

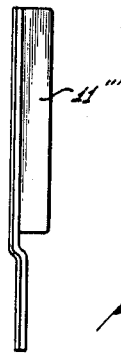
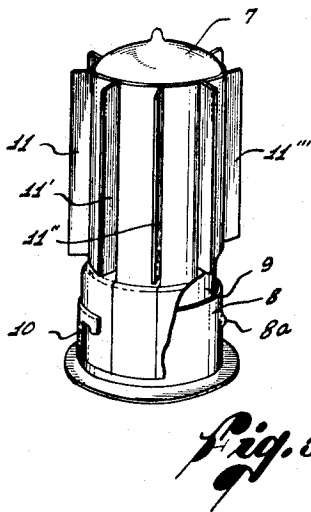
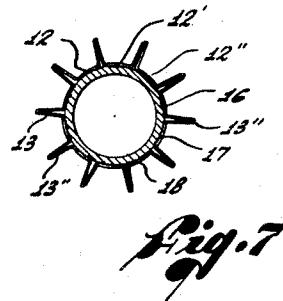
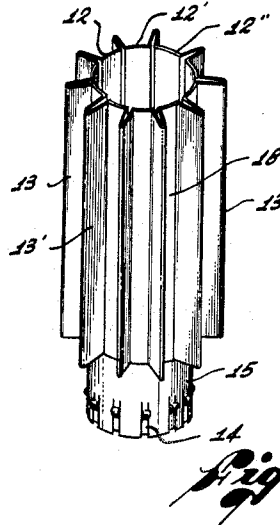
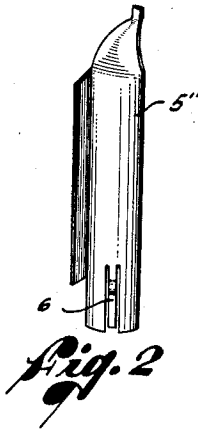
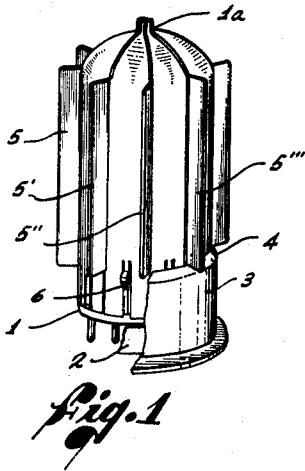
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HEAT-DISSIPATING TUBE SHIELD

Filed May 2, 1960



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HEAT-DISSIPATING TUBE SHIELD

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4 Claims. (Cl. 174—35)

This application is a continuation-in-part of my co-
pending application, Serial No. 814,091, entitled "Heat
Dissipating Shield," now Patent No. 3,023,264.

My invention relates to the electronic art, and more
particularly to retentive heat-dissipating electrostatic
shields for vacuum tubes, transistors, rectifiers, diodes,
and similar electronic components.

Retentive tube shields as hitherto produced and used
suffer the defects of inferior heat absorptive and radio-
active capabilities, excessive cost, undesirable weight,
limited applicability, and inferior electrostatic shielding.
Some contemporary shields employ partially effective
heat conductive liners which fit between the tube envelope
and the JAN-shield to carry the tube heat to the shield and
thence to the atmosphere. As has been pointed out in
my referenced co-pending application, this construction
is the reverse of the ideal design for maximum heat dis-
sipation and shielding, in that the heat must be conducted
from the tube envelope to the shield liner (which contacts
only a portion of the tube surface), thence through the
thin-section metal of the liner to the annular shield (which
only incompletely contacts the surface of the liner), and
thereafter through the JAN shield to its outer radiative
surface, of which the heat-dissipative area is only slightly
greater than that of the tube. This design suffers the
obvious defects of localized temperature differentials in
the tube envelope, which lead to cracks and tube failure;
imperfect heat transfer from the tube to the atmosphere;
excessive weight; and difficulty of manufacture and use.

A further defect encountered in the currently-produced
tube shields resides in the fact that these shields require
special bases, and therefore cannot be fitted to existing
equipment. Although some heat-dissipating shields have
been devised which can be used with the standard JAN
shielded socket, it has been found that these shields only
imperfectly retain the vacuum tube or other component
in the socket.

Therefore, it is an object of this invention to provide
a retentive heat-dissipative shield structure which offers
complete thermal contact of the shield with the tube sur-
face to be cooled, and which in addition offers greatly
augmented heat dissipative area.

