

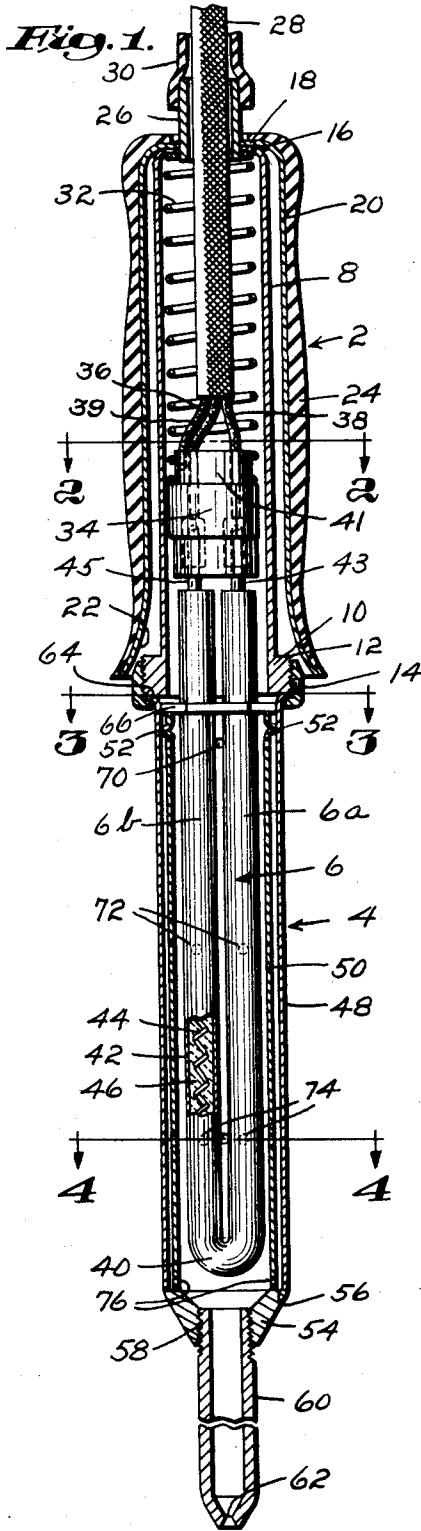
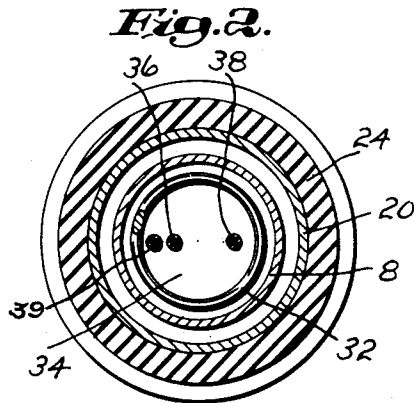
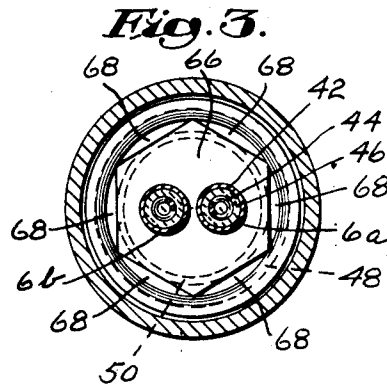
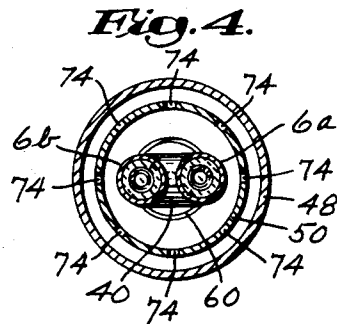
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S. J. KAMINSKY

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DEVICE FOR PRODUCING HOT AIR

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Inventor:
Stanley J. Kaminsky,
by **Porter, Chittick & Russell**
Attorneys

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DEVICE FOR PRODUCING HOT AIR

Stanley J. Kaminsky, Norwood, Mass.

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This invention is concerned with a tool designed to produce a continuous stream of hot air. The device is of such character that it may be held in the hand and the hot air stream directed at any particular location. The tool may be put to any desired use. It is particularly useful in the welding of plastics, but this is only one field of activity in which it has been found effective.

