Sept. 29, 1942. W. BUSCHBECK ET AL 2,297,200

LIQUID COOLED CONDENSER

Filed Feb. 24, 1939 2 Sheets-Sheet 1

Fig. 1

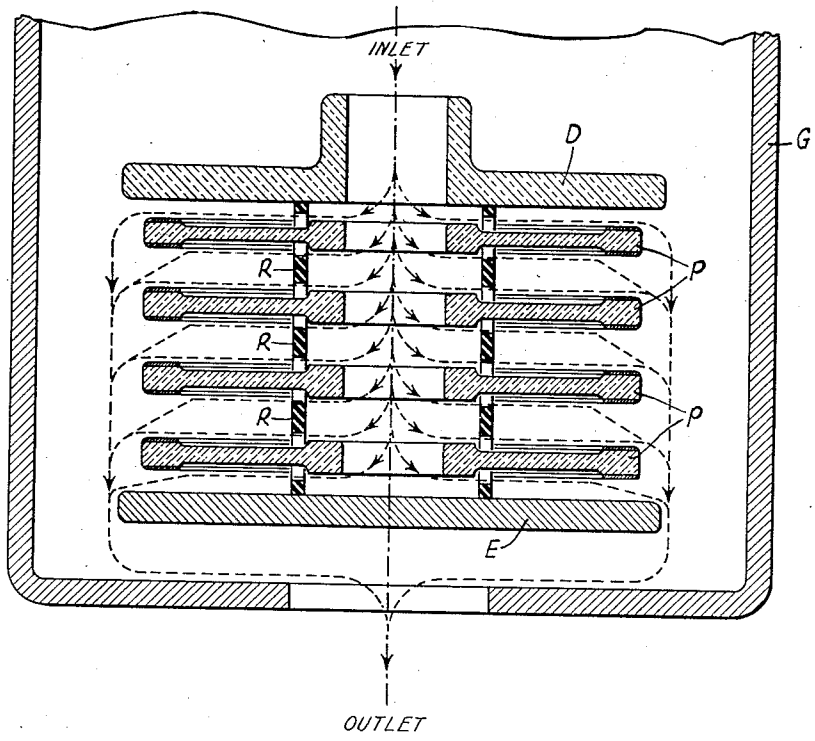
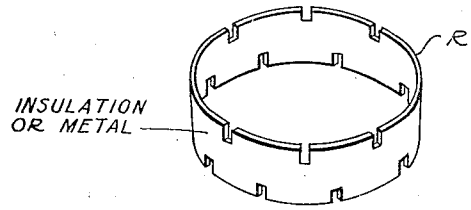


Fig. 2



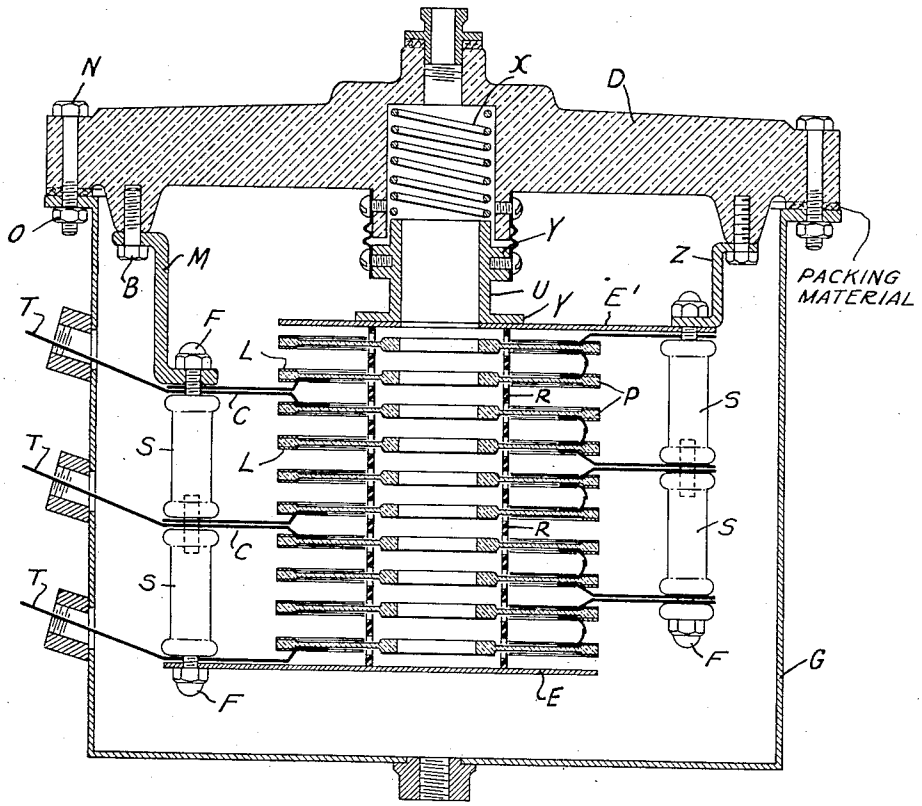
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Fig. 3



