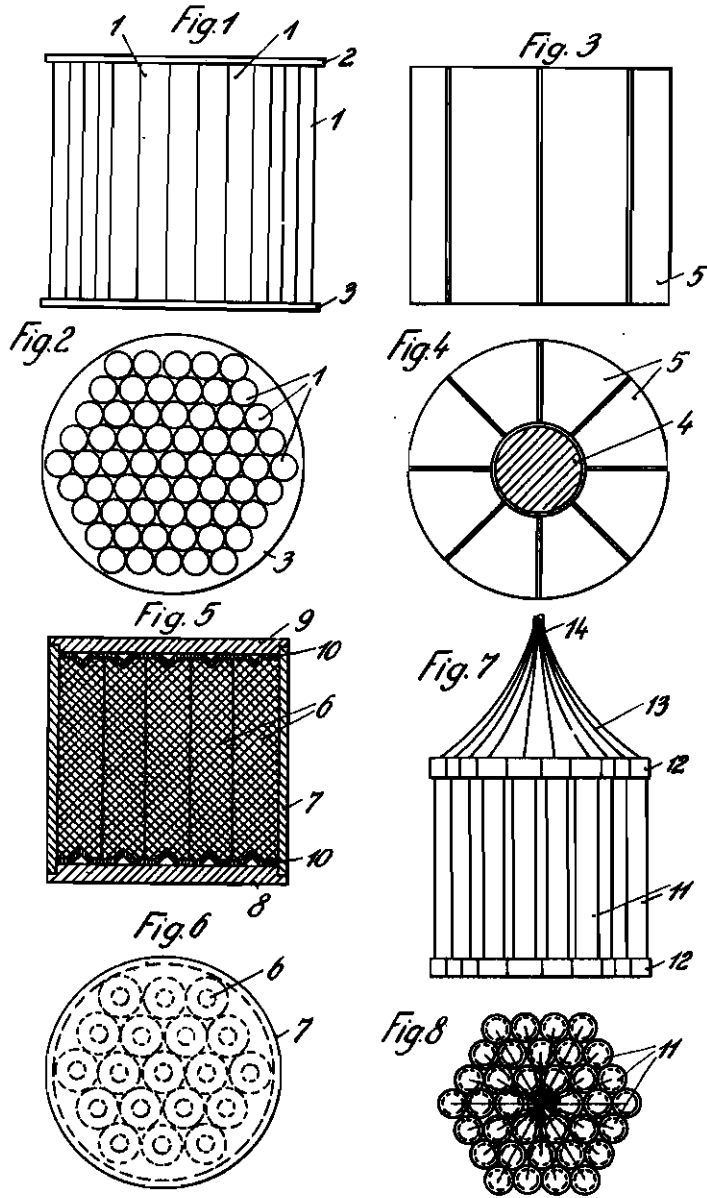


PUBLISHED
MAY 18, 1943.
BY A. P. C.

E. DOETSCH
RESISTANCE SYSTEM
Filed April 17, 1940

Serial No.
330,201



Inventor:
Ernst Doetsch
By
Young, Egan & Thompson
Attorneys

ALIEN PROPERTY CUSTODIAN

RESISTANCE SYSTEM

Ernst Doetsch, Nurnberg, Germany; vested in the
Allen Property Custodian

Application filed April 17, 1940

This invention relates to a compound resistance system or unit, more particularly, for use in excess voltage circuits.

For various electrotechnical purposes, and, more particularly, for excess voltage or overpressure circuits so called "compound" resistances are used, consisting of a mixture of conductive or semi-conductive and insulating substances, in the form of rods, discs, cylinders or plates. The data of the resistance, such as, its electric conductivity, heat conductivity, its dependence or independence from the working voltage and from changes of temperature are determined by the composition of the mixture.