One of the objects of the present invention is to provide a tool supplied with electricity and compressed air so constructed that air passing therethrough in appreciable volume will be continuously and uniformly heated to a temperature in the order of 800 to 1000 degrees or higher, if desired, with means for directing the air in a concentrated stream at a selected area to be treated. The tool may be manually manipulated or it could be supported in a machine to be mechanically controlled.

Another object of the invention is the provision of a barrel construction so insulated by the moving air within that the exterior of the barrel will not become dangerously hot, thereby eliminating the need of exterior insulation.

Another object of the invention is the provision of a handle construction insulated from the barrel in such manner that there will be no temperature rise of the handle.

The invention will be more clearly understood as the description proceeds with the aid of the accompanying drawings in which

Fig. 1 shows the complete tool in vertical section, with the exception of the electrical heating element which is in side elevation and partially cut away.

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1.

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 1.

The major elements of the tool comprise a handle 2, a barrel 4, and a heating element 6.

The handle comprises a metal cylinder 8, having an enlargement 10 at its lower end, which enlargement is externally threaded as at 12 to receive a threaded flanged nut 14 which acts to hold the barrel 4 fixed with respect to the handle in a manner that will hereinafter be explained. The upper end of cylinder 8 is flanged inwardly at 16 where it is rigidly affixed to an overlying inwardly extending flange 18 of a concentric metal cylinder 20 spaced from cylinder 8 as shown. The lower end of cylinder 20 is flared as at 22 so as to provide clearance with respect to nut 14 and to protect the user's hand against movement toward the barrel. A removable grip 24, preferably of flexible insulating material, entirely surrounds and covers the cylinder 20.

A metallic tubular extension 26 is affixed in airtight relation to the flange 16 of cylinder 8. This extension is large enough to permit the passage therethrough of the electric cable 28 which feeds the heating element 6. A flexible hose 30, usually of substantial length to permit

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any required movement of the tool, is attached to extension 26 and this hose is connected to any convenient source of air or other suitable gas under pressure. The size of hose 30 with respect to cable 28 is such that should the hose 30 accidentally be stepped upon there will still be clearance between cable 28 and the interior hose wall to permit continued flow of air therethrough. This is important as it minimizes the possibility of the heating element burning out through overheating due to lack of air flow.

Within cylinder 8 is a helical spring 32 with its upper end bearing against the inturned flange 16. The lower end of spring 32 engages a circular electrical socket 34 smaller than the interior of cylinder 8 which socket receives the individual wires 36 and 38 of the electrical supply. A third wire 39 is grounded to the metal cap 41 of the socket, which cap in turn is grounded to the flange 16 through spring 32. The socket at its lower end receives cooperating prongs 43 and 45 extending thereinto in conventional fashion from the upper ends of the two parts of the heating element 6. By this construction electricity may be conveniently supplied to the heating element 6 to raise the temperature of the latter to any desired figure as determined by the power supplied and the rate of flow of air thereover.

The heating element 6 comprises a continuous unit bent in hairpin manner as at 40 with the two vertical legs hereinafter being referred to as 6a and 6b. This element differs from the conventional cartridge and coil types of heating elements by incorporating the hairpin bend which results in giving greater exposed heating area in a minimum space. This heating element comprises a metal exterior tube 42 and an interior electrical resistance coil 44 separated therefrom by insulation 46. The heat of the coil is transmitted through the insulation to the tube 42.

The barrel 4 is preferably made of stainless steel. This barrel comprises an outer cylinder 48 and an inner cylinder 50. These two cylinders are held in concentric spaced relation by means of four laterally extending projections 52 spaced 90 degrees apart at the upper end of cylinder 48. Two of the projections are shown in Fig. 1. The lower ends of the two cylinders 48 and 50 are held in concentric spaced relation and closed by means of a tapered end piece 54 which is welded to the ends of both tubes as at 56. The lower open end of end piece 54 may be threaded as at 58 to receive a nozzle 60 having an opening 62 at its outlet end for directing air to the position desired.

The upper end of outer cylinder 48 has an outwardly turned flange 64 which is engaged between the bottom face of enlargement 10 and the inturned flange of nut 14. By setting up on nut 14 tightly the barrel 4 will be rigidly connected with the handle 2.

