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ARRANGEMENT ADAPTED TO SUPPRESS RADIO FREQUENCY CURRENTS ON CONDUCTORS

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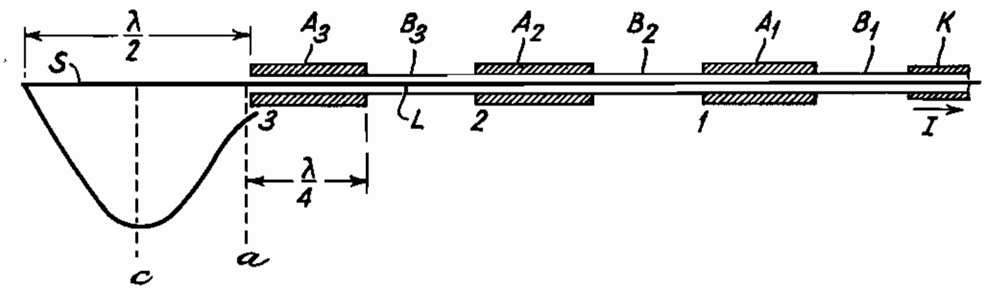

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ARRANGEMENT ADAPTED TO SUPPRESS RADIO FREQUENCY CURRENTS ON CONDUCTORS

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This invention relates to means to suppress the flow of radio frequency currents on conductors, especially of the so-called "shell" waves on the outer surface of cable shielding. Contradistinct to prior practice, according to this invention, to the said end, the conductor which is to be rid of radio frequency waves is built up of portions of dissimilar characteristic impedance, preferably of $\lambda/4$ length rather than by the aid of a short-circuit or rejector system, with the result that the radio frequency waves are gradually attenuated completely as a result of reflections produced at the points of discontinuity of the characteristic impedance. The general and broad principle underlying the invention shall now be explained in greater detail by reference to the appended drawing as applied to the feeding of an antenna S by way of a shielded line or cable L. If the outer shell of the line were simply free-ended, this outer surface, in the light of experience, would become excited; in other words, so-called shell waves would arise and these would exercise a harmful effect upon the antenna radiation. In order to avoid the said waves, the outer sheath is composed of several pieces or portions A_1, B_1, A_2, B_2 of dissimilar wall thickness, and each of these possesses different characteristic impedance values. The length of these components is preferably equal to $\lambda/4$. Now, if the assumption is made that at the juncture of connection points of the cable K itself there still flows a vanishingly small current I, it can be demonstrated that the current at point

$$1=\frac{Z_B}{Z_A}$$

and the current at point

$$2=I\cdot\left(\frac{Z_B}{Z_A}\right)^2$$

while the current at point

$$3=I\cdot\left(\frac{Z_B}{Z_A}\right)^3$$

where Z_B and Z_A the surge or characteristic impedances of the line portions A and B. For instance, if

$$\frac{Z_B}{Z_A}=3$$

it follows that at point K flows a current equal to one-twenty-seventh that at point 3; in other words, the shell wave has dropped to $^1/_{27}$th. If, in line with what is being shown in the drawing, there is moreover used an antenna at the base of which only a small current intake is required, in other words, for instance, a $\lambda/2$ antenna, it will be seen that also the shell wave amplitude at the base end of the antenna is extremely small. If the antenna currents at points *c* and *a* are as 10:1, it follows that the amplitude of the shell waves at point K is $=^1/_{270}$th the amplitude at point B. These shell waves may be taken to be negligible for practical purposes.

The invention is not confined to the suppression of shell waves, in fact, it may generally be used for the purpose of suppressing radio frequency waves along conductors. If the length of the component parts is not made equal to $\lambda/4$, then the calculation is somewhat more complicated. However, the attenuation of shell waves also in this instance is practicable in the same way as above described.

HANS OTTO ROOSENSTEIN.