It is a further object of my invention to provide reten-
tive heat-dissipative shields for electronic elements, which
can be produced and sold very economically.

A still further object of this invention is to provide a
heat-dissipating shield structure which is bonded integrally
to the tube envelope, and which is provided with means
for securely retaining the tube-shield combination in the
tube socket under conditions of severe vibration and
shock.

An additional object of my invention is to provide a
heat-dissipating shield which is bonded integrally to the
vacuum tube or other electronic component, and which
effectively protects the tube or component from mechan-
ical damage.

Another important object of my invention is to provide
a retentive heat-dissipative shield for vacuum tubes or
similar components, which is in the form of a flexible
and extensible finned cylinder, and which can be fitted
easily to tube envelopes exhibiting considerable variations
in diameter, which effectively retains the tube or com-

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ponent in its socket, and which can be manufactured
economically.

These and other objects and advantages of my inven-
tion will be apparent to persons skilled in this art, from
the study of the specifications and drawings, in which:

FIGURE 1 shows a retentive heat-dissipating tube
shield constructed in accordance with one embodiment
of my invention;

FIGURE 2 depicts a perspective view of one of the
finned elements which in combination form the shield
structure shown in FIGURE 1;

FIGURE 3 is an end view of the element shown in
FIGURE 2;

FIGURE 4 illustrates one of the elements which co-
operate to form another embodiment of retentive heat-
dissipating tube shield constructed in accordance with
a different form of this invention;

FIGURE 5 pictures a retentive heat-dissipating tube
shield formed by combination of a group of the elements
shown in FIGURE 4;

FIGURE 6 is a perspective view of a flexible cylin-
drical retentive tube shield which provides intimate spring
contact with the tube envelope, in combination with aug-
mented heat-dissipative surface; and

FIGURE 7 depicts a sectional view of the retentive
tube shield structure depicted in FIGURE 6.

Referring now to FIGURE 1, a vacuum tube 1 is
mounted in a tube socket which includes a terminal plate
2 and a cylindrical skirt 3 whose upper end terminates in
an inwardly-formed lip 4. To the vacuum tube 1 are
bonded finned shield elements 5, 5', 5'', 5''', etc., which
are formed to such contour that in their combination they
effectively surround, shield, and protect the envelope of
the vacuum tube 1, including the tube evacuation tip 1a.

The configuration of one of the finned shield elements
for the cooling and protection of a vacuum tube having
the configuration shown in FIGURE 1 is depicted in
FIGURES 2 and 3; FIGURE 2 presents a perspective
view of one shield element; and FIGURE 3 is an end
view of the same element.

As is shown in FIGURES 1, 2 and 3, the lower portion
of each shield element is slitted to form a spring tab 6.
The spring tabs 6 are formed and positioned, as shown
in the figures, in such manner that when the vacuum tube
1 is inserted fully into the tube socket, the plurality of
spring tabs engage the inwardly-formed lip 4 of the tube
socket skirt 3 and thereby effectively position and retain
the vacuum tube in the tube socket under conditions of
severe vibration or shock.

As has been hereinbefore stated, the shield elements 5,
5', 5'', 5''', etc., are firmly bonded to the tube envelope
by means of a resin, such as one of the epoxy resins, or
by an elastomer, such as one of the silicone compounds.
These substances are cited only as examples, and it is to
be understood that many other bonding agents may be
used for this purpose. I have found that the rate of heat
absorption from the tube envelope, and the rate of heat
conduction through the bonding agent to the finned shield,
are greatly increased by the addition of a heat absorptive
substance, such as carbon black or colloidal graphite,
to the bonding resin or elastomer.

Referring now to FIGURE 4, we see depicted here a
heat-dissipative finned shield element 11'', which is formed
to that configuration required to enable the shield element
to conform to the contours of a vacuum tube 7, as may
be seen in FIGURE 5. The lower ends of the shield ele-
ments are flared outward as shown, to form an enlarged
cylindrical skirt, proportioned to fit snugly over the tube
socket skirt 8 of FIGURE 5. As is shown in FIGURE
5, the plurality of finned shield elements 11, 11', 11'',
11''' (here shown cut away for the sake of clarity), are

provided with outwardly-formed grooves 10, in the shape of an inverted L, which fit over, and retentively lock to a pin 8a (and its diametric counterpart).

