June 4, 1963 W. J. ROUSSAN, JR., ETAL 3,092,705

BUSHING CONSTRUCTION IN AIR HEATING DEVICE

Filed Dec. 26, 1961

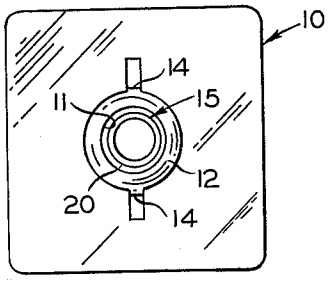


FIG. 1.

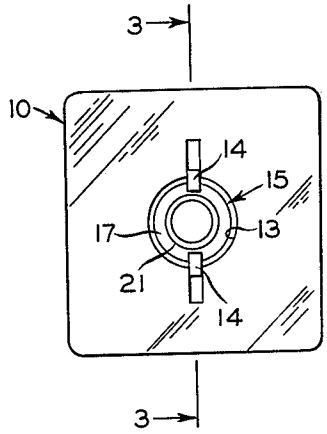


FIG. 2.

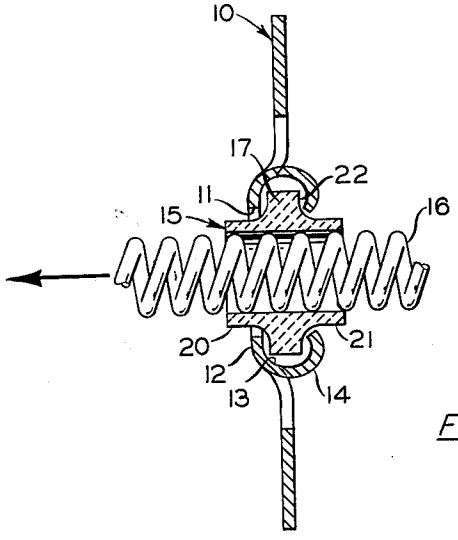


FIG. 3.

INVENTORS
WILFORD J. ROUSSAN, JR.
and MILTON OSTERMAN
BY
Cohn and Powell
ATTORNEY

United States Patent Office 3,092,705 Patented June 4, 1963

3,092,705

BUSHING CONSTRUCTION IN AIR HEATING DEVICE

Wilford J. Roussan, Jr., and Milton Osterman, St. Louis, Mo., assignors to Industrial Engineering & Equipment Co., St. Louis, Mo., a corporation of Missouri

Filed Dec. 26, 1961, Ser. No. 162,100
3 Claims. (Cl. 219—19)

This invention relates generally to improvements in an air heating device of an electrical resistance type sometimes referred to as a blast coil space heater, and more particularly relates to an improved means for mounting and insulating the heating coils in the frame structure of the unit.

An important object of the present invention is to provide an improved assembly of the mounting bracket panels and insulator bushings for the coil elements of electric heaters.

More specifically, it is an important objective to provide a relatively simple and inexpensive means for mounting insulator bushings, preferably made of porcelain or lava material, in a metal bracket panel, such that the bushings will be retained with their axes in substantial parallelism.

Another important object is achieved by the provision of a bushing assembly in which the bushings can be easily replaced in case of damage. Other advantages are realized by the mounting construction for the insulator bushing which lends itself to the installation of the bushings to the metal panels by automatic tooling.

Still another important objective is realized by the provision of a metal panel, constituting one of several such supports for spans of a resistance coil that extends through regularly spaced openings in such panel. The openings have their marginal portions displaced from the plane of the panel to form sockets that open toward one side of the panel and to form embossments on the opposite side. The insulator bushing is made with an annular intermediate flange or collar that seats in its associated socket and which is held in place by bendable tabs struck from the metal panel.

Yet another important object is provided by the structural arrangement and formation of the tabs struck out from the panel so that their ends integral with the panel are adjacent the socket while their free ends are reversely bent to overlap the socket and to engage the enlarged portion of the tubular bushing seated in the socket against the displaced marginal portion, whereby to retain the enlarged bushing portion in such socket and to secure the bushing to the panel. A relatively reduced bushing portion extends through the panel opening. To provide a more stable construction, the dimensions of the panel opening and the socket approximate substantially the dimensions respectively of the reduced bushing portion and the larger bushing portion.

Another important object is obtained by the general arrangement of a panel of single thickness in which an opening is formed, the marginal portion of the opening being displaced from the plane of the panel to provide a socket adapted to receive a peripheral flange of a tubular bushing, and of means bent from the panel to overlap the bushing flange to secure the bushing to the panel.

An important object is to provide a bushing mounting that is simple and durable in construction, economical to manufacture and assemble, efficient in operation, and which is adapted to hold an electrical heating coil in secure, insulated relation to the panel of the frame structure.

The foregoing and numerous other objects and advantages of the invention will more clearly appear from the following detailed description of a preferred embodiment, particularly when considered in connection with the accompanying drawing, in which:

FIG. 1 is a side elevational view of the bushing mounting;

FIG. 2 is an elevational view from the opposite side of FIG. 1, and

FIG. 3 is an enlarged cross sectional view as seen along lines 3—3 of FIG. 2.

Referring now by characters of reference to the drawing, it will be apparent that only a section of the bracket panel generally indicated at **10** is illustrated in an air heating device of the type previously mentioned. The frame structure of the unit includes a plurality of bracket panels **10** arranged in laterally spaced parallel relation. As is well-known in a blast coil heater, the electrical resistance coil is carried by the plurality of bracket panels, the coil extending in one direction to bridge the panels **10** and then being reversed to extend in the opposite direction so that the coil provides a multiplicity of regularly spaced parallel coil spans.

