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2,439,672

ELECTRICAL CONDENSER

Filed March 31, 1944

2 Sheets-Sheet 1

Fig. 2.

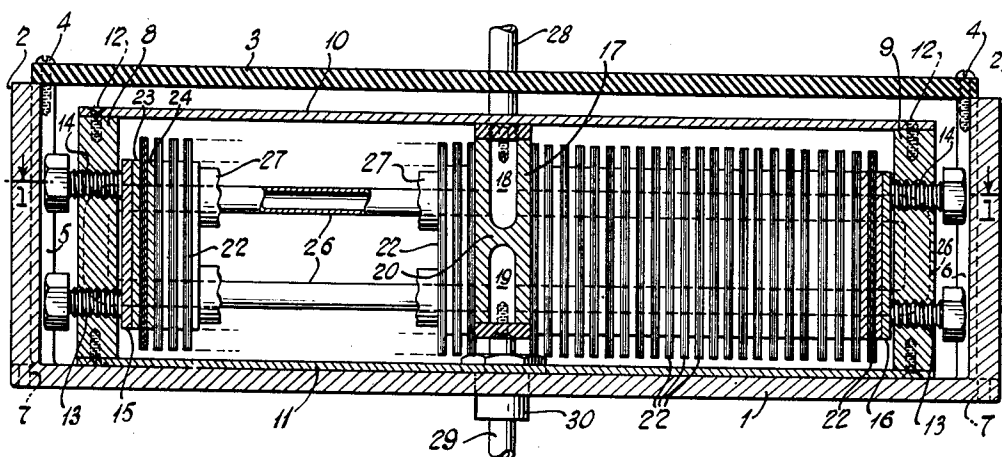
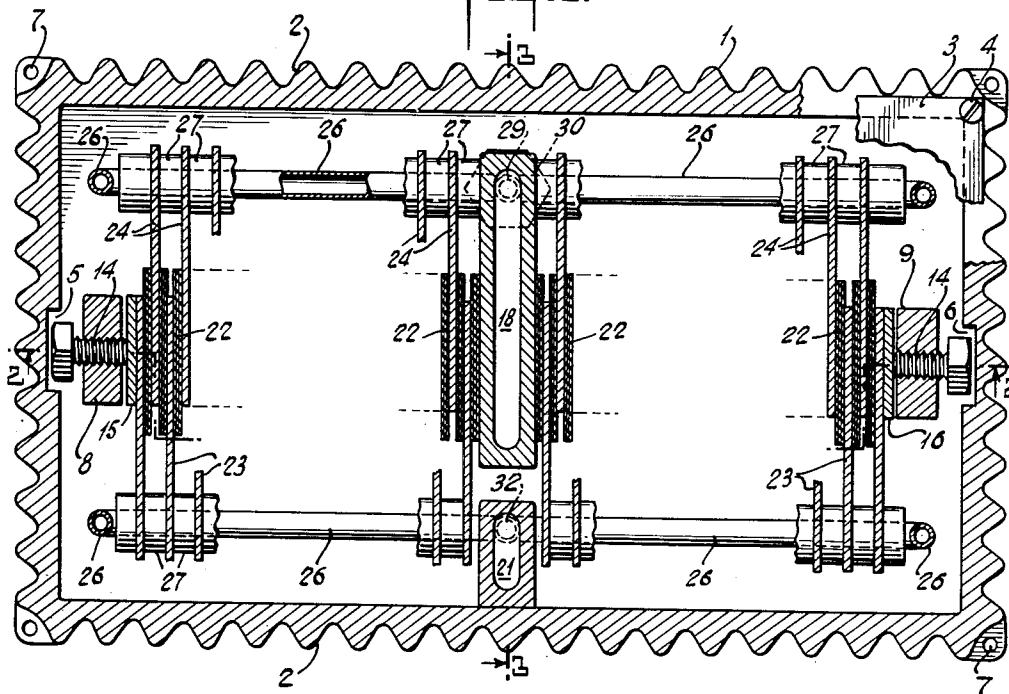


Fig. 1.

