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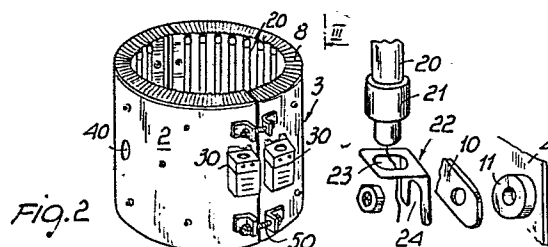
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54 Electric heater for industrial processing machinery in general.

57 This invention relates to an electric heater for industrial processing machinery in general.

A currently much felt problem in the manufacture of electric heaters for industrial processing machines is that it is not always possible to achieve a uniform and accurate distribution of temperature at the region to be heated.

The above technical problem is solved hereby with an electric heater (1) for industrial processing machinery in general, which comprises a supporting housing (2,3) adapted for association with a region of an industrial processing machine to be heated. The housing carries, on its side facing the region to be heated, a plurality of electric resistors, preferably in the form of electric wire coils inserted in quartz tubes (20), adapted to deliver heat mainly by radiation to said region to be heated.



This invention relates to an electric heater for industrial processing machinery in general.

As is known, many industrial fields and particularly that of plastics processing machines, involve the use of electric heaters, which are installed at pre-arranged areas of a machine in order to bring its temperature up to a preset level as a direct function of the type of processing to be carried out.

10       Conventional electric heaters generally comprise a band element which is applied to contact the region to be heated and supplies heat to a part of interest mainly by conduction.

      This type of heaters, although widely employed, have the disadvantage that it cannot ensure any accurate and perfect distribution of temperature over the area to be heated because the points of contact between the resistor in band form and the area to be heated are unavoidably limited so that there occur areas where heat is better transmitted than at areas where a very thin layer of intervening air greatly deteriorates such delivery of heat.

20       Another drawback is then the thermal inertia which is typical of band resistors results in a waste of heat to the external environment, with attendant increase in power consumption which, of course, raises the overall operation costs.

      A further problem is that, since heat cannot be supplied in large amounts, in many cases the

operating capacity of the machine equipped with said resistor is also affected, thus cutting down the working time and rate.

It should be further added to the above that  
5 in the event of the band resistor becoming damaged, the resistor must be replaced as a whole, which considerably aggravates service costs.

It is a primary object of this invention to  
10 eliminate such prior drawbacks by providing an electric heater which is purposely designed for industrial machinery in general, and in particular for use on plastic material processing machines, and which can transfer its heat almost instantaneously  
15 with a minimum of wasted heat and consequent advantages of power consumption.

It is a further object of the invention to provide an electric heater which is so constructed as to afford a distribution of the temperature values  
20 over a region to be heated which is at all times uniform and unaffected by external factors of difficult controllability.

Another object of this invention is to provide an electric heater which, in addition to involving  
25 extremely quick and simplified assembling procedures, can be quite safe and reliable in use.

A not unimportant object of the invention is to provide an electric heater which can be easily manufactured from readily available elements and  
30 materials, and which can be highly competitive

even from a purely economical standpoint.

These and other objects such as will be apparent hereinafter are all achieved by an electric heater for industrial processing machinery in general, according to the invention, characterized in that it comprises a supporting housing adapted for association with a region to be heated of an industrial processing machine, said supporting housing being provided, on the side thereof facing said region to be heated, with a plurality of electric resistors operative to transfer heat to said region to be heated mainly by radiation.

Further features and advantages will be apparent from the following detailed description of a preferred, but not limitative, embodiment of this electric heater, with reference to the accompanying illustrative drawing, where:

Figure 1 is a perspective view of the electric heater in the open position thereof;

Figure 2 is a perspective view of the electric heater in the close position thereof;

Figure 3 is a sectional view taken along the line III-III of Figure 1; and

Figure 4 is a schematical exploded view of the resistor connections.

