

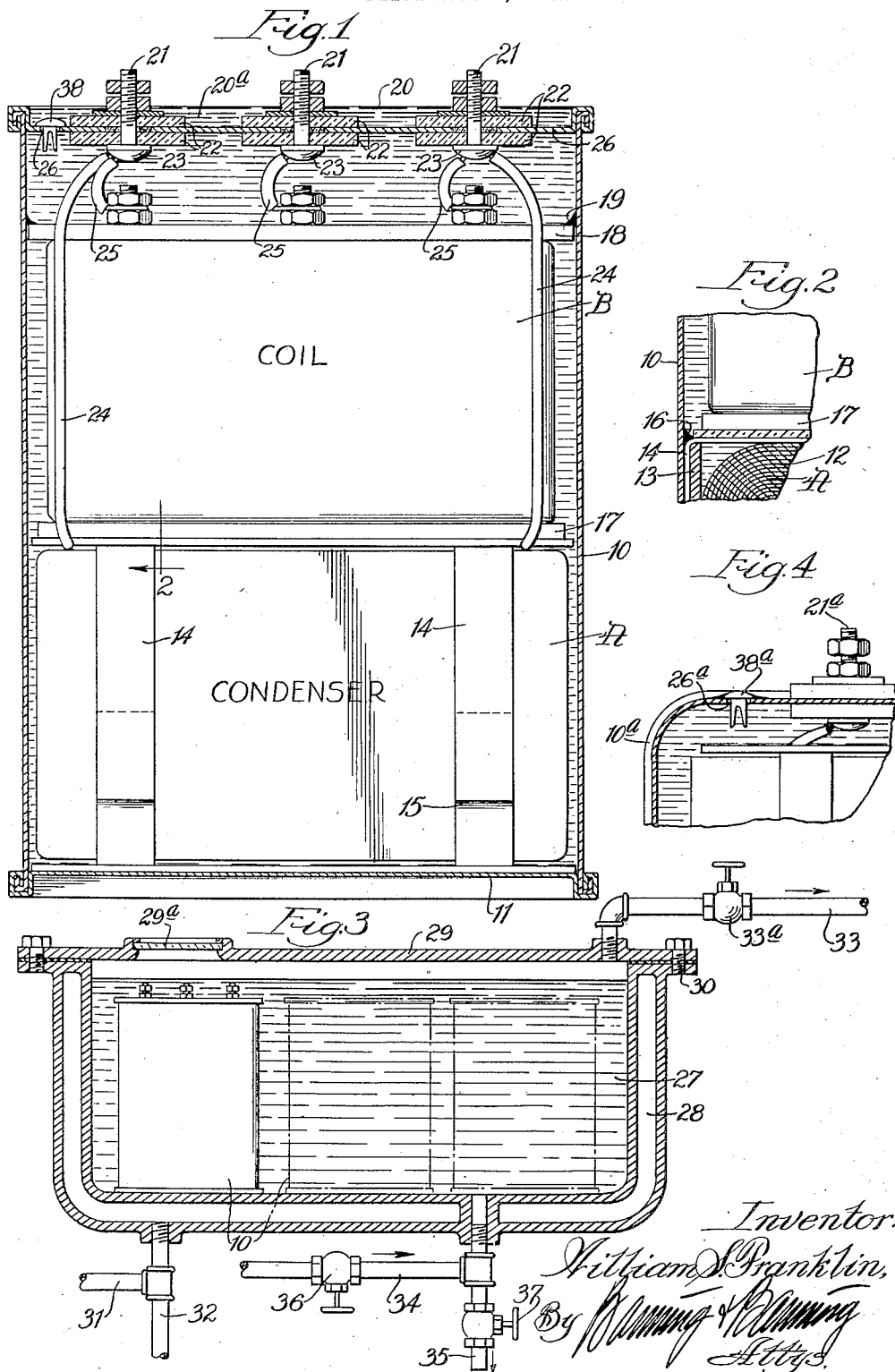
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SEALED CONDENSER AND METHOD OF MAKING SAME

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SEALED CONDENSER AND METHOD OF  
MAKING SAME

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An object of this invention is to provide an oil-sealed condenser or coil, particularly one in which there are no voids and no occluded gases or moisture. Another object is to provide a novel method of making the same which will insure substantially the complete elimination of oxygen and other occluded gases from the finished condenser.

