May 4, 1954 H. W. TAYLOR 2,677,750

ELECTRIC AIR HEATING SPRAY UNIT

Filed Sept. 3, 1952

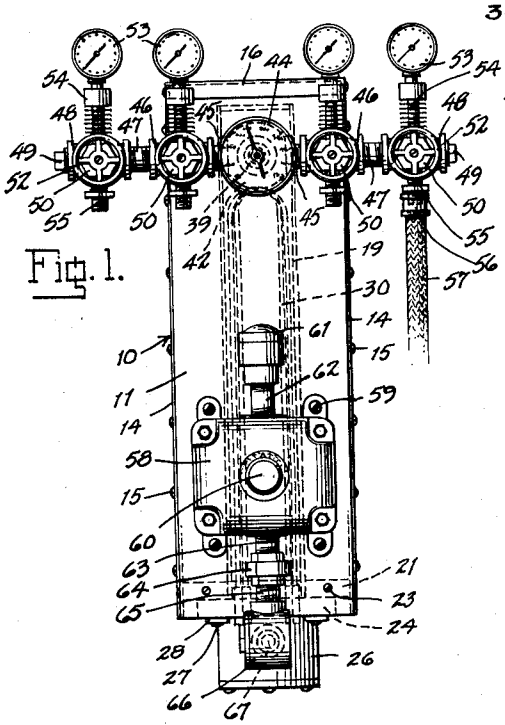


Fig. 1.

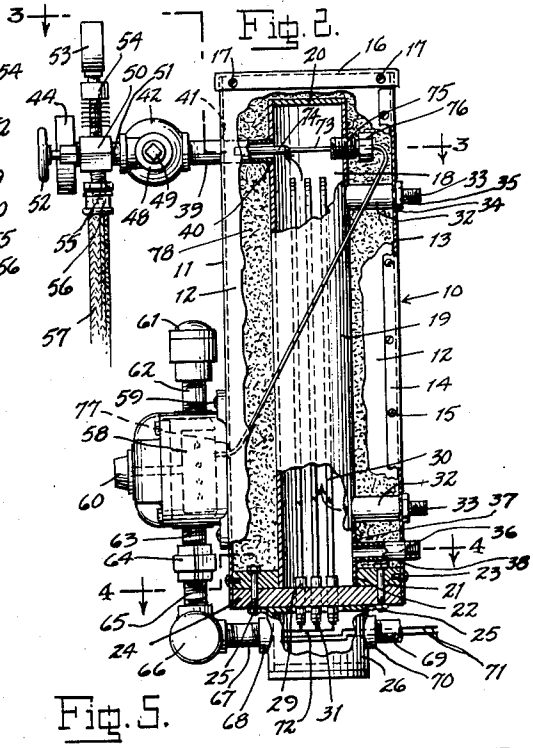


Fig. 2.

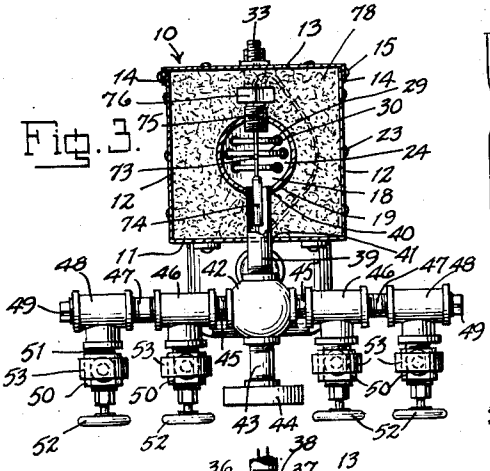


Fig. 3.

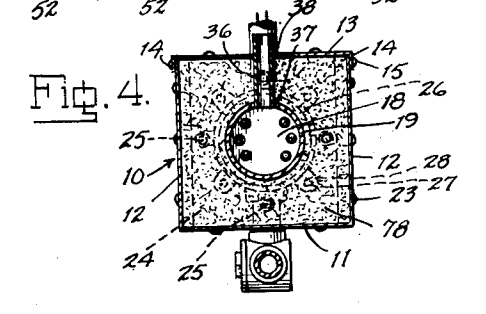


Fig. 4.

