May 21, 1940. F. KOSTKA 2,201,864

METHOD AND APPARATUS FOR THE MANUFACTURE OF ELECTRIC CONDENSERS

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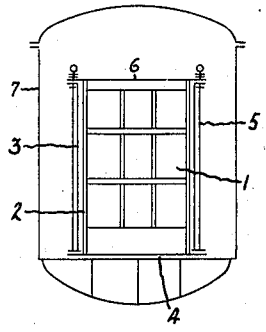
Fig. 1.



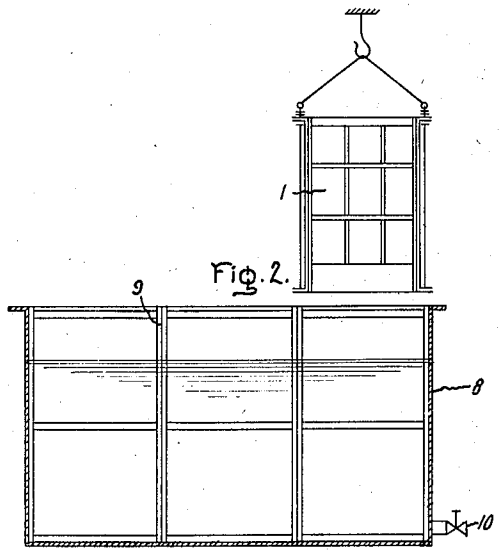
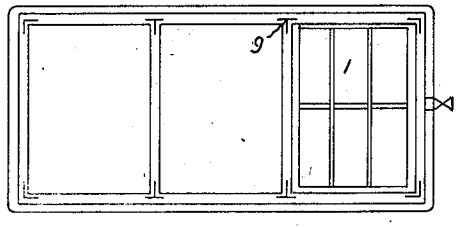


Fig. 2.

Fig. 3.



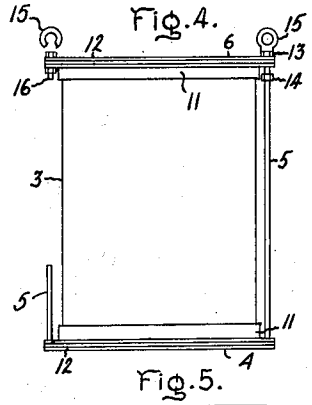
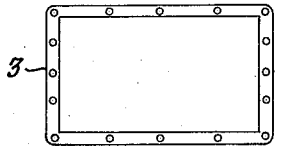


Fig. 4.

Fig. 5.



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His Attorney.

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2,201,864

METHOD AND APPARATUS FOR THE MANUFACTURE OF ELECTRIC CONDENSERS

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9 Claims. (Cl. 175—41)

The present invention relates to electric condensers or capacitors and more particularly to large condensers or capacitors which are made up of a plurality of individual condenser units.

A principal object of the present invention is the provision of an improved method and apparatus for the manufacture of such condensers or capacitors.

For an understanding of other objects of the invention and of that which I believe to be novel and my invention, attention is directed to the following detailed description and the claims appended thereto, taken in conjunction with the accompanying drawing in which an exemplary embodiment of the invention is illustrated.

In the manufacture of condensers it has been common practice heretofore to subject the condensers to treatment, such as vacuum, heat and impregnation with oil or other liquid impregnating medium, with the condensers completely assembled in their final containers or casings. With the ever growing demand for condensers of larger and larger capacities, this heretofore commonly practiced method, which was satisfactory for small condensers, introduces difficulties in the manufacture of large condensers due to the increased weights and sizes of the condensers themselves and also to the fact that it is impractical to provide impregnating vessels of sufficient size to accommodate such large condensers in their finally assembled form.

According to the present invention, the difficulties indicated in the preceding paragraph are overcome by constructing the large condenser of a plurality of component individual condenser units and by treating the latter individually in existing impregnating vessels of standard size. After the treatment of the individual condenser units, they are transferred in specially designed auxiliary containers to the casing of the large condenser, the condenser units being kept submerged in the impregnating medium while in their auxiliary containers. After insertion of the auxiliary containers into the large vessel or casing, they are then partly or entirely removed leaving the condenser units and their surrounding impregnating medium in the large vessel which is filled with liquid medium such as oil to sufficient extent to wash over or submerge the condenser units while their auxiliary containers are being removed. During the treatment of the condenser units in the impregnating vessel, the auxiliary containers are partly or entirely opened so that the active condenser parts are effectively exposed to the desired treatment which commonly includes subjecting the condenser unit to vacuum, heat and impregnation with liquid such as oil or other insulating medium. The auxiliary containers are preferably so constructed that the container bases can be detachably secured thereto in a manner to render the containers capable of holding fluid. These detachable bases are unfastened when the auxiliary containers and their contents are disposed in the final casing of the condenser so that the auxiliary containers may be removed from the casing.

