

Description

This invention pertains to a cathode-ray tube with a contact spring attached to an internal magnetic shield.

A color cathode-ray tube (CRT) typically has an internal magnetic shield to reduce the influence of magnetic fields on electron beam trajectories as a cathodoluminescent screen of the tube is scanned. The shield is usually made of 0.1 mm thick cold-rolled steel and is fastened to a shadow-mask frame so that the shield and frame are magnetically coupled. The magnetic shield is designed to fit into the funnel and be as close to the funnel wall as possible, but should not touch the funnel to avoid any friction between the shield and a conductive anode coating on the inner surface of the glass funnel.

It has been conventional practice to attach a flexible contact spring to the rear portion of the magnetic shield for effecting an electrical connection between the shield and the conductive coating on the inner surface of the funnel. One means of attaching the contact spring to the magnetic shield is by welding, which tends to erratically produce splatter. The resultant loose particles therefrom are detrimental to tube operation, such as by blocking apertures in the shadow mask or causing shorts and high-voltage arcing.

An improvement in the state of the art was disclosed in U.S. Patent No. 4,310,779 (issued to Penird et al. on 12 January 1982), wherein the contact spring has a wrap-around clip which is facily affixed to a fluting formed in the rear ledge of the magnetic shield. However, such a contact spring does not firmly lock onto the magnetic shield, resulting in problems due to "loose" springs. Hence, there is need for a cooperative locking combination which firmly secures the contact spring to the magnetic shield.

To achieve this object a cathode-ray tube having the features of claim 1 is provided. By virtue of these features, the co-operative locking combination firmly secures the contact spring to the magnetic shield by preventing further insertion as well as removal of the spring from the underpass formed between the ends of the bar member disposed substantially parallel to the flat surface of the shield. It is pointed out that from US-A-4 433 267 there is known a CRT having an internal magnetic shield connected to a conductive coating on the inner surface of the CRT by a contact spring fixed to the shield by a clip-on attachment.

Moreover, clip-on attachment means of the tongue and groove type are known per se from US-A-3 851 435.

In the drawings:

FIGURE 1 is a cross-sectional view illustrating a

pair of contact springs attached to an internal magnetic shield within a cathode-ray tube.

FIGURE 2 is a cross-sectional view taken along line II-II of FIGURE 1.

FIGURE 3 is a plan view of an enlarged rear portion of the internal magnetic shield without the contact spring attached thereto.

FIGURE 4 is a cross-sectional view taken along line IV-IV of FIGURE 3.

FIGURE 5 is a plan view illustrating a contact spring adapted for attachment to the internal magnetic shield.

FIGURE 6 is a side elevation view of FIGURE 5.

FIGURE 7 is a plan view of an enlarged rear portion of the internal magnetic shield with the contact spring attached thereto.

FIGURES 1 and 2 show a cathode-ray tube 10 having a faceplate panel 12 sealed to a funnel 14 along an edge 16 of the panel 12. The tube 10 has an internal magnetic shield 18 disposed therein proximate an inner surface 20 of the funnel 14. The magnetic shield 18 is fastened to a shadow-mask frame 22, which is supported by mounting studs 24 that extend inwardly from the faceplate panel 12. The inner surface 20 of the funnel 14 has a conductive coating 26 thereon extending along the surface 20 to a predetermined distance from the edge 16. This conductive coating 26 comprises a graphite coating which serves as the anode for the tube 10. A pair of contact springs 28 are attached to a substantially flat surface 30 at the rear portion of the internal magnetic shield 18, for effecting an electrical connection between the shield 18 and the conductive coating 26.

FIGURES 3 and 4 show a bar member 32 disposed substantially parallel to the flat surface 30. Both ends 34 and 36 of the bar member 32 are integrally connected to the flat surface 30 such that a narrow underpass 38 is formed between the ends 34 and 36. This underpass 38 may be formed by machine stamping the area 40 surrounding the bar 32 away from the plane of the flat surface 30, whereby the bar member 32 is disposed substantially along the plane of the flat surface 30. The machine-stamped area 40 is disposed closely adjacent to an edge 42 at the rear portion of the internal magnetic shield 18, as shown in FIGURE 3. The internal magnetic shield 18 is usually made of cold-rolled steel having a thickness of approximately 0.1 millimeter, which is easily machine stamped. The bar member 32 may also have a longitudinal crest 43 machine stamped therein and extending onto the flat surface 30 for structural strength. Similarly, the surrounding area 40 may also have ridgelike crests 45 machine stamped therein to provide structural rigidity and strength.

