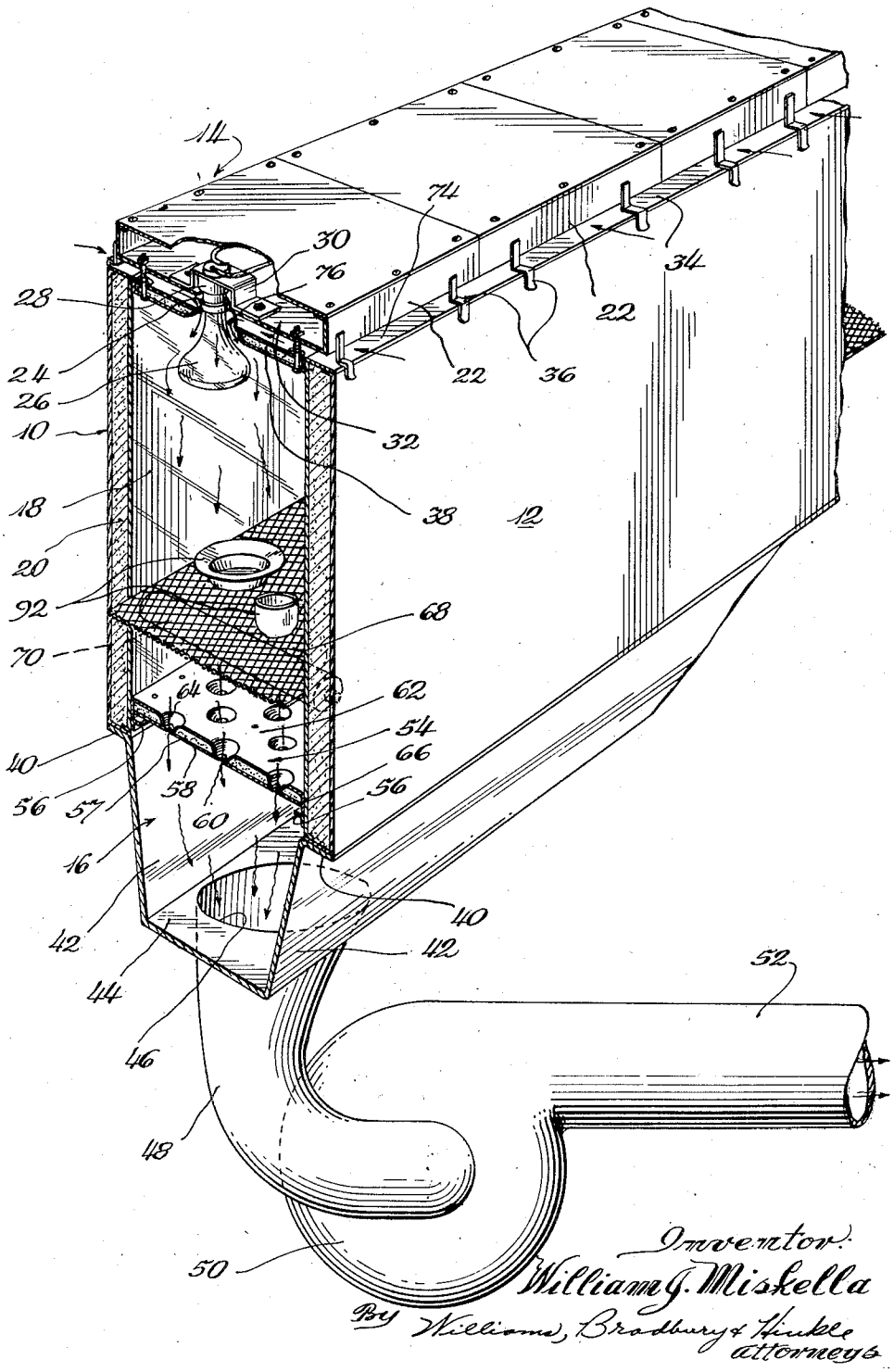
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INFRARED OVEN

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INFRARED OVEN

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1 Claim. (Cl. 34—60)

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My invention relates to heating and drying equipment, and particularly to an infrared oven through which the objects to be subjected to infrared radiation may be passed by means of a conveyor system.