The heating element 6 is maintained in correct position with respect to the handle and the barrel in the following manner:

A multi-sided plate 66 has two holes therethrough through which extend the two legs 6a and 6b of the heating element. This plate is rigidly secured in airtight relation to the two legs so that upon proper mounting of plate 66 with respect to the barrel the heating element will be maintained in spaced relation with interior cylinder 50. Plate 66 as shown in Fig. 3 is hexagonal and of such dimensions that the six corners of the plate fit within the upper end of outer cylinder 48. The underside of the plate rests on the upper end of the inner cylinder 50, and the six sides of the hexagon being spaced from the interior of cylinder 48 provide a plurality of openings 68 through which air may pass as it flows downwardly from the interior of the cylinder 8 to enter the annular space between cylinders 48 and 50. It will be understood, how-

ever, that plate 66 can assume other configurations so long as it covers the upper end of the inner cylinder 50 and has laterally extending projections that will engage the inner wall of outer cylinder 48 to hold the plate and heating element in correct position. Spring 32 acting on socket cap 41 constantly urges the heating element downwardly so that the hexagonal plate 66 attached to legs 6a and 6b is always firmly in engagement with the upper end of cylinder 50. With the plate 66 in this position, the heating element will be correctly located within and spaced from the wall of inner cylinder 50.

The construction just described is substantially immune to damage from dropping to the floor from normal working position as the barrel and handle are of steel and the heating element has its exterior of metal and is supported in space within inner cylinder 50.

Attention is now directed particularly to the air passages in the inner cylinder 50 leading from the annular space between cylinders 48 and 50 to the interior of cylinder 50. The object of the arrangement of the air passages is to have them in such number and area that air flowing downwardly from cylinder 8 to a position between outer and inner cylinders 48 and 50 will pass through apertures in inner cylinder 50 to encounter the heating element 6 in increasing volume as the lower end of the element is approached. By arranging the apertures through the inner cylinder 50 in the manner about to be described, the result is a greater and faster flow of air between the inner and outer cylinders 50 and 48 as the lower end of the barrel is approached. This has the desirable result of insulating the outer cylinder through the rapid flow of air and of keeping the temperature of the outer tube more nearly uniform from end to end. The air passing through the barrel 4 keeps the outer surface sufficiently cool so that other insulation is not needed.

The air passages or apertures are arranged as follows:

At the upper end of cylinder 50 there are four air passages 70 spaced 90 degrees apart, of which three are shown in Fig. 1. At an intermediate lower level, there are six air passages 72, of which four are shown in Fig. 1; and at a still lower level at the section at which Fig. 4 is taken, there are eight air passages 74, five being shown in Fig. 1 and all eight in Fig. 4.

By this arrangement it can be seen that if the areas of the several apertures are equal, the volume of air flowing through holes 70 will be equal to X, the volume flowing through holes 72 will be $1\frac{1}{2}X$, and the volume flowing through holes 74 will be $2X$. Thus air flows between cylinders 48 and 50 with increased velocity as the lower end is approached. This has the desired increased cooling effect that maintains the exterior of barrel 4 at a suitable temperature. Obviously the numbers and locations of the holes and their areas may be varied to give different effects which might be necessary with heating elements of greater or less temperature.

In order to prevent the development of dead air spots between the lower ends of cylinders 48 and 50, two additional holes 76 are provided through which a lesser amount of air constantly flows to mingle with the high temperature air flowing off the heating element 6.

The summary of the operation of the unit is as follows:

The electricity is turned on to feed through cable 28 to the heating element 6. Air under pressure passing through hose 30 and extension 26 enters cylinder 8, flowing downwardly past the exterior circumference of socket 34 and thence through the openings 68 provided by the hexagonal plate 66 to flow downwardly into the annular space between outer and inner cylinders 48 and 50. Some of the air immediately enters inner cylinder 50 through the apertures 70 to commence flowing downwardly along the hot heating element 6. This heated air then mingles with a greater quantity of air entering through apertures 72 and flows downwardly within inner cylinder 50 over heating element 6 to have its temperature raised still further. This portion of the air in turn mingles with the final quantity of air entering through apertures 74

and the total air then passes over the lower end of the heating element to be brought to final maximum temperature prior to being forced outwardly through end piece 54 and nozzle 60 (which nozzle may be of any convenient shape and dimension) to be delivered to the desired position.

