UNITED STATES PATENT OFFICE

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FLAME_HEATER_CATHODE_TUBE

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3 Claims. (Cl. 250—27.5)

1 This Invention relates to thermionic tubes, and
more particularly to an electron tube wherein
thermionic emission is obtained by applying a
novel and improved electron tube device of very
simple construction wherein the customary catho-
heating filament is omitted and wherein the
cathode is heated by a flame, a no electrical power
supply being required for heating the cathode.
A further object of the invention is to provide a
thermionic tube wherein very high emission is
obtained, said tube being relatively small in
physical size, being inexpensive to manufacture
and having beam characteristics whereby high
power handling capability, high power sensitivity
and high efficiency are obtained.

Further objects and advantages of the inven-
tion will become apparent from the following de-
scription and claims, and from the accompanying
drawings, wherein:

Figure 1 is a top plan view of a thermionic tube
constructed in accordance with the present in-
vvention.

Figure 2 is an elevational view of the tube of
Figure 1.

Figure 3 is a bottom plan view of the tube of
Figure 1.

Figure 4 is an enlarged vertical cross-sectional
view of the tube of Figure 1.

Figure 5 is a horizontal cross-sectional view of
the tube taken on line 5—5 of Figure 4.

Referring to the drawings, 11 designates a gen-
erally cylindrical metal housing or shell to which
is secured an axial inner metal tubular member
12, which functions as the cathode of the tube.

The space between cathode 12 and shell 11 is
hermetically sealed by an annular bottom mem-
ber 13 of insulating material, said space being
evacuated to a very low pressure. Positioned in
said space coaxially with cathode 12 is a cylin-
drical plate 14, and interspersed between plate 14
and the cathode and coaxial therewith is a cylin-
drical grid 15. Grid 15 is connected to a contact
prong 16 which passes through bottom member
13 and is secured thereto and plate 14 is con-
ected to a similar contact prong 17. A flame
device 18, such as a Bunsen burner, is adapted to
be positioned inside cathode 12 to heat said cath-
ode to the temperature required for the ther-
monic emission of electrons.

Cathode 12 is formed with a plurality of radial
corrugations 19 of substantial depth and extend-
ing parallel to the axis of the cathode for its en-
tire length. The inner crests 20 of said corruga-
tions 19 define heat transmission fins which are
close adjacent the heating flame and serve to
localize the regions of high thermionic emission,
thereby providing radial, substantially planar
electron beams of high electron density which
radiate toward plate 14 when said plate is charged
with positive voltage. The peripheral portion of

cathode 12 also emits electrons but at a lower
density, the majority of the electrons being con-
dined to the radial sheets above described. By
thus corrugating the cathode, the active emission
area is greatly increased, as over a smoothly
cylindrical cathode, and the current-handling
capability of the tube is considerably magnified.

The flow of electrons from cathode 12 is modu-
lated in the usual manner by signal voltage ap-
p lied to grid 15.

A further advantage derived from the corru-
gated cathode employed in the tube is that the
inter-electrode capacitance between the cathode
and the grid, and between the cathode and the
plate is the same as or less than with the smoothly
cylindrical cathode, whereas the electron emission
of the corrugated cathode is much greater, as
above explained. Said emission will be much
greater than that obtained in conventional tubes
having electrically heated cathodes since much
greater heat may be applied to the cathode by
the above-described flame method.

Since the cathode is heated by a flame directly
applied thereto, no separate electrical power sup-
ply for heating the cathode is required.

Although the specific embodiment above de-
scribed is a triode, the present invention may
be applied to any of the conventional tube types
employing more than one grid by substituting
the flame-heated cathode for the electrically
heated cathode employed in the tubes of the prior
art.

While a specific embodiment of a flame-accti-
vated electron tube has been disclosed in the
foregoing description it will be understood that
various modifications within the spirit of the in-
vention may occur to those skilled in the art.
Therefore it is intended that no limitations be
placed on the invention other than as defined by
the scope of the appended claims.

What is claimed is:

1. An electron tube comprising an annular
metal shell having a non-conducting portion,
said shell being hermetically sealed and evacu-
ated, an electrode in said shell, said electrode
being spaced from the inner wall of the shell,
and a terminal in said non-conducting portion
3. An electron tube comprising an annular metal shell which is generally cylindrical in external contour and having a non-conducting base, said shell being hermetically sealed and evacuated, a plurality of spaced concentric cylindrical electrodes in said shell, the inner electrode being spaced from the inner wall of the shell, said inner wall being formed with a plurality of radial corrugations extending parallel to the axis of the shell and defining a plurality of inwardly extending radial fins, in the hollow center of the shell, and a plurality of terminal prongs carried by said base, each electrode being connected to a terminal prong.

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