The internal magnetic shield 18 also has an integral indentation 44 disposed in the flat surface

30 parallel to the bar member 32, as shown in FIGURES 3 and 4. The indentation 44 is disposed in the flat surface 30 at a position to prevent further insertion of the contact spring 28, as explained further below. The indentation 44 may be machine stamped in the internal magnetic shield 18 at the same time the bar member 32 is formed therein.

FIGURES 5 and 6 show the contact spring 28 having a substantially flat end 46. A resilient ramp-shaped tongue 48, having a ramp section 50, projects from the flat end 46, as illustrated in FIGURE 6. An end 56 of the ramp section 50 is substantially orthogonal to the plane of the flat end 46, and has a tab 57 projecting at an obtuse angle therefrom. The tab 57 prevents further removal of the flat end 46 from the underpass 38 should the resilient tongue 48 be depressed after insertion of the contact spring 28, as explained below, by projecting beneath and contacting an edge of the ridgelike crest 45 in the surrounding area 40. The tongue 48 is positioned such that the bar member 32 contacts the ramp section 50 and depresses the tongue 48 towards the flat end 46 as the flat end 46 is being inserted through the underpass 38 (described below). The tongue 48 is integrally connected to the flat end 46 and extends from an aperture 52 in the center of the flat end 46, as illustrated in FIGURE 5. The contact spring 28 is made of 0.18 mm thick cold-rolled steel and may be formed by machine stamping. The area of the flat end 46 surrounding the aperture 52 may have a ridgelike crest 53 machine stamped therein to provide structural rigidity and strength.

The contact spring 28 also has integral ridge means 54, positioned parallel to and away from the bar member 32 on the side of the contact spring 28 opposite the tongue 48, for contacting the integral indentation 44 disposed in the flat surface 30 of the internal magnetic shield 18. The ridge means 54 may be machine-stamped in the contact spring 28 at the same time the tongue 48 is formed therein. The end of the spring 28 opposite the flat end 46 has a two-pronged terminal contact element 55 formed to effect contact with the conductive coating 26 disposed on the inner surface 20 of the funnel 14.

FIGURE 7 shows the internal magnetic shield 18 and contact spring 28 locked together. The contact spring 28 is attached to the flat surface 30 of the internal magnetic shield 18 by inserting the flat end 46 of the contact spring 28 through the underpass 38 in the magnetic shield 18. As the flat end 46 is being inserted through the underpass 38, the bar member 32 contacts the ramp section 50 of the resilient tongue 48 and depresses the tongue 48 towards the flat end 46. The flat end 46 is inserted through the underpass 38, sufficiently, to allow the end 56 of the ramp section 50 to clear

the bar member 32 and spring back to contact an edge 58 of the bar member 32, as illustrated in FIGURE 7. The end 56 of the ramp section 50 locks firmly against the edge 58 of the bar member 32 adjacent the underpass 38, thereby preventing removal of the flat end 46 from the underpass 38 without affirmatively depressing the resilient tongue 48 downward and bending the tab 57 upward above the ridgelike crest 45 in the surrounding area 40.

In order to prevent further insertion of the flat end 46 through the underpass 38 after the tongue 48 has sprung back, the ridge means 54 in the contact spring 28 contacts the indentation 44 in the flat surface 30 and stops any further movement of the spring 28. Thus, the present invention provides a cooperative locking combination which firmly secures the contact spring 28 to the internal magnetic shield 18. No additional clip or welding is necessary; therefore, labor and particle generating processes are eliminated. The present invention also eliminates problems due to "loose" springs.

Claims

1. A cathode-ray tube having an internal magnetic shield disposed therein proximate an inner surface of a funnel of said tube, wherein a contact spring is attached to a substantially flat surface at the rear portion of said magnetic shield for effecting an electrical connection between said shield and a conductive coating disposed on the inner surface of said funnel, and wherein to form a cooperative locking combination:

said magnetic shield (18) has a bar member (32) disposed substantially parallel to said flat surface (30) and integrally connected at both ends (34,36) thereof to said flat surface such that a narrow underpass (38) is formed between said ends and

said contact spring (28) has a substantially flat end (46) with a resilient ramp-shaped tongue (48) projecting therefrom and positioned such that said tongue could be depressed towards said flat end on insertion of said flat end through said underpass, said flat end extending through said underpass sufficiently to allow an end (56) of said ramp-shaped tongue to clear said bar member and spring back to contact an edge (58) of said magnetic shield, thereby preventing removal of said spring,

the end (46) of said contact spring (28) having integral ridge means (54), positioned parallel to and away from said bar member (32) on the side opposite said tongue (48), for contacting a part (44) of said magnetic shield (18) disposed



30 parallel to the bar member 32, as shown in FIGURES 3 and 4. The indentation 44 is disposed in the flat surface 30 at a position to prevent further insertion of the contact spring 28, as explained further below. The indentation 44 may be machine stamped in the internal magnetic shield 18 at the same time the bar member 32 is formed therein.