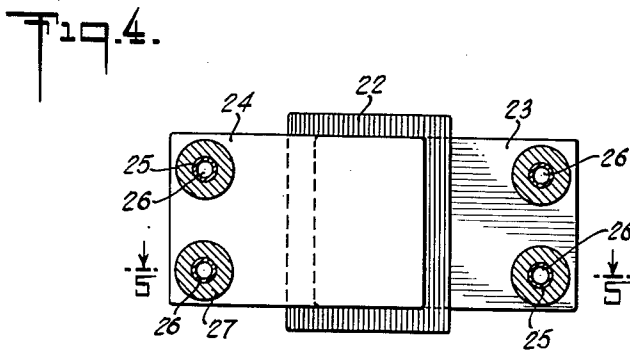
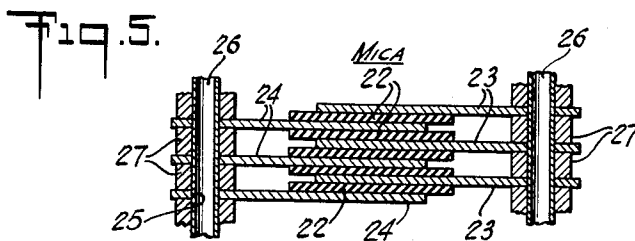


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Fig. 3. A cross-sectional view of a fluid control device, likely a valve or pump, showing internal components and fluid flow paths. The device has a central body (20) with two main ports. The left port is labeled "INLET 1 FROM FLUID SOURCE" at the top and "OUTLET 1 BACK TO FLUID SOURCE" at the bottom. The right port is labeled "INLET 2 FROM FLUID SOURCE" at the top and "OUTLET 2 BACK TO FLUID SOURCE" at the bottom. The central body (20) contains internal components (18, 19, 26, 27) and is surrounded by a housing (2). The device is shown in a cross-section with various numbered parts (1, 2, 3, 10, 11, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33) indicating different components and seals.



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ELECTRICAL CONDENSER

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9 Claims. (Cl. 175-41)

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This invention relates to new and useful improvements in electrical condensers of the type which are particularly adapted for use in industrial oscillators, although not limited specifically thereto.

An object of this invention is to improve industrial oscillator condensers generally.

Another object of this invention is to provide an electrical condenser of the central terminal type with improved electrical cooling members arranged to be electrically associated with the central terminal of the condensers.

A feature of this invention is the arrangement of a condenser stack of mica dielectrics maintained under high compression with heavy electrode members having water circulated around them for improved cooling of the condenser stack.

Industrial high frequency oscillation condensers require the handling of very heavy currents for long periods of operation without undue heating. It has been found that most condensers of the prior art type are not suitable for such use, as they become overheated. Overheating of the condenser, especially the dielectrics, increases losses in the condenser and frequently results in subsequent breakdown of the entire structure. The central terminal construction of a condenser for industrial heating is desirable where water cooling is employed, as both ends of the condenser stack are maintained at the same electrical potential. Therefore, the only insulation material required within the condenser is that of the insulation dielectric actually employed in the condenser stack. Therefore, a larger surface area can be employed for cooling the condenser stack.

This invention is a further improvement in the cooling means of industrial oscillator condensers as disclosed in my copending application Serial No. 490,851, filed June 15, 1943.

This invention will best be understood by referring to the accompanying drawings in which:

Fig. 1 is a plan view of the condenser of this invention, taken on line 1-1 of Fig. 2.

Fig. 2 is a longitudinal section of Fig. 1, this section being taken on line 2-2, of Fig. 1 and Fig. 3.

Fig. 3 is a cross-section of Fig. 1, the section being taken on line 3-3 of Fig. 1.

Fig. 4 is a detailed elevation showing the condenser stack and associated cooling vanes, and

Fig. 5 is a section taken on line 4-4 of Fig. 4.

Referring now in detail to the drawings, a metal casing 1, which is provided with external cooling ribs 2, has an insulating cover 3 which is secured

