Nov. 17, 1970 R. O. BARR 3,541,373

CATHODE RAY TUBE WITH BIFURCATED CONTACT SPRING BETWEEN THE SHADOW MASK FRAME AND THE INTERNAL CONDUCTIVE COATING

Filed April 16, 1969 2 Sheets-Sheet 1

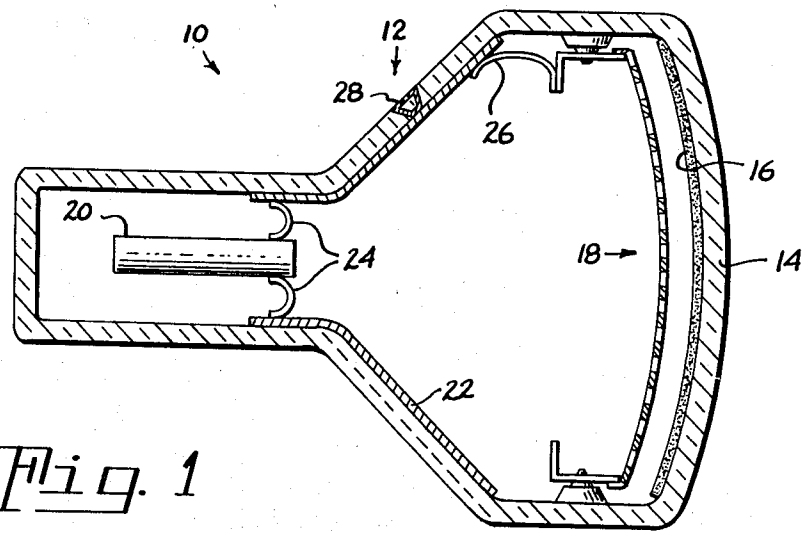


Fig. 1

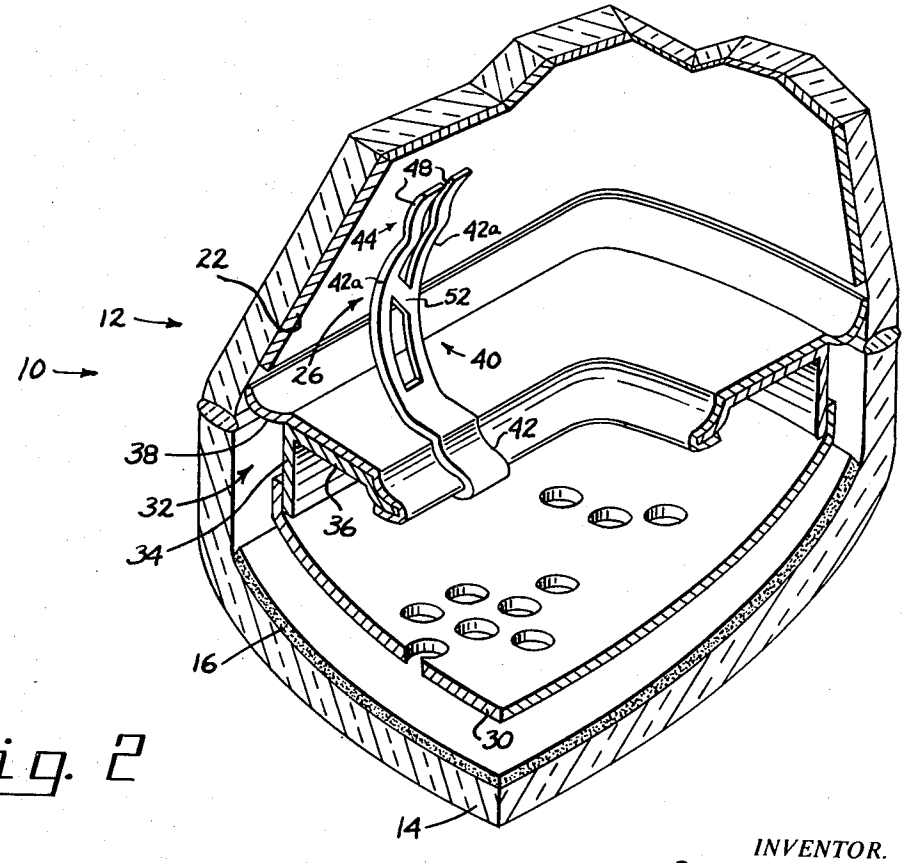


Fig. 2

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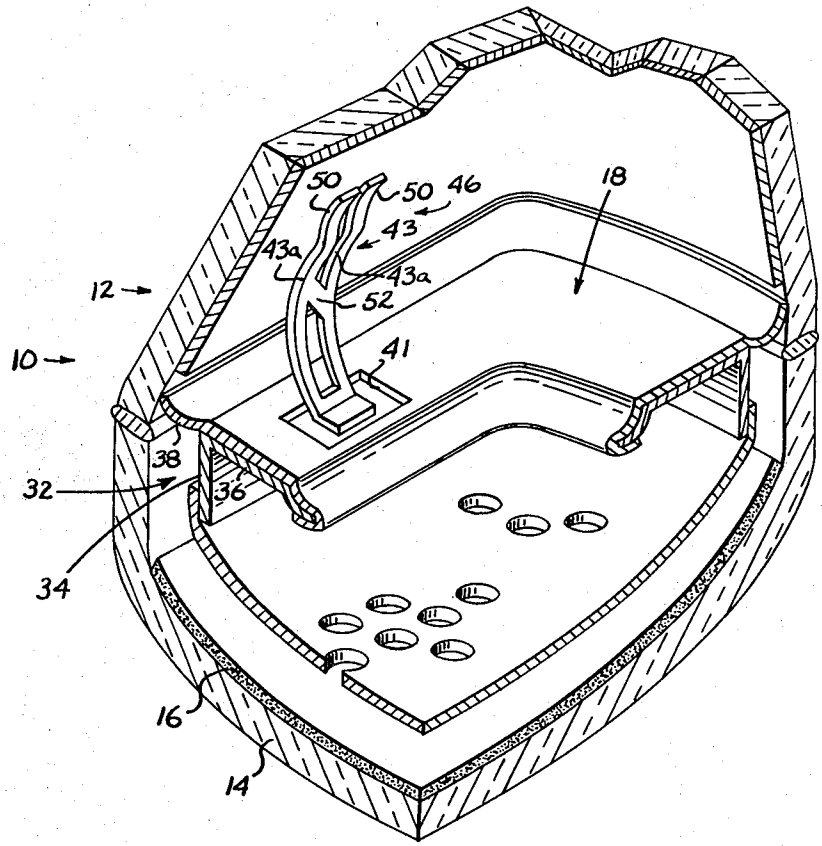


Fig. 3

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CATHODE RAY TUBE WITH BIFURCATED CONTACT SPRING BETWEEN THE SHADOW MASK FRAME AND THE INTERNAL CONDUCTIVE COATING

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U.S. Cl. 313—85 2 Claims

ABSTRACT OF THE DISCLOSURE

A contact spring for providing an electrical path from an internal conductive coating to a shadow mask frame in a color cathode ray tube. The spring is bifurcated for the greater part of its length and the tines formed by the bifurcation are free to act independently of each other. In another embodiment the tines are interconnected by an angled member substantially intermediate their length whereby each tine has a different vibration frequency.

BACKGROUND OF THE INVENTION

This invention relates to contact springs and more particularly to contact springs for providing an electrical path between an internal conductive coating and a shadow mask frame in a color cathode ray tube.

Contacts for achieving the above-described paths are known in the art. Problems exist in the area of shock resistance; i.e., under mechanical shock and the subsequent vibrations therefrom being passed on to the contact spring, electrical contact is momentarily lost between the conductive coating and the frame, resulting in a temporary loss of picture. In an attempt to counteract this effect the springs have been formed of a heavier material to exert greater force upon the conductive coating. This technique introduces other problems however, in that the heavier springs tend to chip off the conductive coating, which is usually Aquadag, a carbon composition. When the coating is chipped away enough, contact may be permanently lost, resulting in an inoperative tube.

Plural identical contacts have also been utilized, spaced around the frame, but this approach has proven unacceptable since it increases the cost and does not solve the problem.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore an object of the invention to obviate the disadvantages of the prior art.

It is another object of the invention to enhance the operation of color cathode ray tubes.

It is a further object of the invention to provide an improved contact spring for color cathode ray tubes.

Yet a further object of the invention is the enhancement of the shock resistant characteristics of color cathode ray tubes.

These objects are accomplished in one aspect of the invention by the provision, in a color cathode ray tube, of an electrical contact spring that comprises a bifurcated contacting end. Each of the tines of the bifurcated end operates substantially independently of the other.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic sectional view of a color cathode ray tube;

FIG. 2 is a partial sectional perspective view illustrating a preferred embodiment of the invention; and

FIG. 3 is a view similar to FIG. 2 illustrating an alternate embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

For a better understanding of the present invention together with other and further objects, advantages and capabilities thereof, reference is made to the following disclosure and appended claims in connection with the above-described drawings.