These and other objects, as will hereinafter appear, are fully described in the following specification and shown in the accompanying drawing, in which—

Figure 1 is a vertical sectional view through a condenser embodying the invention;

Fig. 2 is a partial detail on the line 2 of Fig. 1;

Fig. 3 is a vertical sectional view through a chamber for holding the condensers while they are being exhausted, heated and filled with oil; and

Fig. 4 is a partial view similar to Fig. 1 showing a modified form of container.

The condenser or the like which is the subject of the present invention is shown in Fig. 1, in which the condenser A and coil B are enclosed within a metal can 10. This can has a bottom 11 sealed therein in any well known manner. Into this can with the cover removed is inserted the condenser A which, as shown in Fig. 2, has a condenser body 12 of well known paper wound type which is suitably wrapped with heavy paper and the like, after which the metal plate 13 is secured at each side by means of metal straps 14 which are passed therearound and the ends soldered as at 15. To secure this condenser in place the straps 14 are then soldered as at 16 (Fig. 2) to the inside of the can, thereby firmly securing the condenser in place.

A heavy sheet of suitable insulating material, such as cardboard 17, is then laid over the top of the condenser after which the coil B, if one is to be inserted, is placed thereover. The upper portion of the coil usually having a metal plate 18 (Fig. 1) which is secured to the inside of the can by one or more spots of solder 19.

A metal cover 20 is then placed over the top of the metal container, and this is rolled or soldered in place in any well known manner. This cover carries terminals 21 which pass through the cover, and which are insulated therefrom by suitable insulators 22. The lower ends 23 of these terminals are soldered to the leads 24 from the condenser, and to the leads 25 from the coil before the cover is fastened on the condenser. This cover contains two openings 26 which are

left open until just prior to sealing them, as will later be explained.

With the can and its contents thus assembled, it together with others is placed in a suitable heating and exhausting chamber, as shown in Fig. 3. This chamber is formed by a hollow jacket 27 which is provided with a steam jacket 28, and to which a cover plate 29 is secured as by means of cap screws 30. A steam pipe 31 leads to the jacket space 28 and is connected to a pipe 32 for drawing off water condensed from the steam.

A pipe 33 connects with the chamber 27 through the cover plate 29 and leads to a vacuum pump (not shown). At the same time means is provided for supplying oil to the chamber 27 which consists in a pipe 34 leading to a suitable source of oil supply, while a pipe 35 is connected thereto for draining off the surplus oil. These pipes are controlled by means of valves 36, 37 respectively.

Having now inserted a number of cans 10 to be evacuated and filled with oil into the chamber 27, the cover plate 29 is put on and tightly clamped down, the valves 36, 37 controlling the oil pipes being closed. At the same time the valve 33 on the vacuum line is likewise closed so that no vacuum is used on the chamber during the first heating stage. Steam is then turned into the jacket 28 and the temperature of this jacket is raised to 235° to 240° F. and maintained at this temperature for about two hours. After the chamber and its contents are thus thoroughly heated the valve 33 is opened and vacuum is applied to this chamber, and the heating at this temperature and exhausting are continued for twelve hours longer, making a total of about fourteen hours of heating at this temperature. The vacuum during this period is maintained at about 1 mm. of mercury.

At the end of this fourteen hour period the temperature is reduced to about 180° F. and while the vacuum is maintained at 1 mm. of mercury a suitable insulating oil is introduced into the chamber to a depth sufficient to completely submerge all of the cans. This oil is preferably preheated to a temperature of about 180° F. and is introduced through the oil pipe 34, while the valve 37 remains closed. As soon as a sufficient amount of oil has been introduced to bring the oil level to a point slightly above the cans, as shown in Fig. 3, the valve 36 is again closed. A window 29a is provided in the cover for observing the oil level in the chamber so as to cut off the admission of oil at the desired height.

As soon as this oil level rises to a point above the top of the cans the oil will flow by gravity through the holes 26 in the tops of the cans, since there is substantially no gas of any kind in the cans to impede its progress. This oil will find its way into all of the interstices in the condenser and in the coil, and will completely fill the space between the condenser and the transformer coil and the can. The vacuum is then maintained at the same value as is also the temperature of 180° F. for a period of four hours after the oil is introduced, thereby insuring that substantially all traces of oxygen or other gases within the can have been eliminated.

