

[54] **RADIATING COAXIAL CABLE**

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[51] **Int. Cl.**..... **H01q 13/22, H01p 3/06**

[58] **Field of Search**..... **333/84 C, 96 R, 84 R;**
343/770-771, 843, 895, 789

[56] **References Cited**

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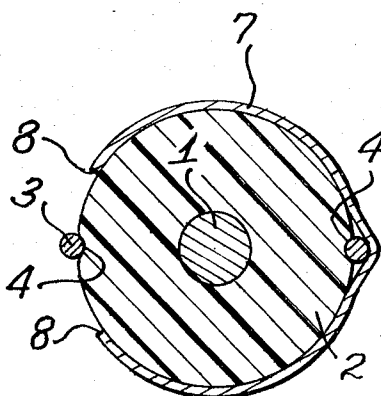
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Primary Examiner—Alfred E. Smith
Assistant Examiner—Wm. H. Punter
Attorney, Agent, or Firm—Bacon and Thomas

[57] **ABSTRACT**

A radiating, high frequency transmitting coaxial cable includes a center conductor, a dielectric layer, one or more field perturbing elements embedded in the surface of the dielectric a desired depth, and an apertured outer conductive shield in conductive contact with each field perturbing element and covering a major portion of the cable surface for enabling a signal transmitted down the cable to be radiated outwardly from the cable through the apertures in an efficient and controllable manner over the length of the cable. The disclosed field perturbing element with or without the apertured outer shield arrangement is the crux of this invention and distinguishes same over high frequency radiating cables of the prior art. Various configurations of the invention are described, including an arrangement enabling the radiating characteristics of the cable to be varied along the cable length to compensate for attenuation losses of transmitted signal strength and other conditions.

11 Claims, 9 Drawing Figures



SHEET 1 OF 2

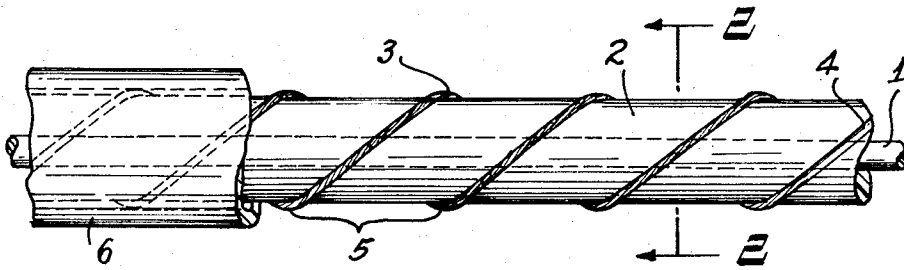


Fig. 1.

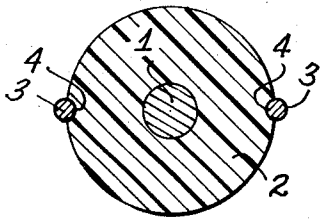


Fig. 2.

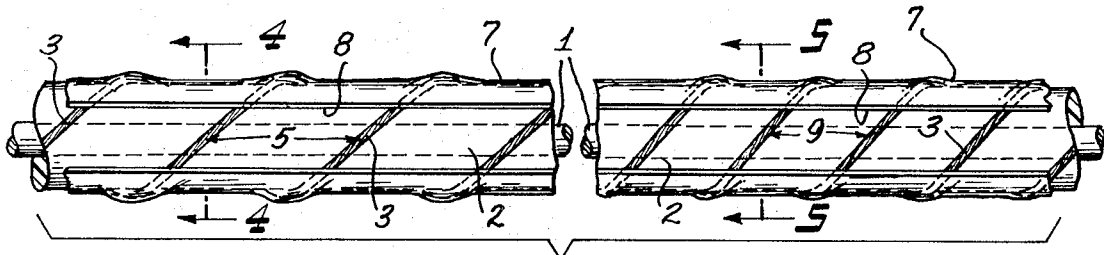


Fig. 3.

