

Aug. 12, 1969

E. R. FULLER ET AL
TELEVISION AND LIKE CAMERA CATHODE RAY TUBES WITH
DAMPED TARGET STRUCTURES

3,461,336

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4 Sheets-Sheet 1

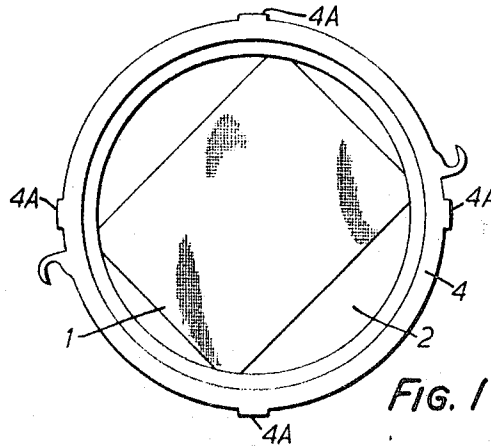


FIG. 1

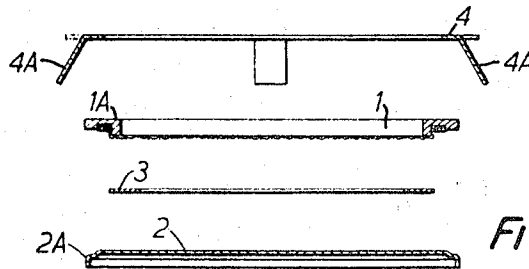


FIG. 2

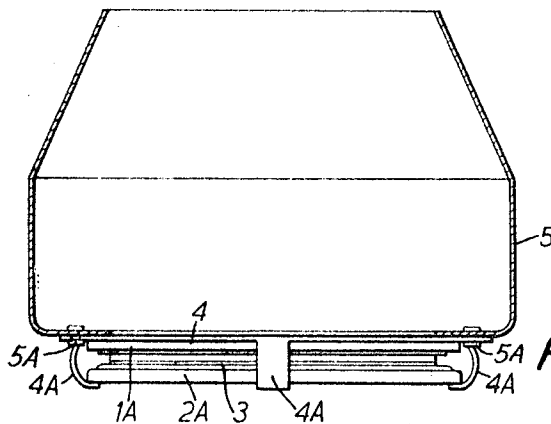


FIG. 3

INVENTORS
Edwin Russell Fuller and Norman Arthur Stark
BY
Baldwin Wright Miller & Brown
ATTORNEYS

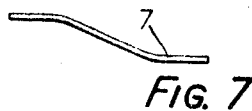
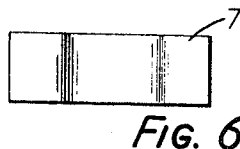
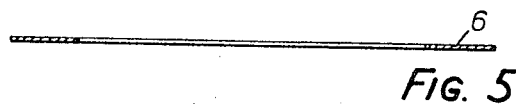
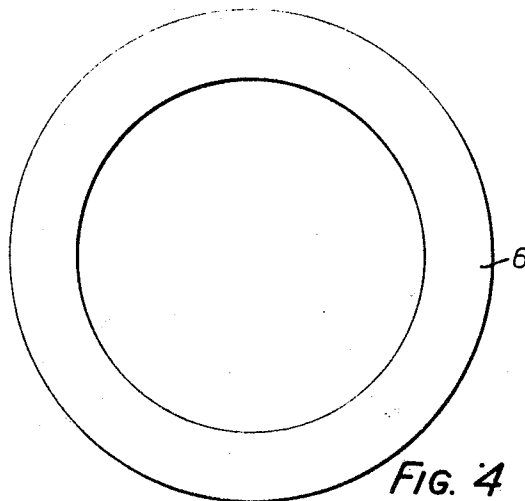
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Edwin Russell Fuller and Norman Arthur Stark
INVENTORS
BY
Baldwin Wight Miller & Brown
ATTORNEYS

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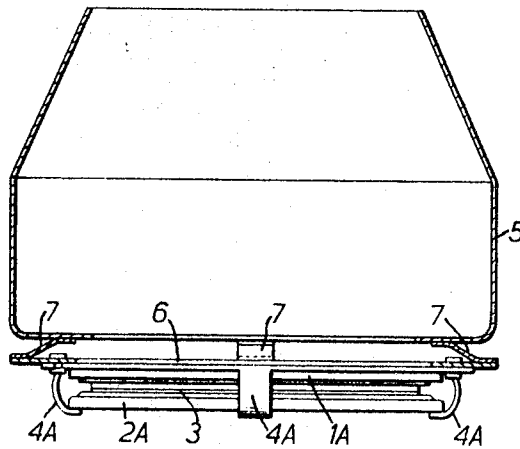


