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[31] **971/67**

1,946,262 2/1934 Adams ..... 219/373(UX)  
2,609,477 9/1952 Borda ..... 219/382X  
2,681,408 6/1954 Bronk ..... 219/379  
3,149,224 9/1964 Horne et al. .... 219/501X  
3,419,708 12/1968 Niewyk et al. .... 219/364(UX)

FOREIGN PATENTS

662,887 7/1938 Germany ..... 219/381  
400,548 4/1966 Switzerland ..... 219/373

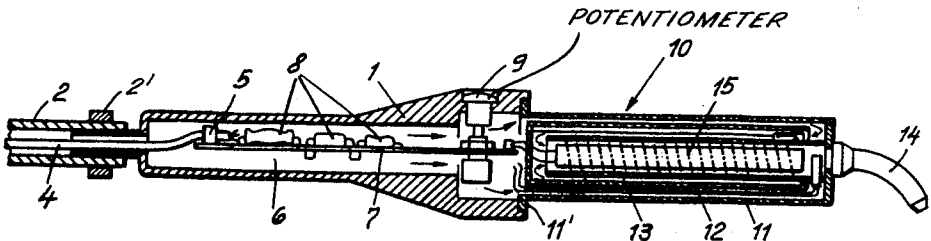
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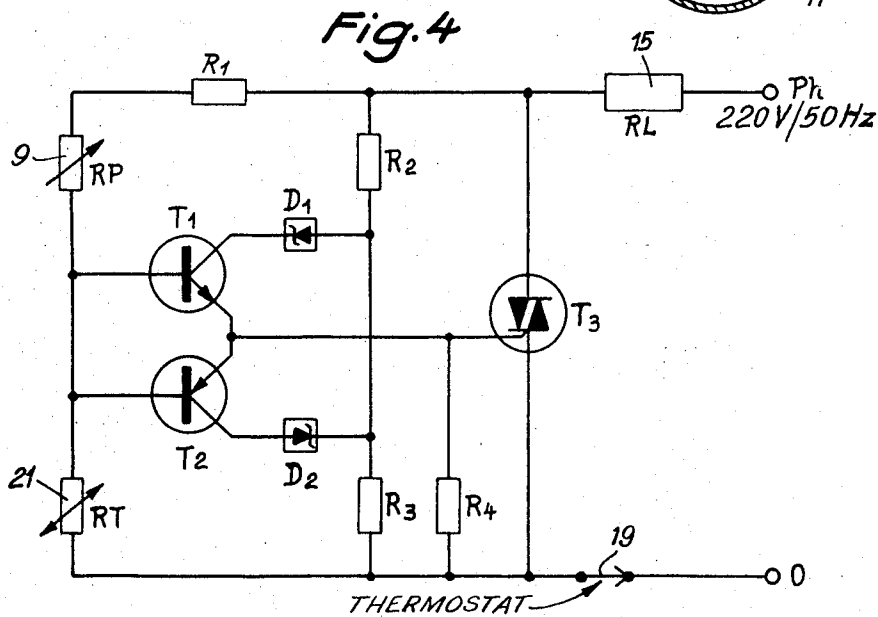
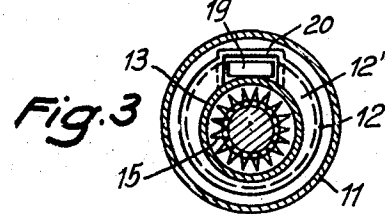
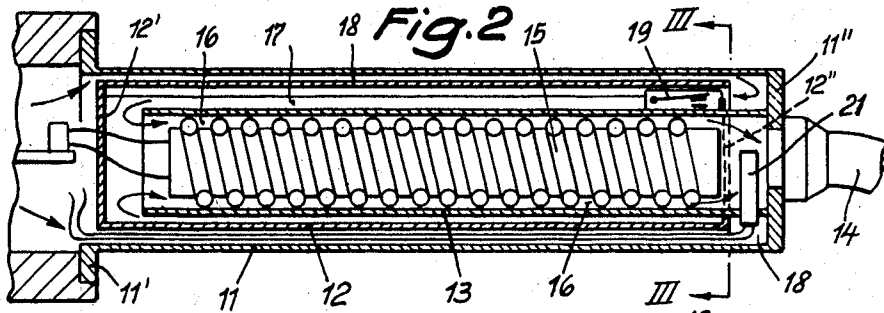
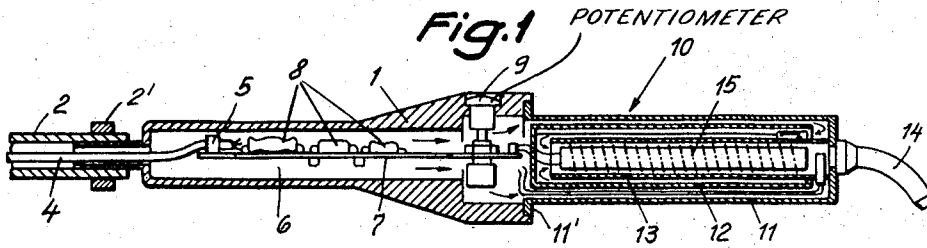
[54] **ELECTRICALLY HEATED HOT-AIR DISPENSER**  
**3 Claims, 4 Drawing Figs.**