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by means of screws 4. The inside end of casing 1 is provided with slots 5 and 6. The outer corners of casing 1 are provided with apertures 7 for securing the condenser in position to any suitable structure. A longitudinal clamp is provided for the condenser stack and comprises two steel end plates 8 and 9 which are approximately $\frac{1}{4}$ " thick, by $1\frac{1}{4}$ " wide by $3\frac{1}{4}$ " long. The two steel end plates are joined together by means of two cross-ties 10 and 11 of steel strap approximately $\frac{1}{8}$ " thick, $1\frac{1}{4}$ " wide and $9\frac{1}{4}$ " long. The cross-ties 10 and 11 are secured to members 8 and 9 by means of flat-head screws 12. For applying compression to the condenser stack each steel plate is provided with two bolts 13 and 14 which are threaded into members 8 and 9. The end of the bolts 13 and 14 apply pressure to end compression plates 15 and 16. The bolts 13 and 14 are of sufficient length to have their heads project in slots 5 and 6 to retain the condenser stack in a central position within the casing 1. The central terminal portion of the stack comprises a high potential center stack casting 17 which has located therein apertures 18 and 19 which are formed by a central partition 20. The low potential or casing terminal member 21 is of similar construction to member 17 except that it is shorter in length as indicated in Fig. 1 of the drawing. The condenser stack is preferably that of the parallel connected type to form a low capacity high current stack which is particularly adapted for industrial heating by high frequency oscillations in the range of ten megacycles. Each side of the high potential terminal member 17 there is located a plurality of alternately arranged mica dielectrics 22 which are composed of mica laminations having a total thickness of .060 inch, $2\frac{1}{4}$ " in width by $3\frac{1}{4}$ " in length. The mica dielectrics are supported by metal electrodes 23 and 24 which are alternately arranged on each side of the mica dielectrics.

Figs. 4 and 5 show a detailed arrangement of the condenser stack wherein the electrodes 23 and 24 are provided with apertures 25 through which long U-shaped cooling tubes 26 pass. Spacing collars 27 space the electrodes 23 and 24 apart at suitable distances and are preferably soldered thereto. There are four long U-shaped tubes 26 for the entire stack. The cooling of the condenser stack is accomplished by having an inlet tube 28 which is connected from any suitable fluid source, not shown, in fluid communication with the upper aperture 18 of member 17. The outlet tube 29 is in fluid communication with the lower aperture 19 and is arranged to carry the

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fluid back to its source. As the inlet 28 and the outlet 29 are maintained at high potential, it is necessary that they be insulated from the casing. Inlet 28 is insulated by the cover 3 and insulating bushing 30 is provided to insulate outlet 29. The casing or low potential side of the condenser has an inlet tube 31 which enters the upper aperture of member 21 and is in fluid communication with any suitable source and is maintained at a different potential from that of the fluid source which is connected to inlet and outlet tubes 28 and 29. The outlet tube 32 is in fluid communication with the lower aperture in member 21 and returns the fluid back to the same source as that connected with inlet tube 31. The condenser stack is secured in position by having the heads of bolts 13 and 14 located within slots 5 and 6 of the casing 1. The entire condenser stack is surrounded with oil or wax 33 which will stand a high temperature.

In the operation of this device the condenser stack is cooled by the cooling fluid or oil 33 and in addition by the circulating fluid or liquid, which may be water or any other suitable liquid, entering inlets 28 and 31. The water entering inlets 28 and 31 circulates each side of the stack, first passing through the upper apertures in members 17 and 21, then circulating through the U-shaped tube 26 and entering lower apertures in members 17 and 21. The liquid then returns to its source through outlets 29 and 32.

While I have indicated and described a system of my invention, it will be apparent to one skilled in the art that my invention is by no means limited to the particular devices shown and described, but that many modifications may be made without departing from the scope of my invention.

What I claim is:

1. An electric condenser comprising a casing containing oil, a plurality of solid dielectric sheets, a plurality of electrodes of greater area than said dielectric sheets positioned each side thereof, said electrodes being interleaved alternately and extending beyond an edge of each one of said dielectric sheets to form a condenser stack within said casing, a hollow metallic cooling body having two hollow portions, said hollow metallic cooling body being located in the central portion of said condenser stack, a liquid cooling means including a fluid conduit in fluid communication with each hollow portion of said hollow metallic body and in thermal contact with each one of said electrodes to cool said condenser by the circulation of a liquid.

2. An industrial heating condenser comprising a condenser stack, having a plurality of solid dielectric sheets of mica, a plurality of metallic electrodes interleaved alternately and extending beyond said dielectric sheets to provide cooling radiation therefor, a hollow metallic body having a central partition divided to form upper and lower portions located in the mid-position of said condenser stack, an inlet fluid passage connected to the upper portion and a fluid outlet connected to the lower portion of said hollow metallic body, and means including fluid conduits in contact with each electrode and connected to the upper and lower portions of said hollow metallic body for passing a cooling liquid through said hollow body to cool said condenser.

