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FURNACES FOR TREATING CERAMICS

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FIG. 1

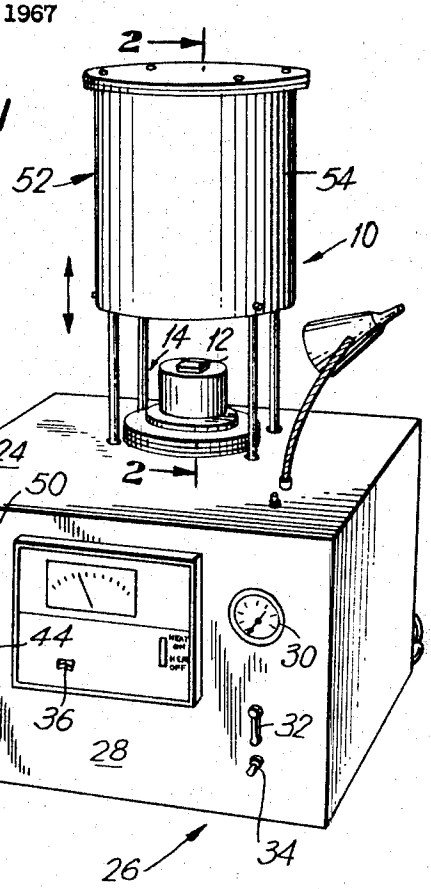
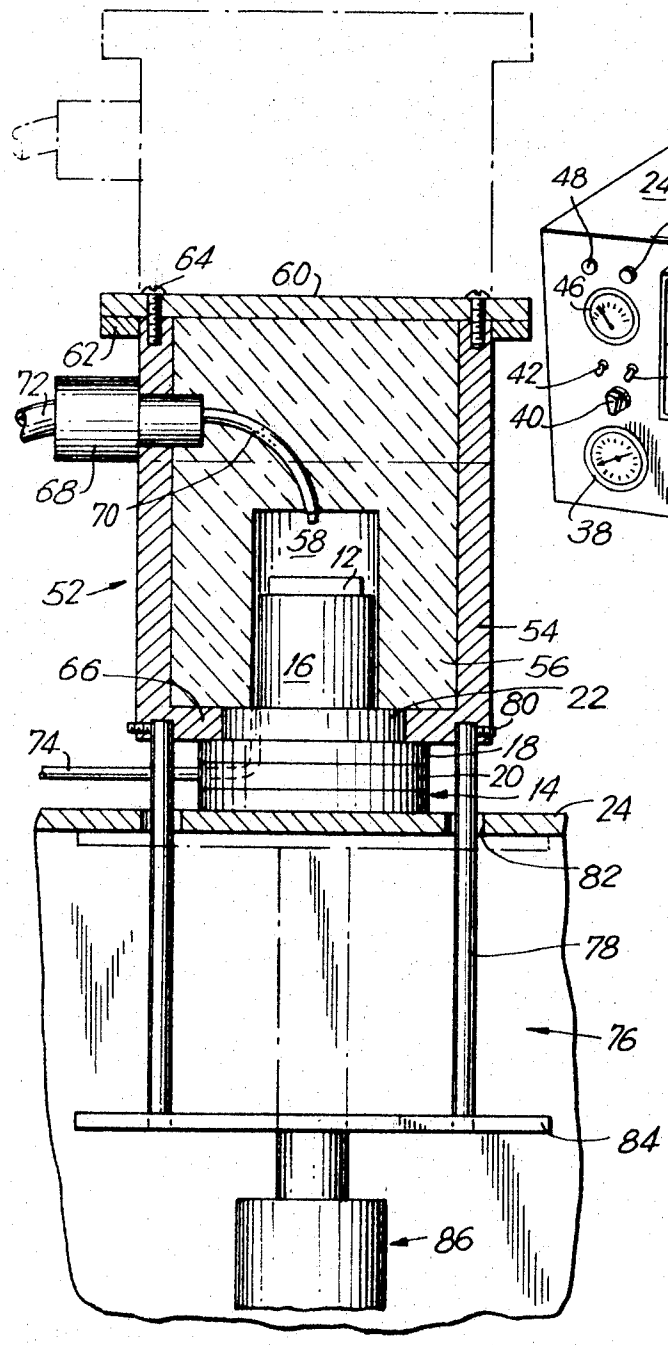