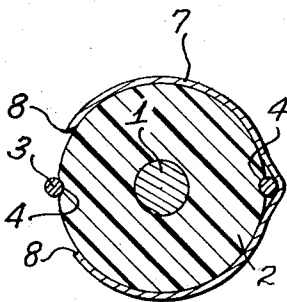


Fig. 4.

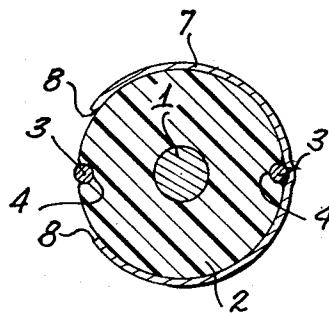


Fig. 5.

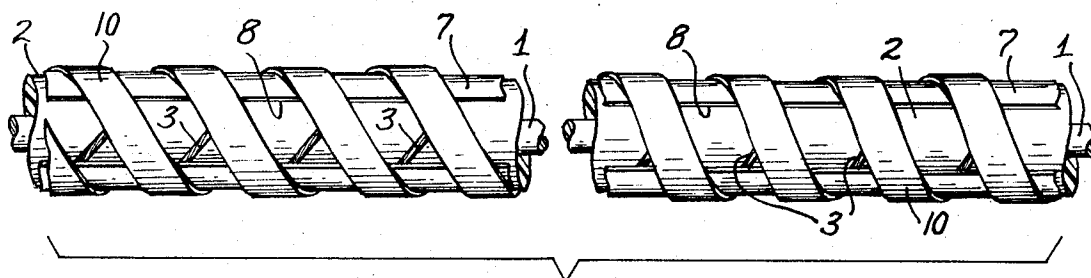


Fig. 6.

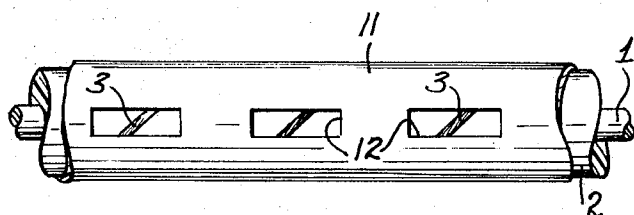


Fig. 7.

Fig. 8.

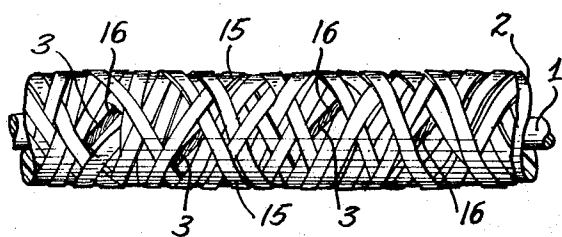
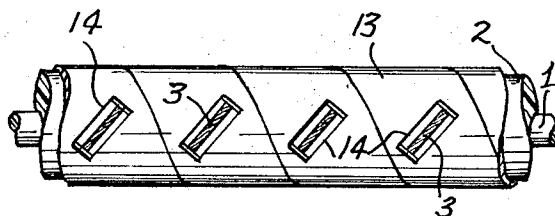


Fig. 9.

RADIATING COAXIAL CABLE

BACKGROUND OF THE INVENTION

The present invention is an improvement in the field of high frequency radiating coaxial cables, sometimes referred to as "leaky" coaxial cables, or antenna/transmission lines.

In the prior art, various arrangements of leaky coaxial cables used for tunnel, building, shipboard and other communication systems are known. U.S. Pat. Nos. 3,691,488; 3,668,573; 3,729,740; and 3,735,293 all show such cables and provide extensive discussions of theory and applications of high frequency radiating "leaky" coaxial cables.

While leaky waveguides or antennas are also shown in the prior art as being used for similar applications, see for example U.S. Pat. Nos. 2,761,137; 2,816,285; 3,560,970; 3,629,707; and 3,648,172, the prior art relating to waveguide technology is generally considered by those skilled in this field to be distinguishable from the prior art relating to coaxial cable technology, since the problems to be solved, the method of operation of the respective systems and the design parameters are considered to be substantially different in the two fields.

