

Feb. 13, 1962

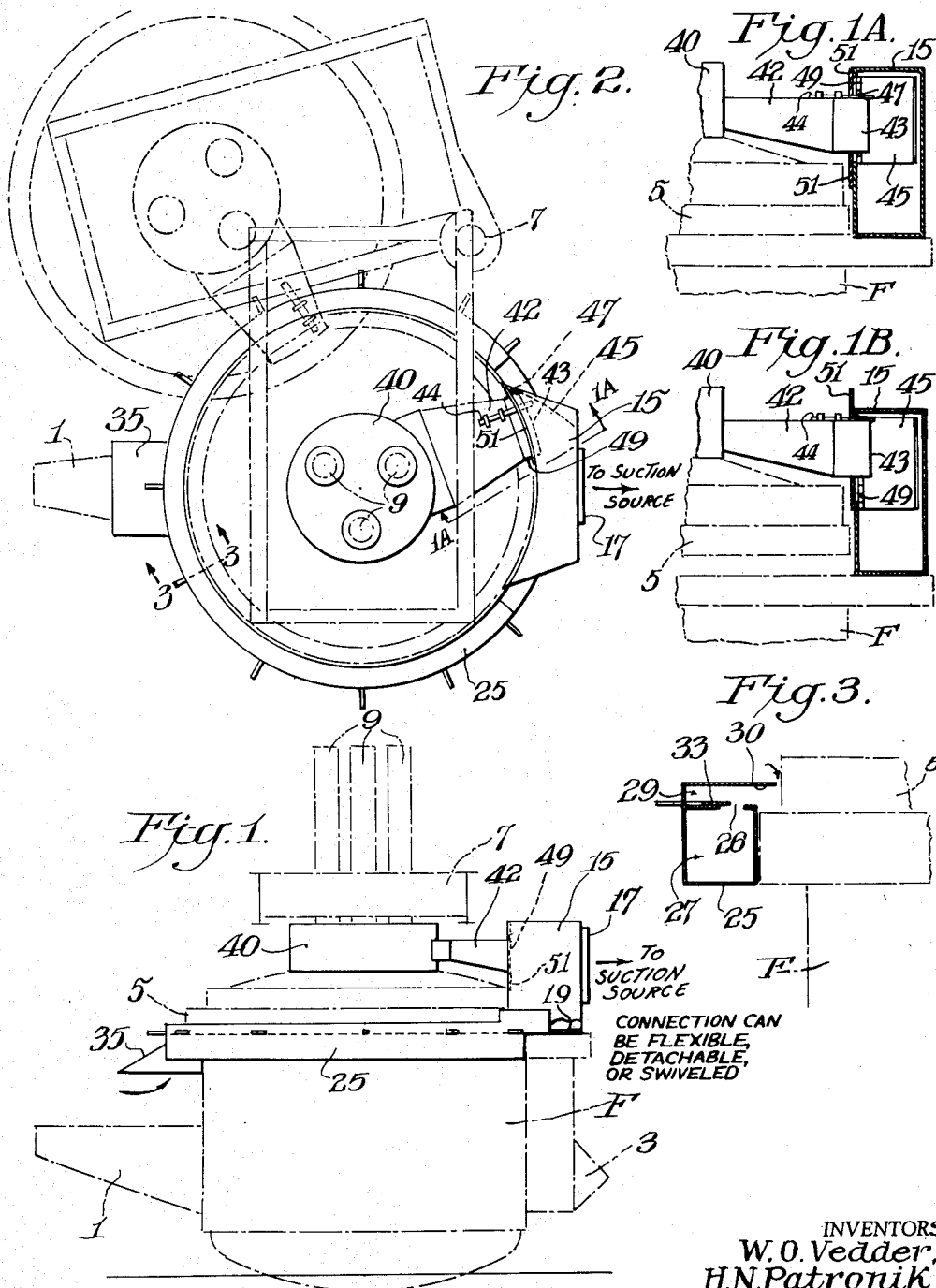
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FURNACE HOOD

