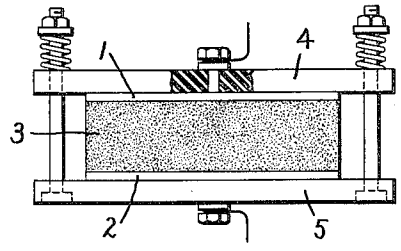
E. KRAUS.

CRYOLITE RUTILE COMPOSITION.

APPLICATION FILED AUG. 3, 1911.

1,045,985. Patented Dec. 3, 1912.



Witnesses:
Earl G. Klock.
J. Ellis Glen.

Inventor:
Ernest Kraus,
by Albert G. Davis
His Attorney.

UNITED STATES PATENT OFFICE.

ERNEST KRAUS, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CRYOLITE-RUTILE COMPOSITION.

1,045,985. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed August 3, 1911. Serial No. 642,108.

To all whom it may concern:

Be it known that I, ERNEST KRAUS, a subject of the Emperor of Austria-Hungary, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Cryolite-Rutile Composition, of which the following is a specification.

My invention comprises a new composition of novel properties which is particularly useful in the electrical arts where a material having a negative temperature resistance coefficient is desired as for example, in a motor starter, a thermal cut-out and the like.

The accompanying drawing illustrates one form of resistor made in accordance with my invention, and provided with current connections.

I have discovered that when ordinary commercial rutile, which consists principally of titanic oxid together with about 2–3% of iron oxid, and some other impurities, is introduced into fused cryolite that the rutile dissolves and yields when cold a conducting mass having a high negative temperature resistance coefficient.

A solution of pure rutile in cryolite begins to conduct when its temperature has been raised somewhere between 50 to 100° C. depending on the voltage and other conditions and then increases rapidly in conductivity with rise of temperature. In my present opinion the iron oxid, or some reduction product of the same renders the mass conducting when cold, allowing a current to pass which heats up the mass to the point where the rutile itself takes part in the conductivity.

The rutile can be dissolved to the amount of 42% but ordinarily I prefer to use 25 parts of rutile for 75 parts of cryolite. The cryolite is first heated to about 900° C. and the rutile is then stirred in. The heating is continued for about a half hour to thoroughly complete the solution. The mass is allowed to cool, and when solidified is powdered. The powder is packed into a graphite crucible or other suitable container and reheated in an electric furnace to about 1800° C. to render it thoroughly homogeneous. When solidified it is cut into slabs of desired dimensions and provided with appropriate electrical contacts as illustrated, for example, in the drawing which shows the contact plates 1, 2 spring pressed against the resistor 3, by sheets 4, 5 of insulating material, or in any other suitable manner.

From room temperature to 300° C. the conductivity of a resistor made as above described increases about 100 fold.

It will be understood that the resistance material above described need not be in the form of a coherent stick, and can be used in any relation where a self-reducing resistance is required for controlling a current, magnifying the effect of current variations or similar purposes.

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

1. A composition of matter containing cryolite and rutile.

2. A composition of matter consisting of a solution of rutile in cryolite having a high negative temperature resistance coefficient.

3. A composition of matter consisting of a solution of rutile containing iron in cryolite.

4. A composition of matter consisting of a solid solution of commercial rutile in cryolite which has been heated in contact with carbon to a temperature of about 1800° C.

5. A self reducing resistance material consisting of a solution of rutile in cryolite.

In witness whereof, I have hereunto set my hand this 1st day of August 1911.

ERNEST KRAUS.

Witnesses:

JOHN A. MCMANUS, Jr.,

ROBERT SHAND.