It is very difficult to make large integral bodies, such as, discs, of a perfectly homogeneous mixture whose electric resistance is absolutely uniform over the whole cross section of the body. Therefore, in view of the high electrical stresses to which the compound resistances are subjected nowadays as they are tested or in practical service, it occurs in some instances that the heat produced in the resistance is not uniformly distributed over its cross section, owing to a non-homogeneous structure of the resistance and consequent non-uniform distribution of the electric load over the cross section, whereby electric puncture may result.

It is an object of the present invention to avoid such non-uniformity in the resistance.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:—

Fig. 1 is a side elevation of a resistance system having the invention applied thereto.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a side elevation of a modification.

Fig. 4 is a plan view of this modification.

Fig. 5 is an axial section of a further modification.

Fig. 6 is a plan view of Fig. 5.

Fig. 7 is a side elevation of still another modification and

Fig. 8 is a plan view of Fig. 7.

Similar reference numerals denote similar parts in the different views.

According to the invention, the resistance unit is built up of a plurality of individual elements

and the individual resistance elements are accurately measured electrically and mutually adjusted before they are assembled, in order to ensure a uniform loading of all elements, making up together the total cross section of the combined resistance unit.

Referring now to the drawings in greater detail, and first to Figs. 1 and 2, it will be seen that a plurality of rod shaped resistance elements 1 are combined to a bundle of hexagonal cross section, with end plates 2 and 3 effecting the electric connection.

It is also contemplated, within the purview of this invention, that resistance elements of different specific resistance and different voltage characteristics may be combined to attain special effects, such as, a valve effect, which is of special importance where the resistance is to be used for carrying off, or leakage, or arrester purposes. For example, as shown in Figs. 3 and 4, a central, cylindrical resistance element 4 may be surrounded by sector-shaped elements 5 and the central element 4 may have a higher resistance and its resistance may show a greater change with the voltage than that of elements 5, whereby this central element 4 will practically operate only when very high overpressures are occurring which cannot be absorbed by the sector elements 5.

It is also contemplated, moreover, that the resistance elements may be enclosed in an insulating casing of ceramic materials, artificial resin or the like, in which suitable recesses are provided for the resistance elements. A resistance unit of this type is illustrated in Figs. 5 and 6, in which resistance elements 6 are enclosed in a cylindrical cover 7 with end plates 8 and 9, and connected to any suitable terminals (not shown) by means of contact plates 10.

Figs. 7 and 8 illustrate an arrangement in which rod-shaped resistance elements 11 having thickened end collars or contact caps 12 are connected by wires 13 to a terminal 14.

It will be appreciated that my novel type of resistance offers very important advantages over the known types of compound resistances. The load may be increased considerably owing to the full participation of the total cross section of the combined resistance in the conduction of the current. Owing to the augmentation of the total surface of the combined resistance the cooling conditions are substantially improved. The heat developed by frequent loading of the resistance is immediately radiated so that punctures due to high temperature may be avoided.

It will be noted that the increase of the total surface of the resistance is particularly useful where the resistance is to be used for high frequency, in view of the skin effect becoming more and more pronounced with increasing frequency. As is well known, stresses in intervals of 0,001 to 0,02 seconds, with a frequency of 2×10^4 cs to 10^7 cs, are produced by the discharge of atmospheric disturbances and frequencies of 200 to 1000 cs are produced by interruption of short-circuits. Therefore, my novel composite resistance is very efficient for carrying off flash-over or excess voltages.

Another advantage of my combined resistance resides in the fact that in case of extremely high loads of the kind occurring in the discharge of atmospheric disturbances the puncture is restricted to one resistance element only while the

remaining resistance elements are left unaffected and the resistance unit remains intact.

If desired, the interspaces between the single resistance elements may be filled up by phenol-formaldehyde condensation products of the type known under the registered trade mark "Bakelite" or by gypsum, or by any other suitable solid, liquid or gaseous insulating material, and the adjacent resistance elements may be interconnected in this manner.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

ERNST DOETSCH.