SUMMARY OF THE INVENTION

The present invention is an improvement in the field of high frequency radiating coaxial cables, and in particular the incorporation of one or more field perturbing elements embedded in the surface area of the dielectric layer of the cable to improve the radiating properties of the cable. The field perturbing element may be a good or very poor conductor, or be of any conductivity in between, provided the conductivity (or dielectric constant) of the field perturbing element is different from that of the dielectric material in the cable surrounding the center conductor. Preferably, for optimum operating characteristics, the relative conductivity of the field perturbing element is substantially different from that of the dielectric layer of the cable.

A conductive shielding layer for enclosing the dielectric and field perturbing element along the cable length is also preferred, particularly when the field perturbing element is a poor conductor and a return line and shield of good conductivity is desired as part of the cable construction. The conductive shielding is apertured, the aperture either being, for example, a continuous slot or separate windows, and may extend along one side only of the cable when directional control of the radiated signal is desired. The slot or other aperture feature of the shielding exposes discontinuous portions of each field perturbing element and the adjacent dielectric layer material for radiation of field energy outwardly from the cable when a signal is applied to the cable.

The invention is based on the discovery that the incorporation of the field perturbing element in the cable as presently disclosed results in a cable having significantly improved radiating characteristics as compared to prior art radiating cables. The discovery has also been made that the radiating characteristics of the coaxial cable embodying the present invention may be simply and efficiently adjusted along the length of the cable during the manufacturing operation to produce a cable that is capable of radiating energy at various

levels along its length with a constant internal energy level impressed on the center conductor, or a cable that may compensate for downline losses of transmitted signal power to maintain a constant radiated energy level.

According to the present invention, the spacing between unshielded portions of the field perturbing element and the degree of embedment in the dielectric layer of the field perturbing element are simply adjusted along the cable length to achieve this objective, all within functional limits. Alternatively, the unshielded areas of each field perturbing element are modified along the cable to provide the radiation adjusting feature.

The cable of the present invention thus has an inherent capability that enables it to be designed to meet a wide variety of applications. In a subway tunnel environment where the cable length is long and the mobile receiver antenna is relatively close, a cable having less radiation strength and minimum coupling losses down the cable is desired so that the transmitted signal strength is preserved along the length of the cable. In a building environment where a central, omnidirectionally radiating cable may be used as a security communications link, the radiated signal strength must be relatively strong over a relatively short cable length to enable signal coupling to a mobile receiver anywhere within the building perimeter. The design of the cable of the present invention can be simply adjusted to achieve any objective of this nature, all as will be made clear in the following description of the preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a portion of the basic radiating coaxial cable of this invention, without an outer conductive shield element;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 shows a portion of the radiating cable having a slotted conductive shield and a variable radiating characteristic along its length;

FIG. 4 shows a section view taken along line 4—4 of FIG. 3;

FIG. 5 shows a section view taken along line 5—5 of FIG. 3;

FIG. 6 shows a portion of the radiating cable having a composite outer conductive shield;

FIG. 7 shows a portion of the radiating cable having a tubular, apertured shield;

FIG. 8 shows a portion of the radiating cable having a helically wound apertured shield; and

FIG. 9 shows a portion of the radiating cable having a loosely braided shield.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIG. 1, the basic radiating cable of this invention comprises a coaxial type cable including at least a single center conductor 1, which may be solid or stranded, and of any suitable conductive material suitable for the particular application of the cable, preferably copper or copper clad aluminum. Of course, two center conductors could be provided if desired, in accordance with conventional balanced coaxial cable construction techniques. A dielectric layer 2, which may be polyethylene, foamed or unfoamed, for example, surrounds the inner conductor over the length of

the cable as is also conventional with coaxial cable constructions.