With reference to the drawing figures, the electric heater for industrial processing machinery in general, as generally designated with the

reference numeral 1, comprises a supporting housing which is generally configured to match the shape of the region to be heated whereto the heater 1 is to be applied.

5        In accordance with the exemplary, and not limitative, embodiment shown in the drawing, the supporting housing comprises first and second half-bodies 2 and 3 substantially similar to each other and shaped to conform to a semicylindrical surface, for  
10 matching the electric heater to a region to be heated of cylindrical configuration.

Each half-body, 2 and 3, has a semicylindrical internal surface 4 and semicylindrical external surface 5 which is conveniently spaced apart from  
15 the internal surface to create an interspace effective, as will be explained hereinafter, to limit the waste of heat to the environment.

The inner surface 4 and outer surface 5 are interconnected by spacers 6 conveniently, but not  
20 necessarily, comprising small perforated disks of steatite or any other material which be a good electric insulator as well as thermal insulator.

Experimentally, it has been found convenient, though not mandatory, to provide a plurality of  
25 spacers 6 uniformly arranged between the surfaces 4 and 5 such as to achieve a good compaction and mechanical interconnection of the two surfaces.

Moreover, between the two surfaces 4 and 5, there may be provided a thermal insulator adapted to further  
30 improve the prevention of heat waste to the environment.

The surface 5 is completed, at the ends thereof, with a flange 8 facing radially inwardly toward the center, which serves the function of a bearing and centering element for the heater 1 relatively to the region to be heated.

Advantageously, for reasons which will be made clear hereinafter, the inner surface 4 will have a mirror-like finish on its side facing the region to be heated.

On said side of the inner surface 4, there is provided a plurality of electric resistors, which may be connected, depending on contingent requirements, either in series or parallel with one another, and a peculiar feature of the invention is that the electric resistors provided on one half-body are fed independently from the electric resistors provided on the other half-body, in order to avoid the presence of electric leads led past the hinge area 9 which unites the two half-bodies 2 and 3 together.

The electric connections on each half-body are advantageously implemented through conductive plates 10 which are associated with the surface 4 by means of spacers 11, also in the form of small perforated disks acting as electric insulators for the plates 10 relatively to the surface 4.

Each electric resistor comprises a coil element contained in quartz tubes 20 which have fairleads 21 of an electrically insulating material at their ends, and are carried on angle brackets 22 having on one flange or leg a throughgoing hole 23 for coupling to

the fairleads, and on the other flange a fork-like element 24 for electric connection to the plate 10.

This type of connection is highly advantageous, in that it affords adequate support to each  
5 resistor while allowing a quick and easy replacement where the electric resistor is damaged or burned out.

The number and type of the electric resistors being utilized may be varied in accordance with the heating levels to be achieved, bearing in mind that  
10 the resulting heat application is a direct function of the applied electric power.

Each half-body 2 and 3 is provided, on its outer surface, with a connector 30, of a type known per se, for connection to the power supply  
15 electric cables.

A peculiar characteristic of the invention is that the transfer of heat to the region to be heated is mainly effected by radiation from the individual resistors to the part to be heated, without any  
20 direct contact between the resistors and region or surface to be heated.

Furthermore, the surface 4, being treated to a mirror finish, will act as an additional reflector element for the direct transfer of heat to the  
25 surface to be heated.

Preferably, the transfer of heat will occur in the infrared band, as it has been found that the best heat transfer coefficients are obtained by adopting for the resistors suitable temperature  
30 levels to produce the emission of infrared rays.

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To complete the foregoing description, it is to be noted that at least one of the half-bodies will be formed with a throughgoing aperture 40 for the introduction of conventional temperature checking probes therethrough.

Moreover, at the mating edges of the half-bodies 2 and 3, there are provided closure ties 50 which permit an accurate clamping of the resulting enclosure onto the part to be heated.

It should also be noted that the shape of the housing or enclosure will be modified each time to fit the configuration of the region to be heated, it having as its sole characteristic that of presenting a configuration substantially matching that of the region to be heated.