Filed April 10, 1961

2 Sheets-Sheet 1



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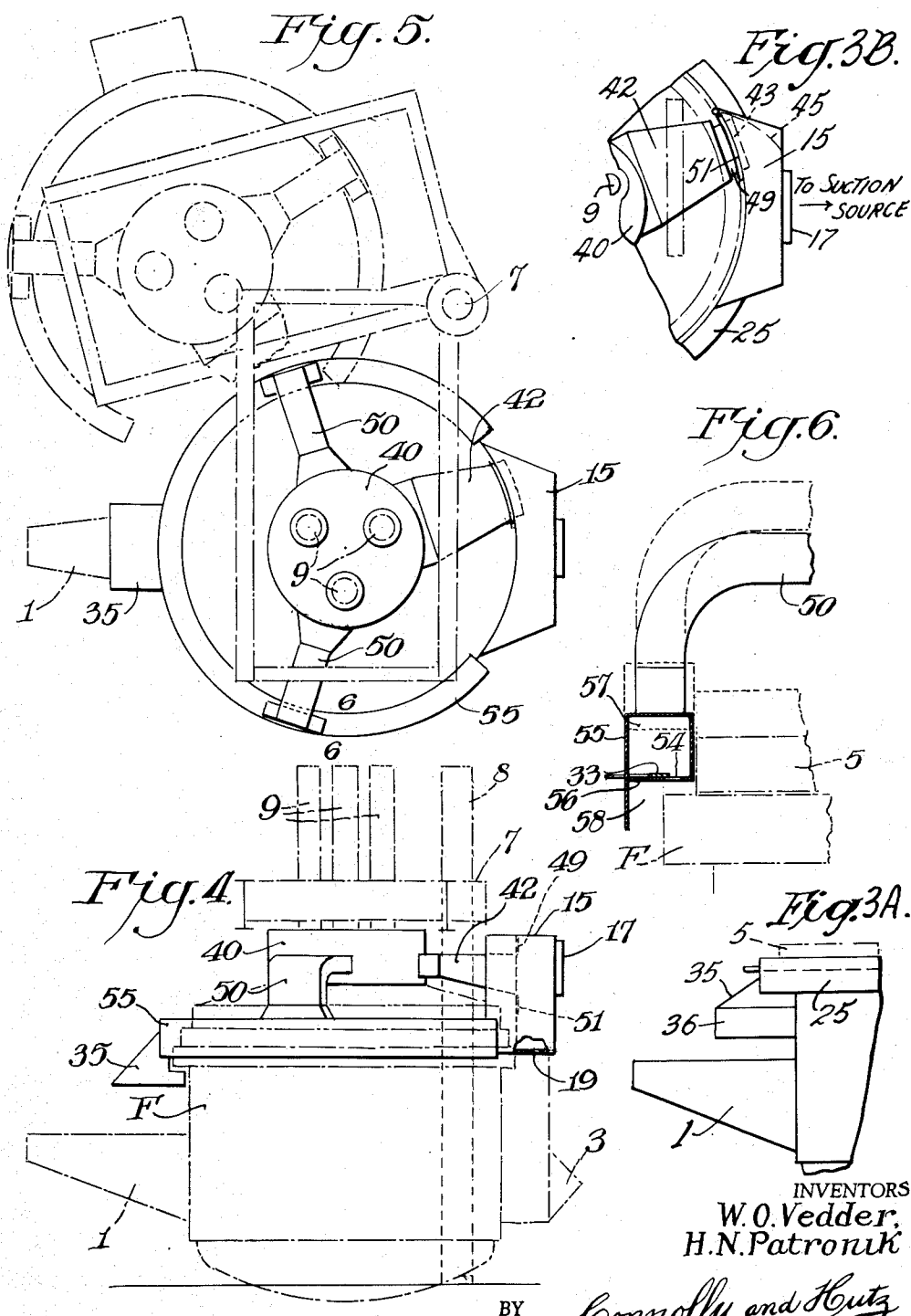
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FURNACE HOOD

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Filed Apr. 10, 1961, Ser. No. 101,908

9 Claims. (Cl. 13—9)

The present invention relates to furnace hoods. More particular this invention relates to hoods which are used with furnaces that have removable roofs. This application is a continuation-in-part of application Serial No. 781,701 filed December 19, 1958.