Referring now to the drawings with greater particularity, there is shown in FIG. 1 a diagrammatic view of a typical color cathode ray tube **10**. The tube **10** comprises an evacuated electrically non-conductive envelope **12** with a face plate **14** formed at one end. A luminescent screen **16** is positioned on the internal surface of the face plate and a shadow mask electrode **18** is positioned adjacent thereto. An electron source **20** is positioned remote from the screen and is formed to provide one or more electron beams for energizing the screen **16**.

An electrically conductive coating **22**, such as Aquadag, is provided on an internal surface of the envelope **12** and extends from the electron source **20** to a point closely adjacent the shadow mask electrode **18**. At least one element of the electron source is connected to the coating **22** as by means of snubbers **24** and a means for providing an electrical path **26** is formed between the coating **22** and the shadow mask electrode **18**. An electrically conductive button **28** is positioned in a wall of the envelope and serves as the means for providing high voltage to coating **22**.

The shadow mask electrode **18** comprises generally a fragile foraminated portion **30** which is connected at its peripheral edge to a relatively rigid frame **32**. The frame **32** has an upstanding wall **34** which, at its upper portion is provided with an inwardly extending flange **36**. This assembly may be supported within the envelope by any suitable means, such, for example, as a plurality of leaf springs spaced around the periphery of the frame which engage studs formed on an interior surface of the face plate wall. This type of mounting system is well known in the art and will not be detailed here.

Generally, there is also provided in such tubes a beam shield **38** which fills in the gap between the frame **32** and the wall of the tube and prevents stray electrons from hitting the screen and causing color impurities.

Since it is necessary for the proper operation of the tube that the shadow mask electrode **18** be maintained at the same voltage as that applied to the conductive coating **22**, electrical path means **26** is provided therebetween.

In this instance the electrical path providing means is in the form of a contact spring **40** which is fixed to frame **32** (FIG. 2). The spring may be formed with a clip portion **42** which snaps over the edge of the flange **36** and shield **38** or it may be welded directly to the flange as is spring **43** in FIG. 3. To allow spring **43** to be welded directly to the flange a cut-out portion **41** is provided in beam shield **38**.

The greater portion of the length of springs **40** and **43** is bifurcated thus providing, respectively, tines **42***a* and **43***a*. The tines operate substantially independently of one another and are provided at their contacting ends **44** and **46** with curved segments **48** and **50**. With a contact spring so formed the likelihood of an electrical interruption to the mask electrode **18** is greatly reduced since a shock transmitted to the tube is unlikely to disturb both contacting tines at the same time, thus leaving one of them always in contact with coating **22**. This substantial guaranty of contact allows the use of a weaker spring material and thus reduces the possibility of the coating **22** being eroded.

In an alternate embodiment of the invention each of the tines of a contact may be provided with different vibration frequencies thus virtually assuring the fact that under shock one of the tines will always maintain contact. This

may be accomplished by the provision of an angled interconnecting portion **52** which extends across the bifurcation. The angled portion **52** causes each of the tines to have a different mean free length and thus a different frequency of vibration.

It will be seen from the above that there is herein provided a contact spring that has many advantages over the prior art. It greatly enhances color picture tubes by eliminating a very annoying problem. It provides an improved and novel contact spring that makes the tube more resistant to mechanical shocks and the subsequent vibrations and thus greatly enhances the overall performance of the tube.

While there have been shown what are at present considered to be the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made herein without departing from the scope of the invention.

I claim:

1. In a color cathode ray tube having an electrically insulating envelope, a screen portion on one surface of said envelope, an apertured parallax barrier adjacent said screen, a rigid frame structure supporting said barrier and an electrically conductive coating formed on another of said envelope surfaces and means for providing an electrical path between said frame and said conductive coating, the improvement comprising: providing said last named means with a bifurcated end which contacts said electrically conductive coating, each of the tines of said bifurcated end being substantially independent of the other and each of said tines having a different vibration frequency.

2. The invention of claim **1** wherein said means for providing said electrical path comprises: a frame contacting portion; and a conductive coating contacting portion, said coating contacting portion comprising spaced apart tines and an angled portion interconnecting said tines for providing different vibration frequencies for each of said tines.

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174—50.52; 339—277