July 24, 1962 G. W. HOLZ 3,046,378

FLUID HEATER

Filed April 25, 1960

Fig. 1

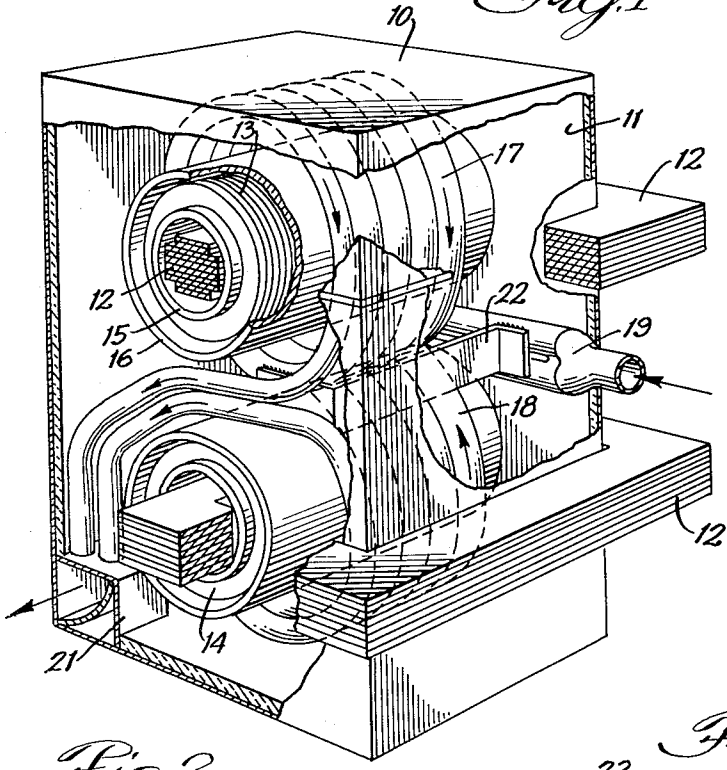


Fig. 2

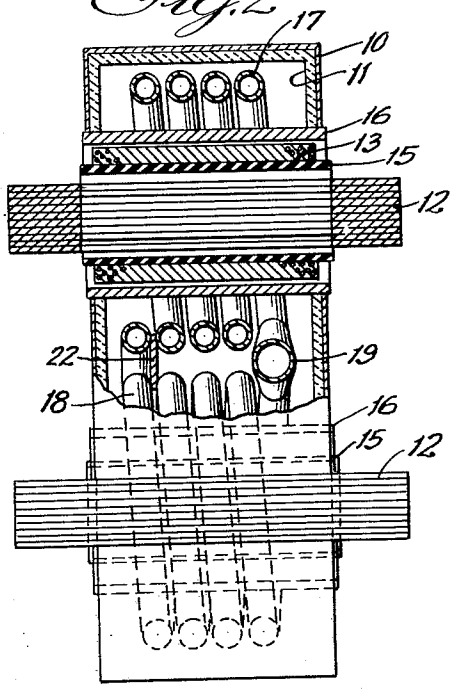
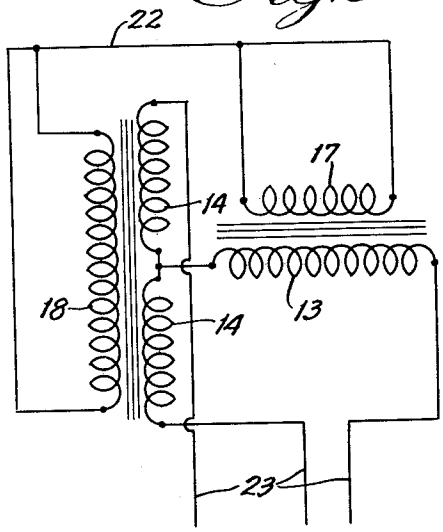


Fig. 3



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FLUID HEATER

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This invention relates to fluid heaters and more particularly to an electrically operated apparatus for heating air and similar non-conducting fluids. For many types of applications it is necessary to heat a relatively large volume of air or similar fluid to a relatively high temperature rapidly. It is not practical in many cases to use a large furnace due to irregulatrities of demand for heated air or to space limitations or both. The problem has, therefore, presented real difficulties.

It is, therefore, one of the objects of the present invention to provide a fluid heater which is electrically operated and which is capable of heating a large volume of air to a high temperature rapidly and efficiently while requiring a minimum of space.

Due to the electrical operation, the apparatus is capable of functioning efficiently to supply an intermittent demand and can also be made to occupy a minimum of space.