3. An electric condenser comprising a metallic casing, an insulating cover for said casing, a clamped condenser stack secured within said casing, a first metallic hollow partition extend-

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ing partly inward from a side of said casing, a second metallic hollow member centrally secured to said condenser stack and located adjacent said first metallic hollow partition, a first inlet and an outlet fluid cooling conduit connected to be in fluid communication with said first metallic partition and some of the electrodes of said condenser stack, and a second inlet and outlet fluid cooling conduit connected to be in fluid communication with said second metallic member and the other electrodes of said condenser whereby the entire condenser stack is cooled by two cooling systems which are electrically separated.

4. An electrical condenser comprising a plurality of solid dielectric sheets, a plurality of metallic electrodes interleaved alternately and extending beyond an edge of each one of said dielectric sheets to provide cooling radiation therefor, and means to bind all of said dielectric sheets and said electrodes together to form a condenser stack, a hollow metallic cooling chamber located at the mid position of said condenser stack, a fluid barrier located in a central position within said hollow metallic cooling chamber to divide the cooling chamber in two portions, said hollow metallic cooling chamber having cooling tubes in thermal contact with said metallic electrodes, and fluid connections with the two portions of said hollow cooling chamber whereby all of said tubes are in fluid communication with an external source of fluid for cooling said condenser stack.

5. An industrial heating condenser comprising a condenser stack, having a plurality of solid dielectric sheets, a plurality of metallic electrodes interleaved alternately and extending beyond an edge of each one of said dielectric sheets to provide cooling radiation therefor, a hollow metallic body having a central partition divided to form upper and lower portions located in the mid-position of said stack, fluid cooling tubes fluid connected to the upper portion of said hollow metallic body and in thermal contact with said electrodes, and fluid cooling tubes fluid connected to the lower portion of said metallic body and in thermal contact with said electrodes, fluid connections with the upper and lower portions of said hollow metallic body whereby all of said tubes are in fluid communication with an external source of fluid for cooling said condenser stack.

6. An electrical condenser comprising a metallic casing, a plurality of solid dielectric sheets, a plurality of metallic electrodes interleaved alternately and extending beyond said dielectric sheets to provide cooling radiation therefor, and clamping means to bind all of said dielectric sheets and said electrodes together to form a condenser stack located within said casing, a metallic body having two hollow portions located at the mid-position of said condenser stack, said hollow metallic body having fluid cooling tubes in fluid contact with each electrode and the hollow portions of said hollow body, and means connecting each hollow portion of said metallic body for fluid communication with an external source of fluid for cooling said condenser stack.

7. An electric condenser comprising a casing containing oil, an insulating cover secured to said casing, a plurality of solid dielectric sheets, a plurality of electrodes of greater area than said dielectric sheets positioned each side thereof, said electrodes being interleaved alternately and extending beyond an edge of said dielectric sheets to form a condenser stack, a two-part hollow me-

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tallic body located in the central portion of said condenser stack, liquid cooling means including said two-part hollow metallic body, and a plurality of conduits some of which conduits pass through said cover to be electrically insulated from said casing, others of said conduits being fluid connected to be in thermal contact with said electrodes and in fluid communication with portions of said hollow metallic body, whereby said condenser is cooled by the circulation of liquid therethrough.

8. An industrial oscillator condenser comprising a plurality of solid dielectric sheets, a plurality of metallic electrodes interleaved alternately and extending beyond an edge of each side of said dielectric sheets, said metallic electrodes each having two apertures in the extending portion thereof, means for dividing said condenser at the central portion thereof including a metallic body having two hollow portions, a plurality of metallic U-shaped tubes for electrode fluid cooling means, each tube being arranged to pass through the apertures in said metallic electrodes, the open ends of said U-shaped tubes being arranged to be in fluid communication with the two hollow portions of said metallic body, and fluid connections with the two hollow portions of said metallic body whereby all of said tubes are in fluid communication with an external source of fluid for cooling the electrodes of said condenser.

9. An industrial oscillator condenser comprising a metallic casing, a plurality of solid dielectric sheets, a plurality of metallic electrodes alternately arranged to extend in groups beyond

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the opposite edges of said dielectric sheets and in intimate contact therewith, insulating means for electrically maintaining one group of said extending electrodes at a different polarity than that of the other group of extending electrodes, said insulating means including a first metallic body centrally secured between two of said dielectric sheets, a second hollow metallic body centrally secured to said metallic casing, two separate inlet and outlet fluid cooling conduits in fluid communication with the respective first and second hollow metallic bodies whereby each separate fluid cooling conduit is maintained at a different electrical polarity and in thermal contact with the group of extending electrodes of like polarity.

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