In spray coating objects with many types of commercial coating materials, such as lacquers and enamels and particularly the cheaper grades of these paint-like substances, a large amount of a very volatile and inexpensive solvent is used as a thinner which must be removed during the baking and drying step of the coating process. In recent years there has been an increase in the use of infrared radiated heat for baking and drying coating materials, and it has been found that it is necessary to devote considerable time to the maintenance of the equipment, particularly when cheap materials are used. As the object is passed through the infrared oven and the volatile constituents of the solvent are removed through the application of infrared radiated heat, a "fog" of this solvent will accumulate in the oven, and because of its somewhat gummy characteristics, it will adhere to parts of the oven such as the infrared lamps and the reflective surfaces. In order to preserve the efficiency of the oven, the infrared lamps must be cleaned frequently and the reflective surfaces polished, else there be too great a loss through the absorption of heat by this gummy condensation on the surfaces of the oven parts.

It has been the practice to attempt to remove the evaporated solvents by passing a stream of air lengthwise through the oven; that is, parallel to the movement of the object being treated and substantially or generally perpendicular to the path of heat radiated from the infrared lamps. This method of air circulation has been found objectionable because the density of the "fog" of evaporated solvent is cumulatively concentrated toward the air outlet end of the oven. The cumulative movement does not effectively prevent it from condensing on such parts to an extent which is objectionable, and there is necessity for constant maintenance of the oven to keep it clean.

Another object to the endwise flow of air through the oven is that it has the effect very rapidly of removing the air which may become heated by contact with the infrared bulbs and the objects being heated, and such removal is an undesirable heat loss from the oven.

It is therefore the principal object of the present invention to provide an infrared oven which

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overcomes the objections now present in many commercial ovens as outlined hereinbefore.

It is another object to remove the "fog" of evaporated solvent from the oven in such a manner that the "fog" does not tend to concentrate at any particular spot in the oven.

Another object is to remove the fumes from the evaporation of the solvent from a coating material in such manner that there is no interference with the transmission of the infrared radiated heat from the infrared lamps to the object.

Another object is to provide an infrared oven in which the lamps and reflective surfaces of the oven are maintained in a substantially clean condition during normal operation of the oven.

A further object is to provide an infrared oven in which a minimum amount of maintenance is required.

It is a further object to provide an infrared oven in which the air is circulated in such a manner as to effect a cooling of the infrared lamps and the transfer of heat by conduction and convection from the lamps to the object being heated.

It is another object to provide an infrared oven having objects and advantages claimed herein which is inexpensive in construction and efficient in operation.

Other objects and advantages will become apparent from the following description taken in conjunction with the drawing which contains a single figure illustrating one embodiment of my invention.

My novel oven includes a pair of heat insulated, substantially parallel walls 10 and 12 which may be supported upon a frame which has not been shown for the purpose of simplicity of illustration. At their upper ends the space between the walls is closed by a support 14 for the infrared lamps which may be of the type illustrated, described, and claimed in my co-pending application Serial No. 632,058, filed November 30, 1945, now Patent No. 2,478,001. The space between the lower ends of the walls is closed by an open-sided duct 16 which will be more fully described hereinafter.

Each of the walls 10, 12 may be constructed so that their inner surfaces 18 are coated with a reflective material such as porcelain, or chromium or cadmium plating for instance. The space between the inner and outer sheets forming the walls 10 and 12 is filled with asbestos, Fiberglas or other suitable insulating material 20. The walls 10 and 12 are formed in a box-like struc-

ture and support the means 14 for holding the bank of lamps in position.

The support 14 comprises a number of box-like elements 22, each of which is perforated at 24 to permit the insertion of the base of the infrared lamp 26 into a standard socket 28. The socket 28 is mounted on a flanged U-shaped strap 30 which is bolted to the bottom 32 of the box 22. The boxes are supported on the upper edges 34 of the walls 10 and 12 by means of small spacer chairs 36 which may be welded or bolted to the side walls of the boxes 22. Depending from the bottom 32 of the box 22 is a heat insulated reflective panel 38 of the type described in my aforesaid co-pending application. The panels 38 close the space between the upper edges of the walls 10, 12 and are provided with openings 76 to permit insertion of the necks and bases of the infrared lamps 26.

At the bottom of the oven the duct 16 preferably runs its entire length, or if the oven be exceedingly long, a number of such ducts may be placed lengthwise of the oven. These ducts are attached to the bottoms of the walls 10, 12 by means of flanges 40 which may be welded or bolted thereto. The duct 16 has generally sloping side walls 42 which incline toward a bottom wall 44. Approximately at the mid point of each duct 16, there is a large opening 46 which leads to a duct 48 forming the inlet for a blower 50 having an exhaust 52. The blower 50 may be of any standard construction and of a size suitable for creating a proper draft of air through the oven and may be driven by an electric motor, not shown.