The radiating cable includes a field perturbing element embedded in the surface of the dielectric layer of the cable. In the preferred embodiment as shown in FIG. 1, the field perturbing element comprises one or more elements 3 extending along the cable at an angle with respect to the center conductor 1, and embedded in the dielectric a predetermined amount as shown at 4 in FIG. 2, whereby the field energy transmitted down the cable (primarily in the dielectric at R.F. frequencies) is perturbed by elements 3 and is caused to radiate radially outwardly with respect to the cable for creating a radiated signal that can be received by a mobile antenna, for example, such as on a subway car, or a personal receiver set. Field perturbing elements 3 here are shown as continuous helically wrapped strands of conductor material in this embodiment, but it must be noted that this arrangement is described for illustrative purposes only, and enables the cable embodying this invention to be economically and dependably produced. As will be pointed out below, for example, where an outer conductive shield is utilized, the elements 3 may be discontinuous, since an outer ground plane conductor will be provided by the sheathing, and a continuous outer conductive field perturbing element is not required to provide a ground plane conductor.

The field perturbing element 3 may be a relatively poor conductor or a relatively good conductor, the essential criteria being that its conductivity (or dielectric constant, if it is a very poor conductor) is different from that of the dielectric layer 2. Obviously, within limits, substantial differences in relative conductivities between the dielectric layer 2 and the field perturbing element 3, results in better perturbation of the field energy transmitted down the cable, and better cable radiating characteristics.

The field perturbing element 3 in FIG. 1 comprises one or more strands of aluminum wire coiled about and embedded in dielectric layer 2 (see FIG. 2). While the cable of FIG. 1 is illustrated as being round in cross-section, obviously this is for illustrative purposes only and the cable could be of any practical cross sectional configuration. The only essential characteristic that is required with any cable configuration embodying this invention is that the field perturbing element must be embedded in the dielectric layer at least to some extent, depending on the desired radiating characteristics of the cable, and it must cut across the energy field transmitted down the cable. Preferably, as shown in FIGS. 1 and 3, this is achieved by spirally wrapping one or more lengths of the field perturbing element 3 around the dielectric 2 with the pitch of coiling being such that gaps 5 or 9 (the difference in gap sizes will be explained below) of desired dimensions are left between individual coils of element 3 over the length of the cable. An outer nonconductive sheathing 6 of conventional form is normally provided to insulate the cable from surrounding structure and to protect the cable itself against wear and moisture. The sheathing 6 may be clear or pigmented and is substantially invisible to radiation energy in the order transmitted by the cable of this invention.

An outer apertured conductive radiation shielding element or layer 7 in intimate physical and electrical contact with the field perturbing element 3 may be provided as shown in FIGS. 3 and 4. The conductor and

shielding element 7 here is preferably formed of thin aluminum foil or the like, to provide an outer conductive and shielding layer for the cable, but could be formed of any relatively thin, conductive material. The outer shield 7 is apertured in this instance to directionally control the radiation characteristics of the cable, the aperture feature in the embodiment of FIG. 3 comprising a continuous slot 8 extending along one side of the length of the cable, exposing discontinuous portions of the field perturbing element 3 and the areas of the dielectric layer 2 immediately adjacent the exposed portions of the field perturbing element. As can be seen in FIG. 4, the shield may cover a major proportion of the cable periphery, and preferably covers between 60 and 85 percent of the outer cable surface area, the particular desired radiating characteristics of the cable determining the particular shielding coverage used in any application, as will be discussed below. Again, as with any embodiment of the cable of this invention, an outer non-conductive sheath 6 as shown in FIG. 1 would normally cover the cable assembly.

Some significant structural features and operating characteristics of the cable of this invention are worth noting at this point. First, the invention is based on the discovery that if the field generated in a surrounding dielectric layer enclosing a center conducting wire in a coaxial cable is perturbed, the radiation characteristics of the cable in the perturbed areas are enhanced to a substantial extent. By embedding a suitable elongated element or elements in the dielectric layer that has markedly different electrical conductivity properties than the dielectric layer, and configuring it so that it lies at an angle to the center conductor, the field generated and radiated in and through the dielectric material of the cable when a radio frequency signal is carried thereby is perturbed wherever the embedded element cuts across the radiated field, causing the cable to radiate more intensively in these areas than if no field perturbing element were provided. Tests have shown that the unshielded cable configuration of FIG. 1 radiates at higher energy levels than a comparable cable having no field perturbing element. Moreover, loss of signal strength over the length of the cable is less using the cable of this invention for comparable radiation strengths, since lower losses along the cable length need be endured for achieving desired coupling between the radiating cable and a receiver antenna.

