Oct. 9, 1962 J. ISREELI 3,057,603

GLASS TUBE COIL ASSEMBLIES AND HEATING BATHS

Filed March 11, 1958 2 Sheets-Sheet 1

FIG. 1

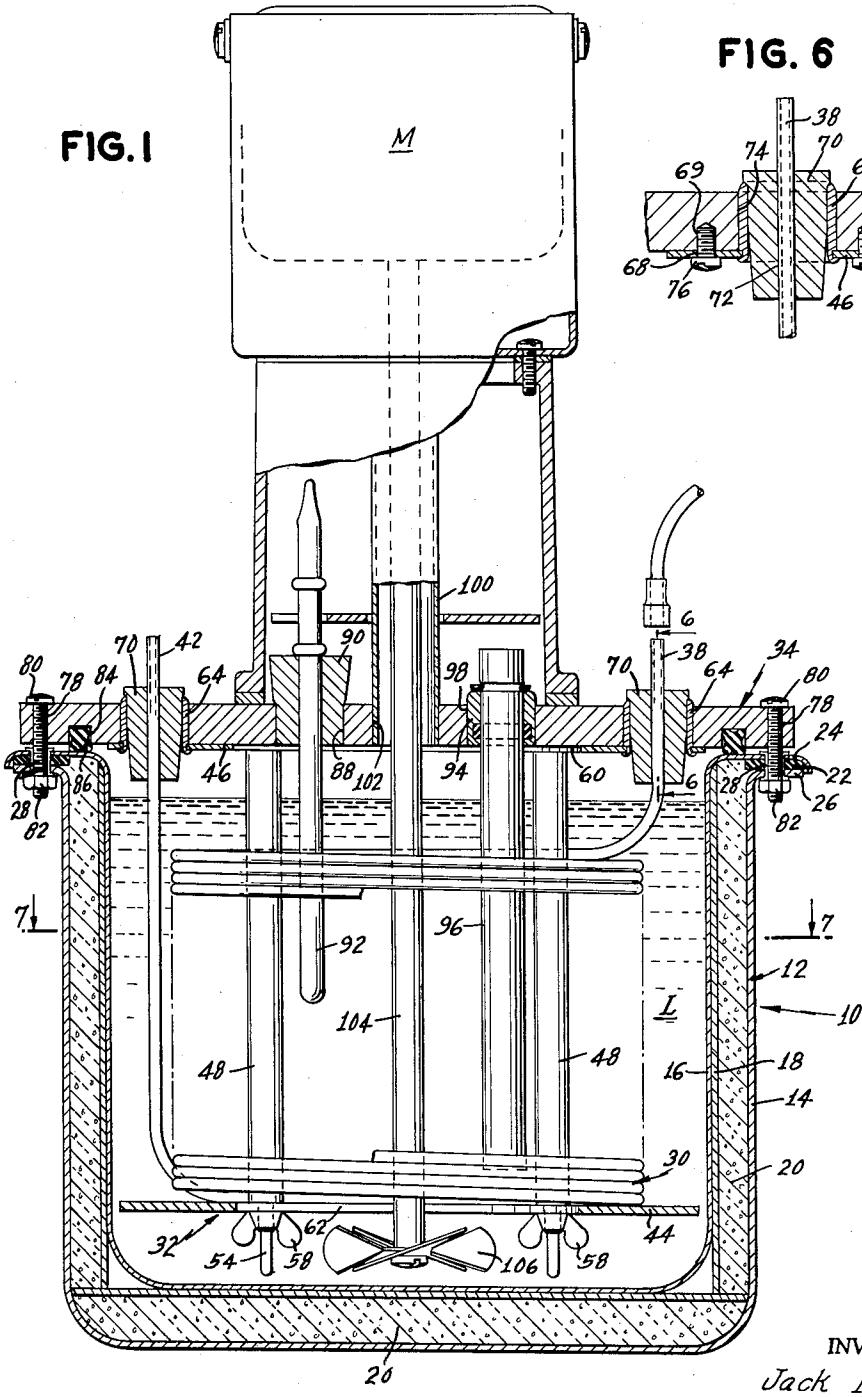


FIG. 6

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Filed March 11, 1958 2 Sheets-Sheet 2