The operation of this electric heater is quite simple and can be readily inferred from the foregoing.

After applying the heater to a desired area, the electric power supplied to the resistors produces an immediate transfer of heat, thus cutting down the thermal flywheels normally associated with heaters of known design. Moreover, the transfer of heat by radiation affords a uniform distribution of the temperature levels over the region being heated, which levels may even reach very high values, thus bringing about the advantage of an accurate control of the temperature of the region being heated as well as of a perfect distribution, which considerably facilitates the effectuation of the operations to be carried out on the machine incorporating this



heater.

The invention as outlined hereinabove is susceptible to many modifications and variations without departing from the scope of the instant  
5 inventive concept.

Moreover, all of the details may be replaced with other technically equivalent elements.

Finally, the materials used, if compatible with specific requirements, and the dimensions  
10 and contingent shapes may be any selected ones to fit individual applicational requirements.

CLAIMS

1           1. An electric heater for industrial processing  
2 machinery in general, characterized in that it  
3 comprises a supporting housing (2,3) adapted for  
4 association with a region to be heated of an  
5 industrial processing machine, said supporting  
6 housing being provided, on the side thereof facing  
7 said region to be heated, with a plurality of  
8 electric resistors (20) operative to transfer heat to  
9 said region to be heated mainly by radiation.

1           2. An electric heater according to Claim 1,  
2 characterized in that said supporting housing  
3 comprises first (2) and second (3) half-bodies  
4 substantially similar to each other and being hinged  
5 along one mating edge (9) thereof, said half-bodies  
6 (2,3) having a surface arranged to substantially match  
7 the surface of said region to be heated.

1           3. An electric heater according to the preceding  
2 claims, characterized in that each said half-body (2,3)  
3 has an inner surface (4) and an outer surface (5)  
4 associated with and spaced apart from said inner  
5 surface, said outer surface (5) being held apart from  
6 said inner surface (4) by spacers (6) comprising small  
7 perforated disks of an electrically and thermally  
8 insulating material.

1           4. An electric heater according to one or more of  
2 the preceding claims, characterized in that the inter-  
3 space defined between said inner surface (4) and said  
4 outer surface (5) is filled with a thermally insulating  
5 material.

1           5. An electric heater according to one or more  
2 of the preceding claims, characterized in that the  
3 side of said inner surface (4) facing said region to be  
4 heated is treated to a substantially mirror finish.

1           6. An electric heater according to one or more  
2 of the preceding claims, characterized in that said  
3 plurality of electric resistors comprises coils of  
4 electric wire inserted into quartz tubes (20).

1           7. An electric heater according to one or more  
2 of the preceding claims, characterized in that it  
3 comprises fairlead elements (21) connected to the ends  
4 of said quartz tubes (20), said fairlead elements (21)  
5 being adapted for engagement in a through hole (23)  
6 formed in one flange of a bracket (22) carrying on the  
7 other flange a fork-like element (24) for electric  
8 connection to conductive plates (10) provided on said  
9 inner surface and connected to the electric power supply  
10 of said heater.

1           8. An electric heater according to one or more  
2 of the preceding claims, characterized in that said  
3 plates (10) are associated with said inner surface (4)  
4 through intervening spacers (11) in the form of small  
5 perforated disks of an electrically insulating material.

1           9. An electric heater according to one or more  
2 of the preceding claims, characterized in that the  
3 resistors in each said half-body (2,3) are provided with  
4 a current supply independent of the other of said half-  
5 bodies.

1           10. An electric heater according to one or more  
2 of the preceding claims, characterized in that each  
3 said half-body (2,3) has, associated with said outer

4 surface (5), an electric connector (30) for connection  
5 to the electric power supply.

1 11. An electric heater according to one or more  
2 of the preceding claims, characterized in that, located  
3 at the axial ends of said outer surface (5), a flange  
4 (8) is provided facing radially toward the center of  
5 said half-bodies (2,3) and being adapted to function  
6 as a bearing and centering element for connecting said  
7 supporting housing to said region to be heated.

