Jan. 26, 1932. W. DUBILIER 1,842,374

POWER FACTOR CONDENSER

Filed Oct. 22, 1927

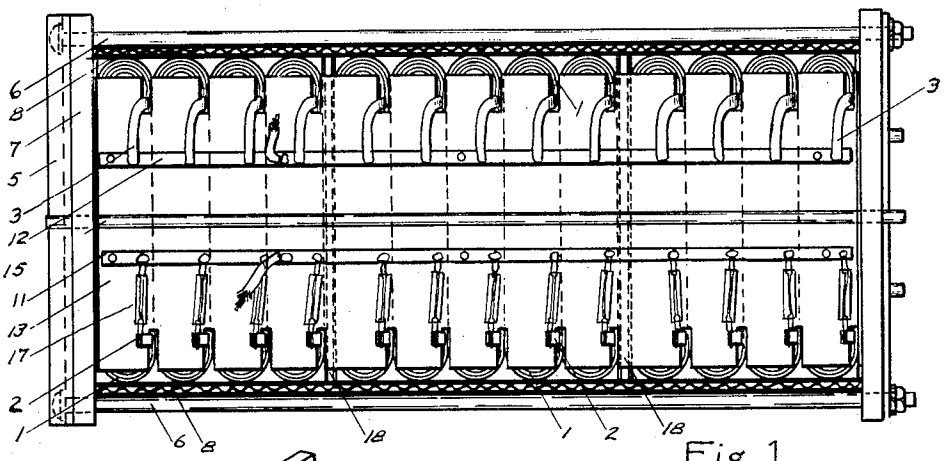


Fig. 1

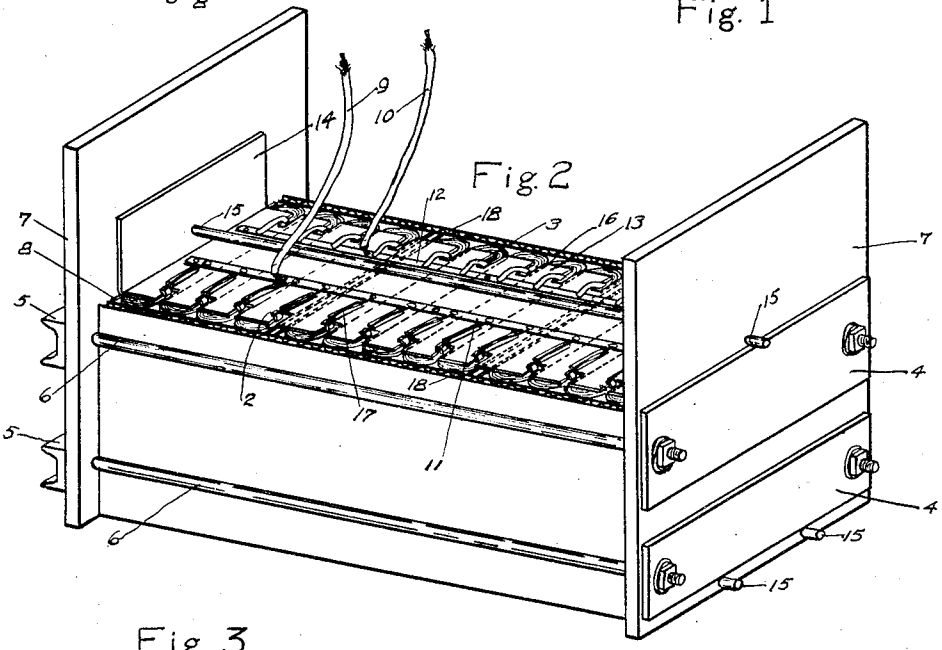


Fig. 2

Fig. 3

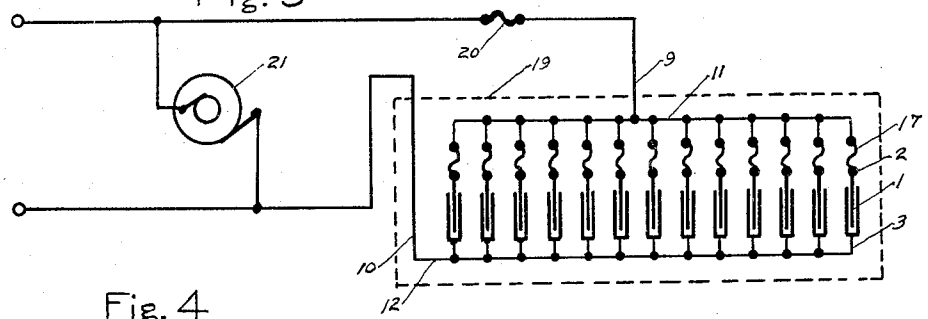
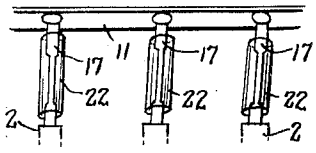


Fig. 4



BY

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UNITED STATES PATENT OFFICE

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POWER FACTOR CONDENSER

Application filed October 22, 1927. Serial No. 228,050.

This invention relates to electrical condensers, particularly condensers to correct the power factor of alternating current motors, and other alternating current apparatus.

An object of the invention is to provide a unitary condenser structure so arranged that, if a given part short circuits, the remainder will not be affected and can remain in service. Other objects and advantages are set forth in the following description, taken with the drawings, which show a preferred embodiment of my invention. But this disclosure is illustrative only, and I may vary the details of shape, size and arrangement of parts to the full extent permitted by the scope and meaning of the appended claims, in which the novelty of the invention is expressed.

In the drawings the same numerals identify the same elements in the various figures.

Figure 1 is a plan view of a condenser embodying this invention,

Figure 2 is a perspective view thereof,

Figure 3 is a diagram showing the circuit connections when the condenser is in operation; and

Figure 4 is an enlarged view showing more in detail the construction of certain fuses.

The condenser comprises a series of parts or sections 1, which consist of alternate layers of dielectric and conducting material. Each section may be of the type that is made by winding paper and metal foil into a flattened roll. These parts are each provided with terminals 2 and 3. All of the sections are held in a stack under compression by a clamp, one abutment of which comprises two normally bowed spring pieces 4, preferably