FIG. 2

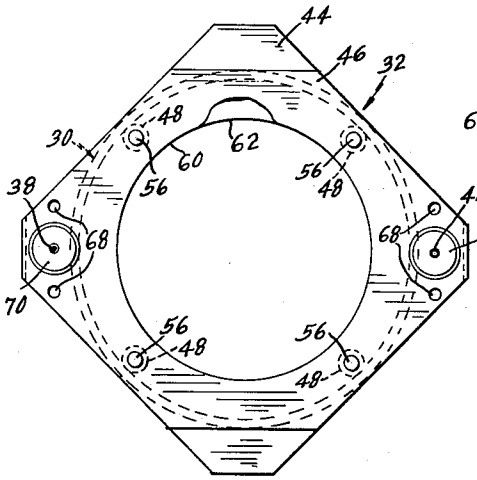


FIG. 3

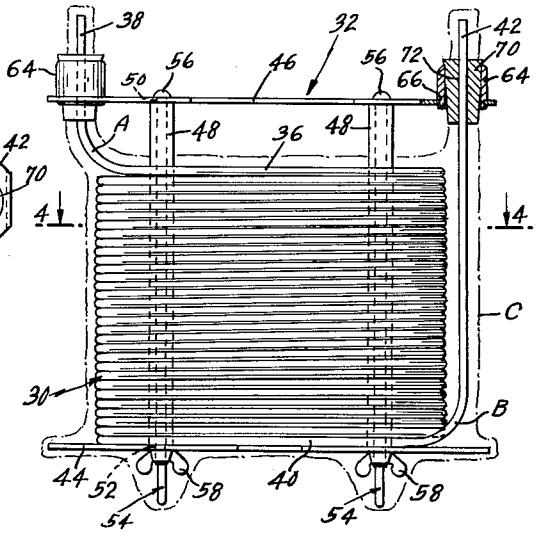


FIG. 4

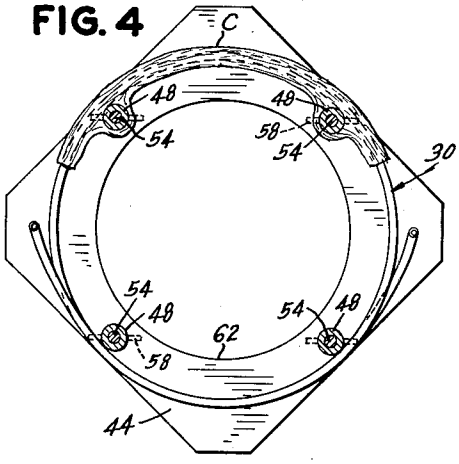


FIG. 5

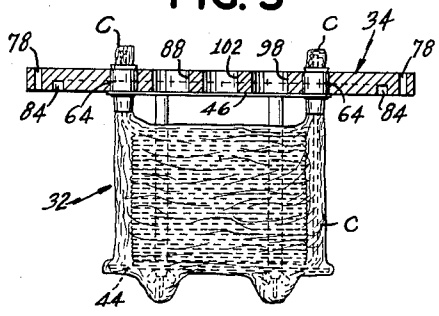
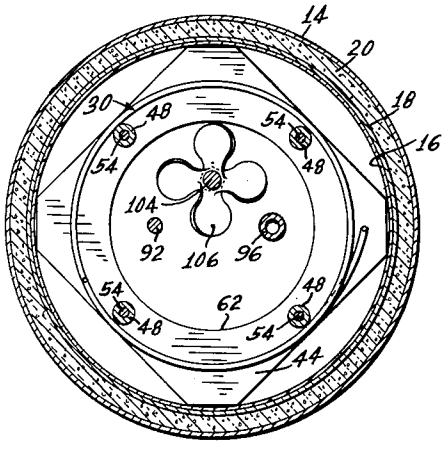


FIG. 7



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3,057,603

GLASS TUBE COIL ASSEMBLIES AND HEATING BATHS

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4 Claims. (Cl. 257—199)

The present invention relates to heating baths for heating various fluids, in analysis and other processes.