Adjacent the bottom of the oven and extending between the walls 10 and 12 is a heat insulated perforated panel 54 which rests upon rails 56 which are welded or bolted to the inner sides of the walls 10, 12. The panel 54 is composed of a bottom sheet 58 having a regular pattern of perforations 60 and a top sheet 62 which contains perforated depressions 64 coinciding with the perforations 60 in the sheet 58. The top sheet 62 is bent down at the edges to provide depending flanges 66 which ride on the rails 56, permitting the heat insulated panel 54 to be slid lengthwise of the oven, making it easily removable for cleaning when necessary. Suitable heat insulation material 57 is retained between the sheets 58 and 62. If desired the panel 54 may be made in sections to facilitate handling during removal.

Between the bank of lamps 26 and the heat insulated panel 54 is a perforated or screen conveyor 68 which is supported on rollers 70 journaled in the walls 10 and 12. The ends of the oven are closed by suitable panels (not shown in the drawing) which have openings in them of such size as to permit passage of the objects being treated, which, in the illustration, are dishes 92. These end closing panels may or may not be heat insulated, as conditions dictate. It is understood, of course, that other types of conveyor systems may be used depending upon the size, shape and other characteristics of the objects being treated.

The operation of this infrared oven is relatively simple and entails merely insuring that the blower speed is sufficient to create a proper circulation of air through the oven so as to remove the fumes or "fog" of evaporated solvent. When the oven is operating properly, the conveyor means carries the objects through the oven directly in the path of the heat radiated from the infrared lamps 26. The air circulated by the blower 50 enters the oven through the space 74 between the boxes 22 and the insulated panel 38, and then passes down through the openings 76 in the panel 38. As the air passes over the lamps 26, it becomes heated and in turn cools the lamps and their bases which is desirable because the temperature of the lamps is thus maintained at a level which is low enough to prevent deterioration of the cement which secures the glass envelope in the metal base, thereby increasing the effective life of the infrared lamps. The heated air passes down through the oven between the walls 10 and 12 and over the objects which are being subjected to infrared radiation. The path of circulated air is substantially parallel to the direction of the rays radiated from the infrared lamps 26. Thus the tendency of the evaporated solvent to rise in the oven and condense on the surface of the bulb or on the reflective surfaces of the walls 10 and 12 is inhibited. Furthermore, because the air which passes over the lamps 26 becomes heated, it can transfer a substantial portion of that heat to the object, thereby increasing the efficiency of the oven.

The conveyor system—illustrated as a belt 68—is so constructed that it does not present an obstacle to the relatively free flow of air therethrough or therepast. By the time the air reaches the panel 54, it contains a substantial amount of evaporated solvent and a portion of this gathers or accumulates on the top surface 62 of the panel 54. The air is drawn through the panel 54 into the duct 16 and is exhausted by the blower through the duct 52 to the atmosphere or to some other suitable place where the volatile solvents will not create a nuisance.

It has been pointed out that the air which is circulated through the oven carries an appreciable amount of evaporated solvent which condenses on the top surface of the panel 54; after a time it will become desirable to remove this gum or crust. For this reason, the panel 54 is mounted on the rails 56 which permit the panel or sections thereof to be slid lengthwise of the oven and removed. It may be wiped off with a cloth and a suitable cleaning solvent such as benzine, carbon tetrachloride, or naphtha. Periodically, it may be found desirable to clean the inner surface of the duct 16; however, this is not essential because once the air has carried the solvent past the conveyor, any accumulation of evaporated solvent on the surfaces of the lower portion of the oven or on the panel 54 is not material or harmful and in no way affects the efficiency of the oven or its operation.

Having described the preferred embodiments of my invention, numerous changes in its construction and operation may become apparent to those skilled in the art and may be made without departing from the spirit and scope of my invention, and I therefore desire to be limited only by the scope of the appended claim.

I claim:

An infrared oven adapted to have a conveyor pass therethrough to carry objects to be subjected to infrared radiation comprising in combination a pair of substantially parallel walls, a plurality of infrared lamps, a lamp support bridging between the upper edges of said walls but spaced therefrom to provide an air inlet, said lamps depending from said support and into the space between said walls, a heat insu-

lated reflective panel carried by but spaced from said lamp support closing the space between said walls adjacent the top thereof, said panel having a plurality of lamp openings through which said infrared lamps project into the space between said walls, the space between said lamp support and said panel and said lamp openings forming an air inlet passage, an air outlet duct closing the space between said walls opposite said bank of infrared lamps, said duct having an opening communicating with the interior of the oven, and an air circulating means for causing flow of air through said inlet passage, between said walls over the objects being subjected to infrared radiation and out through said duct.

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