of metal. The other abutment consists of the two rigid bars 5. These abutments are pulled together by tension bolts 6, which tension flattens the clamping members or spring pieces 4 and the presence of these springs insures that the compression of units 1 will always be maintained. Large wood blocks or end elements 7 are placed between the abutments and the condenser elements. Insulating side sheets 8 are located between the metal tension rods 6 and the condenser units 1. A similar end sheet of thin insulating material is placed between each end of the stack and adjacent to the end elements or wood block 7 to insure the insulating action of the wood.

Terminals 9 and 10 lead into the condenser from the outside by way of bus-bars 11 and 12. These bars are mechanically fastened to a cover or insulating sheet 13 which overlies the tops of the parts 1 and has turned up ends 14 that rest against the wood blocks 7. This insulating sheet 13 is held in position by a wood rod or dowel 15, which passes through ends 7 and the turned up portions 14. Two more of these structural rods 15 pass through the blocks 7 and underneath the parts 1 to hold the parts in place. Here it should be noted that the insulating sheet 13 covers the entire top of the sections 1, having notches 16 cut out to permit the terminals 2 and 3 to pass through. The terminals 3 are directly connected to bus-bar 11 by means of fuses 17, the main features of this invention centering about these fuses.

The fuses 17 with no protection other than the sheet of insulating material 13 and the wax (not shown) in which the complete assemblage is embedded are entirely operative.

Figures 1, 2 and 4 show a preferred modification of the fuses in which each individual fuse is enclosed in an insulating tube 22 which tube 22 insures against any appreciable melting or contamination of the enclosing wax. This arrangement also results in more uniform operating characteristics of the fuses, particularly since the melting point of a fuse may vary when in contact with the impregnating wax.