FIG. 8

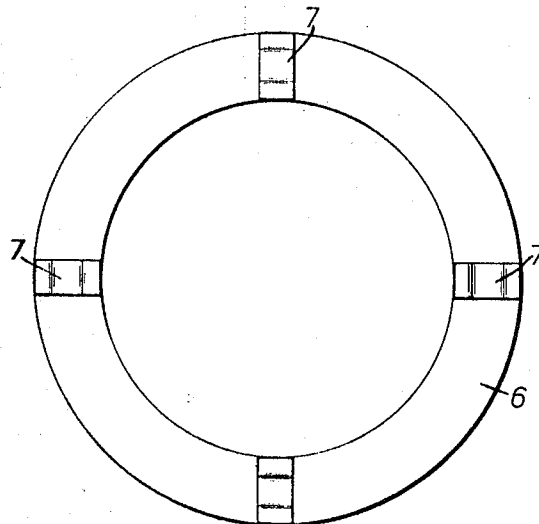


FIG. 9

INVENTORS
Edwin Russell Fuller and Norman Arthur Stark
BY
Baldwin Wight Miller & Brown
ATTORNEYS

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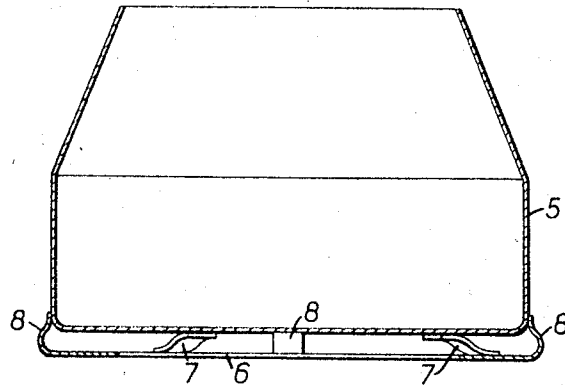


FIG. 10

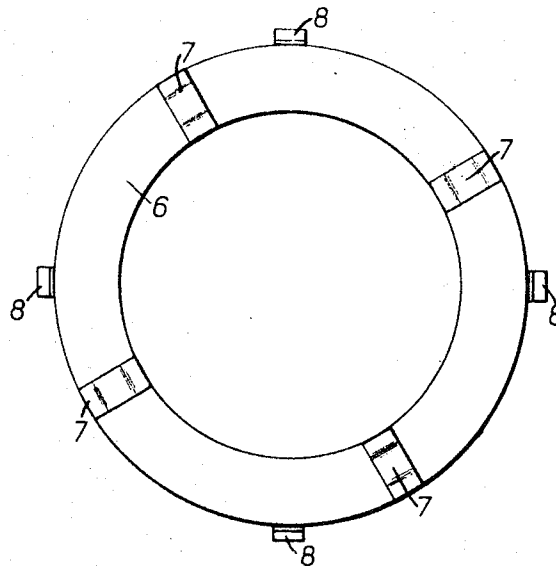


FIG. 11

Edwin Russell Fuller and Norman Arthur Stark
INVENTORS
BY
Baldwin Wright Diller & Brown
ATTORNEYS

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TELEVISION AND LIKE CAMERA CATHODE RAY TUBES WITH DAMPED TARGET STRUCTURES

Edwin Russell Fuller and Norman Arthur Slark, Essex, England, assignors to English Electric Valve Company Limited, London, England, a British company

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7 Claims

ABSTRACT OF THE DISCLOSURE

A camera cathode ray tube, of the kind incorporating a target assembly comprising a resistive membrane closely spaced from a conductive mesh is provided with a relatively heavy supporting member to which the target assembly is attached. The supporting member is in turn connected to a carrier by spring means which allow movement of the target assembly and carrier member towards and away from the carrier but which prevents movement in other directions.

This invention relates to television and like camera cathode ray tubes and more specifically to camera tubes, such as the well-known image orthicon tube, of the kind in which there is provided a target electrode assembly comprising a membrane of highly resistive material, such as glass, closely spaced from a conductive mesh, the assembly being employed, in well known manner, to produce an electrical image of a subject of transmission and being scanned by a cathode ray to develop picture signals from that image.

