

E. E. F. CREIGHTON.
 REACTOR.
 APPLICATION FILED MAY 29, 1916.

1,317,003.

Patented Sept. 23, 1919.

Fig. 1.

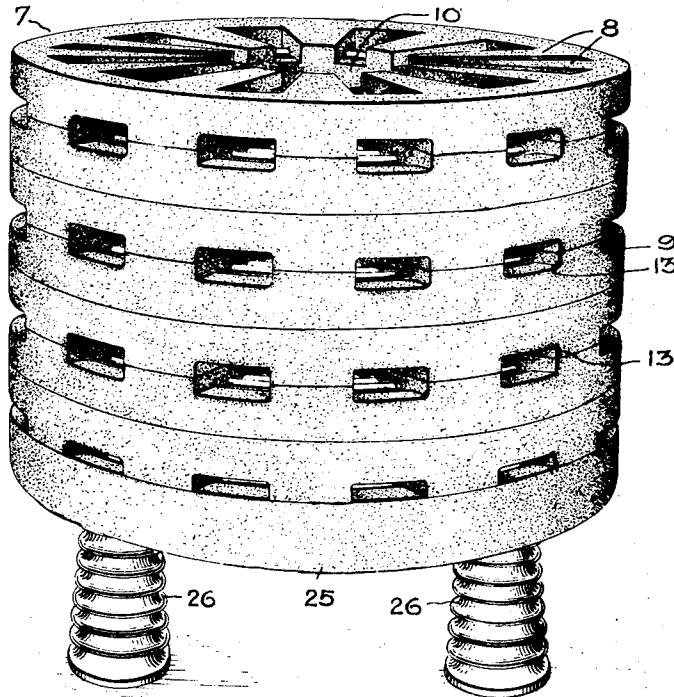


Fig. 2.

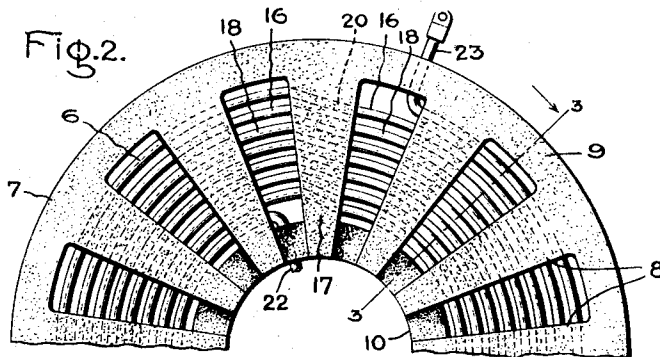
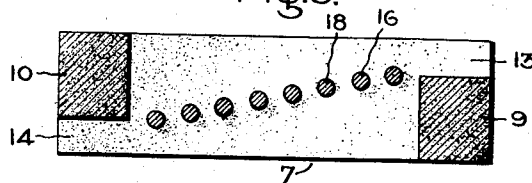


Fig. 3.



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UNITED STATES PATENT OFFICE.

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REACTOR.

1,317,003.

Specification of Letters Patent. Patented Sept. 23, 1919.

Application filed May 29, 1916. Serial No. 100,553.

To all whom it may concern:

Be it known that I, ELMER E. F. CREIGHTON, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Reactors, of which the following is a specification.

My invention relates to power or current limiting reactors, and the object of my invention is to provide an improved, simple and cheap device of this character.

My invention contemplates a reactor of a substantially bare conductor or conductors, the turns of which are embedded in a plastic, the cross-overs between parts of the winding, as between circular turns, preferably being located within the supporting material.

The essential characteristic of power or current limiting reactors is a rugged construction, for the purpose of the reactor is to limit the current as at short circuits, which results in great mechanical strains on the device, and if the device is to justify its use it must resist these strains and preserve its form without fail. These results are secured according to my invention by solidly embedding the conductor in a suitable plastic as concrete, making distortion or destruction practically impossible. Ease of installation and inspection and the elimination of all parts which are not flame proof are attractive features of the reactor hereinafter described in detail. Locating crossovers of the winding within the mass of the plastic results in the best utilization of the winding space as is indicated hereinafter and tends to increase the voltage to which the device may be subjected without arcing between turns thereof and possesses other advantages.

In the accompanying drawing I have illustrated one embodiment of my invention. Figure 1 is an elevation of a reactor embodying my invention. Fig. 2 is the plan view of a part of one of the sections of this reactor. Fig. 3 is a sectional view on the line 3—3 of Fig. 2.

The reactor of Fig. 1 is made up of a number of sections like that illustrated in Figs. 2 and 3. Each section comprises a

single coil or layer of a conductor 6 embedded in and supported by a plastic 7. Preferably this conductor is bare or substantially uninsulated. The carrying mass 7 comprises arms or radial supports 8 separated to provide ventilation; the supports are jointed at their ends by outer and inner ring portions 9 and 10. A space 13 is left between the ring portion 9 and one side of the section and a similar space 14 is left between the ring 10 and the other side of the section. These spaces aid in the ventilation of the device as more fully appears herein-after.