As shown in FIGURE 5, the plurality of finned shield elements is securely bonded to the tube envelope 7 by a film 9 of heat-transfer bonding agent which, as hereinbefore set forth, may be formed of either rigid or elastomer plastic material.

Referring now to FIGURES 6 and 7, a finned shield 13 includes a substantially cylindrical, longitudinally slotted surface formed by the contiguous arcuate sections 12, 12', 12'', etc., which constitute an integral structure with heat-dissipating fins 13, 13', 13'', etc. extending outwardly at opposite sides of the slots. The radial flexibility of the structure permits the finned tube 18 to be slipped readily over tubular envelopes, such as those employed for vacuum tubes and similar electronic components, and maintains a constant inward spring force which serves to hold the arcuate sections 12, 12', 12'', etc. in intimate contact with the surface of the tubular envelope. FIGURE 7 depicts a cross-sectional view of a tube envelope 16, enclosed and shielded by the finned shield 18 shown in FIGURE 6. The efficiency of heat transfer from the tube envelope 16 to the finned shield 18 may be enhanced by coating the inner arcuate surfaces with an elastomer 17.

The shield structure depicted in FIGURES 6 and 7 may be formed by hydro-forming, electro-forming, or other techniques well known in the metal-forming art, these techniques forming no part of the present invention.

The heat-dissipative shield structure 18 carries a cylindrical skirt 15 having a diameter which enables it to fit closely inside of the cylindrical skirt of the tube socket as hereinbefore described for FIGURE 1. As likewise hereinbefore described in connection with FIGURES 1 and 2, the skirt 15 is slitted and the strips so formed are shaped to provide spring tabs, of which the tab 14 is exemplary. The outwardly-extending portions of the tabs are shaped and positioned in such manner that they lock securely under the inwardly-formed lip of the JAN socket skirt, as hereinbefore described for FIGURE 1.

In use, the finned shield element 18 is slipped over a vacuum tube or other electronic component and the combination pressed securely into position in the tube socket. The finned shield provides effective electrostatic shielding, thermal cooling, mechanical protection, and secure retention in the tube socket.

The foregoing forms of my invention are cited as exemplary only. Other embodiments of my invention will be apparent to those skilled in the art, and it is my intent that all such modified forms of this invention be included in the scope of the appended claims.

I claim:

1. A heat dissipating electrical shield for an electronic component comprising: a finned cylinder formed from a continuous sheet of metal and having the outer surfaces of the cylinder and fins free to radiate remotely into the ambient atmosphere, each of said fins being double walled and being formed by two closely adjacent metal surfaces which extend outwardly from a narrow longitudinal slot

in the wall of said cylinder and which are integrally connected at their outer ends, said cylindrical shield being thereby provided with radial resiliency whereby said shield is urged to contract; and a heat conducting bonding material between the inner surface of said cylinder and the outer surface of the electronic component to facilitate heat transfer therebetween.

2. A heat dissipating electrical shield for an electronic component comprising: a finned cylinder formed from a continuous sheet of metal and having the outer surfaces of the cylinder and fins free to radiate remotely into the ambient atmosphere, each of said fins being double walled and being formed by two closely adjacent metal surfaces which extend outwardly from a narrow longitudinal slot in the wall of said cylinder and which are integrally connected at their outer ends, said cylindrical shield being thereby provided with radial resiliency whereby said shield is urged to contract; a heat conducting bonding material between the inner surface of said cylinder and the outer surface of the electronic component to facilitate heat transfer therebetween; and retaining means on said shield for securing said shield to the skirt of a socket adapted to receive said component.

3. An electronic component comprising: an envelope of substantially closed-end, cylindrical form enclosing the elements of the component; shield means shaped and dimensioned to enclose both the cylindrical body and free end portion of said envelope in substantially continuous, heat-conductive contact therewith; heat radiative means extending outwardly from said shield means to augment the area thereof and disposed to radiate freely into the ambient atmosphere; and a heat-conductive plastic bond between the inner surface of said shield means and the outer surface of said envelope to increase the heat transfer therebetween and to secure the envelope and shield means together, said shield means having a depending portion interengaging with the skirt of a socket receiving said component in good thermal and electrical conducting relation.

4. The electronic component defined in claim 3 in which said heat-conductive plastic bond is formed by an epoxy resin containing carbon black to improve the heat conductivity thereof.

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