A defect which has long been a source of trouble in camera tubes of the kind referred to is that generally termed "microphony" from an analogy with microphonic effects in thermionic valves. It is caused by vibration of the glass or similar membrane in relation to the mesh and/or by both of these members in relation to the support—usually a peripheral ring structure, which carries them. It usually manifests itself by the presence, in pictures reproduced from the signals developed by the tube, of bars of light and shade extending in the scanning line direction and which generally move up or down in the field direction. They may persist for indefinite periods of time and may be stimulated by applied mechanical shock, or incident sound from external sources. Sometimes they occur apparently spontaneously without observable external cause. Many expedients have been adopted in order to eliminate the undesirable effects of microphony. Among the expedients adopted are the use of specially chosen materials for the spacers employed to space the glass membrane from the mesh, the adoption of special shapes for these spacers and the provision of spacers arranged to act as dampers to damp out relative vibrations of the membrane relative to the mesh. Most of these expedients have provided some improvement but, so far as the present applicants are aware, none of them as so far known, has been really satisfactory especially in the case of image orthicons with relatively large target electrode assemblies—for example the so-called 4½" image orthicons.

The present invention is explained in connection with and is illustrated in the accompanying drawings in which FIGURES 1, 2 and 3 illustrate typical known target assembly practice in image orthicon tubes and are provided for purposes of explanation and FIGURES 4 to 11 inclusive illustrate the present invention. Like references denote like parts throughout.

FIGURE 1 is a face view of a typical known target assembly, FIGURE 2 is an "exploded" view, taken at right angles to FIGURE 1, showing the separated parts of the assembly of FIGURE 1, and FIGURE 3 shows the assembly of FIGURE 1 mounted in known manner on a so-called "target cup" by which it is carried.

Referring to FIGURES 1 to 3 the target assembly therein shown consists of a mesh 1 of copper or other conducting material which is spaced by means of a metal or insulated spacer 3 from a membrane 2 of glass or other suitable highly sensitive material. Each of the parts 1 and 2 is mounted in a surrounding mounting ring 1A or 2A as shown, and the spacer 3 is positioned between these rings so as to give the required spacing. The parts 1, 2 and 3 are held together by means of a carrier ring 4 having ears or lugs 4A which are bent round and over the ring 2A carrying the membrane 2 as best shown in FIGURE 3. The structure consisting of the assembled parts 1, 2, 3 and 4 is mounted in an electrode 5, known as a target cup. The said structure is usually directly mounted on the target cup 5 by rigid means such as screws 5A as shown in FIGURE 3 though sometimes soft cushions are interposed between the said assembly and the said target cup in order to achieve a semi-rigid mounting of the former on the latter while preventing relative movement between them.

It has been found by experiment with arrangements as illustrated in FIGURES 1 to 3 that, with such a rigid or semi-rigid mounting of the target assembly proper on the target cup, vibration set up in the target cup by, for example, mechanical vibration, shock or noise, can readily be transmitted to the target assembly and that this is liable to cause microphony even if the said assembly is provided with damping means with the object of damping out the vibrations thus transmitted. The object of the present invention is to overcome or reduce this defect and to provide a good degree of isolation of the target assembly from the target cup as respects transmission of vibration from the latter to the former. It will readily be appreciated that, if this is done, the liability for the setting up of vibration in the target assembly is much reduced and the requirements, as respects vibration damping, of any vibration damping means which may be provided in said assembly (none are shown in FIGURES 1 to 3) are correspondingly reduced.

According to this invention the target assembly of a camera tube of the kind referred to is mounted on a member which is in turn carried from a carrier therefor by spring means permitting movement of the structure comprising said assembly and said member directly towards and away from said carrier member but substantially preventing relative movement in other directions.

Normally the aforesaid carrier will be the usually provided target cup. The aforesaid member is preferably an inertia member constituted by a platform member which is heavy in relation to the target assembly proper.

The target assembly may be directly and rigidly mounted on the said member. Alternatively, however, cushioning means may be interposed between the target assembly and the aforesaid member so as to provide a semi-rigid mounting of the former on the latter.

In one way of carrying out the invention the target assembly is mounted on an inertia member constituted by an annular platform which is carried from the target assembly carrier by means of a plurality of strip springs equidistantly spaced round said annular platform and attached each at its opposite ends to said platform and to said carrier, the springs being radially arranged and extending between the platform and the carrier.

Vibration damping means may be provided between the platform and the carrier. Such damping means may be

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constituted by, for example, looped lengths of woven metal braid or of soft metal strip or the like extending between the platform and the carrier and affixed to both. Such damping means may conveniently be interspersed with the springs. Thus, for example, there might be four springs at 90° and four lengths of woven braid, also at 90°, each being midway between two springs.