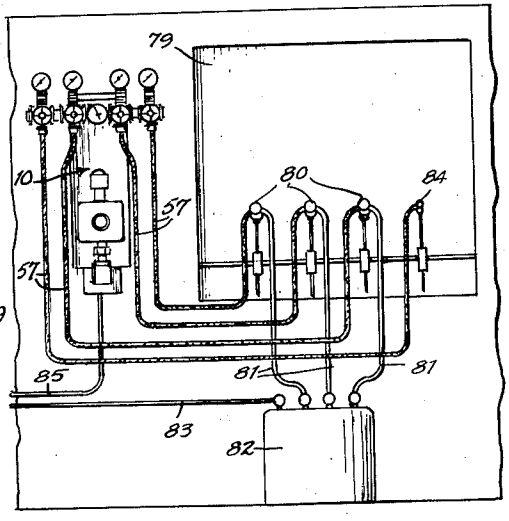


Fig. 5.

INVENTOR.
HOWARD W. TAYLOR
BY
ATTORNEY.

Patented May 4, 1954

2,677,750

UNITED STATES PATENT OFFICE

2,677,750

ELECTRIC AIR HEATING SPRAY UNIT

Howard W. Taylor, Danbury, Conn., assignor to The Capitol Machine Company, Danbury, Conn., a corporation of Connecticut

Application September 3, 1952, Serial No. 307,639

7 Claims. (Cl. 219—39)

1

This invention relates to an electric air heating spray unit, particularly for use in connection with paint or similar spray coating apparatus, wherein the coating material is sprayed upon a succession of articles by means of spray nozzles in which paint or enamel under air pressure is mixed and atomized with high pressure air. In certain types of work it is desirable to apply the spray in a heated condition, and the practice heretofore has been to preheat the coating material. This has been unsatisfactory because of the inabiilty to maintain desired uniform temperatures, as well as the tendency of the heated paint, enamel, or other coating material, to clog the tanks, hose lines and nozzles, requiring costly delays in cleaning and reconditioning the equipment.

It is proposed in the present invention to provide a heated air spray unit whereby heated air at desired temperatures and pressures may be supplied to the spray nozzles to attain the desired heated spray.

An object of the invention is to provide a unit wherein the air flowing therethrough will be automatically maintained at a desired temperature and may be taken therefrom through hose lines to individual nozzles at desired pressures. To this end, the unit includes a heated air distributing manifold having a plurality of individual pressure controlled hose line connections.

A further object is to provide an air heating unit having a high degree of safety, adapting it for use in the hazardous atmosphere of paint shops and the like, the air heating compartment being insulated and all electrical parts being enclosed in explosion and dust proof casings.

A further object is to provide an air heating unit which will eliminate oil and water troubles which were heretofore experienced in the use of unheated air, the process of heating the air according to the invention removing any oil and water particles therefrom.

A further object is to provide a unit which may be readily assembled and disassembled, and to this end it is particularly proposed to provide insulation surrounding the air heating compartment and confined within on outer casing, such insulation being in the form of finely divided insulating material which may be readily poured into the container about the heating compartment in assembling the unit and readily poured therefrom when it is desired to attain access to internal parts of the unit for repair or replacement.

Other objects and advantages of the invention

2

will become apparent from a consideration of the folowing detailed description taken in connection with the accompanying drawing wherein a satisfactory embodiment of the invention is shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawing:

Fig. 1 is a front elevation of an air heating unit according to the invention, one hose line being shown connected to the manifold section thereof;

Fig. 2 is a view partially in side elevation and partially in vertical section with parts broken away;

Fig. 3 is a view partially in top plan and partially in horizontal section, taken along the line 3—3 of Fig. 2;

Fig. 4 is a horizontal sectional view taken along the line 4—4 of Fig. 2; and

Fig. 5 is a diagrammatic view showing the arrangement of the air heating unit in relation to the spray booth and spray nozzles.

Referring to the drawings, the air heating unit comprises an outer casing, indicated generally as 10, constructed of sheet metal and of generally rectangular form including a rectangular front wall 11, rectangular side walls 12—12, bent rearwardly at right angles to the front wall, and a removable rear wall 13, also rectangular in form and having forwardly bent side flanges 14—14 secured by screws 15 over the rearward vertical marginal edge portions of the side walls 12. A flanged cover 16 is removably secured upon the upper end of the casing by screws 17.

Centrally within the casing there is provided an air heating chamber or space 18 enclosed by a vertically disposed cylindrical metal tube 19, closed at its upper end by a top closure plate 20 welded within the upper end of the tube, and being mounted at its lower end in a base plate 21 having a circular opening 22 in which the lower end of the tube is fitted, the base plate 21 being secured within the casing by screws 23 engaged through the side walls of the casing and screwed into the peripheral edges of the base plate.