Another object is to provide a fluid heater which is powered by three-phase electrical current and which is so constructed as to be able to utilize a large amount of power efficiently.

According to a feature of the invention, the fluid to be heated is circulated in parallel through two tubes coiled around cores energized through primary windings with the tubes serving as secondary windings and being short circuited to heat the fluid flow therethrough.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing in which:

FIGURE 1 is a perspective view of a fluid heater embodying the invention with parts broken away;

FIGURE 2 is a side view partly in section and partly in elevation; and

FIGURE 3 is a wiring diagram.

The complete fluid heater as shown in FIGURES 1 and 2 comprises a generally rectangular casing **10** which may be formed of sheet metal or other suitable material insulated on its interior by layers of insulation indicated at **11**. It will be understood that, if desired, the entire interior space of the casing around the coils and cores could be filled with insulation, although for practical purposes a lining of the casing with a layer of insulation as shown is sufficient.

The casing is traversed by two magnetic cores **12** which may be identical rectangular cores formed of laminated soft iron. The cores **12** are arranged in parallel spaced relation as shown in the drawings, with one leg of each core extending through the casing and the legs of the cores extending around the sides of the casing. In the actual construction, one leg of each core may be detachably connected to the other legs thereof in a manner well understood in the art but not shown in the drawing to facilitate assembly.

The legs of the cores which are within the casing are surrounded by windings **13** and **14**, respectively, which

serve as primary windings to energize secondary windings in which the fluid is heated. Preferably, the windings **13** and **14** are wound around insulating sleeves **15** which surround the core and are in turn surrounded by insulating sleeves **16** which separate them from the secondary windings.

According to the present invention, the secondary windings are formed by metal tubes **17** and **18** which are coiled respectively around the sleeves **16** as shown. The tubes are preferably made of a high resistance metal having a high melting point such as Inconel which is very satisfactory for the purpose. The fluid to be heated is adapted to flow through the coils **17** and **18** in parallel, and for this purpose the inlet ends of the coils are connected together in a Y connection **19** which is preferably connected to the outlet port of a blower to circulate air or other fluid to be heated through the coils. At the outlet end both coils are connected to a discharge boss **21** in the casing **10** which communicates with an outlet port through the casing wall through which the heated fluid flows. In order to short circuit the secondary coils **17** and **18**, a connection in the form of a bar **22** is secured by welding or brazing to the inlet ends of the tubes adjacent to the Y connection **19** and to the outlet ends of the tube adjacent to the point at which they leave the primary windings.

Electrically, the apparatus is powered by three-phase current and is connected in a Scott connection as illustrated diagrammatically in FIGURE 3. As shown in this figure, the windings **13** and **14** are connected in the usual manner employed in a Scott connection and are supplied with three-phase current from leads **23**. The tubes **17** and **18** define the secondary windings associated with the primary windings in a manner common with the Scott connection and short circuited by the connection **22**. In this way, when the primary windings are supplied with three-phase alternating current, a relatively high amperage low voltage current will be generated in the coils **17** and **18** to heat them to a high temperature. The air or similar fluid flowing therethrough will, therefore, be heated rapidly and efficiently by transfer of heat from the tubes themselves. By arranging the tubes in parallel, a relatively large volume of fluid can flow through the apparatus with a minimum of resistance to the flow so that the apparatus will function efficiently to raise the maximum volume of fluid to a high temperature with a minimum amount of space being required.

While one embodiment of the invention has been shown and described in detail, it will be understood that this is for the purposes of illustration only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. A fluid heater comprising a pair of magnetic cores, two primary windings wound on said cores in a Scott connection and adapted to be connected to a source of three phase electric current, a secondary winding on each of the cores, the secondary windings comprising metal tubes interconnected at their ends for flow of fluid to be heated in parallel therethrough, and a conductor connecting the opposite ends of the secondary windings to short circuit them.

2. A fluid heater comprising a pair of magnetic cores, two primary windings wound on said cores in a Scott connection and adapted to be connected to a source of

three phase electric current, a secondary winding on each of the cores, the secondary windings comprising metal tubes joined in a Y connection at one end and communicating with a common discharge chamber at the other end for parallel flow of fluid to be heated therethrough, and a conductor interconnecting the opposite end portions of the secondary windings to short circuit said windings.

3. A fluid heater comprising a pair of spaced parallel magnetic cores, two primary windings wound on the cores in a Scott connection and adapted to be connected to a source of three phase current, a metal tube wound around each of the cores and defining a secondary winding therefor, said tubes being interconnected at their opposite ends for parallel flow of fluid to be heated therethrough, and conductor means connecting the opposite ends of the secondary windings and short circuiting each of the secondary windings.

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