FIG. 2



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FURNACES FOR TREATING CERAMICS

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ABSTRACT OF THE DISCLOSURE

A furnace for treating ceramic materials. The furnace has a stationary support means which carries the work. A muffle means defines a heating chamber in which the work is treated, and a moving means is operatively connected with the muffle means to displace the latter from a rest position where it is situated beyond the support means and the work carried thereby to an operating position where it encloses the work and at least part of the support means in the heating chamber so as to heat the work therein. As a result of this construction, the work remains absolutely stationary so that all possible vibrations are avoided and any tendency for the work to crumble during treatment thereof or during displacement of the heating chamber into its operative location enclosing the work is reliably prevented.

BACKGROUND OF THE INVENTION

The present invention relates to furnaces.

In particular, this invention relates to furnace for treating ceramic materials such as porcelain and the like. Furnaces of this general type are used, for example, in dental laboratories by dental technicians for the purpose of manufacturing dental components.

As is well known, work material of this type is extremely delicate and great care must be taken not only during the actual treatment of the work by heating thereof but also during the transition period when the work becomes situated within a heating chamber of a furnace. Quite often, even with the exercise of considerable care, the removal of the moisture from the work results in crumbling thereof.

This latter highly undesirable property is extremely difficult to avoid because the work is subject to some degree of vibration during movement of the work into the heating chamber defined by the muffle of the furnace.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a furnace of the above general type which will avoid the above drawbacks.

In particular, it is an object of the invention to provide a furnace which will reliably avoid transmission of any vibrations to the work so that the latter will be very greatly protected against the possibility of crumbling or any other type of cracking or failure due to vibratroy movements which are transmitted to the work itself.

It is also an object of the invention to provide a relatively simple compact structure which can be very reliably operated without the exercise of great skill while at the same time achieving a vibration-free mounting of the work not only during the actual heating thereof in the furnace but also during transition of the work between its condition at the exterior of the furnace and its condition during the heating in the interior of the furnace.

It is particularly an object of the present invention to provide a furnace of the above type which is especially adaptable for use in dental laboratories in connection with the manufacture of dental components.

In accordance with the invention, a support means is provided to carry the work, and this support means is stationary so that the work also is stationary. A muffle means which defines a heating chamber of the furnace in which the work is to be treated is supported for movement with respect to the support means and the work which is carried thereby, and a moving means is operatively connected to the muffle means to displace it between a rest position situated beyond the support means and the work carried thereby and an operating position where the heating chamber of the muffle means encloses the work and at least part of the support means which carries the work.

BRIEF DESCRIPTION OF DRAWINGS

The invention as illustrated by way of example in the accompanying drawings which form part of this application in which:

FIG. 1 is a perspective illustration of one possible embodiment of a structure of the invention.

FIG. 2 is a fragmentary sectional elevation taken along line 2—2 of FIG. 1, in the direction of the arrows and showing the details of the furnace structure at an enlarged scale, as compared to FIG. 1.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawings, the furnace **10** which is shown therein for treating a ceramic material, such as a work piece **12**, includes a support means **14** which is stationary and carries the work **12** so that the work **12** also will remain stationary when mounted on the support means **14**. This support means includes a simple pedestal **16** having an upper cylindrical end provided with a top surface on which the work **12** rests. The lower end of the pedestal **16** has an enlarged diameter and may be provided with a gasket **18** in the form of a silicone pad ring resting on a lower portion **20** of the support means and surrounding a portion **22** thereof which is of a diameter between the diameter of the upper part of the pedestal **16** and the base part **20** thereof which carries the gasket **18**. The support means further includes a base plate **24** which fixedly carries the pedestal **16** in any suitable way.