The base plate 21 is inwardly offset from the lower edges of the casing 10 and within the space thus provided at the lower end of the casing, a closure plate 24 is secured to the underside of the base plate 21 by means of bolts 25, this closure plate closing the lower end of the chamber 18 and providing a support for an explosion proof junc-

tion box 26 which is secured to its under side by screws 27 engaged through attachment lugs 28 provided upon the junction box. The plate 24 mounts the lower mounting ends 29 of a plurality of resistance heating elements 30—30 of inverted V-shape disposed vertically within the chamber 18, the lower terminal ends 31 of the mounting portions 29 extending into the junction box 26.

In addition to the support of the tube 19 by the base plate 21, it is rigidly connected to the removable rear wall 13 of the casing by means of a pair of horizontally disposed posts 32—32 welded to the side of the tube, each provided at its outer end with a threaded stud 33 engaged through a hole 34 in the wall 13 and secured by a nut 35. These threaded studs 33 serve as mounting studs for the unit, being readily attachable to any desired supporting structure in relation to the spray apparatus. At the lower end of the tube 19 there is provided a horizontally disposed air inlet tube 36 secured at its inner end as by welding in a hole 37 in the tube 19 and having its outer end extending outwardly through a hole 38 in the casing rear wall 13. This inlet tube is adapted to have connected thereto a compressed air supply hose from a suitable air compressor and accumulator (not shown).

At the upper end of the chamber 18 in proximity to the upper ends of the resistance heating elements 30, there is provided a horizontally disposed air outlet tube 39 secured at its inner end as by welding within a hole 40 of the tube 19 and extending at its outer end through a hole 41 in the casing wall 11. A distributing manifold for the connection of a plurality of hose lines to the unit is mounted upon the outer end of the outlet tube 39, and consists of a pipe cross fitting 42 having one side connected to the pipe 39 and its opposite side connected to a pipe 43, upon the outer end of which is secured a temperature gage 44. The other two opposed sides of the cross fitting are each connected to a pair of hose line connecting units, the parts of these units at each side comprising a pipe connection 45 screwed into the cross fitting, a pipe T-fitting 46 screwed upon the pipe connection 45, a pipe connection 47 screwed into the T-fitting 46, a second T-fitting 48 screwed upon the pipe connection 47, and a closure plug 49 screwed into the outer end of the T-fitting 48.

Each of the T-fittings 46 and 48 is provided with a valve fitting 50 connected to the center connection of the T-fitting by a threaded pipe connection 51, this valve fitting being of any suitable type and shown as provided with a control knob 52 controlling its air chamber whereby a controlled pressure of air from the manifold is distributed through the valve fitting. The air chamber of the valve fitting has connected to its upper side an air pressure gage 53 having an after-cooler unit 54 interposed between the air chamber and the valve for the purpose of radiating heat from the air flowing to the gage. To the lower side of the air chamber there is connected a hose connecting threaded nipple 55 upon which the end fitting 56 of a hose line 57 may be screwed.

The unit, as illustrated, is a four gun outlet type, adapted to have four hose lines connected to it for the purpose of serving four spray guns or nozzles. Obviously, the invention contemplates any suitable number of hose line connections, it being only necessary to add hose line connecting units to the manifold. Through the individual pressure control afforded by the valves, any desired pressure may be provided for the individual nozzles.

Upon the forward front wall 11 of the casing 10 a thermostat unit 58 of suitable explosion and dust proof type, is secured by screws 59, the thermostat unit being provided with a control knob 60 at its forward side and a pilot light 61, also of explosion and dust proof type, connected to its upper side by a pipe connection 62. The lower side of the thermostat is connected to the junction box 26 by an explosion and dust proof conduit consisting of a pipe connection 63 screwed into the base wall of the thermostat casing, a pipe coupling member 64 screwed upon the pipe connection 63, a pipe connection 65 screwed into the coupling, an explosion and dust proof elbow pipe unit 66 screwed upon the pipe connection 65, and a pipe connection 67 screwed at one end into the elbow and at its other end into the threaded union hub 68 at one side of the junction box. A power line carrying pipe 69 is screwed into the threaded union hub 70 at the other side of the junction box. The power line 71 through the pipe 69 is carried through the junction box and thence through conduit to the thermostat, the thermostat in turn being connected by a conductor 72 to the terminal ends of the resistance heating elements 30. Fig. 2 shows the connection of the conductor 72 to one side of each of the heating elements.