FIGURES 5 and 6 show the contact spring 28 having a substantially flat end 46. A resilient ramp-shaped tongue 48, having a ramp section 50, projects from the flat end 46, as illustrated in FIGURE 6. An end 56 of the ramp section 50 is substantially orthogonal to the plane of the flat end 46, and has a tab 57 projecting at an obtuse angle therefrom. The tab 57 prevents further removal of the flat end 46 from the underpass 38 should the resilient tongue 48 be depressed after insertion of the contact spring 28, as explained below, by projecting beneath and contacting an edge of the ridgelike crest 45 in the surrounding area 40. The tongue 48 is positioned such that the bar member 32 contacts the ramp section 50 and depresses the tongue 48 towards the flat end 46 as the flat end 46 is being inserted through the underpass 38 (described below). The tongue 48 is integrally connected to the flat end 46 and extends from an aperture 52 in the center of the flat end 46, as illustrated in FIGURE 5. The contact spring 28 is made of 0.18 mm thick cold-rolled steel and may be formed by machine stamping. The area of the flat end 46 surrounding the aperture 52 may have a ridgelike crest 53 machine stamped therein to provide structural rigidity and strength.

The contact spring 28 also has integral ridge means 54, positioned parallel to and away from the bar member 32 on the side of the contact spring 28 opposite the tongue 48, for contacting the integral indentation 44 disposed in the flat surface 30 of the internal magnetic shield 18. The ridge means 54 may be machine-stamped in the contact spring 28 at the same time the tongue 48 is formed therein. The end of the spring 28 opposite the flat end 46 has a two-pronged terminal contact element 55 formed to effect contact with the conductive coating 26 disposed on the inner surface 20 of the funnel 14.

FIGURE 7 shows the internal magnetic shield 18 and contact spring 28 locked together. The contact spring 28 is attached to the flat surface 30 of the internal magnetic shield 18 by inserting the flat end 46 of the contact spring 28 through the underpass 38 in the magnetic shield 18. As the flat end 46 is being inserted through the underpass 38, the bar member 32 contacts the ramp section 50 of the resilient tongue 48 and depresses the tongue 48 towards the flat end 46. The flat end 46 is inserted through the underpass 38, sufficiently, to allow the end 56 of the ramp section 50 to clear

the bar member 32 and spring back to contact an edge 58 of the bar member 32, as illustrated in FIGURE 7. The end 56 of the ramp section 50 locks firmly against the edge 58 of the bar member 32 adjacent the underpass 38, thereby preventing removal of the flat end 46 from the underpass 38 without affirmatively depressing the resilient tongue 48 downward and bending the tab 57 upward above the ridgelike crest 45 in the surrounding area 40.

In order to prevent further insertion of the flat end 46 through the underpass 38 after the tongue 48 has sprung back, the ridge means 54 in the contact spring 28 contacts the indentation 44 in the flat surface 30 and stops any further movement of the spring 28. Thus, the present invention provides a cooperative locking combination which firmly secures the contact spring 28 to the internal magnetic shield 18. No additional clip or welding is necessary; therefore, labor and particle generating processes are eliminated. The present invention also eliminates problems due to "loose" springs.

Claims

1. A cathode-ray tube having an internal magnetic shield disposed therein proximate an inner surface of a funnel of said tube, wherein a contact spring is attached to a substantially flat surface at the rear portion of said magnetic shield for effecting an electrical connection between said shield and a conductive coating disposed on the inner surface of said funnel, and wherein to form a cooperative locking combination:

said magnetic shield (18) has a bar member (32) disposed substantially parallel to said flat surface (30) and integrally connected at both ends (34,36) thereof to said flat surface such that a narrow underpass (38) is formed between said ends and

said contact spring (28) has a substantially flat end (46) with a resilient ramp-shaped tongue (48) projecting therefrom and positioned such that said tongue could be depressed towards said flat end on insertion of said flat end through said underpass, said flat end extending through said underpass sufficiently to allow an end (56) of said ramp-shaped tongue to clear said bar member and spring back to contact an edge (58) of said magnetic shield, thereby preventing removal of said spring,

the end (46) of said contact spring (28) having integral ridge means (54), positioned parallel to and away from said bar member (32) on the side opposite said tongue (48), for contacting a part (44) of said magnetic shield (18) disposed



at a position to prevent further insertion of said flat end through said underpass after said tongue has sprung back.