In the use of electrical furnaces, there is a problem of satisfactorily and efficiently removing discharged fumes, smoke and dust which are emitted from certain areas of the furnace body. In a typical electrical furnace, the above fumes, etc., may emanate from the heating electrode passageways in the furnace roof, from the point of jointure of the roof with the furnace body, and from the pouring and slag spouts. In addition, the furnace may include working and loading doors from which the above fumes, etc., may escape into the surrounding atmosphere.

Among the objects of the present invention is the provision of a novel furnace hood that is very effective for trapping the above discharges with a minimum amount of exhaust air yet is simple to use and maintain, and also presents a reduced amount of interference with normal furnace operations and adjustments.

The above as well as additional objects of the present invention will be more clearly understood from the following description of several of its exemplifications, reference being made to the accompanying drawings in which:

FIGS. 1 and 2 are side and plan views of one embodiment of the hood of the present invention in position upon a furnace provided with a roof, dash-dot lines showing the roof in place and dash-double-dot lines in FIG. 2, showing the roof laterally withdrawn;

FIG. 1A is a detail sectional view of the construction of FIG. 2 taken along line 1A—1A;

FIG. 1B is a view similar to FIGS. 1 and 1A taken with the roof shown lifted up in position for lateral withdrawal;

FIG. 3 is an enlarged detail view showing a portion of the hood and taken along lines 3—3 of FIG. 2;

FIGS. 3A and 3B are enlarged detail views similar to FIGS. 1 and 2 respectively showing modification of these constructions; and

FIGS. 4, 5 and 6 are views similar to FIGS. 1, 2 and 3 respectively of a further modified hood construction incorporating the present invention.

According to the present invention a furnace hood has a distribution box for mounting at a top portion of the furnace periphery for connection to a suction source, a ring-shaped conduit extending around the top of the furnace in communicating relationship with the distribution box, ports in the conduit for applying the box suction at selected locations around the top of the furnace, an electrode manifold hood portion for mounting on the furnace roof in electrode-encircling arrangement, said hood having a connector extension for connecting the electrode manifold hood portion to said box, said extension and box having automatic engaging elements connected to automatically establish a suction connection between the box and the manifold when the roof is in place over the furnace body, and to automatically close this suction connection when the roof is removed from the furnace body, said box and ring conduit being shaped to leave roof clearance over the furnace body.

The ring-shaped conduit is desirably divided into two

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ring-shaped compartments, one providing a continuous suction opening adjacent the furnace top and the other having spaced ports with externally manipulatable adjustable closures at selected locations around the conduit to establish communication between the two compartments.

Referring now to the drawings and more particularly to FIGS. 1—3, there is shown a rocking furnace F, a pouring spout 1 extending from one side of the furnace F while a slag spout 3 extends from the opposite side of the furnace F. The furnace may be rocked so that either the primary furnace product or the slag may be poured from the furnace. Since the rocking structure is old in the art, it is not shown in the drawing. A furnace top or roof 5 is supported by a pivoted frame 7 of well-known construction and operation whereby the top may be removed from or returned to operating position on the furnace to permit top charging of the furnace. In FIG. 2, the frame 7 is shown in both the closed and charging positions. A plurality of heating electrodes 9 extend through the roof 5 of the furnace, to heat the furnace contents.

The hood for covering the areas of the furnace F from which fumes, dust and smoke are emitted includes a distribution box 15 which is mounted on the upper portion of the furnace F as shown. A port 17 is provided for connecting the hood to a suction source. Port 17 can be mounted at the back of the distribution box as illustrated, or at either side of the box. It is advisable that the box be connected with the suction source through a flexible or readily detachable connector or swivelled connection or the like, so that the distribution box may be rocked or tilted with the furnace F during either the pouring of the metal or other primary furnace product from the spout 1 or when pouring the slag layer from the spout 3. By way of example, port 17 can be connected by a permanent conduit that extends over and runs along the axis around which the furnace tilts. Such extension can then be provided with a rotating joint that is also permanently connected to the source of suction.