In the upper end of the chamber 18, above the upper ends of the resistance heating elements, there is horizontally disposed a thermostat capillary 73 having a bulb end 74 centrally positioned axially within the air outlet pipe 39, the capillary being carried through a pipe coupling 75 screwed into the tube 19 and through a stuffing box 76 upon the outer end of the pipe coupling, from which it is carried down through the space between the tube 19 and the casing 10 and through an opening 77 in the front wall 11 of the casing to the thermostat. Thus the air moving upwardly under pressure through the chamber 18 is heated by the resistance heating elements, and as it passes the end of the outlet pipe 39 its temperature affects the thermostat capillary to regulate the current to the heating elements. The temperature of the air supplied to the manifold is thus maintained to substantially correspond to the thermostat setting.

In the casing 10, in surrounding relation to the tube 19, finely divided insulating material 78 is poured, so that it forms an insulating mass completely filling the space between the tube 19 and the casing. In order to remove the insulating material for the purpose of examination, repair or replacement of the parts within the casing, it is only necessary to remove the cover 16 and pour the insulating material from the casing.

The heated air passes through the outlet tube 39 at the same temperature both to the manifold and the thermometer 44, so that there is a visual air temperature indication to be checked against the setting of the thermostat. The heated air under pressure passes to the several valve units of the manifold and may be taken off each unit at any desired pressure by controlling the air chamber of the valve 50 through operation of the control knob 52, the gage 53 indicating the controlled pressure. Thus the air flowing through the individual hose lines may be controlled up to the maximum pressure or entirely shut off, as desired.

Fig. 5 illustrates diagrammatically a typical installation in relation to a spray booth 79.

There are shown three spray guns 80 respectively connected by hose lines 81 to a container 82 containing paint, enamel, or other suitable coating material, which is forced to the spray guns in the usual manner by air pressure supplied to the container through a hose line 83. The three guns 80 have hose lines 57 from three of the manifold outlets of the heater unit connected thereto. A fourth hose line 57 is shown connected to an air spray nozzle 84 which simply blows heated air upon articles previously sprayed by the guns 80. The heating unit is supplied with air under pressure through a hose line 85 connected to the inlet tube 36.

What is claimed is:

1. In an electric air heating spray unit, an outer casing comprising a base wall having a central opening, a top wall, and side walls extending between said base and top walls, an inner elongated vertically disposed heating chamber within said casing comprising a tubular side wall open at its lower end and inwardly spaced from said side walls of said casing, and a top wall closing its upper end and downwardly spaced from said top wall of said casing, the lower end of said tubular side wall being engaged with said base wall and being open downwardly through said opening of said base wall, an air inlet conduit connected to said tubular side wall of said chamber contiguous to its lower end and extended laterally outwardly above said base wall through a side wall of said casing, an air outlet conduit connected to said chamber contiguous to its upper end and extended outwardly through said casing, a closure plate member removably secured to said base wall and enclosing said opening thereof and the lower end of said chamber, a vertically disposed electrical resistance heating means secured to and supported by said closure plate within the lower open end of said chamber extending upwardly out of contact with said tubular side wall to a point in proximity to said outlet conduit and spaced downwardly from said top wall of said chamber, a heat responsive element disposed within said outlet conduit, a thermostat arranged to control the voltage to said heating means, and means connecting said heat responsive element to said thermostat.

2. In an electric air heating spray unit, an outer casing comprising a base wall having a central opening, a removable top wall, and side walls extending between said base and top walls, an inner elongated vertically disposed heating chamber within said casing comprising a tubular side wall open at its lower end and inwardly spaced from said side walls of said casing, and a top wall closing its upper end and downwardly spaced from said top wall of said casing, the lower end of said tubular side wall being engaged with said base wall and being open downwardly through said opening of said base wall, an air inlet conduit connected to said tubular side wall of said chamber contiguous to its lower end and extended laterally outwardly above said base wall through a side wall of said casing, an air outlet conduit connected to said chamber contiguous to its upper end and extended laterally outwardly through said casing, a closure plate member removably secured to said base wall and enclosing said opening thereof and the lower end of said chamber, a vertically disposed electrical resistance heating means secured to and supported by said closure plate within the lower open end of said chamber extending upwardly out of contact

with said tubular side wall to a point in proximity to said outlet conduit and spaced downwardly from said top wall of said chamber, a heat responsive element disposed within said outlet conduit, a thermostat arranged to control the voltage to said heating means, means connecting said heat responsive element to said thermostat, and finely divided pourable insulating material within said casing in surrounding relation to said chamber and between its top wall and said removable top wall of said casing, said material being pourable into and out of said casing through the upper end of said casing upon removal of said top wall therefrom.