The steam is then cut off from the pipe 31 and the valve 33<sup>a</sup> is closed. The drain valve 37 is opened and the excess oil in the chamber is drained off. It will be noted, however, that the cover 20 is provided with a depressed center, as shown in Fig. 1, so that when the oil is drained off from the bottom of the chamber through the pipe 35 a sheet of oil to the depth of the depression 20<sup>a</sup> in the cover will remain, thereby insuring that oxygen or other gases will not readily pass through the openings 26.

The cover 29 is now removed and the cans filled with this hot oil are lifted out of the chamber 27 to a table, or the like. A rivet 38 is then dropped through the oil into each of the openings 26 and solder is applied to the top of the rivet, and to the adjacent surfaces of the metal cover thereby completely closing the same.

In Fig. 4 is shown a modified form of the invention in which the can 10<sup>a</sup> is provided with a cover on the side instead of at the top. In this form the openings 26<sup>a</sup> are at the top of the can. The rivet 38<sup>a</sup> may be dropped in place previous to moving the can after filling, as above described. If care is exercised no oil in the can will be spilled, and hence no moisture, air, oxygen, or other gas will be admitted to the can. Soldering is then done as before.

The oil used is a suitable condenser oil. The coil referred to herein may be a choke, a resistance, a transformer, etc. The contraction of the oil due to cooling is accommodated by the spring of the sides of the can. It is essential to the operation and life of the condenser that no vacuum be present in the finished condenser. In this condenser the sides of the can are made yieldable so as to spring inwardly as the oil cools, thereby preventing such vacuum.

Thus it will be seen that a very superior method has been provided for sealing condensers, and that a superior condenser is provided by this method.

I claim:

1. The method of deaerating and sealing wound condensers comprising assembling the condenser in a container which is air-tight except for certain openings at its top and which is deformable at atmospheric pressure, enclosing the container in a confined space, heating said space for a period long enough to thoroughly heat said condenser, exhausting the space while the heating is continued for a relatively long period, filling the space with a suitable oil so that the container is completely filled with the oil through said opening after which the heating and exhausting are continued for a time sufficient to remove all air from the oil and condenser, and

sealing the opening in the container while the openings are submerged in the oil.

2. The method of deaerating and sealing wound condensers comprising assembling the condensers in a container which is air-tight except for certain openings at its top and which is deformable at atmospheric pressure, enclosing the container in a confined space, heating said space for a period of two hours at a temperature of approximately 240° F., exhausting the space to about 1 mm. of mercury while the heating is continued for a further period of about twelve hours, filling the space with a suitable insulating liquid to a depth sufficient to submerge the container so as to completely fill said container with the liquid, continuing the exhausting and heating to about 180° F., for another four hours to remove all air from the oil and condenser, and finally sealing the opening in the container while the openings are submerged in the oil.

3. A hermetically sealed condenser, comprising a wound condenser body, a metal container enclosing the same, a metal band secured around the condenser body, said band being secured to the inner sides of the metal container to provide a continuous space between the condenser and container, an insulating oil filling all spaces in and around the condenser and completely filling the container, and terminals connected to the condenser body passing through the container and insulated therefrom, substantially all air having been removed from the condenser and oil before sealing the container.

4. A condenser comprising a can, a wound condenser body, deaerated insulating oil completely filling all spaces in the can and condenser and the can sealed against the entrance of air, the condenser body having terminals insulated from each other and hermetically sealed in a wall of said can, said can being sufficiently stiff to protect and support the condenser in ordinary usage but having a portion of such flexibility as to readily respond to contraction or expansion of the body of deaerated oil completely filling every portion thereof so as to prevent the formation of voids therein due to changes in temperature, whereby through the elimination of air from the can, condenser and insulating oil and preventing the formation of all voids within the sealed condenser the breakdown voltage of the condenser is raised to and maintained at that of the deaerated oil.

5. The method of deaerating and sealing wound condensers comprising assembling the condenser in a container which is air-tight except for a certain opening at its top and which when sealed is deformable by atmospheric pressure, enclosing the container in a confined space, heating said space for a period long enough to thoroughly heat said condenser, exhausting the space while the heating is continued for a relatively long period, filling the space with a suitable oil so that the container is completely filled with the oil through said opening after which the heating and exhausting are continued for a time sufficient to remove all air from the oil and condenser, and sealing the opening in the container while the oil and container are still hot and while the container is completely filled with oil.

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