One object of the invention is to provide means to protect a coil of glass tubing of a heating bath or other apparatus against breakage during shipment and handling.

Another object is to provide an improved support for a coil of glass tubing for a heating bath or other devices.

A further object is the provision of improved means for stirring the heating liquid in which the fluid-heating coil is immersed whereby to provide a substantially uniform temperature of the heating liquid in the different parts of the bath.

A yet further object is generally to provide a heating bath of improved construction and operation.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated for carrying out the invention:

FIG. 1 is a vertical sectional view of a heating bath according to the invention;

FIG. 2 is a top plan view of the coil assembly;

FIG. 3 is a side elevation of the glass coil assembly in condition for shipping, with parts shown in section for purposes of illustration;

FIG. 4 is a cross sectional view along line 4—4 of FIG. 3;

FIG. 5 is an elevation view of the glass coil assembly mounted onto the heating bath cover;

FIG. 6 is a section along line 6—6 of FIG. 1; and

FIG. 7 is a section along line 7—7 of FIG. 1.

Referring now to the drawings in detail, there is shown in FIGURE 1 a heating bath assembly 10 pursuant to the present invention, said assembly comprises a jacketed receptacle 12 having an outer casing 14 in spaced relation to an inner casing 16 and being provided with insulation in the space therebetween, for example, asbestos 18 which covers the outer surfaces of inner casing 16 and glass wool 20 disposed between the asbestos and the outer casing 14. A gasket 22 is provided between the top flanges 24 and 26 of inner and outer casing 16 and 14, respectively, and eyelets 28 secure the inner and the outer casing in spaced relation, with gasket 22 therebetween at the upper parts thereof.

A glass coil 30 is disposed within receptacle 12 and for that purpose is mounted in a coil holder assembly 32, the latter being supported by the receptacle cover 34, as will hereinafter be described in greater detail. Referring more particularly to FIGURE 3, coil 30 comprises a cylinder of glass tubing closely and helically formed into a plurality of convolutions. Uppermost convolution 36 terminates in an upwardly extending inlet portion 38 and lowermost convolution 40 terminates in upwardly extending outlet portion 42. The coil holder assembly 32 comprises a bottom plate 44 and a top plate 46, said plates being maintained in parallel spaced relation by means of symmetrically disposed hollow spacer posts 48, positioned in registry with corresponding aligned openings 50 and 52, in top plate 46 and bottom plate 44, respectively. A bolt 54 having an enlarged head 56 disposed at the outer side of top plate 46, extends through each spacer post 48 and the associated plate openings, and projects beyond bottom plate 44. A wing nut 58 is threaded onto the projecting part of each bolt and is tightened to secure said plates in said parallel spaced relation.

Top plate 46 and bottom plate 44 are provided with large central apertures 60 and 62, respectively. A pair of bushings 64 are press fitted and staked into symmetrically disposed openings 66 at opposite sides, respectively, of aperture 60 in top plate 46, and said top plate is also provided with a pair of mounting holes 68 at opposite sides of each opening 66. A tapered stopper 70 is inserted in each bushing 64 and held in fluid tight relation therewith, each of said stoppers having a through central opening 72 to accommodate the inlet and outlet portions, respectively, of glass coil 30 in fluid-tight relation therewith.

When mounting the glass coil 30 in the coil holder assembly 32, the bottom plate 44 is removed from the coil holder by removing wing nuts 58. Thereafter the glass coil is inserted into the assembly, being guided therein by spacer posts 48 which slidingly engage the inner diameter of the coil, inlet and outlet portions 38 and 42 are passed through the corresponding stopper apertures 72 a sufficient distance so that after bottom plate is reassembled onto the coil assembly, lowermost convolution 40 of the glass coil lightly touches said bottom plate. Using a small point flame, the glass coil is heated gradually and evenly at the bends A and B to remove the stresses in the coil, after which the latter is allowed to cool.