The cable of configuration of FIG. 1 is relatively inefficient for appreciable distances, since it is unshielded and therefore radiates omnidirectionally without modulation over the length of the cable, ignoring the slight effect certain materials used in the outer sheath may have on the radiation level. Therefore, a more practical approach towards achieving a radiating cable for high frequency energy is to partially shield the cable, as shown in FIG. 3, for example, to control the radiation losses over the length of the cable (downline attenuation losses), and, more importantly, to directionally control the radiated signal transmitted by the cable.

Windows and slots of various types have been used in the prior art and are generally well known in the field of leaky coaxial cables. However, in the prior art configurations, the use of a field perturbing element such as now disclosed was not known, and therefore, previous antenna/transmission lines have required the provision of relatively large "windows" or slots in the outer shield to achieve the desired coupling strengths de-

manded of certain cable applications. Unfortunately, this has resulted in the loss of directional control over the radiated signal from these cables in tunnels or other areas where large ground planes are involved with the incumbent necessity that such cables cannot be mounted on the walls of such tunnels because of the increase in downline attenuation. The requirement for mounting such cables spaced from the ground plane walls naturally becomes a very expensive and cumbersome necessity.

The present discovery that the field perturbing element intensifies the signal radiated from the transmitting cable has resulted in a cable design such as shown in FIG. 3, for example, where the radiated signal through the slots 8 is intensified by reason of the presence of the unshielded portions of the field perturbing element(s) 3 in the slot area. The radiated energy furthermore is directionally controlled through one side only of the cable because of the shielding element or layer 7. Since, when compared to radiating cables not having a field perturbing element incorporated in their structure, the cable of the present invention can radiate at a stronger level for a particular signal strength transmitted down the cable, or can radiate at a particular level over a longer cable length before downline attenuation losses must be compensated for, the advances in the art provided by the present invention immediately become evident.

Certain variations in the composition of the field perturbing element 3 are within the scope of the present invention. It has been discovered that the field perturbing element 3 need not necessarily be a good electrical conductor in the usual sense to enable its functioning as a field perturbing element. The only essential requirements, insofar as its composition is concerned, is that its electrical conductivity properties (or, stated in the reverse sense, the dielectric constant of the material) must be different than those of the dielectric layer; preferably, for achievement of the best radiation characteristics of the cable, they should be substantially different from those of the dielectric layer. Thus, assuming that the field perturbing element is a relative non-conductor, the essential characteristic is that its dielectric constant is substantially different from the dielectric constant of the dielectric layer so that the field surrounding the center conductor when a signal is transmitted therethrough is perturbed as it crosses the field perturbing element. Preferably, the field perturbing element is a conductor, such as aluminum, or synthetic resin that has been made relatively conductive by the addition of a suitable conductive material to its composition.

The size of the field perturbing element has been found to materially affect the radiated signal strength, while the electrical conductivity of the element itself does not appear to be a greatly significant factor, aside from considerations mentioned above in connection with the dielectric layer. Aluminum and copper function in a similar manner when tested as field perturbing elements.

