

A MULTIWIRE CABLE FOR RECORDING FROM MOVING SUBJECTS

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One of the main sources of artefacts when recording biological potential changes in moving subjects is the electrostatic charge over the insulation of the wires connecting the subject with the recording apparatus. Particularly in highly insulating plastic coating a charge of hundreds of volts may build up. Any movement of the insulating coating may evoke capacitively a change of

potential which may be large in relation to the biological potential changes. This effect may be prevented to a large degree by the use of coaxial screened cable. In multichannel electroencephalography, however, an interconnecting cable made up of these coaxial cables may be too cumbersome. This is particularly the case in 8-channel radio telemetering where a 16-wire connection of the electrodes

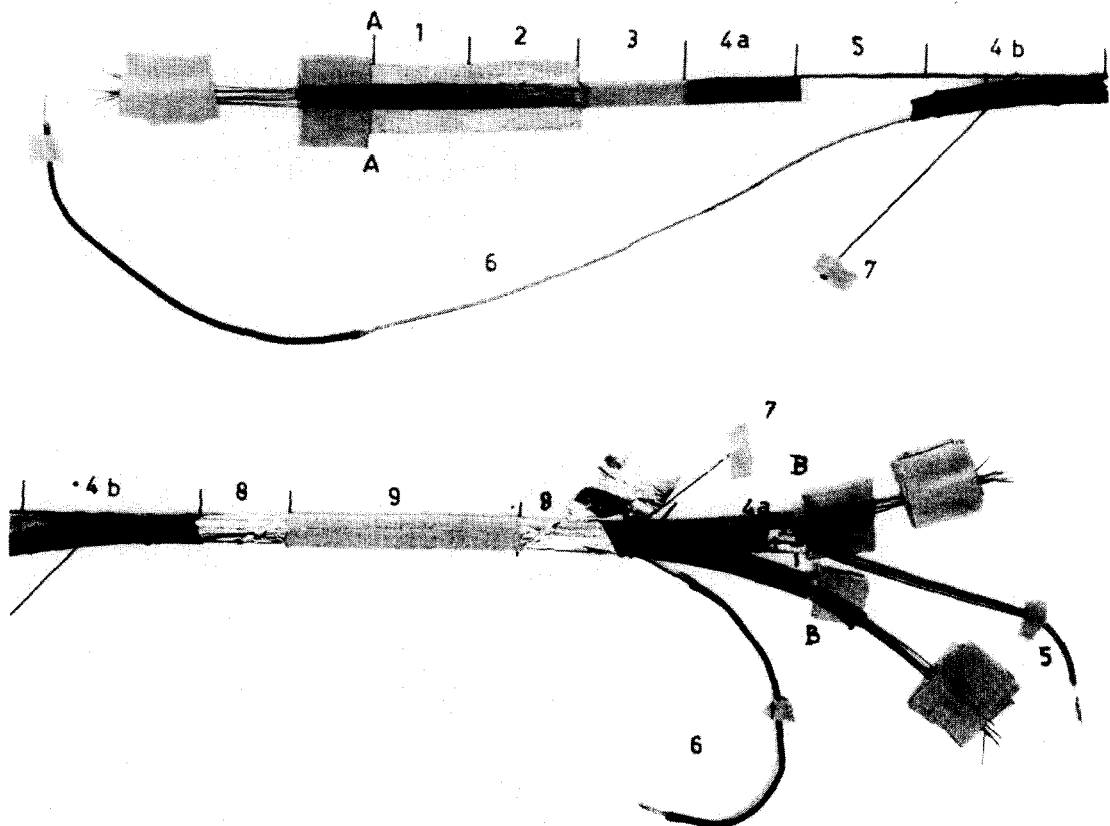


Fig. 1

Survey of different stages.

A and B. Perpendicular cut in the tape near the end of the wire. 1. Wires and cotton threads on adhesive tape. 2. Addition of zinc-oxide paste diluted with petrol. 3. Folding over the tape. 4a. Coating with fluid graphite. 4b. Second bundle. 5. Flat phosphor bronze strip. 6. Litz copper wire. 7. Cotton thread wound around assembly. 8. Aluminum foil. 9. Final wrapping of adhesive cotton zinc oxide tape.

with the amplifiers is necessary. For this reason a multiwire cable has been developed of reduced diameter, sufficient flexibility and strength, which may be moved and bent without potential differences occurring in the wire. The main principle in the construction of this multiwire cable is to prevent the occurrence of electrostatic charge.

The cable is made of insulated stainless steel wires, separated by cotton thread, surrounded by adhesive tape, coated with graphite sheathed by aluminum foil and mechanically strengthened by a metal strip. The cable is constructed in nine stages which are described in the following and which are indicated in Fig. 1 and 2.

1. A strip of cotton (not plastic!) zinc oxide adhesive tape of the length desired is stretched over a table with the sticky side up. On the sticky side 8 insulated stainless steel wires (diameter 0.2 mm) are strung in parallel, separated by cotton threads. The wires are a few inches longer than the length of tape. To keep them in position they are stuck to the table with pieces of adhesive tape until stage 5.

2. The wires and cotton threads are coated with zinc oxide paste diluted somewhat with petrol.

3. Near the ends of the cable (*A* and *B* in Fig. 1) the adhesive tape is cut in perpendicularly to the wire. The adhesive tape between *A* and *B* is folded over the wire from both sides.

4a. The adhesive tape is painted with liquid graphite with the exception of a 1–2 mm collar at each end.

4b. A second bundle of 8 wires is made as described above.

5. The two bundles of wires are placed at either side of a flat metal strip of phosphor bronze, 0.3 mm thick, 5 mm wide and as long as the cable. By means of a wire this strip may be connected to ground.

6. An uninsulated copper wire (litz) is placed along the outside over the entire length of the bundles.

7. The two bundles, the metal strip and the copper wire are connected by a cotton thread, wound around them.

8. The assembly is enveloped in a strip of aluminum foil.

9. The aluminum foil is wrapped in adhesive zinc oxide tape and the construction of the cable is completed.

A few comments may be given.

ad 1. The insulation of the wires is high, any electrostatic charge, however, is immediately removed by the comparatively low resistance of the surrounding zinc oxide

and cotton. The cotton threads prevent the wires from touching and thus from damaging one another when moving.

4a. The liquid graphite is added to increase the conductivity of the cotton of the adhesive tape.

ad 5. The metal strip of phosphor bronze is used for increasing the mechanical strength of the cable while retaining its flexibility.

ad 6. The copper litz wire is used as "ground" or "mass" lead.

ad 8. The aluminum foil is used as a screening sheath.

A cable as described above has been used in human and animal EEG recording during many tens of hours, often submitted to considerable stress, without breaking. Even extensive movement of the cable does not produce artefacts in the records.

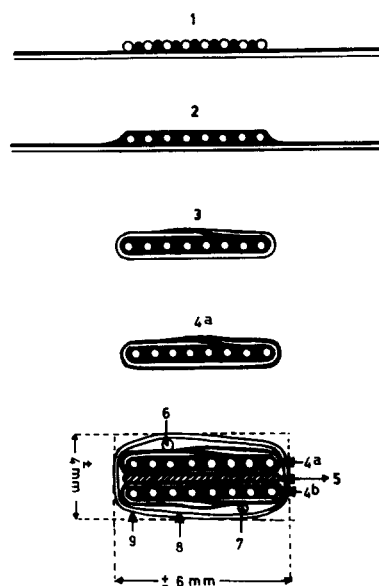


Fig. 2

Cross-section of different stages. Circles: stainless steel wire. Dots: cotton thread. The numbers indicate the stages as in Fig. 1.