In accordance with one of the above stated objects of this invention, provision is made to protect glass coil 30 against breakage during shipment and handling. For this purpose, the coil is coated with a protective layer C of a suitable rigid material which is substantially inflexible and holds the convolutions of the coil in fixed relation so that the coil thus encased in this material is, in effect, a cylinder in which the glass convolutions are held against relative movement and vibration of the convolutions is prevented. The protective layer C is composed of a substance which is soluble in water or other liquid L of the heating bath in which the coil is immersed, so that the layer C is automatically removed when the coil is disposed in said liquid in the assembly of the heating bath at the place to which it is shipped. In this connection it will be understood that the heating coil assembly illustrated in FIGS. 2 to 4, is packed as a separate unit for shipment purposes, and that various other parts of the bath are also shipped in disassembled condition in convenient units which can be readily assembled together with the coil 30 to form the complete heating bath.

The protective layer C in which the coil is embedded is preferably a polyalkylene glycol,

$$HOCH_2(CH_2OCH_2)CH_2OH$$

it is available on the market as "carbowax 6000." It has an average molecular weight of 6000–7500 and is solid at normal temperatures. As previously indicated it dissolves readily in water. It also dissolves readily in diethylene glycol which is the preferred heating liquid L for the heating bath. For coating the coil 30 the carbowax is heated until it is barely liquid and the coil is dipped therein several times up to the stoppers 70, in order to completely encase the coil and its convolutions in a hollow cylinder of the material, as illustrated by FIGS. 3 to 5. The glass coil assembly is dipped into the carbowax up to the bottom of the stoppers as often as necessary until the glass coil is encased and connected to the spacer posts with the solidified "carbowax" C, the latter also encasing the upwardly extending inlet and outlet portions 38 and 42, respectively, up to the stoppers 70. By so treating the coil assembly, the glass coil is held rigidly and without stress in position, whereby it can withstand

even very rough handling and can thus be shipped without incurring the risk of breakage.

Receptacle cover **34** is provided with a pair of openings **74** adapted to snugly receive bushings **64** of the glass coil assembly, and the latter is secured to the receptacle cover by means of screws **76** which pass through mounting holes **68** in coil assembly top plate **46** and are threaded into holes **69** in the bottom surface of said receptacle cover, as best shown in FIGURE 6. As best shown in FIGURES 1 and 5, receptacle cover **34** is provided with mounting holes **78** in registry with eyelets **28** on receptacle **12** for securing the cover onto the receptacle by any suitable means, such as screws **80** and nuts **82**. A groove **84** is provided on the underside of receptacle cover **34** and is adapted to receive a gasket **86** whereby a fluid tight seal is obtained between the cover and receptacle when the latter are secured together in the manner described above. Receptacle cover **34** is also provided with an opening **88** in which there is mounted a stopper **90**, in fluid tight relation, which carries a thermostat **92** for controlling the temperature of the heated bath in the receptacle. A bushing **94** carrying an electric heater **96** in fluid tight relation is mounted onto cover **34** in an opening **98** provided therefor.

A sleeve **100** is accommodated in an opening **102** therefor in cover **34**, said sleeve having disposed therein a rotatable stirrer shaft **104** carrying at the lower end thereof propeller **106** for agitating the heated bath. With reference to FIGURE 7, it will be noted that in accordance with this invention stirrer shaft **104** is mounted eccentrically in receptacle **14**. As a result of the eccentric position of stirrer **106**, the heating liquid is more effectively stirred in the receptacle **12** during the heating thereof by heater **96**, whereby the temperature of said liquid is substantially uniform throughout the body of liquid in the receptacle.

Shaft **104** extends downwardly in the receptacle through apertures **60** and **62** of the glass coil assembly **32** and the blades are disposed in said receptacle below bottom plate **44**. A motor M for turning the stirrer is mounted above the heating bath assembly.

It will be understood that in assembling the heating bath after shipment, the coil assembly unit **32** is secured to the receptacle cover **34** and that after the receptacle **12** is filled with the heating liquid L to the desired level, said cover is secured to the receptacle and the other parts are mounted on the cover to complete the assembly. When the liquid is heated by heater **96** to the desired temperature, the carbowax will readily dissolve in the bath and the heating bath assembly will be ready for its normal operation. During said normal operation, the stirrer is operative to agitate the bath so as to provide a uniform temperature distribution therein, and thermostat **92** is operative to control the heater so as to maintain the desired temperature in said bath.