The lower portion of the distribution box 15 is formed so as to provide an opening 19 in the bottom or side whereby, when the box 15 is mounted in position on the furnace, the opening 19 lies above the slag spout 3, and fumes, etc., issuing from the slag spout 3 will be drawn into the box 15 through the opening 19 to then be disposed of through port 17. Opening 19 is of limited size for passage of the slag door if necessary, and for limiting maximum withdrawal of air to prevent short circuiting of the suction flow throughout the remainder of the hood.

To provide suction around the periphery of the furnace top at the joint where the furnace top meets the furnace roof, a ring-shaped conduit 25 is supported around the furnace top. The ends of the conduit 25 are connected with the box to provide suction connection therebetween.

As shown more clearly in FIG. 3 of the drawing, the ring has spaced-apart openings 26 through which suction is applied at selective points around the furnace top to draw off the fumes, dust and smoke emitting therefrom. Preferably, the ring-shaped conduit is divided into a lower compartment 27 and an upper compartment 29. The openings 26 mentioned above communicate with the atmosphere surrounding the furnace top through the continuous open face 30 of the upper compartment 29, while the lower compartment opens into the box 15. Adjustable baffles 33 are slidable and preferably supported by the floor of the upper compartment to selectively cover the openings 26 and thereby control the suction flow through them.

A flared hood canopy 35 is affixed to and extends outwardly from that portion of the ring baffle 25 overlying the pouring spout 1 to collect and gather any fumes and

other materials emitted from the pouring spout. These materials are picked up by the suction under the canopy 35 and are drawn into the compartment 27 from which the canopy opens. The canopy can also be provided with depending skirt portions where it is desired to help guide emitted materials to within closer range of the ring suction. This modification is illustrated in FIG. 3A.

An electrode manifold hood portion 40 is positioned over the electrodes 9 in electrode-encircling relationship and is fastened to the roof 5 of the furnace F either directly or through intervening spacer arms. A suitable clearance can be provided between the electrodes 9 and the encircling portions of the manifold hood portion 40 to permit air to be drawn into the hood portion 40 when it is connected with the distribution box 15, to draw off any materials escaping between the electrodes and the furnace roof. To provide the suction connection between the box 15 and the manifold hood portion 40, a connector conduit 42 is fixed to the manifold hood portion in communicating relationship therewith and extends outwardly therefrom into the distribution box 15 as is shown more clearly in FIGS. 1A, 1B and 2 of the drawings. A self-closing door 45 is preferably mounted on a spring hinge 47 to provide an opening 49 in the inner wall of the distribution box 15 as shown in FIG. 2 of the drawings. The spring loading structure 47 yieldably urges the door towards the closed position over the opening 49. When the furnace roof 5 is moved into position upon the furnace F, as in FIG. 1, an adjustable arm 44 on the free end 43 of the connector 42 urges the door 45 from its closed position to its opened position, as shown in FIG. 2 of the drawings. The adjustable arm can be omitted and the free end of the connector itself relied upon to open the door 45, as illustrated in FIG. 3B. When the furnace roof 5 is swung laterally outwardly away from the furnace F, the connector 42 moving away with the roof permits the door 45 to close. This closing seals off the suction opening 49 so that the suction continues to remain effective around the top of the furnace body through the ring conduit 25, through the box opening 19 and the flared hood 35 over the pour spout 1 to continue to remove the smoke, fumes, etc., issuing from these areas.

To permit the roof 5 to be raised from the furnace F immediately prior to swinging away the roof in the usual manner, the opening 49 has a vertical dimension which is greater than the vertical dimension of the mouth of the connector 42 by an amount at least corresponding to the vertical roof travel, which is generally a few (3-12) inches. To prevent loss of suction through this extra spacing, an outwardly extending flange 51 is fixed to the free end of the connector 42 and has upper and lower segments that are shaped to snugly fit against the top and bottom edges of opening 49 and effectively close off the gaps at these locations. The flange can also extend out horizontally to similarly close off any horizontal clearance gaps at these points.