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**219/364, 219/368, 219/374, 219/379, 219/501**  
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**F24h 3/04**  
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**379—381, 501**

[56] **References Cited**  
**UNITED STATES PATENTS**  
1,227,324 5/1917 Russell et al. .... 219/381  
1,313,861 8/1919 Reid et al. .... 219/379

**ABSTRACT:** A hot-air dispenser having an elongated handle at one end of which an electric power-supply cable and a compressed-air tube are connected so that the inflowing air passes around the circuit elements and temperature-control potentiometer contained in the handle. At the other end of the handle, a series of coaxial tubes are provided, the innermost of which contains a resistive heating element and communicates with the outlet nozzle at the forward end of the heating assembly. The compressed air passes back and forth through the spaces between the tubes and from the outermost chamber inwardly. A bimetallic switch is cooled by the flow of compressed air but heats in the absence of airflow to cut off the resistive heating element when air supply is interrupted.





INVENTOR.

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**ELECTRICALLY HEATED HOT-AIR DISPENSER**

In hitherto used electric hot-air jet apparatus with compressed-air supply and an electric resistive-heating element, the connection of the air tubes is effected separately from the current-supply cable, an arrangement which has proved to be disturbing when handling the apparatus. Altering the temperature of the air while keeping the quantity of air constant is attained either by changing the heating element, by stepped switching or by connecting a variable ratio transformer in series with the heating element. A special drawback, however, exists when the heating element is provided in the hot-air apparatus, since the surface of the hot-air generator may attain temperatures which may lead to accidents and outbreaks of fire.

The invention has for its object the provision of an electric hot-air producing apparatus, in particular for welding thermoplastic material, wherein the handle incorporates an electric control device, around which the supplied compressed air flows and which is fitted with a potentiometer enabling the heating capacity to be continuously regulated; the hot-air generator incorporates a resistive heating element and is built onto the handle of the apparatus, the air being led through a plurality of hollow-cylindrical ducts surrounding the heating elements in the form of jackets, by syphonlike action. A thermostat controlling the heating current circuit is built into the return duct at a constricted cross section.

The accompanying drawing shows an embodiment illustrating the invention.

In the drawing:

FIG. 1 shows a partial longitudinal section of the hot-air jet apparatus;

FIG. 2 shows a sectional view of the front part of the apparatus on a larger scale;

FIG. 3 is a sectional view taken on the line III-III of FIG. 2; and

FIG. 4 represents the wiring diagram of the electronic control device fitted in the apparatus.

The electric hot-air jet apparatus shown includes a handle 1 onto the rear end of which a compressed-air tubing 2 is introduced. The compressed-air tubing is held by a pull-relieving clamp 2'. The current-supply cable 4 lies in air tubing 2 and is introduced together with the tubing into the handle 1, within which the end of the cable is secured by a separate pull-relieving clamp 5 on the carrier 7. Located on carrier 7 in a hollow space 6 of handle 1 through which the supplied air flows, is an electronic control device 8 for continuous regulation of the heating capacity, whose wiring diagram is illustrated in FIG. 4.

