Extended Use of Rubber Insulation in Telephone Cords

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FAVORABLE experience in the manufacture and use of rubber-insulated conductors in telephone cords* has indicated the desirability of extending the use of rubber insulation to other types of cords so that they may better withstand the most severe conditions of station and central-office service.

Standard cords with rubber-insulated conductors and a brown textile-braided outer covering are well adapted for normal station use. In places where usage is much more severe, however, such as at coin boxes, in business offices, restaurant kitchens, markets, laundries and in many industrial plants a much more rugged cord is needed. Cords are subjected in these services to abnormal wear and to kinking which detracts from their appearance. They may also have to withstand frequent wetting with water or other liquids as well as contamination with grease, dirt or chemicals.

*Record, *Nov.*, 1937, *p.* 85 and *Aug.*, 1938, *p.* 396.

For these situations rugged cords with rubber-insulated conductors and a tough rubber jacket have been developed. They are finding extensive use in the telephone plant, not only in the specific locations mentioned, but also for residence and general use in localities where long periods of high humidity or actual condensation of moisture are encountered. Their use may also be advisable in residences where cord kinking is troublesome.

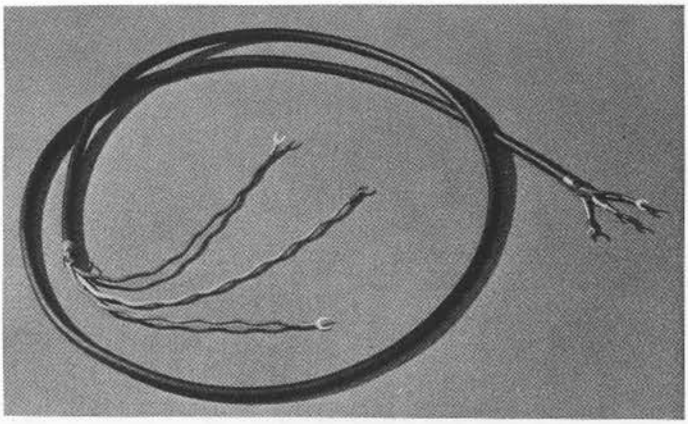

Fig. 1—Rubber-insulated station cords have rubber-insulated conductors with filler threads between them and a spaced serving of cotton to bind the conductors together

In manufacture, the rubber-covered conductors are twisted together (Figure 2) with cotton filler threads, which lie in the interstices, and covered with a cotton binding to form a smooth core. The core is then covered with a thick extruded jacket of tough brown rubber. A cord structure of this type costs more than that used in the braided type of cord but the longer life of the rubber-jacketed cord justifies its use where service conditions are severe. The rubber jacket has the further advantage that its stiffness and torsional resistance are greater and this minimizes the tendency of the cord to become twisted and kinked in service.

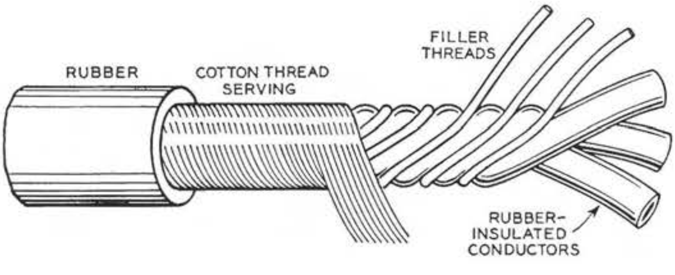

Fig. 2—Station cords with an outer covering of rubber are used where service conditions are unusually severe, as at coin boxes and in industrial plants

Experiments and field tests had been conducted previously to determine whether a rubber jacket could be employed advantageously instead of glazed cotton as a covering for switchboard cords. A rubber jacket was found unsuitable for this application because it was difficult to attach the cord securely to its associated plug; also, friction between the rubber jacket and the walls of the hole in the plug shelf prevented the cord from being restored readily.

Use of rubber insulation to replace silk and cotton on the individual conductors of the switchboard cords showed promise as a means of improving the electrical insulating properties of the cords and reducing substantially their manufacturing cost. That development, which would require changes in design of upwards of 150 standard cords, seemed warranted considering the probable future demand for the cords.