While the heating bath of the present invention is of general utility as a heating bath, it has been especially effective in continuous analysis or processing systems and apparatus of the character described in U.S. Patent No. 2,797,149. It will be understood that the coil **30** may be used in a cooling bath if so desired, and in such case may constitute a fluid-cooling element. Also, it is apparent that the means for protecting a frangible element such as a coil of glass tubing is applicable generally to such coils whether used for heat exchange purposes in a heating or cooling bath or for other purposes. It will be understood further that the protective material C may be removed by a solvent liquid other than the liquid employed in the heating bath.

As various changes may be made and will occur to skilled artisans, in view of the present disclosure, I do not wish to be limited to the specific construction herein shown or described except as may be required by the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

1. A heating bath assembly comprising, a receptacle for a liquid bath, a cover for said receptacle securable thereto in fluid tight relation therewith, coil holder means carried by said cover and comprising a pair of plates in parallel spaced relation and a plurality of spacer posts extending between said plates, transversely thereof, and holding said plates in said relation, a coil of glass tubing mounted between said plates and having one end thereof in engagement with one of said plates and having the convolutions thereof adjacent said spacer posts, the other of said plates having apertures therein and said coil being provided with inlet and outlet parts extending through said apertures, said coil having convolutions which are normally relatively movable, and a solidified substance securing said convolutions to each other in fixed relation and to said spacer posts for preventing breakage of said coil during the handling and shipping thereof, said coil being immersed in said liquid bath when said cover is secured to said receptacle, said solidified substance being of a type which is dissolvable in said liquid bath when the latter is heated to its operating temperature.

2. A heating bath assembly comprising, a receptacle for a liquid bath, a cover for said receptacle securable thereto in fluid tight relation therewith, coil holder means carried by said cover and comprising a pair of horizontal upper and lower plates in parallel spaced relation and a plurality of vertical spacer posts extending between said plates, transversely thereof, and holding said plates in said relation, a coil of glass tubing mounted between said plates and having one end thereof in engagement with said lower plate, said upper plate having apertures and said coil being provided with inlet and outlet parts which extend upwardly through said apertures, said coil having convolutions which are normally relatively movable, and a solidified substance securing said convolutions to each other in fixed relation and to said spacer posts for preventing breakage of said coil during the handling and shipping thereof, said coil being immersed in said liquid bath when said cover is secured to said receptacle, said solidified substance being of a type which is dissolvable in said liquid bath when the latter is heated to its operating temperature.

3. A heating bath assembly comprising, a receptacle for a liquid bath, a cover for said receptacle securable thereto in fluid tight relation therewith, coil holder means carried by said cover and comprising a pair of plates in parallel spaced confronting relation, a coil of glass tubing mounted between said plates and having one end thereof in engagement with one of said plates, the other of said plates having apertures and said coil being provided with inlet and outlet parts which extend through said apertures, said coil having convolutions which are normally relatively movable, and a solidified substance securing said convolutions to each other in fixed relation and to said spacer posts for preventing breakage of said coil during the handling and shipping thereof, said coil being immersed in said liquid bath when said cover is secured to said receptacle, said solidified substance being of a type which is dissolvable in said liquid bath when the latter is heated to its operating temperature and being a normally solid polyalkylene glycol and said liquid bath being diethylene glycol.

4. A bath assembly comprising, a receptacle for a liquid bath, a cover for said receptacle securable thereto in fluid tight relation therewith, coil holder means carried by said cover and comprising a pair of plates in parallel spaced relation and a plurality of spacer posts extending between said plates, transversely thereof, and holding said plates in said relation, a coil of glass tubing mounted between said plates and having one end thereof in engagement with one of said plates and having the convolutions thereof adjacent said spacer posts, said coil having convolutions which are normally relatively mov-

able, the other of said plates having apertures and said coil being provided with inlet and outlet parts which extend through said apertures, a solidified and substantially inflexible substance securing said convolutions to each other in fixed relation and to said spacer posts to prevent relative movement of said convolutions and thereby prevent breakage of said coil during the handling and shipping thereof, said coil being immersed in said liquid bath when said cover is secured to said receptacle, said solidified substance being of a type which is dissolvable in said liquid bath.

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