At one or more points within the stack of sections, stiffening plates 18 are placed to maintain the flatness of the paper wound parts 1.

A surrounding casing or box 19 is indicated by dotted lines in Fig. 3. After assemblage this casing 19 is filled with molten wax so that all of the condenser sections, including their terminals and fuses, are embedded therein. In this figure a main fuse 20 is shown between the condenser as a whole and the alternating current. The diagram, Fig. 3, shows how the condenser is installed. Its

terminals are connected directly across the terminals of an alternating current motor, 21 for example, so that the exciting currents of the motor, as distinguished from the useful currents, can surge directly into the condenser and be returned in time for the next cycle instead of surging out into the main line thereby overloading transformers and power house lines with non-productive current, used only for remagnetizing the coils of the motor.

This invention, as applied to power factor correction condensers, operates as follows:

In case a puncture develops through the dielectric of any given section, of course the entire current being supplied to the motor would, in time, be short circuited, not just through the condenser as a whole, but all of the current would pass through this particular section. However, long before the outside current would have time to pass through the shorted place, all of the other sections will discharge through the short circuited place producing a rather severe discharge. The fuse 17 of this particular unit is, of course, blown and this would happen even if the fuse 17 were no smaller than the main fuse 20. An enormous arc is produced but it is quickly extinguished due to the fact that the current is alternating instead of direct, the current becoming zero at the time of reversal in the cycle. In fact, the adjacent condenser sections through their capacitance may allow some of the current to surge into them thus aiding in extinguishing the arc at the next zero point in the alternating cycle. The damaged section is thus automatically cut out of circuit, and the arc being quickly extinguished, operation will then continue perfectly normal except at a slightly reduced capacity, the one section no longer functioning. This merely means that the power factor will not be so thoroughly corrected as it was while all of the sections were operative; but no greater injury or impairment of function will occur.

The invention is not limited to the single modification above described, but numerous changes could be made without exceeding the scope of the appended claims.

Having described my invention, what I believe to be new and desire to secure and protect by Letters Patent of the United States is:

1. An electric condenser comprising end elements, clamping members bearing on said elements, tension rods joining said members, structural rods engaging the end elements, and insulating material between the tension rods and the condenser.

2. A condenser as stated in claim 1 in which one of said clamping members is in the form of a flattened leaf spring.

3. An electric condenser comprising a plurality of sections, end elements, stiffening plates interspersed among the sections, clamping members in operative relation with said elements, tension rods connecting the clamping members, insulation between the rods and sections, structural rods extending between the end elements, an insulating sheet held in position adjacent said sections by one of said last named rods, and one or more bus-bars attached to said insulating sheet.

4. A condenser as stated in claim 3 in which one of the clamping members is a leaf spring for yieldably compressing said units.

5. An electric condenser comprising a plurality of parts each composed of layers of dielectric and conducting material, arranged so that the layers in the several parts are parallel, end elements located adjacent the parts and parallel to said layers, structural members extending through said elements to partially envelop said parts, and a clamp operatively connected to said elements, said clamp including tension rods that complete the enveloping of said parts.

6. A unitary condenser structure comprising a plurality of electric parts, an element at each end of the structure, clamping members bearing on said elements, tension rods joining said members, sticks joining said elements, said rods, elements and sticks structurally enveloping the units, bus-bars adjacent the row of parts and insulation between the parts and one or more of the bus-bars and between the parts and the tension rods.

7. In a condenser comprising sections having terminals and members adjacent said sections, the combination of an insulating sheet located adjacent said terminals and held in place by one of said members and one or more bus-bars attached to the insulating sheet.

8. A condenser as stated in claim 7 in which the insulating sheet is provided with notches through which some of the terminals project.

In testimony whereof I affix my signature.

WILLIAM DUBILIER.