Although the majority of dial-system telephone calls do not involve the service of an operator or of switchboard cords, some of the calls will continue to require the use of manually operated switchboards. Toll systems are operated in general through manual switchboards and, in a large number of towns, local service is more economically given by manual boards. Added to these cord demands are those required for maintenance purposes in existing manual-system central offices, many of which are relatively new, and in the large number of manual private branch exchange boards. Both of these types of equipment may continue in service for a number of years.

Experimental cords of various designs were made up and were subjected to forced manual plugging tests simulating actual service conditions. On the basis of these tests, cords were given field service trials for a final check of their serviceability.

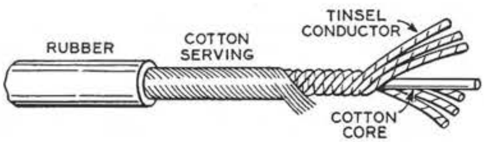

Fig. 3—The new rubber-insulated conductor for switchboard cords has a serving of cotton over the tinsel conductor and a thin outside layer of rubber applied by a continuous vulcanizing process

Rubber-insulated conductors developed for these cords had to be smaller than those used in station cords so that the completed cords could be held within the specified diameter limits. The new structure is shown in Figure 3. A thin wall

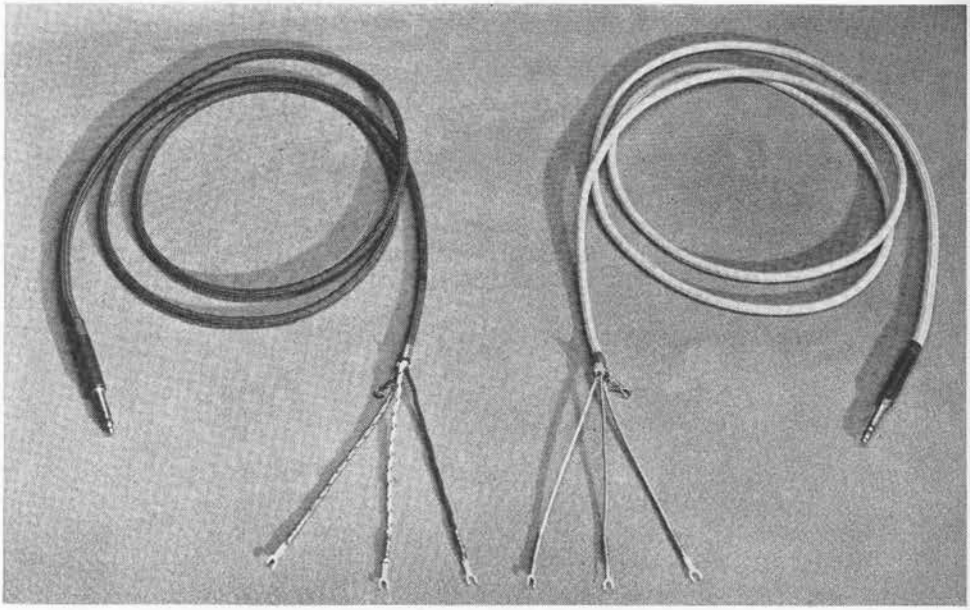

Fig. 4—Switchboard cord with rubber-insulated conductors (right) has better electrical characteristics and greater flexibility than cord with textile-insulated conductors (left)

of rubber is applied by the continuous vulcanizing process in the several different colors required. The twisted and filled-core construction, the glazed cotton reinforcements and the outer braiding used in former cords have been retained. New solderless tips were developed to match the smaller diameter of the insulated conductors.

Switchboard cords with rubber-insulated conductors are better adapted to economical methods of manufacture than those with textile insulation. They are more flexible and can be handled with greater ease by the operators at the switchboards. Their service life is relatively the same as that of the textile-insulated cords and they retain flexibility during prolonged periods of high relative humidity, such as occur along sea-coast localities during the summer months. Their electrical insulation characteristics remain at a high level during severe climatic conditions.