The embodiment in FIGS. 4 through 6 is similar to that described above except that the ring conduit is here shown at 55 as fastened to the furnace roof 5 instead of the furnace body F. This ring 55 communicates with the distribution box 15 through rib conduits 50 which connect to the manifold hood portion 40. The rib conduits 50 are also secured in fixed manner to the furnace roof so that when the furnace roof 5 is raised and swung outwardly from the furnace, they will also move with it and with the ring conduit. In this connection FIG. 6 shows how the roof ring and rib conduits move vertically.

As also shown in FIG. 6, the ring in this modification of the invention is divided into upper and lower compartments 57, 58, with the lower compartment exposed over its entire extent to the joint between the furnace body and roof. A wall 56 forms a partition between these compartments and has openings 54 that apply the suction at selected points around the furnace periphery. Suc-

tion from the box 15 communicates through the connector 42 and manifold hood portion 40 into the rib conduits 50 to the ring 55 and through the ring openings. Adjustable slides 33 supported by the walls 56 are positioned adjacent the openings 54 to control or adjust the suction flow to the furnace.

FIG. 4 also shows in dash lines the vertical pivot support 8 for the roof mounting.

A feature of the present invention is the use of relatively small size hood members that do not extend much over an area in which a strong temperature differential exists. Thus the ring conduit need be no more than about twelve inches in width, as measured from one of its side walls to the other, and in some instances even as little as a six inch width is quite suitable. Likewise the electrode manifold 40 need only project out radially about four to six inches beyond the electrodes themselves. During furnace operation the hood portion adjacent the electrodes is heated to a much higher temperature than the ring portion so that large sheets of metal such as normally used for hoods undergo considerable warpage and distortion if they are arranged to extend in unbroken manner from the roof center to its edge.

The various conduit sections of the present invention are conveniently interconnected in such a way that the connections allow a little slippage to further reduce the thermal stresses. Connection 43-49 in the illustrated constructions allows substantially complete stress reduction at this location.

It is preferred to have the ring conduit extend vertically across the roof joint by a distance no greater than the vertical travel of the roof during its normal removal and return operations. Thus, the projection of the upper wall of compartment 29 above the top of the furnace body in the construction of FIGS. 1-3 is preferably less than the few inches of such vertical travel. The same applies to the downward projection of the lower compartment in the construction of FIGS. 4-6. This enables the hoods to be affixed to standard type furnaces without requiring any serious furnace modifications.

The hoods of the present invention can be used with furnaces having detachable roofs whether the furnaces are rocking as illustrated above, or tilting or even where the furnaces are used without any rocking or tilting. Although the illustrated furnaces are of the top-loading variety, the hoods can be used with furnaces loaded from the side or any other manner.

The construction of the type shown in FIGS. 1-3 is particularly desirable because even with the roof removed for loading, very efficient venting is obtained by reason of the continued highly effective application of suction from the distribution box as well as the ring conduit.

On the other hand, with some furnaces a structure such as ring 25 mounted around the top of the furnace body interferes with the proper loading of the furnace; or parts of the furnace or other equipment may be so closely spaced with respect to the top of the furnace body that there is no room for a ring such as that shown at 25. With these types of constructions the embodiments of FIGS. 4, 5 and 6 is very effective. The ring 25 can also be replaced by other arrangements for directing the section to those portions of the furnace type periphery where fume control is important. A few spaced suction locations around this periphery can be used in place of a continuous suction ring, and each individual suction site can be connected by separate or common ducts to the distribution box or any other convenient source of suction. A similar substitution can be made for the ring 55 in the construction of FIG. 5.