Numeral 9 designates a potentiometer for regulation of the heating current. At the front end of handle 1 there is fitted the hot-air generator 10 which comprises an outer tube 11, a central air-directing tube 12 and an inner air-guiding tube 13, the outer tube 11 forming the jacket of the hot-air generator and being connected to handle 1 by a flange 11'. The outside of the front end wall 11'' of jacket tube 11 has arranged thereon the hot-air jet nozzle 14, while the inner side thereof has fixed thereon the inner air-guiding tube 13, open at its rear end. Numeral 15 denotes the resistance heating element which is fitted with clearance into the inner tube 13 in order to form a hot-air duct 16, with the resistance heating spiral situated directly in the air current. The central means 12 serving as air-directing tube is partly open at the front and is provided with a closing cover 12' at the back. Together with the inner tube 13 it forms the return-flow duct 17. Formed between the directing tube 13 and the jacket tube 11 is the outer hollow cylindrical air duct 18. In this duct the air is preheated, and at the same time the jacket tube 11 is effectively cooled. Near the front end of central tube 12, a bimetallic thermostat 19 is fitted in the return-flow duct 17 between said tube 12 and inner tube 11. Thermostat 19 is located at a passage opening 20 (FIG. 3) of the front partial closure 12'' of the central tube 12, constricting the return-flow duct 17. At this passage 20 the

speed at which the air flows is greatly increased, so that an interruption of current by the thermostat can only occur when the air flow is insufficient or fails. 21 designates a thermistor or semiconductor for keeping the temperature of the hot air constant. This thermistor projects into the hot-air duct 16 immediately ahead of the hot-air outlet at the jet nozzle 14, while its connecting portion lies in the cold-air zone 18 outside the inner tube 13.

As can be seen from the wiring diagram in FIG. 4, the electronic control device arranged in handle 1 allows the heating capacity of resistance RL of heating element 15 to be continuously regulated through a potentiometer 9, shown at RP in FIG. 4. The heating is regulated by means of a TRIAC, which is controlled through a stabilized voltage divider and two Zener diodes D<sub>1</sub>, D<sub>2</sub> which are coupled in opposition to the transistors T<sub>1</sub>, T<sub>2</sub>. By the voltage divider, which is formed by thermistor RT and potentiometer RP, the bases of the transistors are controlled. The purpose of the Zener diodes is to compensate a fluctuation of  $\pm 10$  percent in the line voltage. According to the setting of the potentiometer RP and the magnitude of the thermistor resistance, which is determined by the outlet temperature at nozzle 14, the control voltage at the TRIAC rises or falls. Thus the capacity of the heating is controlled by the phase splitting, which is dependent on the temperature of the air current. This circuit makes it possible to keep the air temperature at the nozzle constant, and in fact independent of any fluctuations between  $\pm 10$  percent in the line voltage and independent of the rate of air flow. Resistors R<sub>1</sub> - R<sub>4</sub> bias the TRIAC and the transistors T<sub>1</sub>, T<sub>2</sub>.

I claim:

1. A hot-air dispenser, comprising:

an elongated hollow handle having means defining an air flow passage therethrough;

means for connecting an air-supply tube to said airflow passage at one end of said handle and an electric cable to said one end of said handle whereby relatively cool air traverses the interior of said handle;

a heating unit affixed to the other end of said handle and including an outer cylindrical tube, a central cylindrical tube coaxially received in said outer cylindrical tube with a clearance communicating with the interior of said handle airflow passage at the end proximal said handle and receiving air therefrom, the end of the clearance remote from the handle being closed, and an inner cylindrical tube coaxially received in said central cylindrical tube with a second clearance closed at the end proximal the handle and communicating with the first-mentioned clearance remote from said handle, the interior of said inner tube communicating with said second clearance proximal to said handle;

a resistive heating element received in said inner tube and defining therewith a heating chamber traversable by air; nozzle means secured to said heating unit remote from said handle and communicating with said chamber of said inner tube; and

temperature control means including circuit means received in the airflow passage of said handle, exposed to the flow of cooling air therethrough, and connected to said resistor heating element for controlling the current flow therethrough, and a temperature-responsive element positioned immediately ahead of said nozzle means and exposed to air traversing said chamber and connected to said circuit means.

2. The hot-air dispenser defined in claim 1 wherein said cable and said tube are each secured to said handle by a separate pull-relieving clamp.

3. The hot-air dispenser defined in claim 1, said circuit means includes a potentiometer mounted in said handle, said dispenser further comprising temperature-responsive switch means in one of said clearances for disconnecting said resistive heating element upon failure of the air supply of said chamber.