A. A. LOW.

ELECTROMAGNET COIL CONSTRUCTION.

APPLICATION FILED DEC. 12, 1908.

931,445. Patented Aug. 17, 1909.

Fig. 1.

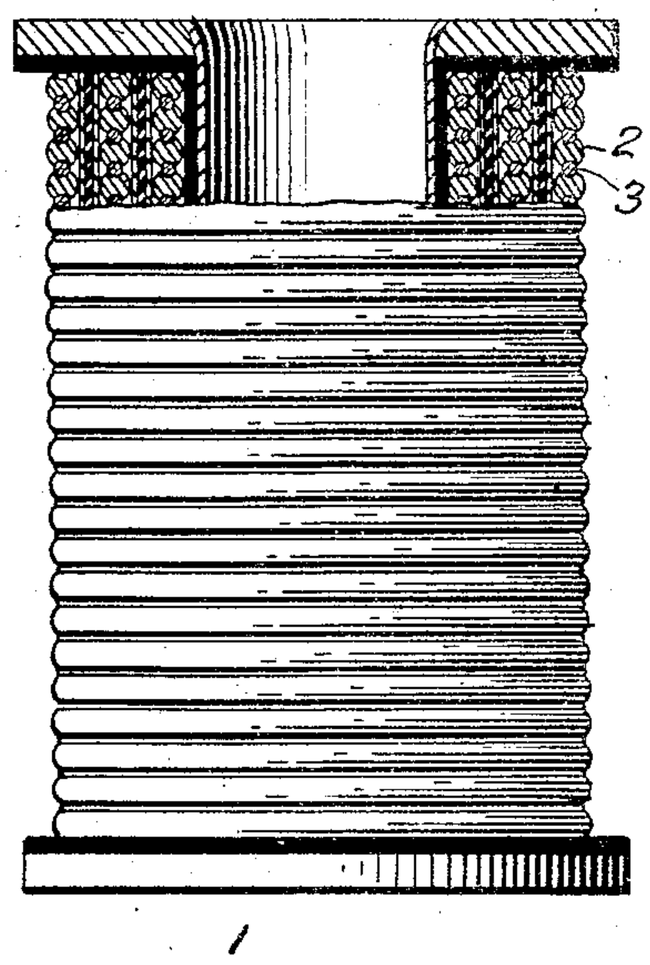


Fig. 2.

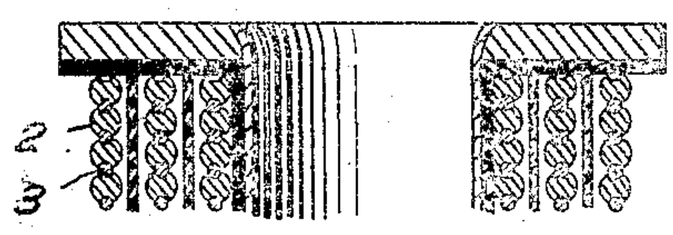


Fig. 4.

Fig. 5.

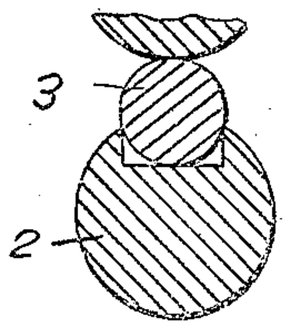


Fig. 6.

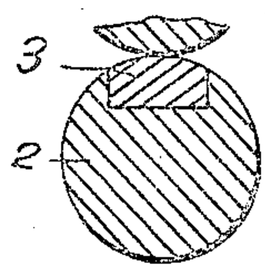


Fig. 3

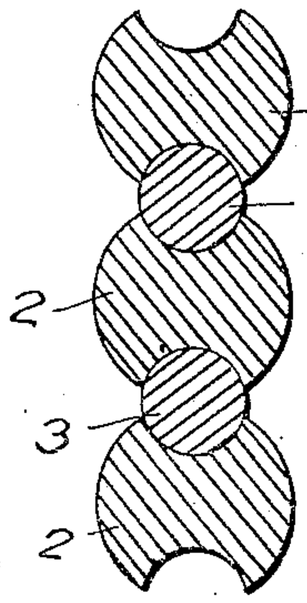
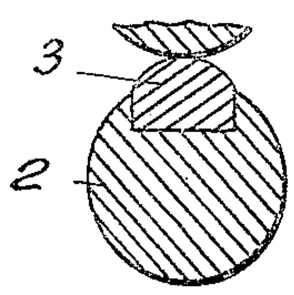


Fig. 7.



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ELECTROMAGNET-COIL CONSTRUCTION.

No. 931,445. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed December 12, 1908. Serial No. 467,282.

To all whom it may concern:

Be it known that I, ABBOT A. LOW, a citizen of the United States, and resident of Horseshoe, in the county of St. Lawrence and State of New York, have invented certain new and useful Improvements in Electromagnet-Coil Construction, of which the following is a specification.

This invention relates to electromagnet coil construction and has for its object the provision of a coil of compact construction in which the greatest possible number of turns of wire may be placed in a given space and also the provision of means for insulating the successive turns of wire in such a manner that the insulation will not be destroyed by the heat generated in the coil by the passage of the current therethrough or otherwise.

The object of the invention is to avoid the difficulty experienced in electromagnet coils in which the ordinary insulated wire is used of the insulation being destroyed when the coil is excessively heated.