2. A cathode-ray tube as defined in Claim 1, wherein said part of the internal magnetic shield (18) comprises an integral indentation (44) disposed in said flat surface (30) parallel to said bar member (32).
3. A cathode-ray tube as defined in Claim 1 or 2, wherein the end (56) of said ramp-shaped tongue (48) is substantially orthogonal to the plane of said flat end (46), and has a tab (57) projecting at an obtuse angle therefrom toward said integral ridge means (54).
4. A cathode-ray tube as defined in Claim 1, 2 or 3, wherein said tongue (48) is integrally connected to said flat end (46) and extends from an aperture (52) in the center of said flat end, having been machine-stamped therefrom.
5. A cathode-ray tube as defined in Claim 1, 2, 3 or 4 wherein said bar member (32) is disposed substantially along the plane of said flat surface (30), the area (40) surrounding said bar member having been machine-stamped away from the plane of said flat surface to form said underpass (38).
6. A cathode-ray tube as defined in Claim 5, wherein said machine-stamped area (40) surrounding said bar member (32) is disposed closely adjacent to an edge (42) at the rear portion of said internal magnetic shield (18).
7. A cathode-ray tube as defined in any preceding Claim, wherein said contact spring (28) and said internal magnetic shield (18) comprise cold-rolled steel having thicknesses of approximately 0.18 and 0.1 millimeter, respectively.

Revendications

1. Un tube à rayons cathodiques comprenant un écran magnétique interne disposé dans celui-ci à proximité d'une surface interne d'un cône dudit tube, où un ressort de contact est fixé à une surface sensiblement plane à la portion arrière de l'écran magnétique pour effectuer une connexion électrique entre l'écran et un revêtement conducteur disposé sur la surface interne dudit cône, et où pour former une combinaison de verrouillage coopérative :

l'écran magnétique (18) comporte un élément formant barre (32) disposé sensiblement parallèle à la surface plane (30) et relié inté-

gralement aux deux extrémités (34, 36) de celui-ci à la surface plane de telle sorte qu'un passage secondaire étroit (38) soit formé entre lesdites extrémités et

le ressort de contact (28) comporte une extrémité sensiblement plane (46) avec une langue élastique en forme de rampe (48) faisant saillie de celle-ci et positionnée de sorte que ladite langue puisse être enfoncée vers l'extrémité plane lors de l'insertion de l'extrémité plane à travers ledit passage secondaire, ladite extrémité plane s'étendant à travers le passage secondaire suffisamment pour permettre à une extrémité (56) de la langue en forme de rampe de dégager l'élément formant barre et de revenir élastiquement pour contacter un bord (58) de l'écran magnétique, empêchant de la sorte le retrait dudit ressort,

l'extrémité (46) du ressort de contact (28) ayant un moyen formant strie intégrale (54), positionné parallèlement à et au loin de l'élément formant barre (32) au côté opposé de la langue (48) pour contacter une partie (44) de l'écran magnétique (18) disposé en une position pour empêcher une autre insertion de l'extrémité plane à travers le passage secondaire après que la langue soit ramenée élastiquement.

2. Un tube à rayons cathodiques selon la revendication 1, où la partie précitée de l'écran magnétique interne (18) comprend une indentation intégrale (44) disposée dans la surface plane précitée (30) parallèle à l'élément formant barre précité (32).
3. Un tube à rayons cathodiques selon la revendication 1 ou 2, où l'extrémité (56) de la langue en forme de rampe (48) est sensiblement orthogonale au plan de l'extrémité plane précitée (46) et comporte une patte (57) faisant saillie à un angle obtus de celle-ci vers le moyen formant strie intégrale (54) précité.
4. Un tube à rayons cathodiques selon la revendication 1, 2 ou 3, où la langue précitée (48) est reliée intégralement à l'extrémité plane précitée (46) et s'étend à partir d'une ouverture (52) au centre de l'extrémité plane, ayant été estampée par machine à partir de celle-ci.
5. Un tube à rayons cathodiques selon la revendication 1, 2, 3 ou 4, où l'élément formant barre (32) est disposé sensiblement le long du plan de la surface plane (30) précitée, la surface (40) entourant l'élément formant barre ayant été estampée par machine hors du plan de la surface plane pour former le passage secon-



daire précité (38).