FIGURES 4 to 11 illustrate two embodiments of the invention. FIGURES 4 and 5 are mutually perpendicular views of an inertia platform ring 6 on which the target assembly is mounted and FIGURES 6 and 7 are mutually perpendicular views of one of four strip springs by means of which the ring 6 is carried from a target cup. In a practical case each of the springs could be made of spring strip approximately 0.5" long, 0.1" wide and 0.01" thick bent into the shape shown in FIGURE 7. The springs are welded at their outer ends to the outer part of one face of the platform ring 6, the said springs being spaced circumferentially at 90°, extending radially inwards with respect to the platform ring and inclining upwards away from it as best shown in FIGURE 9 which is a face view of the platform ring showing the face to which the springs are attached. The platform ring 6 is heavy in relation to the target assembly and may be made, for example, of nickel chromium alloy.

Bolted to the platform ring 6 and on the side thereof away from the spring 7 is the target assembly proper which is shown in FIGURE 8 as an assembly as illustrated in FIGURES 1, 2 and 3. The inner ends of the springs 7 are welded to the target cup 5 so that the inertia platform ring 6, with the target assembly mounted thereon, is carried from the target cup 5 by the said spring 7. As will be seen, the springs allow movements of the platform ring 6, with the target assembly mounted thereon, directly towards and away from the target cup—i.e. allow movements in the axial direction—but do not allow relative movements in any other direction, e.g. tangentially. In FIGURE 8 the target assembly proper is shown directly mounted by means of bolts on the platform ring 6 so that the mounting of the former on the latter is rigid. If desired, however, cushioning (not shown) may be provided between said assembly and said platform ring to provide a semi-rigid mounting.

FIGURES 10 and 11 show, similarly to FIGURES 8 and 9 respectively a modification in which damping is provided between the inertia platform ring 6 and the target cup 5. The damping is provided by vibration damping elements 8 each midway, circumferentially, between two of the spring 7 and each attached at its ends to the target cup and to the platform ring. The damping elements may take any of a variety of forms, e.g. they may be looped lengths of soft metal strip but are shown in FIGURES 10 and 11 as consisting of looped lengths of woven stainless steel braid. They serve to absorb relative vibration between the platform ring 6 and the target cup 5. In order to simplify FIGURE 10 the target assembly proper is not shown, only the platform ring 6 to which it is attached being shown. It may, however, be attached to said platform ring either in a rigid manner or in a semi-rigid manner as already described with reference to FIGURE 9.

In the foregoing description the target assembly is described as, and in FIGURE 8 as illustrated is, a known assembly as shown in FIGURES 1 to 3 and without vibration damping means embodied in its construction. It is preferred, however, to provide damping means in the

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structure of the target assembly itself, which damping means may be of any desired and suitable form. Since the particular form employed, however, does not form part of the present invention no damping means for incorporation in the target assembly itself has been shown or described.

We claim:

1. In a camera tube having a target electrode assembly for producing an electrical image of a subject of transmission and for being scanned by a cathode ray to develop picture signals from the image and including a target electrode assembly comprising a membrane of highly resistive material closely spaced from a conductive mesh, the combination comprising an inertia platform member mounting said target assembly, a further member, fixed in relation to the remainder of the tube, carrying said platform member, and resilient means, including a plurality of strip spring members, interconnecting said platform member and further member for permitting movement of the inertia platform member directly toward and away from said further member in a direction normal to the lateral extent of the platform member and for substantially preventing relative movement in other directions, said plurality of strip spring elements resiliently supporting said platform member and entire target assembly upon said further member.

2. A tube as claimed in claim 1 wherein the aforesaid further member is the normally provided target cup.

3. A tube as claimed in claim 1 wherein the target assembly is directly and rigidly mounted on the aforesaid inertia platform member.

4. A tube as claimed in claim 1 wherein cushioning means are interposed between the target assembly and the aforesaid inertia platform member so as to provide a semi-rigid mounting of the former on the latter.

5. A tube as claimed in claim 1 wherein said inertia platform member is constituted by an annular platform, said strip members extending radially from and being equidistantly spaced around said annular platform.

6. A tube as claimed in claim 5 wherein vibration damping means are provided between the platform and the carrier.

7. A tube as claimed in claim 6 wherein said vibration damping means are constituted by looped lengths of inherently friction damping material extending between the platform and the carrier and affixed to both.

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JOHN W. HUCKERT, Primary Examiner

A. J. JAMES, Assistant Examiner

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