Each coil or layer comprises a plurality of substantially circular concentric turns of the conductor 6 as illustrated in Fig. 2. Thus the turn 16 extends around the center of the section as a center from the right hand side of the arm or radial support 17, to the left hand side of the arm 17. Likewise, the turn 18 is circular from the right hand side of the arm 17 to the left hand side thereof, but the radius thereof is shorter than the radius of the turn 16. The cross-over 20 by which the turn 16 is joined in series to the turn 18 (and likewise the other cross-overs between the other turns) is within the arm or radial support 17 of the mass of plastic. The cross-overs of this section are illustrated by dotted lines in the arm 17 of Fig. 2. Cross-overs between various parts of reactors are sources of various difficulties for various reasons, and so arranging them that they are embedded in the plastic material eliminates these difficulties to a considerable extent. For example, thus embedding them gives such cross-overs greater strength to resist the magnetic stresses tending to distort the cross-overs and shields them from chance blows. And furthermore, since the distance between the turns of the conductor is necessarily reduced at the cross-overs, and since the dielectric strength of the plastic is very generally of a higher value than the dielectric strength of the material surrounding the reactor, as the air of the atmosphere, the winding space is used more efficiently than were the cross-overs made between arms or radial supports. 22 and 23 are the terminals of the coil of the section of Fig. 2.

In the construction of each section the conductor thereof is wound up in a removable form or mold suitable for temporarily holding the turns in position and for fixing the shape of the supporting mass. The turns are given their final shape and relative places in the mold, the layer as a whole being disposed at an angle to the winding axis as illustrated particularly in Fig. 3 and thus resembling a truncated cone. The plastic material 7 in its fluid form is then cast into the form or mold supporting the conductor and after the plastic has hardened the form or mold is removed, the plastic further cured or water proofed or otherwise worked as desired, when the section is complete. Any fairly cheap, sufficiently strong plastic material of the requisite dielectric strength may be used. I have found a number based on Portland cement quite suitable, and resulting in simple and cheap reactors of great mechanical and sufficient electrical strength. Particularly when plastics of this type are employed, care should be taken that they are sufficiently dried out or otherwise cured before being put into use, to have reached substantially constant values of resistance under the voltages contemplated or at least the value of resistance contemplated in the design thereof. The same consideration applies indeed to other types of plastics.

The complete reactor comprises as many of the sections like that of Fig. 2 as may be necessary to secure the desired characteristics, a small reactor comprising a few sections, a larger reactor a greater number of the same sections. These sections are piled one above each other with the radial arms 8 of one section immediately above those of the section immediately below. The sections are alternately reversed as indicated in Fig. 1. In this way the alternate layers of the winding are inclined to the winding axis in alternate directions. The coils are connected together in series alternately at the center of the reactor and at the exterior thereof, the connections being made between the two turns which are brought close together by this manner of assembling. By thus inclining the alternate layers in alternate directions to the winding axis and connecting each two adjacent layers together at those turns which are thus brought close together, the winding space in the direction of the axis of the reactor is utilized to the best advantage; the two turns of any two adjacent layers between which the maximum difference of potential exists, are spaced the maximum distance and sufficiently far apart to sustain this potential, and those two turns of two adjacent layers between which exists the minimum difference of potential are spaced apart only substantially a sufficient distance to sustain this difference of poten-

tial. The remaining pairs of turns of the two adjacent sections are spaced apart distances corresponding to their respective differences of potential.

By assembling the sections with all the arms or radial supports 8 of the different sections immediately above each other, the spaces between the arms or radial supports 8 of the sections are likewise brought immediately above the spaces of the sections below, and hence uninterrupted openings are provided from one end of the reactor to the other through which the surrounding fluid as the air of the atmosphere may freely circulate in contact with the conductor. Furthermore, the openings 13 and 14 above and below the rings 9 and 10 extending into the spaces between the arms 8, are of assistance in cooling the device by allowing greater freedom for the circulation of the cooling fluid into and out of the reactor. The assembled sections are carried by an annular ring 25 which in its turn is carried by insulating legs 26, as indicated.

While I have described the principle of my invention and the best mode I have contemplated for applying this principle, other modifications will occur to those skilled in this art and I aim in the appended claims to cover all modifications which do not involve a departure from the spirit and scope of my invention.

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

1. A reactor comprising a plurality of substantially flat coils, radial supports of a plastic extending across and embedding the turns thereof and spaced apart to provide ventilation, and means for integrally connecting and supporting said radial supports.

2. A reactor comprising a plurality of substantially flat coils of substantially circular concentric and substantially uninsulated turns, radial supports extending across and embedding the turns thereof, said coils having the cross-overs between the turns formed and embedded within said supports, and means for integrally connected and supporting said radial supports.

3. A reactor comprising a plurality of substantially circular concentric turns and a mass of plastic formed with integral supporting members embedding a portion of each of a plurality of said turns for holding the same in position, said turns having the cross-overs therebetween formed and embedded within the mass of plastic.

4. A reactor comprising a winding, and a support embedding a portion thereof; said winding having cross-overs between parts thereof, which cross-overs are formed and entirely embedded within said support.

5. A coiled conductor and a plastic embedding portions of the same, said plastic being formed to provide ventilating spaces ex-

tending across the coils of said conductor, said coils having cross-overs formed and embedded entirely within the plastic.

5 6. A plurality of substantially flat coaxial electrically conducting coils, and radially disposed supports therefor of a plastic material based on cement, said supports

extending across and embedding the turns of such coils and being spaced apart circumferentially to provide ventilation, the whole 10 forming a reactor.

In witness whereof, I have hereunto set my hand this 27th day of May, 1916.

ELMER E. F. CREIGHTON.