This base plate **24** forms the top wall of an instrument housing **26** which contains and carries the instruments and controls for the furnace. Thus, the front wall **28** of the housing **26** carries, for example, a vacuum gauge **30**, a relief valve control **32**, a switch **34** for actuating a chamber lift, as described below, a meter setting control **36**, a timer **38**, a current adjuster **40**, a main switch **42**, a buzz switch **44**, an ammeter **46**, an indicating light **48**, and a fuse **50**.

The chamber lift switch **34** is provided to actuate a moving means which is capable of displacing a muffle means with respect to the support means **14**. The muffle means **52** is of a generally cylindrical configuration and has a rest or inoperative position shown in FIG. 1, where it is displaced above the support means **14**, so that at this time the work **12** can be placed on or removed from the top surface of the support means **14**.

The muffle means **52** has the outer metallic, cylindrical housing **54** in which is located a ceramic muffle **56** defining a heating chamber **58** which has an open bottom, this chamber **58** itself being of a cylindrical configuration. The cylindrical wall **54** is closed by a top plate **60** which has at its lower peripheral surface a ring **62** for properly locating the plate **60** on the cylinder **54**, and suitable screws **64** may be provided for fixing the closure plate **60** to the cylindrical housing **54** of the muffle means so as to

enclose the ceramic muffle member **56** within the housing. At its lower end the housing **54** has an inwardly directed circular flange **66** whose inner periphery is of a diameter precisely matching the exterior diameter of the portion **22** of the support means.

In order to heat the muffle means **54**, a source of energy is connected thereto by way of a thermocouple and power connecting assembly **68** connected to the wiring **70** which heats the muffle, as shown schematically in FIG. 2, and a flexible, electrically conductive connecting structure **72** serves to connect the thermocouple and power connecting structure **68** to a source of energy.

When the muffle means **52** is in its lower operative position shown in FIG. 2, the part of the pedestal **16** which is above the portion **22** thereof is received in the interior of the chamber **58**, and the opening defined by the lower flange **66** is completely closed by the portion **22** of the support means. A vacuum tube **74** extends through the support means to communicate with the interior of the chamber **58** when the muffle means **52** is in its lower operative position shown in FIG. 2, and this vacuum tube **74** is connected with any suitable source of vacuum so that the interior of the heating chamber **58** can be evacuated. The relief valve control **32** is actuated at the end of the operation in order to raise the pressure in the chamber **58** so that thereafter the muffle means can be returned upwardly to its rest or inoperative position shown in FIG. 1.

In accordance with the present invention not only is the support means **14** stationary and the muffle means **52** movable so that the heating chamber **58** is displaced with respect to the work, rather than work with respect to the heating chamber, but in addition a moving means **76**, actuated by the chamber lift switch **34**, is provided for displacing the muffle means **52** in a smooth, vibration-free manner.

For this purpose the muffle means is fixedly connected with a plurality of rods **78** of the moving means. In the illustrated example, there are four such rods extending into bores of the housing **54** at the lower surface thereof and fixed to the housing **54** by said screws **80**, respectively. The base plate **24** which forms the top wall of the housing **26** is itself formed with a plurality of openings **82** through which the rods **78** extend. It is particularly to be noted that these openings **82** are of a diameter larger than the rods **78** and that these rods **78** respectively extend downwardly through the openings **82** with clearance so that there is no slidable or other frictional engagement between the rods **78** and the wall **24**, thus inhibiting the transmission of any vibrations to the structure through the rods **78**. Within the housing **26** the lower ends of the rods **78** are fixed to a plate **84** which is in turn fixed to a displacing structure which may take the form, for example, of a fluid-pressure device **86**. This device may be either pneumatically or hydraulically operated, and actuation of the switch **34** will, for example, introduce air under pressure from a compressed air tank into the cylinder of the device **86** so as to displace the piston therein, or a hydraulic structure may be provided for this purpose, if desired. Also, it is possible to provide a structure where a threaded spindle passes through a rotary nut which is turned so as to displace the spindle which is connected at its top end to the plate **84** so as to displace the latter vertically. Any of these known displacing devices can form part of the moving means **76** for displacing the muffle means **52**.

