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ELECTRIC COMMUNICATION CABLE

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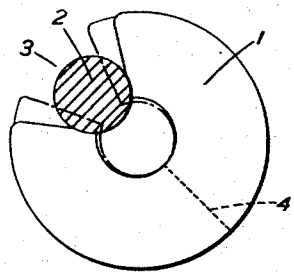


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## ELECTRIC COMMUNICATION CABLE

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2 Claims. (Cl. 260—4)

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This invention relates to improvements in spacing members for air space cables, i. e. coaxial, screened pair and screened quad cables and relates particularly to spacing members in the form of slotted insulating discs which are employed for maintaining the inner conductor or conductors in position within the outer conducting tube. Such spacing discs are quite well known, at all events for use in coaxial cables, but in practice various problems are encountered in the utilisation thereof, one problem being concerned with the material of which the spacing discs are composed. In this connection it is well known that it is desirable to employ as little solid insulating material as possible between the conductors and further it is desirable that the solid insulating material employed should have low loss characteristics at high frequencies. For this reason polystyrene is theoretically a very satisfactory material from which to manufacture the spacing discs; we have however found in practice that substantially pure polystyrene is rather too brittle and that discs of polystyrene show a tendency to split when being pushed on to the inner conductor (considering for the moment a coaxial cable). This tendency may be explained by reference to the accompanying drawing from which it will be noted that as the disc 1 is being pushed on to the conductor 2 the walls of the slot 3 in the disc are sprung apart with the result that a strain is put upon the material of the disc along the dash line 4. With discs of pure polystyrene this strain often proves too great and the discs split along the line 4.

In view of the above results experiments were carried out with a view to making washers having a base of polystyrene and containing other ingredients to render the material sufficiently "springy" to be slipped on to the conductor without splitting. It was however found that an appreciable quantity of such additional ingredients was required with the result that the low loss characteristics of the polystyrene were impaired for use at high frequencies. As a result of further experiments it was found that the provision of a certain amount of monomeric styrene within the polymeric styrene had the effect of plasticising the resulting material without affecting the low loss characteristics of the material. The difficulty then encountered was that it was almost impossible to control the amount of monomeric styrene retained within the material over a period of time in view of the losses due to evaporation and polymerisation of the monomeric material. In this connection it must be remembered that after polymerisation it is generally the practice to shape the polystyrene into sheets which may remain in store for a period of time at the end of which the sheet may be passed through a machine to stamp out discs therefrom after which the discs may be stored again for a period of time before being applied to the conductor. Our experiments have shown that while it is possible to control the amount of monomeric styrene within the originally formed sheet it is impossible to control with any accuracy the amount of monomeric material that will be present within the discs at the time of application to the conductor in view of the losses in the intermediate period and it will clearly be understood that it is at the time of application to the conductor rather than at the time of sheeting that the plasticity is required.

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We have now found that if a certain amount of rubber or closely similar substance be incorporated within the polystyrene sheet it is possible to retain the monomeric styrene within the polymeric styrene for an extended period. It is believed that the rubber acts as a retainer for the monomeric styrene and in this way prevents or at all events greatly retards final "storage" polymerisation and evaporation of the monomeric material. Therefore according to the present invention there is provided a spacing disc, for an air space cable, consisting of a base of polystyrene containing preferably about 10% of rubber or a closely similar substance and at least 3% and preferably as much as 5% of monomeric styrene. It will be appreciated that small amounts of other materials may also be added to the polystyrene if desired, e. g. polyisobutylene, polyethylene, ceresin wax and so on.

In carrying the invention into effect the rubber or similar substance may be mixed with monomeric styrene and the styrene polymerised (e. g. at 100° C.) under control until a desired amount of monomeric styrene remains (e. g. 7.5%), at which point polymerisation should be stopped and the material rolled or otherwise shaped into the form of a sheet from which the spacing discs may be punched. If desired, however, the discs may be moulded direct from a mass of the polymerised material. Alternatively a method may be adopted which comprises partially polymerising styrene milling preferably about 10% of rubber or similar substance into the partially polymerised styrene thereafter further polymerising the styrene until a predetermined amount of monomeric styrene remains and then forming the material into spacing discs.

Experience has shown that if several batches of monomeric styrene of identical volume be polymerised for a certain length of time at a certain temperature then in each case the amount of monomeric styrene remaining will be approximately the same so that by regulating the conditions of polymerisation the amount of monomeric styrene may be controlled.

What we claim is:

1. A process for manufacturing air-space electric cable spacing discs having low loss characteristics at high frequencies and being sufficiently resilient to resist substantial distortion substantially permanently without cracking that comprises partially polymerizing styrene to produce a mixture of monomeric and polymeric styrene, milling rubber into said mixture in a quantity of about 10% of the total weight of the mixture, thereafter further polymerizing the styrene until the monomeric styrene content of the mixture is reduced to a value of 3% to 7½% of the total weight of the mixture, and then forming this mixture into spacing discs.



2. An air-space electric cable comprising a spacing disc having low loss characteristics at high frequencies and being sufficiently resilient to resist substantially physical distortion substantially permanently without cracking, that comprises a mixture consisting predominantly of polystyrene containing at least 3% to 7½% of monomeric styrene serving as a plasticizer for the polystyrene and approximately 10% of rubber serving as a retaining agent for the monomeric styrene.

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