In the drawing, Fig. 1 diagrammatically illustrates an arrangement of an individual component condenser unit enclosed in an auxiliary container and being subjected to treatment in an impregnating vessel; Fig. 2 is a diagrammatic sectional elevational of a large casing or vessel adapted to form the permanent housing for the complete condenser assembly and in which the individual condenser unit enclosed in the auxiliary container is about to be placed; Fig. 3 is a diagrammatic plan view of the large vessel or casing; Fig. 4 is a side elevation illustrating the special design of the auxiliary container for an individual condenser unit, and Fig. 5 is a plan view of the auxiliary container of Fig. 4 with the top cover removed.

In the practice of the present invention an individual component condenser unit may be enclosed in the auxiliary container while being subjected to treatment or the auxiliary container may be placed around the condenser unit subsequently to the completion of the treatment. As illustrated for purposes of example in Fig. 1, an individual condenser unit 1 is subjected to treatment in an impregnating vessel 7 while being enclosed in an auxiliary container 2. The auxiliary container, which is intended to serve as a transfer receptacle, consists essentially of a container mantle 3 and a base or bottom plate 4 as best illustrated in Fig. 4. The base or bottom plate is adapted to be secured in sealing relation to the bottom of the mantle 3 by means of draw bolts 5 in a manner to be described in detail hereinafter. In some cases, as for example when the auxiliary container with its contents is not to be transferred directly from the impregnating vessel to the large casing of the condenser, it may be desirable to provide also a lid or closure plate 6 for the top of the container and such top lid also may be secured in sealing relation to the top of the container mantle 3 by means of draw bolts 5. In case such a top lid is provided, it preferably is left off of the container during treatment of the condenser unit in the impregnating vessel

in order that the active parts of the condenser unit may be effectively exposed to the treating process. In those cases wherein it is desired to treat the condenser unit in the impregnating vessel without the auxiliary container being disposed thereon, the condenser unit is of course most effectively exposed to the treating process and the auxiliary container may be placed around the condenser unit subsequently to completion of the treatment. One of the chief advantages of the method of the present invention is that the individual condenser unit and the auxiliary container may be made sufficiently small that they may be inserted into impregnating vessels of standard size whereas it would be impossible to insert the finally assembled condenser into such an impregnating vessel.

After completion of the treatment of the individual condenser unit in the impregnating vessel, which treatment includes immersing the condenser unit in a body of liquid impregnating medium, the container mantle 3 of the auxiliary container is fastened tightly to the base 4 while the condenser unit remains submerged in the impregnating liquid. By this means it is insured that the condenser unit is kept completely surrounded by impregnating medium such as oil or the like. Also, in case the upper lid 6 is employed, this latter lid may be secured tightly to the upper end of the container mantle while the condenser unit is submerged in the impregnating liquid so that when the auxiliary container is removed from the impregnating vessel, the condenser unit and its surrounding impregnating liquid are tightly sealed within the auxiliary container and effectively protected against exposure to air.

The large vessel or casing 8 is made of sufficient size to provide room for all the individual condenser units when in their finally assembled state to form the complete condenser. This large casing is provided with vertically extending guide ledges or flanges 9 which define compartments within the casing for the individual condenser units and which also facilitate insertion of the auxiliary containers into the compartments. The casing is provided also with a valve 10 which may be employed for regulating the level of a body of liquid filling medium, such as oil or other insulating liquid, within the casing. Such liquid filling medium may be added to the casing 8 after the insertion of the auxiliary containers and their contents into the casing or, as in the illustrated embodiment, may be provided in the casing before the insertion of the auxiliary containers. In this latter case, when the auxiliary containers are transferred to the large casing and lowered into the compartment provided therefor in the manner indicated in Fig. 2, the level of the liquid in the casing may be regulated by means of the valve 10 to prevent overflow of the liquid from the casing and also to insure that when the auxiliary containers are inserted into their respective compartments, that the liquid is maintained at a sufficient depth to insure complete submergence of the condenser units.