A further object of the invention is to simplify and cheapen the coil construction by employing bare wire instead of the usual insulating wire and in forming and arranging the wire so that the same is contained in the least possible space.

In the drawings accompanying this specification like parts in the several views have been given the same reference numbers.

Figure 1 is a side elevation. Fig. 2 is a view similar to Fig. 1, showing the coil after the same has been in use. Fig. 3 is an enlarged cross-section through several turns of the winding showing one arrangement of the insulating and conducting winding. Figs. 4 to 7 are enlarged cross-sectional views of the winding similar to Fig. 3, showing several modifications of the same.

A spool upon which the electromagnet coil is wound is shown at 1. This spool may be of any approved construction and upon the same is wound successive turns for the operating current. These conductors are shown at 2 in the several views in various forms. The conducting winding 2 is provided with a longitudinal recess, either on both sides, as shown in Fig. 2 or on one side, as shown in Figs. 4 to 7. Positioned in this recess is an insulator, shown in various forms at 3 and is preferably formed by winding turns of bare aluminum wire with the conducting wire 2. The aluminum wire oxidizes readily when exposed to the air, especially if some moisture is present, and the oxidation is accelerated when the wire is heated. This forms an insulating coating of oxid for the aluminum wire having sufficient insulating properties to insulate the successive turns of the conducting wire 2 from one another.

It is understood in electromagnet coil construction for any ordinary purposes that the difference in potential or drop between two successive turns of the coil is very small and it has been found by actual tests that a coil wound with bare wire for the conducting winding and having alternately positioned therewith turns of bare aluminum wire with a coating of oxid, as described, will operate successfully and will possess the very desirable property of being able to withstand excessive heating caused by an unusual amount of current or from other sources without breaking down. In fact the effect of the heating, as already explained, is to accelerate and increase the formation of the insulating coating of oxid.

The arrangement of the conducting and insulating winding shown in Fig. 3 provides the most compact arrangement and permits the greatest number of turns to be placed in a given space, but the arrangement shown in Figs. 4 to 7 are preferred in some instances. The insulating winding 3 may be oxidized either naturally or artificially in the manner described before by placing the same in position in the recess of the conducting winding. This will be desirable when the arrangement shown in Fig. 3 is used. With the arrangement shown in Figs. 4 to 7, however, more of the surface of the insulating winding is exposed and, consequently, more readily oxidized as the coil is used. With the arrangement shown in Fig. 5 it will be seen that an air space is also provided in the conducting winding between the same and the insulating winding. In the arrangement shown in Figs. 6 and 7, the insulating winding 3, may be permanently positioned in the recess and the conducting winding and its insulator wound as one wire on the coil.

Where the coil is composed of a plurality of layers of winding, these layers may be insulated from one another by interposing between the same a strip of insulating mate-

rial. This is preferably a composite strip comprising a central layer of mica and outer layers of a combustible material, such as paper or cloth. The mica forms a good insulator, but is so brittle that it is practically impossible to wind or place the same in position upon the successive layers of wire but by using a composite strip constructed as described, this is easily accomplished as the strip may be readily wound upon the successive layer of wire, as shown in the drawings. A further advantage obtained by using a composite insulating strip such as described is that when the coil becomes heated the outer layers being of combustible material burn away leaving the layer of mica in place. This provides an additional space which permits the turns of winding to become separated somewhat, thus increasing the insulating effect. Fig. 1 shows a coil such as described before use and Fig. 2 shows the same coil after the same has been used and heated, and the combustible layers burned away from the strip between the layers of the winding, the effect being, of course, somewhat exaggerated in order to show the separation of the turns of the winding, etc., in the drawing.

It will be understood that the foregoing description and drawing are intended to show a preferred embodiment of the invention for the purposes of illustrating the same and the insulator or insulating winding has been described as aluminum wire which is oxidized on its surface. It is not to be understood, however, that the invention is limited in this respect to any particular material or to the particular form of coil or winding shown and described, as it will be evident that many changes may be made in the details of construction shown and described without departing from the scope of the invention.

What I claim is:

1. An electromagnet coil wound with alternate turns of copper wire and aluminum wire, one partially inclosed by the other.

2. An electromagnet coil wound with alternate turns of copper wire and wire coated with an insulating oxid partially inclosed by said copper wire.

3. An electromagnet coil wound with a conductor for the operating current, said conductor being provided with a longitudinal recess, and having positioned in said recess a second winding formed of a material coated with an insulating oxid.

4. An electromagnet coil wound with alternate turns of bare wire, one forming a conductor for the current passing through the coil and provided with a longitudinal recess therein and the other positioned in said recess and forming an insulator between the successive turns.

5. An electromagnet coil comprising a plurality of layers, each layer having successive turns of a conducting winding alternately positioned with successive turns of an insulator, said insulator being partially inclosed by said conducting winding, and a composite strip located between said layers comprising a central layer of insulating material and outer layers of combustible material.

6. The method of making an electromagnet coil which consists in winding a plurality of layers, each layer having successive turns of a conducting winding having a longitudinal recess therein and an insulator positioned therein, and successively winding upon said layers a composite strip comprising a central layer of insulating material and outer layers of combustible material.

7. A coil having a conductor with a longitudinal recess and an oxidizable insulator positioned in said recess.

Signed at New York in the county of New York and State of New York this 11th day of December A. D. 1908.

ABBOT A. LOW.

Witnesses:
HARRY HERTZBERG,
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