

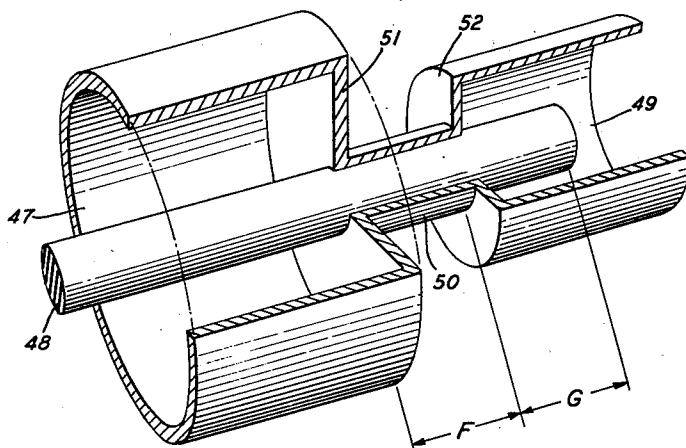
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IMPEDANCE MATCHING IN WAVE GUIDES

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IMPEDANCE MATCHING IN WAVE GUIDES

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452,851, now Patent No. 2,432,093, dated De-
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August 25, 1945, Serial No. 612,680

3 Claims. (Cl. 250—33.63)

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This invention relates to guided electromag-
netic wave transmission and more particularly
to impedance matching in wave guides.

An object of the invention is to connect, with-
out impedance mismatch, an air-filled wave guide
and a section of guide having a solid core of di-
electric material. Another object is to match a
dielectric antenna to an air-filled wave guide.

In accordance with the invention an air-filled
wave guide is matched to a section of guide hav-
ing a solid dielectric core by providing an inter-
mediate sheath which fits around the core for
a certain distance and extending the core into
the air-filled guide for a certain distance. If
the sheath of the section having the dielectric
core is omitted, the protruding portion of the
core may be used as an antenna.

This is a division of application Serial No. 452,-
851, filed July 30, 1942, now Patent No. 2,432,093,
issued December 9, 1947.

The nature of the invention will be more fully
understood from the following detailed descrip-
tion and by reference to the accompanying draw-
ing, the single figure of which is a perspective
view, partly cut away, of a wave guide transfor-
mer in accordance with the invention.

The figure shows a system for transforming the
impedance of a wave guide having a cylindrical
sheath 47 and a solid concentric core 48 of di-
electric material to match the impedance of an
air-filled guide having a cylindrical sheath 49.
The core 48 extends beyond the end of the sheath
47 for a distance F and extends into the sheath
49 a further distance G. The intermediate cy-
lindrical metallic sheath 50 fits around the por-
tion F of the core 48 and is conductively con-
nected to the sheaths 47 and 49 by means of the
metallic end plates 51 and 52, respectively.

In order to match one wave guide to another
one, or to any other wave medium, it is, in gen-
eral, necessary to have two independent tuning
controls. In the system shown, these controls
are the lengths F and G of the dielectric core 48.
The proper adjustment may be determined as
follows: One of the guides is terminated in its
characteristic impedance and wave energy is sup-
plied to the transformer in such a way that it
passes through a standing wave detector located
in the other guide. Then the distances F and G
are adjusted, alternately, to minimize the stand-
ing wave. The desired adjustment is attained
when the detector indicates an absence of any
standing wave.

A special case is the one in which the sheath
47 and the end plate 51 are omitted. This will
generally require a readjustment of the distances
F and G in order to get a proper impedance
match. The protruding portion of the core 48

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may now be used as a dielectric antenna for
launching or collecting electromagnetic wave
energy.

What is claimed is:

1. In combination, an air-filled wave guide
having an end plate with an aperture therein,
a device comprising a solid dielectric core which
extends through said aperture into said guide for
a certain distance, and a metallic sheath which
fits around the external portion of said core for
a certain distance and is conductively connected
to said end plate, said last-mentioned distance
being less than the length of said core external to
said guide and said distances being chosen to
minimize the standing wave in said guide at a
selected frequency, thereby providing an im-
pedance match between said guide and said de-
vice at said frequency.

2. In combination, an air-filled wave guide
having an end plate with an aperture therein,
a wave guide comprising a solid dielectric core
which extends through said aperture into said
air-filled guide for a certain distance, and a
metallic sheath which fits around said core for
a certain distance and is conductively connected
to said end plate, said core being smaller in cross-
section than either of said guides, and said dis-
tances being chosen to minimize the standing
wave in one of said guides at a selected fre-
quency, thereby providing an impedance match
between said guides at said frequency.

3. In combination, an air-filled wave guide
having an end plate with an aperture therein,
a dielectric antenna which extends through said
aperture into said guide for a certain distance,
and a metallic sheath which fits around the ex-
ternal portion of said antenna for a certain dis-
tance and is conductively connected to said end
plate, said last-mentioned distance being less
than the length of said antenna external to said
guide, and said distances being chosen to min-
imize the standing wave in said guide at a se-
lected frequency, thereby providing an impedance
match between said guide and said antenna at
said frequency.

ARTHUR GARDNER FOX.

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file of this patent:

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