The radiated signal strength is affected by the depth of embedment of the field perturbing element in the dielectric layer and the size of the unshielded openings in the outer conductive shield. The more the field perturbing element is embedded in the surface of the dielectric layer, the greater the field perturbation and therefore the better radiation characteristics of the ca-

ble. However, a necessary limitation of the extent to which the field perturbing element can be embedded in the dielectric layer exists by reason of the fact that wherever an outer conductive shield is used, the shield must be in continuous electrically conductive contact with the field perturbing element for the proper functioning of the radiating cable. Thus, as a practical matter, embedment of the field perturbing element more than about 75 percent of the diameter (or cross sectional area) of the field perturbing element results in difficulty in installing the outer shield over the cable while establishing good electrical contact with the field perturbing element. Of course, this is a practical consideration and is not intended to be a limiting factor respecting the present inventive concept. Obviously, the concept here is to inbed the field perturbing element in the dielectric and then apply an apertured conductive shield over the cable in electrical contact with the field perturbing element, all as set forth in the present description and claims. The extent of penetration by the field perturbing element in the dielectric layer will depend on the various parameters involved in the construction and operation of the particular cable embodying the invention. Preferably, the embedding process is achieved by heating the field perturbing element to the softening temperature of the dielectric layer and thereafter manipulating the field perturbing element to cause it first to heat and soften the dielectric layer immediately under and to either side of the element itself, and then to sink into the softened dielectric layer to the desired depth.

The opening size of the slot 8 or other aperture in the shielding layer 7, also affects the radiated signal strength. Too large an opening, of course, results in excessive downline losses when the cable is mounted on a ground plane, as occurs with radiating cables of the prior art. Otherwise, the larger the opening(s), the greater the coupling between the radiating signal and the receiver antenna, and, as would be expected, the greater the loss of transmitted signal strength down the length of the cable. Conversely, smaller openings in the shield exposing less fewer sections of the field perturbing element and adjacent dielectric layer preserve the signal strength down the cable length at the cost of decreased coupling ability between the cable and a receiver antenna.

The number of portions of field perturbing elements allowed to radiate per increment of length of the cable of this invention has been found also to affect the radiating characteristics of the cable. Within certain limits, the more unshielded portions per increment of length, the better the radiation strength and consequently the coupling between the cable and a receiving antenna. This discovery has led to the further discovery that the radiating cable of the present invention could be modified during the manufacture of predetermined lengths of cable by providing more field perturbing elements per increment of length along those portions of the cable where a higher signal strength and better coupling is desired, or to compensate for downline losses over great cable lengths. This becomes a fairly simple task where the field perturbing element is spirally coiled about the dielectric layer, since it is only necessary to adjust the pitch of the coiling apparatus that is applying the field perturbing element to the dielectric layer to change the gap 5 between the individual coils of the field perturbing element.

This is illustrated in FIG. 3, where the pitch of the coils at the left hand of the figure is such that larger gaps 5 are left between the coils than at the right hand section of the figure, where gaps 9 are shown to be smaller than gaps 5 due to a decreasing pitch between the coils. Thus, where such a changing gap is employed between sections of the field perturbing element, and depending on the signal strength available over the length of the cable, the radiating signal strength could be maintained relatively constant over the length of the cable with decreasing internal signal strength (due to natural losses), or could be increased along certain areas of the cable by placing the unshielded field perturbing element portions closer together. Obviously, the dimensions of the slot or other aperture could also be adjusted over the length of the cable, but this has been found to involve manufacturing problems that are appreciably more involved and cost prohibitive than the relatively simple expedient of modifying the pitch of the windings of the field perturbing element along the length of the radiating cable. The gaps between unshielded sections of field perturbing elements must not be so closely spaced that they in effect form an outer shield in themselves, since then the radiating properties of the cable suffer.

Another factor affecting the radiating characteristic of the cable, as indicated above, is the depth of penetration of the field perturbing element in the dielectric layer. This phenomenon has been utilized as still another means for achieving in simple fashion the adjustment of the radiating characteristics of the cable embodying the present invention over the length of the cable.

As shown in FIGS. 3, 4, and 5, the radiating characteristics of the cable of FIG. 3, for example, could be modified over its length by embedding the field perturbing element 3 to a lesser extent at one area of the cable as shown in FIG. 4, or to a greater extent as shown in FIG. 5. As mentioned above, the degree of embedment would be determined based upon the desired end product and the particular operating parameters involved in a particular installation. Generally, deeper embedding creates greater perturbation and enables better coupling between cable and receiver antenna.