The heat in outer cylinder 48 is transmitted only as far as the nut 14. Any further transmission of heat to the handle is prevented by the continuous flow of air through handle cylinder 8. Since this latter cylinder is connected to the larger grip covered cylinder 20 at a very small area where the flanges 16 and 18 engage, there is no heat conduction to cylinder 20. Hence grip 24 remains at normal room temperature even though the barrel may be relatively hot.

In using the tool for plastic welding purposes, the heating element may utilize power in the order of 400 watts to produce an air temperature of from 800 to 1000 degrees. It will be understood, however, that by varying the size of the parts, the power supplied, and the volume of air flowing therethrough, a tool may be made which will be capable of producing substantially any required air temperature within the capacity of the particular heating unit used.

It is my intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

I claim:

1. A hot air heating device comprising an elongated electrical heating unit surrounded by two concentric spaced cylinders with the annular space therebetween closed at one end, means for supplying air to the space between said cylinders at the other end thereof, said inner cylinder having a plurality of apertures therethrough so arranged that air is continually flowing between said cylinders toward the said closed end thereof to cool the exterior cylinder and air is continually flowing through said apertures to reach and flow over and along the said heating unit in increasing volume on its way to the discharge end of said cylinders.

2. A hot air heating device comprising an elongated electrical heating unit surrounded by two concentric spaced cylinders with the annular space therebetween closed at one end, means for supplying air to the space between said cylinders at the other end thereof, said inner cylinder having apertures therethrough of progressively increasing total cross-sectional area as the closed end of said cylinders is approached whereby air is caused to flow between said cylinders to cool the outer cylinder and air in progressively increasing volume will be caused to impinge on and flow over said heating element on the way to the discharge end of said cylinders.

3. A device for producing hot air comprising a continuous tubular element having a handle portion and an air heating portion, said element having an entrance at the handle end to receive air under pressure and having a discharge port at the heating end to deliver heated air therefrom, the heating portion of said element comprising inner and outer cylinders spaced from each other to provide an annular channel connected with the handle portion, means blocking direct entrance of air from said handle portion to said inner cylinder, apertures through the said inner cylinder to permit air to flow from said annular channel into the interior of said inner cylinder, and a heating element in said inner cylinder for heating air flowing thereover as the air passes from said apertures to said delivery opening.

4. A hot air heating device as set forth in claim 2, the means for supplying air to the space between said cylinders comprising a cylindrical element affixed to the outer of said cylinders, an air inlet into said cylindrical element and a handle for gripping said device comprising a second cylindrical element surrounding and spaced from said first cylindrical element and connected to said

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first cylindrical element at a position remote from said cylinders.

5. A device for producing hot air as set forth in claim 3, said handle portion comprising two concentric cylinders spaced from each other and connected at a position remote from said heating portion.

6. A hot air heating device comprising a handle, a barrel connected to and rigidly supported by said handle, and an elongated heating element positioned within said barrel, said barrel comprising inner and outer cylinders concentric with each other and having an annular space therebetween, piping means for supplying air to said barrel, means closing the annular space at one end of said cylinders, means at the other end of said barrel for blocking entrance of air into said inner cylinder while permitting air to enter the annular space between said cylinders, means for mounting said heating element within said handle and barrel in fixed and spaced relation thereto, apertures through said inner cylinder permitting air to flow from the annular space between said cylinders to the interior of said inner cylinder, whereby air may flow over

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said heating element to be heated thereby, the combined area of the said apertures per unit length of said barrel increasing as the exit end of said barrel is approached.

7. A hot air heating device as set forth in claim 6, said handle comprising two concentric cylinders spaced from each other and connected together at the end remote from said barrel.

8. A hot air heating device as set forth in claim 1, said electrical heating unit comprising a continuous element bent in hairpin manner and carried by means adapted to block entrance of air into the end of the inner of said cylinders.

References Cited in the file of this patent

UNITED STATES PATENTS

2,021,955	Carswell et al.	Nov. 26, 1935
2,120,583	Timberlake	June 14, 1938
2,577,269	Richardson et al.	Dec. 4, 1951
2,609,477	Borda et al.	Sept. 2, 1952