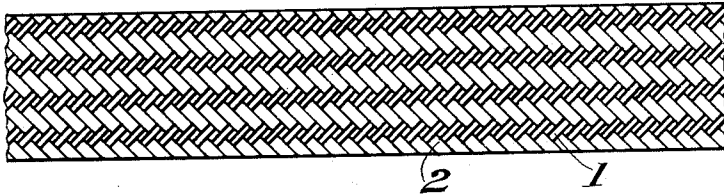


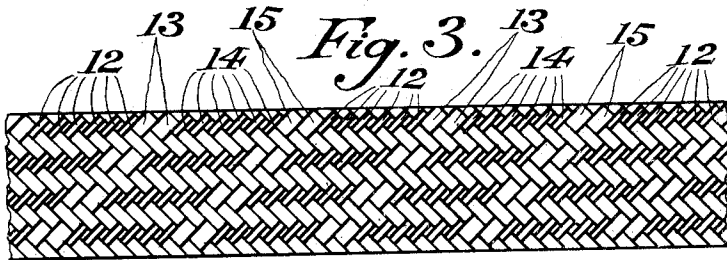
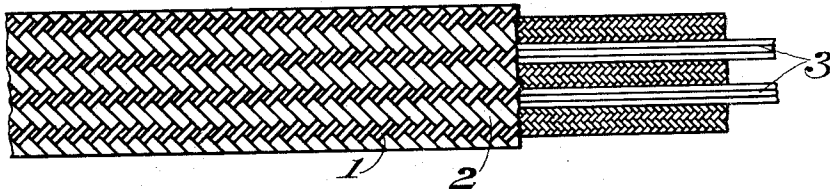
988,099.

Patented Mar. 28, 1911.

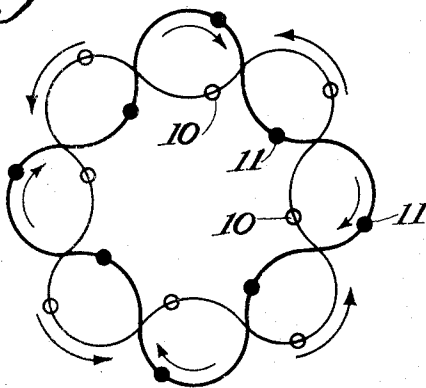
*Fig. 1.*



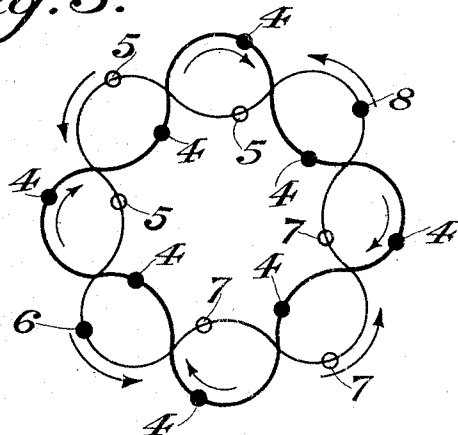
*Fig. 2.*



*Fig. 4.*



*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

OTTO HOFFSTROM, OF CHICAGO, ILLINOIS, ASSIGNOR TO BELDEN MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## FLEXIBLE CONDUCTING-CORD.

988,099.

Specification of Letters Patent.

Patented Mar. 28, 1911.

Application filed July 26, 1907. Serial No. 385,704.

*To all whom it may concern:*

Be it known that I, OTTO HOFFSTROM, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Flexible Conducting-Cords, of which the following is a specification.

My invention pertains to flexible conductors and particularly to multiple conductors, or flexible cords containing a plurality of independent conductors in the same cord.

My object is to provide a more durable cord, and to provide in a cord of limited dimensions a maximum number of independent electrical conductors.

I secure a durable cord by so weaving or braiding the conductors with or upon resilient material as to protect them from cutting or abrading each other. I also provide a system of conducting and non-conducting alternative spirals in a braided cord whereby a plurality of conducting spirals in one layer is secured.

In the accompanying drawings Figure 1 shows diagram of plan of braiding my improved cord; Fig. 2 shows my improved braiding with reinforced conductors; Fig. 3 shows my improved braiding with alternative spirals of insulating material; Fig. 4 shows diagram of loading of braiding machine for the production of the cord similar to that of Fig. 1; Fig. 5 shows diagram of the loading of the braiding machine for the production of a cord similar to that of Fig. 3.

In braiding tinsel cords heretofore it has been the custom to braid over a central insulated conductor with braids of tinsel running in both directions, whereby the tinsel in one direction crosses the tinsel in the other direction, and cutting and abrasion resulted with the bending of the cord in service.