All the dimensions given above are only exemplary and the specific dimension used with any part of the furnace will vary as the size and type of furnace varies.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that, within

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the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A suction hood for open top electrical furnaces having removable roofs provided with heating electrodes, said hood comprising a distribution box for mounting at a top portion of the furnace periphery, said box having a connection for a suction source, a ring-shaped conduit for positioning around the remainder of the furnace top periphery, connection means for providing a suction connection between said conduit and said box, ports in the conduit for applying the box suction at selected locations around the top of the furnace, an electrode manifold hood portion for mounting on the furnace roof in electrode-encircling arrangement, said hood having a connector extension for connecting the electrode manifold hood portion to said box, said extension and box having automatic engaging elements connected to automatically establish a suction connection between the box and the manifold when the roof is in place over the furnace body, and to automatically close this suction connection when the roof is removed from the furnace body, said box and ring conduit being shaped to leave roof travel clearance over the furnace body.

2. The combination of claim 1 wherein the ring conduit is divided into upper and lower compartments, the upper compartment providing a continuous inwardly facing opening adjacent the furnace top, and ports in the bottom compartment at selected locations around the ring conduit communicate the upper compartment with the lower compartment, said ports having externally adjustable closures.

3. The combination of claim 1 in which the distribution box includes an opening that is positioned over a furnace spout when the box is mounted in place, and this opening is baffled to prevent short-circuiting of the suction flow through the remainder of the hood.

4. The combination of claim 1 in which the automatic engaging elements include an opening in the distribution box, a movable door carried by the box for closing that opening, bias structure urging this door toward the closing position, and door opening structure carried by the electrode manifold extension.

5. The combination of claim 4 in which the distribution box opening faces the electrode manifold portion and is several inches taller than the manifold connector extension, and the extension carries an outwardly directed flange that covers the opening section not covered by the extension itself when it is in engagement with the distribution box.

6. A suction hood for open top electrical furnaces having removable roofs provided with heating electrodes, said hood comprising a distribution box for mounting to a top portion of the furnace periphery, said box having a connection for a suction source, a ring-shaped conduit extending around the furnace top, openings in the ring conduit at spaced locations along the conduit for applying suction at selected locations around the top of the furnace, an electrode manifold hood portion for mounting

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in fixed manner on the roof of the furnace in electrode-encircling arrangement, means connecting the ring-shaped conduit with the electrode manifold hood portion to establish suction communication therebetween, a connector extending from the manifold hood portion toward the distribution box, an opening in the box receiving the end of the connector, a self-closing internally swinging door covering the opening and arranged to be opened by the free end of the connector when the roof is moved into closed position to establish a suction connection between the box, the manifold hood portion and the ring-shaped conduit, and to be automatically closed to cut off the suction connection to the manifold hood portion and ring conduit when the roof is removed from the furnace body.

7. The combination of claim 1 wherein the ring conduit supports a flared hood portion for positioning over a pouring spout of the furnace.

8. A suction hood for rocking electric arc furnaces having electrodes carried by a removable roof, said hood including a distribution box for mounting at one side of the top and connection to a source of suction, a narrow ring conduit shaped to extend around the furnace top and connected to said box, the ring having openings to apply the box suction over spouts and working doors in the furnace, and an electrode manifold portion for mounting on the roof in close electrode-encircling arrangement, said manifold portion having a connector extension positioned to reach the distribution box when the roof covers the furnace, said box having a side opening with an inwardly swinging door resiliently urged to the closed position, and said extension having a height a few inches shorter than the opening and having an outwardly directed flange set back from its box engaging end to establish a suction connection between the box and the manifold when the roof is moved laterally into place over the furnace and to maintain that connection when the laterally positioned roof is lowered to and raised from covering engagement with the furnace.

9. A suction hood for open top electrical furnaces having removable roofs provided with heating electrodes, said hood comprising a distribution box for mounting at a top portion of the furnace periphery, said box having a connection for a suction source, additional connection elements for applying this suction to the furnace top periphery, an electrode manifold hood portion for mounting on the furnace roof in electrode-encircling arrangement, said hood having a connector extension for connecting the electrode manifold hood portion to said box, said extension and box having automatic engaging elements connected to automatically establish a suction connection between the box and the manifold when the roof is in place over the furnace body, and to automatically close this suction connection when the roof is removed from the furnace body, said box and said additional connection elements being shaped to leave roof travel clearance over the furnace body.

No references cited.