A specific example of a radiating coaxial cable constructed in accordance with this invention comprises a relatively heavy center conductor formed of copper clad solid aluminum wire, surrounded by a dense foam polyethylene dielectric layer about which an 18 gauge stranded aluminum wire field perturbing element has been wound with a pitch of 1.5 coils per inch, the field perturbing element being embedded in the dielectric layer 0.040 inches. The outer conductor shield is a continuous slotted conductor covering 70 percent of the circumference of the cable (30 percent slot area) leaving a portion of each coil of the field perturbing element and adjacent dielectric layer exposed for radiating when a signal potential is applied to the inner conductor.

As mentioned briefly above, while the field perturbing element 3 is shown as a continuous element in the attached drawings for illustrative purposes, it should be clearly understood that in the embodiments of FIGS. 3-9, for example, where a separate outer conductive shield is provided, the element 3 could comprise discontinuous field perturbing elements such as individual

segments embedded in the dielectric layer 2 in the aperture areas of the shielding. The individual segments in this instance would be unshielded over a portion of all of their lengths to achieve the desired perturbation and radiating effects. Obviously, the placing of such segments in the dielectric along the length of the cable would pose appreciably more manufacturing problems than winding a continuous element 3 about the cable and embedding same in the dielectric layer 2, but the inventive concept extends equally to both arrangements.

Referring to FIG. 6, the outer conductive shield of the cable here is a composite shield assembly including the combination of innermost shielding layer 7 similar to that shown in FIG. 3, and an outer shielding layer 10 which is in the form of a spirally coiled web of conductor material similar to in composition, and wrapped about, the inner shield layer 7 in conductive relationship. The outer shielding layer 10 is wound about the inner layer to overlap the slot aperture along portions of its length and also to partially shield portions of the field perturbing element exposed through the slot 8 in shield 7, as shown in FIG. 6. The portion to the right of FIG. 6 shows the cable having more portions of the field perturbing element covered than the left portion to illustrate that the outer shielding layer may also be utilized to adjust the radiation characteristics of the cable by modifying the areas of the field perturbing element 3 left unshielded along the length of the slot 8.

In FIG. 7 there is illustrated an embodiment of the invention including an apertured outer conductor and shield element 11 having as the aperture feature slotted openings 12 extending along one side of the cable and enclosing both the dielectric layer 2 and the field perturbing element 3. Each aperture 12 exposes a portion of the field perturbing element 3 and adjacent dielectric layer material 2 whereby, when a signal is impressed on the center conductor, the field perturbing element 3 exposed and unshielded at each aperture area may radiate field energy outwardly of the cable.

In FIG. 8, the outer shield 13 is a continuous, spirally wound web of conductive material having apertures 14 therein arranged to lie along one side of the cable when installed thereabout. The apertures 14 expose discontinuous portions of the field perturbing element 3 and adjacent dielectric layer 2 in a similar manner as the other embodiments of the invention.

In FIG. 9, an omnidirectionally radiating cable is shown wherein a loosely braided or discontinuous outer shield 15 exposes through openings 16 in the braiding discontinuous portions of the field perturbing element 3 and adjacent dielectric layer 2 around the cable periphery. As with all the embodiments where an outer shielding is used, the shielding here is in intimate electrical contact with the field perturbing element to in effect short-circuit its radiating potential except in those areas where the shield is apertured. In the aperture area, the field perturbation in the dielectric layer intensifies the radiation properties of the cable which would otherwise be limited to the field buildup at the aperture area of the shielding as shown in the prior art devices.

