COLOUR SELECTING STRUCTURE FOR A CATHODE-RAY TUBE

The present invention relates to a colour selecting structure for a cathode-ray tube (CRT) and, more particularly, to damper wires (fine wires) extended on the tape surface of an aperture grille plate (AG) for a Trinitron (Trade Mark) CRT, to prevent vibrations.

A Trinitron (Trade Mark) CRT uses, as a colour selecting structure, a plurality of tape-like grid elements formed by forming a plurality of vertical apertures in a thin plate, such as a thin steel sheet, by an etching process. The plate is welded to a frame so as to extend it tautly in a fixed tension. The structure, i.e., the etched thin plate, having the apertures, the plurality of tape-like grid elements and the framing elements is called a FAG (aperture grille plate). Electron beams pass through the apertures of the FAG and impinge on the fluorescent screen to make portions of the fluorescent screen luminous.

In the accompanying drawings Fig. 2 is a perspective view of a FAG mounted on a frame, Fig. 3 is a sectional view taken on line I-I in Fig.

2, and Fig. 4 is an enlarged view of a portion of Fig. 2. Shown in Figs. 2 to 4 are a frame 1, a FAG 2, tape-shaped grid elements 2a, apertures 2b, and two damper wires 3 extended perpendicularly to the apertures 2b to restrain the FAG from vibration, damper springs 4 fixedly holding the damper wires 3 on the frame 1. Usually, the damper wires 3 are tungsten wires of a diameter in the range of 10 to 30 μm in diameter. As shown in Fig. 4, the tape-shaped grid elements 2a, i.e., strips of a soft steel, are arranged in parallel to each other and tend to vibrate like the strings of musical instruments according to the length and tension thereof. The vibration of the grid elements 2a disturbs the landing of electron beams on the fluorescent screen, disturbing images formed on the fluorescent screen. Therefore, the damper wires 3 are extended perpendicularly to the grid elements 2a to restrain the grid elements 2a from vibration.

Although the higher the tension of the damper wires, the greater is the effect of the damper wires on the attenuation of the vibration of the aperture grille AG, the high tension of the damper wires entails a new problem. If each tape-shaped grid element 2a, a strip of a soft steel, is dislocated from a correct position 7a to an incorrect position 7b as shown in Fig. 5 by heat or mechanical shock applied thereto, it is possible that the dislocated tape-shaped grid element 2a is held firmly at the incorrect

position 7b and unable to restore itself to its correct position 7a when the tungsten wire is extended excessively tautly. If an aperture grille having dislocated grid elements is put on the screen of a CRT, vertical moiré fringes of fine pitches appear on the screen. These vertical moiré fringes become conspicuous particularly when the entire screen is white.

Accordingly, it is an object of the present invention to provide a colour selecting structure for a Trinitron (Trade Mark) cathode-ray tube, capable of minimizing vertical moiré fringes that deteriorate the quality of the picture displayed on the screen and of attenuating the vibration of the FAG.

According to one aspect of the present invention, there is provided a colour selecting structure for a cathode-ray tube, comprising:

a thin aperture grille plate provided with a plurality of tape-like grid elements; and

damping wires extending across the surface of the aperture grille plate to apply a force to each of the grid elements;

wherein the damping wires are tensioned such that they apply a force to each grid element sufficient to damp resonant vibrations of the elements but insufficient to hold them in a distorted position, said force being in the range of 3 mg to 10 mg.

The force is preferably sufficient to damp vibration well within 20 seconds.

The fine wires extended across the surface of the aperture grille so as to apply a predetermined force

appropriate for attenuating the vibration of the tape-shaped grid elements 2a of the aperture grille and for minimizing vertical moiré fringes formed on the screen by each grid element prevent the deterioration of the quality of pictures displayed on the screen.

Colour televisions, monitors or VDUs can be made using these structures.

The invention also provides a method for constructing a structure as above, including the steps of measuring the minimum force at which resonant vibrations of the grid elements are damped and the minimum force at which the elements are held in distorted positions if dislocated, and arranging the damping wires to apply to each grid element a force between those two minimum forces, said force being in the range of 3 mg to 10 mg.

The present invention will be further described by way of non-limitative example in the following description taken in connection with the accompanying drawings, in which:-

Fig. 1 is a diagrammatic view of assistance in explaining a normal reaction acting on each of the tape-shaped grid elements of a FAG when a damper wire is extended across the FAG;

Fig. 2 is a perspective view of a FAG mounted on a frame;

Fig. 3 is a sectional view taken on line I-I in Fig. 2;

Fig. 4 is an enlarged view of a portion of Fig. 2; and

Fig. 5 is an enlarged sectional view of a portion A in Fig. 4.

Fig. 1 is a diagrammatic view showing the force acting on each tape-shaped grid element 2a of an aperture grille when damper wires are extended across the surface of the aperture grille. The force F′ is, as a matter of course, proportional to the tension F induced in each grid element 2a. In this embodiment, the effect of the force F′ applied by a damper wire 3 to each tape-shaped grid element 2a was tested, the results of which are shown in Table 1.

Table 1

Test Nos.	F′ (mg)	Vibration	Vertical fringes
1	3	Attenuated immediately	Faint
2	6	Attenuated immediately	Faint
3	10	Attenuated immediately	Faint
4	2	Continued 20 sec	None
5	12	Attenuated immediately	Conspicuous

Note: Test Nos. 1, 2 and 3 are for samples meeting the requirements of the present invention. Test Nos. 4 and 5 are for comparative samples, in test 4 the vibration is not attenuated adequately reducing picture quality and in test 5 the moiré fringes are seen.

It is well known from Table 1 that both effective attenuation of the vibration of the FAG and effective minimization of vertical moiré fringes on the screen can be achieved when the damper wires 3 are extended so that the force F′ acting on each of the tape-shaped grid elements 2a

of the FAG is significantly greater than 2 mg and significantly less than 12 mg, i.e. in the range of 3 mg to 10 mg. The force F' shown in Table 1 was measured by a precision spring balance.

As is apparent from the foregoing description, the present invention minimizes the vertical moiré fringes and attenuates the vibration of the FAG quickly.

Improved colour televisions, monitors and VDUs can thus be made.

The invention also provides a method of constructing colour selecting structures which uses the general principles already described.

Although the invention has been described in its preferred form with a certain degree of particularity, obviously many changes and variations are possible therein. It is therefore to be understood that the present invention may be practised otherwise than as specifically described herein without departing from the scope thereof as defined in the appended claims.

CLAIMS

1. A colour selecting structure for a cathode-ray tube, comprising:

a thin aperture grille plate provided with a plurality of tape-like grid elements; and

damping wires extending across the surface of the aperture grille plate to apply a force to each of the grid elements;

wherein the damping wires are tensioned such that they apply a force to each grid element sufficient to damp resonant vibrations of the elements but insufficient to hold them in a distorted position, said force being in the range of 3 mg to 10 mg.

2. A colour selecting structure constructed and arranged to operate substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

3. A colour television or monitor or VDU including a colour selecting structure according to any one of the preceding claims.

4. A method of constructing a colour selecting structure for a cathode-ray tube, the structure comprising a thin aperture grille plate provided with a plurality of tape-like grid elements and damping wires extending across the grille plate to apply a force to each of the grid elements, the method including the steps of measuring the minimum force at which resonant vibrations of the grid elements are damped and the minimum force at which the elements are held in distorted positions if dislocated, and arranging the damping wires to apply to each grid element a

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force between those two minimum forces, said force being in the range of 3 mg to 10 mg.