6. Un tube à rayons cathodiques selon la revendication 5, où la surface estampée par machine (40) précitée entourant l'élément formant barre (32) est disposée adjacente de façon proche à un bord (42) à la partie arrière de l'écran magnétique interne précité (18).
7. Un tube à rayons cathodiques selon l'une des revendications précédentes, où le ressort de contact précité (28) et l'écran magnétique interne précité (18) comprennent un profil à froid ayant des épaisseurs approximativement de 0,18 et 0,1 millimètre, respectivement.

Patentansprüche

1. Kathodenstrahlröhre mit einer internen magnetischen Abschirmung, die in der Nähe der inneren Oberfläche eines Kolbentrichters der Röhre angeordnet ist, wobei eine Kontaktfeder an einer im wesentlichen ebenen Fläche an einem hinteren Teil der magnetischen Abschirmung angebracht ist, um eine elektrische Verbindung zwischen der Abschirmung und einer leitfähigen Beschichtung, die auf der inneren Oberfläche des Kolbentrichters angeordnet ist, herzustellen und wobei zur Bildung einer zusammenwirkenden verrastenden Kombination
 - die magnetische Abschirmung (18) einen Stabteil (32) hat, der im wesentlichen parallel zu der erwähnten ebenen Fläche (30) verläuft und an seinen beiden Enden (34, 36) integral mit der ebenen Fläche so verbunden ist, daß zwischen diesen Enden eine enge Unterführung (38) gebildet wird, und - die Kontaktfeder (38) ein im wesentlichen ebenes Ende mit einer von diesem vorspringenden, federnden, rampenförmigen Zunge (48) hat, welche so angeordnet ist, daß sie beim Einführen des ebenen Endes durch die Unterführung nach unten gegen das ebene Ende gedrückt werden kann, wobei sich das ebene Ende genügend weit durch die Unterführung erstreckt, um es einem Ende (56) der rampenförmigen Zunge zu gestatten, vom Stabteil freizukommen und zurückzufedern sowie einen Rand (58) der magnetischen Abschirmung zu berühren und dadurch eine Entfernung der Feder zu verhindern,
 - das Ende (46) der Kontaktfeder (28) eine integrale Schulter (54) aufweist, welche auf der der Zunge (48) abgewandten Seite parallel zum Stabteil und im Abstand von diesem angeordnet ist, diesem ange-

ordnet ist, um mit einem Teil (44) der magnetischen Abschirmung (18) Kontakt zu machen, der sich in einer solchen Position befindet, daß ein weiteres Einführen des ebenen Endes durch die Unterführung verhindert wird, nachdem die Zunge zurückgefedert ist.

2. Kathodenstrahlröhre nach Anspruch 1, bei welcher der erwähnte Teil der internen magnetischen Abschirmung (18) eine integrale Eindrückung (44) enthält, die in der ebenen Fläche (30) parallel zum Stabteil (32) angeordnet ist.
3. Kathodenstrahlröhre nach Anspruch 1 oder 2, bei welcher das Ende (56) der rampenförmigen Zunge (48) im wesentlichen senkrecht zur Ebene des ebenen Endes (46) verläuft und einen Ansatz (57) aufweist, der von ihm unter einem stumpfen Winkel in Richtung auf die integrale Schulter (54) vorspringt.
4. Kathodenstrahlröhre nach Anspruch 1, 2 oder 3, bei welcher die Zunge (48) einstückig mit dem ebenen Ende (46) verbunden ist und von einer Öffnung (52) in der Mitte des ebenen Endes vorspringt, aus dem sie maschinell ausgestanzt worden ist.
5. Kathodenstrahlröhre nach Anspruch 1, 2, 3 oder 4, bei welcher der Stabteil (32) im wesentlichen längs der Ebene der ebenen Fläche (30) verläuft, wobei der den Stabteil umgebende Bereich (40) maschinell aus der Ebene der ebenen Fläche herausgestanzt worden ist, um die Unterführung (38) zu bilden.
6. Kathodenstrahlröhre nach Anspruch 5, bei der der maschinell ausgestanzte Bereich (40), der den Stabteil (32) umgibt, sich nahe bei einem Rand (42) am hinteren Teil der internen magnetischen Abschirmung (18) befindet.
7. Kathodenstrahlröhre nach einem der vorhergehenden Ansprüche, bei welcher die Kontaktfeder (28) und die interne magnetische Abschirmung (18) kaltgewalzten Stahl mit einer Dicke von etwa 0,18 bzw. 0,1 mm enthalten.