the paint mist is sucked at an appropriate rate by an exhaust fan 4 into the mist processing room 3.

The inside of the mist processing room 3 provides the passage for the air sucked by the exhaust fan 4, and at the middle of the passage, there is provided a water shower spray nozzle 8 to spray water shower to the air containing the paint mist.

The spray nozzle 8 includes a plurality of nozzles laid laterally when viewed from the front of the spraying room to spray water shower to the entire air flow passage in the mist processing room. The spray nozzle 8 is of a wide-angle type and the water shower sprayed from the nozzle 8 will beat the wall of the air passage laid obliquely frontward. Therefore, a sound of water shower spraying and sound of beating the air-passage wall take place.

Also, a guide plate 9 is provided between the upper exhaust fan 4 and lower inlet opening 7 to guide the air flowing through the partially bent air tunnel.

The spray nozzle 8 is provided inside a portion, inclined with respect to the inlet opening 7, of the bent air tunnel to spray water shower against the passing air flow. So, the center of the spraying from the nozzle 8 is generally parallel to the guide plate 9.

Further, the guide plate 9 is positioned so that the water shower sprayed at a wide angle will not beat directly the rear side of the water-flow plate 6 facing the spraying room.

As shown in FIG. 2, a lower trough 10 is provided at the lower portion of the mist processing room 3, and a lower water-flow plate 11 is provided to extend at the lower end thereof into the lower rear water bath 1B. The paint mist is trapped by the overflowing water flowing along the lower water-flow plate 11 from the lower trough 10 (secondary collection). A drainage channel 12 is provided on the bottom of the lower trough 10. The reference 14 indicates an inclined floor connecting the front water bath 1A and rear water bath 1B on the floor of the paint spraying booth to each other.

FIG. 3 schematically illustrates the construction examples of the air tunnels. FIG. 3(a) shows an air tunnel of the conventional paint spray booth, and FIGS. 3(b) and 3(c) show the air tunnels, respectively, included in the present invention. In the air tunnel shown in FIG. 3(a), the sprayed water shower beats directly the rear surface of the water-flow plates 6 and the shower spraying is directed toward the lower inlet opening 7. In the air tunnels shown in FIGS. 3(b) and 3(c), the sprayed water shower beats the guide plate 9 spaced from the water-flow plates 6. Also, the spray nozzle as a noise source is located inside the bent air tunnel not facing the inlet opening 7 and so the beating sound will be reflected during transmission through the bent air tunnel to the spraying room. The sound arriving at the spraying room has thus been attenuated.

Further, an eliminator 20 is provided in the air tunnel to eliminate fine water droplets sucked along with the air by the exhaust fan 4 before the air flow is

discharged to outside. Also, a shield plate 21 is provided just before the intake side of the exhaust fan 4 to define an air detour around which the air flow moves. The shield plate 21 prevents the air flow through the wide air tunnel from concentrating to the center of the exhaust fan 4, causing an uneven flow of the air, while preventing the noise caused by the exhaust fan 4 from being propagated directly to the lower inlet opening 7.

Note that in case the spraying room has a wide frontage and the air tunnel is correspondingly, a plurality of exhaust fans may be used in the air tunnel to keep an even air flow through the air tunnel.

In the paint spraying booth constructed as above according to the present invention, the sound of water shower sprayed from the spray nozzle arrives at the inlet opening after being propagated through the bent air tunnel along the guide plate installed at an angle in relation to the inlet opening of the mist processing room, and so the spraying sound will have considerably be attenuated when it comes into the spraying room, whereby the working environment can be improved greatly.

Also, since the water shower sprayed from the spray nozzle beats the guide plate installed separately from the water-flow plate facing the spraying room and at an angle with respect to the inlet opening, so it will not be transmitted directly to the spraying room. Further, since the sound of the water shower beating the guide plate arrives at the inlet opening after having been propagated through the bent air tunnel along the guide plate, so it will have been attenuated when it comes into the spraying room.

Moreover, the shield plate provided beneath the exhaust fan prevents the operating noise from the exhaust fan from being transmitted directly to the inlet opening through the mist processing room and thus the sound from the exhaust fan is also controlled. Also, since the guide plate is provided inside the air tunnel and isolated from the rear surface of the water-flow plate facing the

spraying room, so the sound of the passing air flow will not be transmitted to the water-flow plate.

As having been described in the foregoing, in the paint spraying booth according to the present invention, noise is not transmitted from its source directly to the spraying room. The noise level can considerably be reduced as compared with that in the conventional paint spraying booths, which leads to an improvement of working environment and hence to an improved working efficiency.

WHAT IS CLAIMED IS:

1. A paint spraying booth comprising a spraying room and an air tunnel formed in a mist processing room, communicating with each other through an inlet opening defined at the boundary between them and on the bottom of the paint spraying booth, and in which a paint mist developed as a result of spraying a paint to an object in the spraying room is collected, through the inlet opening, by an exhaust fan provided in the air tunnel to suck air from the spraying room into the air tunnel for discharge to outside, the paint mist in the air flow thus sucked into the air tunnel is trapped by water shower sprayed from a spray nozzle provided in an air passage defined for the sucked-in air by the air tunnel, and air thus cleaned is discharged by the exhaust fan to outside, wherein:
said air tunnel, defining an air passage having said water shower spray nozzle provided therein, is provided with a guide plate having a wall isolated from a water-flow plate facing the spraying room; and
the air passage in the air tunnel is inclined with respect to the lower inlet opening to provide a bent air passage communicating with the lower inlet opening.
2. The booth as claimed in claim 1, wherein a shield plate is provided just below the intake side of the exhaust fan to define an air detour around it.
3. The booth as set forth in claim 1, wherein the spray nozzle is provided inside the air tunnel whose inside space is bent by the guide plate and with the spraying-direction center thereof set generally parallel to the surface of the guide plate.
4. The booth as claimed in claim 1, wherein the spray nozzle comprises plurality of nozzles disposed laterally when viewed from the front of the spraying room to spray water shower to all the area of the air passage inside the air tunnel.
5. The booth as claimed in claim 1, wherein the spray nozzle is a wide-angle nozzle.