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LIQUID COOLED CONDENSER

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Application February 24, 1939, Serial No. 258,152
In Germany February 25, 1938

6 Claims. (Cl. 175—41)

The invention relates to an improved condenser structure whose plates consist of ceramic material or the like, with metallic layers disposed on both surfaces. Although such material could be produced with comparatively small dielectric losses (the loss angle tan. δ is between 10^{-4} to 10^{-3}), a considerable amount of heat still appears at high load. As in all electric apparatus and machines, it is important to pass off this undesired heat. When forming a stack from a plurality of, circular plates having a certain space distance between them, the cooling agent which may be air or oil is situated between the plates will have only a very poor circulation causing a considerable stagnation of heat. An object of this invention is to provide a novel, compact and efficient liquid cooled condenser.

A condenser according to the invention is constructed in the following manner as shown by the accompanying drawings, in which:

Fig. 1 schematically shows a condenser of this invention in section;

Fig. 2 is a perspective view of a tubular insulating plate spacer;

Fig. 3 is a sectional view of the completed condenser of this invention.

The individual plates P have in the center thereof a circular shaped aperture or the like. Plates P have metallic layers L located on the circular margins of both surfaces. The plates are spaced by means of short tubular pieces R of suitable material, such as, for example, hard paper, ceramic material, artificial resin, metal, or the like. The tubular pieces have suitable slots at the upper and lower edge such as shown in Fig. 2 which represents a single tubular piece R. The condenser column thus formed is completed at one end by a metallic plate E at the lower end thereof. At the other end the cooling agent which may be air or oil passes through an opening in the cover plate D into the space formed by the holes in the plates and tubular pieces, and then passes between the individual plates and leaves the openings in the tubular pieces whereafter it glides in the outer space over the surfaces of the plates thereby effecting an effective removal of the heat produced. The course of the cooling agent is indicated in Fig. 1 by arrows and dash lines. Obviously, it is also possible to have the cooling means entering at the bottom and leaving at the top by placing the entire apparatus according to Fig. 1 upside down. This has the advantage that the heated oil having a lower specific weight and thus the tendency to rise will actually be delivered upwards.