Because this invention relates to the particular mounting of the electrical coil to the bracket panels of the frame structure, and because the mounting to each panel **10** is identical, only a section of a single panel **10** is disclosed in order to emphasize and concentrate on the important features.

The panel **10**, preferably formed of a single flat sheet of metal, is provided with a circular opening **11**. The marginal portion **12** defining the opening **11** is displaced from the plane of panel **10** toward one side of such panel, as is best illustrated in FIG. 3, so as to provide a cup-like socket **13**. The socket **13** is open toward the right hand side of panel **10** as viewed in FIG. 3, while the displaced portion **12** forms an embossment on the opposite side of such panel. The socket **13** is substantially cylindrical in configuration and is relatively shallow in depth.

Struck out from the metal of panel **10** on diametrically opposite sides of the socket **13** are a pair of elongate tabs **14**. As will best appear from FIG. 3, one end of each tab **14** is formed integral with panel **10** immediately adjacent the cylindrical wall defining socket **13**, while the free end of each tab **14** is reversely bent to overlap the opening of the socket **13** during assembly of the unit which will be later described in detail.

Carried by the panel **10** is a tubular bushing referred to at **15** and preferably constructed of a porcelain or lava material. The bushing **15** constitutes an insulator between an electrical heating coil **16** and the panel **10**, the coil **16** extending through the bore of bushing **15**. There is a frictional contact between coil **16** and the tubular bushing **15**.

The tubular bushing **15** includes an annular flange **17** constituting a circular collar located intermediate relatively reduced end portions **20** and **21**. When assembled, the end bushing portion **20** extends through the opening **11** defined by depressed marginal portion **12**. The annular flange **17** seats in the socket **13** against the marginal portion **12**. To provide a symmetrical construction, substantially one-half of the annular flange extends outwardly of the socket **13**. The diameter of annular flange **17** approximates substantially the diameter of socket **13**. Furthermore, the diameter of opening **11** approximates substantially the diameter of reduced bushing portion **20**.

After the annular flange **17** is seated in the socket **13**, the tabs **14** are bent over the flange **17** as is best shown in FIG. 3 to engage the shoulder **22**, the tabs **14** holding the flange **17** in socket **13** and securing the bushing **15** to panel **10**. The free end of tabs **14** are located close to the outer periphery of the reduced end bushing por-

tion **21** to assist in precluding any substantial lateral movement.

When the coil **16** is stretched in spans through a plurality of panels **10**, the panels **10** are arranged to face in a direction so that the tensional force applied to coil **16**, as is illustrated by the arrow in FIG. 3, will be transmitted through the bushing **15** to the abutment of annular collar **17** with the displaced marginal portion **12**. With this structural arrangement, a unit with the greatest strength is realized because there is a greater area over which the tensional load is distributed than if such tensional force were transmitted in the opposite direction and directed against the overlapping tabs **14**.

Although the invention has been described by making detailed reference to a single preferred embodiment, such detail is to be understood in an instructive, rather than in any restricted sense, many variants being possible within the scope of the claims hereunto appended.

We claim as our invention:

1. In an air heating device:

(*a*) a panel provided with an opening, said opening having its marginal portion displaced from the plane of said panel toward one side of said panel to provide a socket,

(*b*) a tubular bushing including a peripheral flange seated in said socket against said marginal portion, a peripheral dimension of said socket approximating the peripheral dimension of said flange, and

(*c*) a plurality of tabs struck out from said panel radially outwardly of said socket, the tabs having their ends integral with the panel adjacent the outermost periphery of said socket and having their free ends which are outwardly of the socket periphery reversed to overlap said flange so as to hold the flange in said socket and to secure the bushing to said panel.

2. In an air heating device:

(*a*) a panel provided with an opening therethrough, said opening having its marginal portion displaced from the plane of the panel toward one side to provide a socket that is open toward the opposite side of said panel,

(*b*) a tubular bushing including a portion seated in said socket against said marginal portion, and including another portion extending through said panel opening, and

(*c*) a plurality of tabs extending radially relative to said opening struck out from said panel in a region outwardly of the periphery of said socket, said tabs

having their ends integral with the panel adjacent the periphery of said socket and having their free ends which are outwardly of the socket periphery reversed to overlap the socket opening and to engage said bushing portion seated in said socket, said tabs holding the last said bushing portion in said socket and securing the bushing to said panel.

3. In an air heating device:

(*a*) a panel provided with an opening therethrough defined by an uninterrupted marginal portion, said opening having its marginal portion displaced from the plane of said panel toward one side of said panel to provide a socket that opens toward the opposite side of said panel,

(*b*) a tubular bushing including a relatively enlarged collar located between the ends of said bushing, said collar being seated in said socket against said marginal portion,

(*c*) the bushing having one end extending through said panel opening, substantially one-half of said collar extending outwardly of said socket,

(*d*) a plurality of tabs extending radially relative to said opening struck out from said panel in a region outwardly of the periphery of said socket, said tabs having their ends integral with the panel located adjacent the periphery of said socket and having their free ends which are located outwardly of the socket periphery reversed to overlap the socket opening and to engage said collar so as to hold the collar in said socket and to secure the bushing to said panel, and

(*e*) a heating coil extending through and frictionally engaging said bushing, the panel being disposed so that the tensional force applied to coil in one direction will be transmitted to the depressed uninterrupted marginal portion of the panel by said bushing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,628,858	Shawk	May 17, 1927
1,809,864	Pearson	June 16, 1931
1,813,767	Reichart	July 7, 1931
2,180,600	Mills	Nov. 21, 1939
2,352,126	Schmitt	June 20, 1944
2,457,608	Shafter	Dec. 28, 1948
2,478,808	Deal	Aug. 9, 1949
2,680,840	O'Neill	June 8, 1954
2,921,172	Hackman	Jan. 12, 1960