In my improved cord, I load the carriers of the braiding machine with tinsel for one direction and with soft flexible material for the other direction, as shown in Fig. 4 wherein the open circles 10 represent the carrier loaded with tinsel and the black circles 11 represent the carrier loaded with resilient material such as a soft thread or strand of properly prepared silk, flax, cotton or rubber. The product resulting is a braiding similar to that shown in Fig. 1 in which the narrow strands 1 represent tinsel and the wide strands 2 represent the thread. It will

be observed that with this construction the strands of tinsel do not touch except lightly at the sides and that they are not pressed or ground together with the use of the cord, all cutting effects being by tinsel upon thread rather than by tinsel upon tinsel. By this means each strand of tinsel is embedded in a mass of yielding material and thus the maximum life of the tinsel strand is attained.

Obviously the cord of Fig. 1 having but one-half the quantity of conducting material of a cord as usually braided with tinsel in both directions, would have a double resistance. To overcome this, I introduce in Fig. 2 the lateral tinsel strands 3.

By loading the braider carriers as shown diagrammatically in Fig. 5, the braiding of Fig. 3 is secured. In Fig. 5 all carriers 4 moving in clockwise direction are loaded with insulating thread. Of the remaining carriers, which pass in counter-clockwise direction, the carriers are loaded with tinsel and insulating thread in alternate groups; thus 5—5—5— are conducting material, 6 is insulating material, 7—7—7 are conducting material and 8 is insulating material. By this arrangement all strands in one direction are of insulation, and strands in the other direction are disposed in groups alternately of insulating and conducting materials whereby spirals are formed of conducting material separated by insulating material.

Fig. 5 illustrates a 16-carrier braider. The cord of Fig. 3 was braided with a 32-carrier braider carrying 16 insulating threads in one direction and in the other direction carrying first, six conducting strands 12, then two insulating strands 13, then six conducting strands 14, then two insulating strands 15, the result being two conducting spirals each of six conducting strands, both spirals lying in the same layer of the flexible cord, but being insulated from each other. I may form thus a three-conductor cord by using a central conductor and a double-conductor braid and thus produce a three-conductor cord of no greater diameter than the two-conductor cord heretofore formed in the same manner but loading all carriers with tinsel. Further, it is possible to arrange the groups of conductors in any desired number of spirals whereby a plurality of independent conducting spirals may lie in the same layer of the flexible cord, and further, such layers may be superimposed with a non-con-

ducting braiding between whereby cords of a large number of conductors may be built by my system of braiding without involving an unduly thick flexible cord. A stranded conductor may be used in each of the elements 12 and 14, or a solid wire of small size, or tinsel. The cushioning of the conductor permits a wide latitude in the selection of the conducting material used.

10 Having thus described my invention what I claim as new and desire to secure by United States Letters Patent is:

15 1. In a flexible cord, a braided layer formed of strands in one direction of insulating material and of strands in the other direction separated into groups, the groups being of conducting material and of insulating material alternately, substantially as described.

20 2. In a flexible cord, a braided layer comprising strands of insulating material in one direction and strands of conducting material in the other direction, the number of conducting strands in the second direction 25 being smaller than the number of insulating strands in the first direction, substantially as described.

30 3. In a flexible cord, a braided layer comprising strands of insulating material in one direction and strands of conducting material in the other direction, the conducting strands of the second direction being divided into groups and being in total number fewer than the strands of insulating material in 35 the first direction, said groups of conducting strands thus braided forming concentric independent conducting spirals, substantially as described.

4. In a flexible cord, a braided layer comprising strands of insulating material in 40 one angular direction, and strands of conducting material in the other direction, the conducting strands being grouped to form a plurality of insulated conductors.

5. In a flexible cord, a braided layer 45 comprising strands of insulating material in one angular direction, and strands of conducting material in the other direction, the conducting strands being grouped to form a plurality of insulated conductors, each such 50 conductor being comprised of a plurality of strands.

6. In a flexible cord, a braided layer comprising strands of insulating material in 55 one angular direction and strands of conducting material interspersed with strands of insulating material in the other angular direction, the conducting strands being grouped to form a plurality of insulated con- 60 ductors, each such conductor comprising a plurality of conducting strands.

7. In a flexible cord, a braided layer comprising resilient insulating strands in 65 one direction, and conducting strands in the other direction, the conducting strands being grouped to form a plurality of concentric independent conducting spirals, each such spiral comprising a plurality of conducting strands.

Signed by me at Chicago, county of Cook 70 and State of Illinois, in the presence of two witnesses.

O. HOFFSTROM.

Witnesses:

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