In the exemplary construction of the auxiliary container 2 illustrated in Fig. 4, the container mantle 3 is provided with flanges 11 at the top and bottom thereof to which the base or lid 4, and upper lid 6 if employed, may be secured. For effective sealing of the top and bottom of the container, gaskets or packings 12 may be provided between the lids 4 and 6 and their supporting flanges. Such gaskets may, if desired, be secured permanently to the flanges. Draw bolts 5 are arranged to extend through bores or apertures in the upper lid 6 and through similar aligned bores or apertures in the top and bottom flanges 11 into screw-threaded engagement with the base plate or lid 4. With the draw bolts connected to the base plate, this latter plate may be drawn into sealed engagement with the lower flange 11 by means of clamping nuts 13 provided on the draw bolts above the lid 6 and the upper flange 11. If on the other hand it is desired to remove the lower lid 4 while maintaining the upper lid 6 in sealing relation to the upper end of the container mantle 3, draw bolts 5 may be screwed out of the lid 4 and the lid 6 secured in firm engagement with the upper flange 11 by means of the cooperative action of clamping nuts 13 on the draw bolts above the lid and other clamping nuts 14 provided on the draw bolts below the upper flange 11. It will be understood, of course, that when it is desired to unscrew the draw bolts from the lower lid 4, nuts 14 must be screwed down a sufficient distance on the draw bolts to permit relative movement between the draw bolts and the upper flange 11. If desired, additional bolts 16 may be provided for securing the upper lid 6 to the upper flange 11. All or part of the draw bolts 5 preferably are provided with eyelets 15 so that hoisting equipment may be secured thereto as indicated in Fig. 2 for transferring the auxiliary containers from the impregnating vessel 7 to the casing 8 and for removing the containers from the casing 8 in a manner to be pointed out hereinafter.

In the exemplary construction illustrated, the complete condenser is made up of three individual component condenser units but it will be understood, of course, that there may be more or less individual units in accordance with the capacity desired, the number of phases or the weight and size it is desired that the complete condenser should have. It will be understood also that the liquid filling medium, which may be oil or other insulating liquid contained in the casing 8, should be cleansed and evacuated in the usual manner before the auxiliary containers with their condenser units are inserted therein.

After the insertion of one of the auxiliary containers with its contents into a compartment provided therefor in the casing 8, draw bolts 5 are manipulated from the upper end of the container to effect detachment of lower lid 4 from container mantle 3. The container mantle may then be withdrawn upwardly from around the condenser unit and from the casing 8, leaving the condenser unit reposing on the lower lid 4 in the casing 8. The impregnating liquid which is transferred along with the condenser unit in the auxiliary container or receptacle, also is left in the casing 8 and intermixes with the filling medium therein. During withdrawal of the container mantle 3, care should be taken to insure continued complete submergence of the condenser unit in the liquid in the larger casing. After one of the component condenser units has been inserted in the larger casing 8 in the manner just described and its auxiliary container removed, the remainder of the component condenser units may be installed in their respective compartments in the larger casing and all the individual units are then connected to terminals carried by a lid (not shown) for the larger casing in any desired manner. The filling of the casing to the proper permanent level and the securing

of the cover or lid to the casing may then be accomplished in the usual manner.

As will be apparent from the foregoing description, an important advantage is derived from the practice of the present invention, which is that the component individual condenser units remain completely enclosed in the impregnating medium in which they were treated throughout the time that they are being transferred from the treating vessel to their final casing so that there is no possibility of their being contaminated by air or moisture during the transfer. A further advantage is that the portion of the original impregnating medium which is transferred with the individual condenser units in their auxiliary containers forms a substantial part of the filling medium in the final casing so that it is necessary to add only a small quantity of additional filling medium to the casing.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a process of manufacturing electric condensers which includes submergence of a condenser body in a liquid medium in one container: the method of handling such condenser body which comprises transferring said body in a transfer receptacle to a second container; the said transferring operation including removing said receptacle out of said first mentioned container in a manner to insure continued complete submergence of said body in said receptacle in a portion of said liquid medium, and immersing said receptacle in liquid medium in said second container to a depth sufficient to insure continued submergency of said body in the liquid medium in said second container; and then causing opening of the bottom of said receptacle so as to permit said body to pass out of the receptacle through the bottom thereof, and withdrawing at least the major portion of the receptacle substantially vertically upward out of said second container, leaving said body submerged in the liquid medium in the second container.

2. In a process of manufacturing electric condensers which includes submergence of a condenser body in a liquid medium in one container: the method of handling such condenser body which comprises transferring said body from said container to a second container in a transfer receptacle having a releasable closure at one end; the said transferring operation including removing said receptacle out of said first mentioned container in a manner to insure continued complete submergence of said body in said receptacle in a portion of said liquid medium, and depositing said receptacle, with said end of the receptacle down, in liquid medium in said second container to a depth sufficient to insure continued submergence of said body in the liquid medium in said second container; and then effecting release of said closure at said end of the receptacle and withdrawing at least the major portion of the receptacle substantially vertically upward out of said second container, thereby to permit said body to pass out of said end of the receptacle and remain submerged in the liquid medium in said second container.