It will be noted that with this construction the muffle means and the support means both have a common vertical axis, and while the support means remain perfectly stationary the muffle means is displaced along this common axis between the lower operating position thereof shown in FIG. 2 and the upper inoperative position thereof shown in FIG. 1.

Because of the above-described structure of the invention, the work **12** will remain absolutely stationary not only during the treatment thereof in the heating chamber **58** of the muffle means but also during transition between its condition at the exterior of this chamber, shown in FIG. 1, and its condition in the interior of the chamber, shown in FIG. 2. In this way, any possible damage to the work resulting from vibratory movements are completely eliminated, and it will be noted that this result also is achieved in part by extending of the rods **78** with clearance through the openings **82**.

At the same time, the structure is simple and compact and through the expedient of displacing the heating chamber **58** with respect to the work the latter is protected against any possible damage to an extent which is far greater than has heretofore been possible.

What is claimed is:

1. In a furnace for treating ceramic materials, stationary support means having an upper surface for carrying the work which is to be treated, muffle means having an opening in the bottom thereof defining a heating chamber for the work, moving means substantially vertically coaxial with said muffle means and operatively connected to the bottom portion thereof for displacing said muffle means from a rest position situated at an elevation higher than said support means and the work carried thereby to an operating position enclosing the work and at least a part of said support means.

2. The combination of claim **1** and wherein at least part of a structure for heating said muffle means is operatively connected thereto for movement therewith and has a flexible connecting structure extending from said muffle means.

3. The combination of claim **1**, and wherein said muffle means is of a generally cylindrical configuration and includes an outer housing and an inner metal body carried by said housing in the interior thereof and having an opening therein to thereby form the heating chamber for the work.

4. The combination of claim **1** and wherein said support means includes a base plate and a pedestal assembly fixed to and extending upwardly from said base plate and having said upper surface for carrying the work, and wherein a vacuum tube communicates through said pedestal of said support means with the interior of said heating chamber when said muffle means is in said operating position thereof to be connected to a source of vacuum for evacuating the interior of said heating chamber.

5. In a furnace for treating ceramic materials, stationary support means for carrying the work which is to be treated, muffle means defining a heating chamber for the work, moving means substantially vertically coaxial with said muffle means and operatively connected thereto for displacing said muffle means from a rest position situated at an elevation higher than said support means and the work carried thereby to an operating position enclosing the work and at least a part of said support means, said support means including a base plate and a pedestal assembly fixed to and extending upwardly from said base plate and having a top surface which forms said surface of said support means which carries the work, said base plate being formed with a plurality of openings situated beyond said pedestal assembly, and said moving means including a plurality of rods fixed to said muffle means and extending downwardly from the latter through said openings of said base plate, respectively, to an elevation lower than said base plate, so that vertical displacement of said rods through said openings of said base plate will result in displacement of said muffle means between said rest and operative positions thereof.

6. The combination of claim **5** and wherein said moving means includes beneath said base plate a structure operatively connected to said rods for vertically displacing the latter.

7. The combination of claim 6 and wherein said structure of said moving means which is operatively connected to said rods is a fluid-pressure assembly which is fixed to said rods for displacing the latter vertically.

8. The combination of claim 5 and wherein a housing for a plurality of control instruments has a top wall which forms said base plate.

9. The combination of claim 5 and wherein said openings of said base plate are larger than said rods with said rods extending with clearance through said openings so that said rods remain out of engagement with said base plate during movement with respect thereto.

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