Fig. 3 shows a preferred mode of construction of the condenser in which the plates are assembled as a complete stack and fastened only to the insulating cover D of the casing G which encloses the entire condenser. The condenser stack including the insulating spacers S and the base plate E is suspended by a metal strap M and bolts B to the cover in the vicinity of the circumference. A strap Z retains the plate E', two insulating spacers S and contact springs C to the cover D. Supporting bolts F may also serve at the same time as a return circuit for the voltage in that they are connected through contact springs C with the appropriate metallic layer L of the condenser plates. Connections may pass out through the casing by means of tubular thread portions T. The plates P spaced by the rings R are pressed between the base plate E and top plate E'. In this manner any desired number of plates can be combined to build up a condenser whereby through suitable connection of the individual layers with one another a number of plates may be connected in parallel, which is not shown, or in series, as shown. The entire plate stack is covered by the cover plate D having a central hole coaxial with the condenser plates. There is arranged upon the cover plate a tubular section U having a flange V, which is pressed against top plate E' by a helical spring X resting against a shouldered aperture portion located in the cover so that the entire plate stack is tightly held together without the possibility that stresses and fractures will appear at heating and through mechanical action. The tubular section serves at the same time as an inlet for the cooling liquid which is inserted through a central opening in the cover. To this end, the tubular piece is tightly and at the same time flexibly joined with the cover D by means of a leather packing Y or the like. The described structure affords an especially simple mounting since the entire plate arrangement with insulators S and the lateral electric tap connections T, etc., can be mounted in the completed state on the cover whereafter it is placed together with the cover into the casing accommodating the condenser and then screwed on by means of bolts N and nuts O. The lateral connections T may be passed through suitable bushings W located in the side of casing G for making external connections thereto.

What is claimed is:

1. A fluid cooled condenser comprising a plu-

rality of annular ceramic plates having a central aperture therein, each plate having a metallized band located on each surface intermediate said aperture and the perimeter thereof, means for passing a cooling fluid through said aperture and over said metallized band in a radial direction, said means including a plurality of rings forming together with the apertures of said plates a hollow space from which the cooling fluid passes, said rings having a plurality of openings for uniformly allowing the cooling fluid to flow over each metallized coating on the surface of said plates.

2. A fluid cooled condenser comprising a plurality of ceramic plates, each plate having a central aperture therein, a metallized band located on each surface intermediate each aperture and the perimeter thereof, means for spacing said apertures apart to form a stack, said means including a plurality of rings having slots arranged so that the apertures in said plates form a channel through which cooling fluid passes and cooperating with said slots so that the cooling fluid passes over the surface of said metallized band in a radial direction to cool said plates.

3. A fluid cooled condenser comprising a plurality of ceramic plates, each plate having a central aperture therein, a metallized band located on each surface intermediate each aperture and the perimeter thereof, means for spacing said apertures apart to form a stack, said means including a plurality of rings of insulating material having slots arranged so that the apertures in said plates form a channel through which cooling fluid passes and cooperating with said slots so that the cooling fluid passes over the surface of said metallized band in a radial direction to cool said plates.

4. A fluid cooled condenser comprising a plurality of ceramic plates, each plate having a central aperture therein, a metallized band located on each surface intermediate each aperture and the perimeter thereof, means for spacing said plates apart to form a stack, said means including a plurality of rings of metal having slots arranged so that the apertures in said plates form a channel through which cooling fluid passes and cooperating with said slots so that the cooling fluid passes over the surface of said metallized band in a radial direction to cool said plates.

5. A fluid cooled condenser comprising a plurality of ceramic plates, each plate having a central aperture therein, a metallized band located on each surface intermediate each aperture and the perimeter thereof, means for spacing said plates apart to form a stack, said means including a plurality of rings having slots located at the upper and lower edges and alternately arranged with respect to each other, said slots also arranged so that the apertures in said plates form a channel through which cooling fluid passes and cooperating with said slots so that the cooling fluid passes over the surface of said metallized band in a radial direction to cool said plates.

6. A fluid cooled condenser comprising a plurality of ceramic plates, each plate having a central aperture therein, a metallized band located on each surface intermediate each aperture and the perimeter thereof, means for spacing said plates apart to form a stack, said means including a plurality of rings having slots arranged so that the apertures in said plates form a channel through which cooling fluid passes and cooperating with said slots so that the cooling fluid passes over the surface of said metallized band in a radial direction to cool said plates, and lateral terminals connected at intermediate points on said stack.

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