3. In an electric air heating spray unit, an outer casing comprising a base wall having a central opening, a top wall, and side walls extending between said base and top walls, an inner elongated vertically disposed heating chamber within said casing comprising a tubular side wall open at its lower end and inwardly spaced from said side walls of said casing, and a top wall closing its upper end and downwardly spaced from said top wall of said casing, the lower end of said tubular side wall being engaged with said base wall and being open downwardly through said opening of said base wall, an air inlet conduit connected to said tubular side wall of said chamber contiguous to its lower end and extended laterally outwardly above said base wall through a side wall of said casing, an air outlet conduit connected to said chamber contiguous to its upper end and extending outwardly through said casing, a closure plate member removably secured to said base wall and enclosing said opening thereof and the lower end of said chamber, a vertically disposed electrical resistance heating means secured to and supported by said closure plate within the lower open end of said chamber extending upwardly out of contact with said tubular side wall to a point in proximity to said outlet conduit and spaced downwardly from said top wall of said chamber, a heat responsive element disposed within said outlet conduit, a thermostat arranged to control the voltage to said heating means, means connecting said heat responsive element to said thermostat, terminal means on said heating means extended through said closure plate, and a junction box secured upon the under side of said closure plate and enclosing said terminal means.

4. In an electrical air heating spray unit, an outer casing, an inner elongated heating chamber within said casing, an air inlet conduit connected to said chamber adjacent one end and extended outwardly through said casing, an air outlet conduit connected to said chamber adjacent the other end and extended outwardly through said casing, electrical resistance heating means within said chamber between said inlet and outlet conduits, a heat responsive element disposed within said outlet conduit, a thermostat arranged to control the voltage to said heating means, means connecting said heat responsive element to said thermostat, and a hose line connector connected to said outlet conduit, a control valve for said connector, and a pressure gage connected to said valve.

5. In an electrical air heating spray unit, an outer casing, an inner elongated heating chamber within said casing, an air inlet conduit connected to said chamber adjacent one end and extended outwardly through said casing, an air outlet conduit connected to said chamber adja-

cent the other end and extended outwardly through said casing, electrical resistance heating means within said chamber between said inlet and outlet conduits, a heat responsive element disposed within said outlet conduit, a thermostat arranged to control the voltage to said heating means, means connecting said heat responsive element to said thermostat, a temperature gage connected to said outlet conduit, a hose line connector connected to said outlet conduit, a control valve for said connector, and a pressure gage connected to said valve.

6. In an electrical air heating spray unit, an outer casing, an inner elongated heating chamber within said casing, an air inlet conduit connected to said chamber adjacent one end and extended outwardly through said casing, an air outlet conduit connected to said chamber adjacent the other end and extended outwardly through said casing, electrical resistance heating means within said chamber between said inlet and outlet conduits, a heat responsive element disposed within said outlet conduit, a thermostat arranged to control the voltage to said heating means, means connecting said heat responsive element to said thermostat, a manifold connected to said outlet conduit and including a plurality of hose line connectors, a control valve

for each of said hose line connectors, and a pressure gage connected to each of said valves.

7. In an electrical air heating spray unit, an outer casing, an inner elongated heating chamber within said casing, an air inlet conduit connected to said chamber adjacent one end and extended outwardly through said casing, an air outlet conduit connected to said chamber adjacent the other end and extended outwardly through said casing, electrical resistance heating means within said chamber between said inlet and outlet conduits, a heat responsive element disposed within said outlet conduit, a thermostat arranged to control the voltage to said heating means, means connecting said heat responsive element to said thermostat, a manifold connected to said outlet conduit and including a plurality of hose line connectors, a control valve for each of said hose line connectors, a pressure gage connected to each of said valves, and a temperature gage connected to said manifold.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,557,142	Cromwell	Oct. 13, 1925
1,946,262	Adams	Feb. 6, 1934
1,985,280	Carleton	Dec. 25, 1934