We claim:

1. A radiating high frequency transmitting cable comprising:
 - a. at least one center conductor;
 - b. a dielectric layer enclosing said conductor;

- c. at least one field perturbing element embedded a predetermined amount in the surface of said dielectric layer, said field perturbing element having different electrical conductivity properties than said dielectric layer, and being disposed so that a major portion of its length is angularly oriented with respect to the center conductor;
- d. an outer apertured conductor and radiation shield element enclosing said dielectric layer and said field perturbing element for at least a portion of the length of the cable, and being in electrically conductive contact with said field perturbing element, the aperture feature of said shield element leaving at least a portion of said field perturbing element and adjacent dielectric layer unshielded in an area of the cable covered by said shield element.
2. A radiating high frequency transmitting cable comprising:
- a. at least one center conductor;
- b. a dielectric layer enclosing said conductor;
- c. at least one field perturbing element embedded a predetermined amount in the surface of said dielectric layer, said field perturbing element having different electrical conductivity properties than said dielectric layer, and being disposed so that a major portion of its length is angularly oriented with respect to the center conductor; said field perturbing element further being a relatively poor conductor having a dielectric constant substantially different from the dielectric constant of said dielectric layer;
- d. an outer, apertured conductor and radiation shield element enclosing said dielectric layer and said field perturbing element over at least a portion of the cable and being in continuous contact with said field perturbing element, the aperture feature of said outer conductor and radiation shield element extending along one side of the cable and at least a portion of said field perturbing element and adjacent dielectric layer being unshielded in the aperture area.
3. A radiating high frequency transmitting cable comprising:
- a. at least one center conductor;
- b. a dielectric layer enclosing said conductor;
- c. at least one field perturbing element embedded a predetermined amount in the surface of said dielectric layer, said field perturbing element having different electrical conductivity properties than said dielectric layer, and being disposed so that a major portion of its length is angularly oriented with respect to the center conductor;
- d. an apertured outer conductor and radiation shield assembly enclosing said dielectric layer and said field perturbing element over at least a portion of the cable length, said assembly comprising concentric first and second conductive layers in electrical contact with each other, the first and innermost layer having a continuous slot aperture extending along one side of the length of the said first shield

- layer and being in continuous electrical contact with said field perturbing element, at least a portion of said field perturbing element and adjacent dielectric layer being left exposed and unshielded by said slot aperture; the second and outermost shield layer being configured to cover a predetermined portion only of the said slot aperture in said first layer and providing partial shielding of that portion of the field perturbing element exposed through the slot aperture.
4. The radiating cable of claim 1, wherein said field perturbing element comprises at least one continuous, elongated, helically coiled element extending over the length of the cable, and further wherein said outer conductor and radiation shield element has a continuous slot therein extending along one side of the cable as its aperture feature, the slot leaving discontinuous portions of said field perturbing element and adjacent dielectric layer unshielded.
5. The radiating cable of claim 1, wherein said field perturbing element comprises at least one continuous, elongated, helically coiled element extending over the length of the cable and further wherein said outer apertured conductor and radiation shield element further comprises a continuous, helically wrapped apertured web totally enclosing the dielectric layer and field perturbing element except in the area where the web is apertured, the apertures in said web being in general alignment along one side of the cable over the length of the shield, and leaving discontinuous portions of said field perturbing element and adjacent dielectric layer unshielded.
6. The radiating cable of claim 1, wherein said field perturbing element is a continuous, metallic wire conductor.
7. The radiating cable of claim 1, wherein said field perturbing element is a continuous element spirally coiled and wrapped about said dielectric layer, the pitch of the coils being such that gaps of predetermined dimensions are left therebetween.
8. The radiating cable of claim 7, wherein the pitch of the coils of the field perturbing element is varied along the length of the cable.
9. The radiating cable of claim 7, wherein the depth that said field perturbing element is embedded in said dielectric layer is varied along the length of the cable.
10. The radiating cable of claim 7, wherein said field perturbing element is embedded in said dielectric layer between 1 and 75% of the cross-sectional area of the field perturbing element.
11. The radiating cable of claim 7, wherein said outer conductor and radiation shield element comprises a loosely braided, conductive radiation shielding element, portions of the braiding of said outer shielding element being discontinuous along the length of the shielding to expose unshielded discontinuous portions of said field perturbing element and adjacent dielectric layer.
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