3. The method of making condensers which includes providing for a condenser unit a transfer container capable of holding liquid but having a detachable bottom, submerging said condenser unit in a body of impregnating liquid in an impregnating vessel, transferring said condenser unit from said impregnating vessel to a casing for the unit while keeping the unit submerged in a portion of said impregnating liquid contained in said transfer container, immersing said transfer container in a body of liquid filling medium in said casing to an extent sufficient to insure submergence of said condenser unit in the filling medium, and then while the condenser unit is kept submerged in the filling medium, detaching said bottom from said transfer container and removing the remainder of the transfer container from said casing, leaving the condenser unit in the casing.

4. The method of making a condenser, which includes individually subjecting a plurality of component condenser units to treatment in a treating vessel, which treatment includes submerging said units in liquid treating medium, removing each of the treated units from the treating vessel while keeping the unit submerged in treating medium in a transfer receptacle having a detachable bottom, transferring said receptacle with its contents to a casing adapted to accommodate said plurality of units, immersing the transfer receptacle in a body of liquid treating medium in said casing to a depth sufficient to insure continued submergence of the condenser unit contained in the transfer receptacle, effecting detachment of the bottom of the transfer receptacle and then removing at least the major portion of the transfer receptacle from said casing while leaving the condenser unit submerged in the treating medium in the casing.

5. In apparatus for the making of condensers comprised of a plurality of individual condenser units, the combination of a casing adapted to form a permanent housing for a plurality of condenser units and capable of holding a body of liquid filling medium surrounding the condenser units, said casing having an open top and substantially vertically extending guide means defining within the casing a plurality of compartments for receiving the individual condenser units, and an auxiliary transfer container for an individual condenser unit adapted to hold a body of liquid impregnating medium surrounding the condenser unit and adapted also to be inserted into said casing between the guide means defining one of said compartments, said transfer container having bottom closure means operable to afford an opening for the passage of a condenser unit outwardly from the bottom of the transfer container.

6. In combination, a casing adapted to form a housing for a condenser comprised of a plurality of individual condenser units and capable of containing a body of liquid filling medium surrounding the condenser units, substantially vertically extending flange means defining within the interior of the casing a plurality of compartments, individual condenser units respectively disposed in said compartments, and a plate member disposed beneath at least one of said condenser units and adapted to form a detachable bottom for an auxiliary container inserted in surrounding relation to said one condenser unit between the flange means defining the compartment in which said one condenser unit reposes, said plate having means arranged to be engaged by means carried by such auxiliary container so that by removal of the auxiliary container with the bottom attached thereto the said condenser unit may be removed from said casing.

7. In apparatus for the making of electric condensers, the combination with a casing adapted to accommodate therein a condenser unit and capable of holding a body of liquid in surrounding relation to the condenser unit, of a receptacle vertically insertable in said casing and adapted

to contain a condenser unit submerged in liquid, said receptacle comprising liquid-tight side walls, a removable bottom closure, means for detachably securing said closure in liquid-tight sealing relation to the bottom of the receptacle, and means accessible adjacent the top of the receptacle for manipulation to effect detachment of said bottom closure to permit removal of the side walls of the receptacle while leaving the contents of the receptacle in said casing.

8. In apparatus for the making of electric condensers, the combination with a casing adapted to accommodate therein a condenser unit and capable of holding a body of liquid in surrounding relation to the condenser unit, of a receptacle vertically insertable in said casing and adapted to contain a condenser unit submerged in liquid, said receptacle having fluid-tight side walls and openings in the top and bottom thereof, plate members adapted to form closures for said top and bottom openings respectively, means for securing one of said plate members in sealing relation to said top opening and means for securing the other of said plate members in sealing relation to said bottom opening, said last mentioned means being accessible from the top of said receptacle for effecting detachment of said bottom plate member from the receptacle so as to permit withdrawal of the receptacle upwardly from around a condenser unit contained therein while the condenser unit is submerged in a body of fluid in said casing and without exposing the condenser unit to air.

9. In apparatus for the making of electric condensers, the combination with a casing adapted to accommodate therein a condenser unit and capable of holding a body of liquid in surrounding relation to the condenser unit, of a receptacle vertically insertable in said casing and adapted to contain a condenser unit submerged in liquid, said receptacle having openings respectively in the top and bottom thereof, a pair of closure plates for the receptacle, means for securing one of said plates in sealing relation to the opening in the top of the receptacle, and draw bolts connected with the other of said plates and arranged for fastening said other plate in sealing relation to the opening in the bottom of the receptacle, said draw bolts being accessible adjacent the top of the receptacle for manipulation to effect fastening and unfastening of said other plate while the bottom of the receptacle is submerged in liquid in said casing.

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