

FIXING OF COLOUR SCREENING STRUCTURES
FOR COLOUR PICTURE TUBES

The invention relates to a method of fixing a colour screening structure for a colour picture tube.

A colour picture tube may comprise, as shown in Figures 9 and 10 of the accompanying drawings, a tube body 1 having a faceplate 1p provided over the inner surface thereof with a colour fluorescent screen 3, electron guns 4, and a colour screening structure 5, such as an aperture grill or a shadow mask, mounted just behind the colour fluorescent screen 3 to ensure that each of the electron beams produced by the electron guns 4 strikes only its intended colour phosphor dots in the colour fluorescent screen 3. The colour screening structure 5 comprises a frame 6 comprising a pair of parallel frame members 6a and 6b extending opposite to each other, and side frame members 6c and 6d extending in parallel to each other so as to interconnect the frame members 6a and 6b, and a grid member 7 provided with a plurality of slits and extending across the frame members 6a and 6b on the side of the frame 6 facing the colour fluorescent screen 3. Supporting spring plates 7A, 7B and 7C provided respectively with through holes 8 are welded respectively to the frame member 6a and the side frame members 6c and 6d of the frame 6. The colour screening structure 5 is mounted on the tube body 1 with the through holes 8 of the supporting spring plates 7A, 7B and 7C receiving pins 9A, 9B and 9C, respectively, attached to the inner surface of a skirt of the faceplate 1p.

A method of fixing the supporting spring plates 7A, 7B and 7C respectively to the pins 9A, 9B and 9C formed of a metal by laser welding has been proposed to prevent the colour screening structure 5 from being dislocated when shocks are applied to the colour picture tube, thereby to improve the shock resistance of the colour screening structure 5. However, this proposed method has a serious problem that the supporting spring plates 7A, 7B and 7C and the pins 9A, 9B and 9C are melted partly during the laser-welding process and contract when cooled after welding, so that the supporting spring plates 7A, 7B and 7C are dislocated relative to the pins 9A, 9B and 9C and dislocate the colour screening structure 5 relative to the faceplate 1p.

The colour fluorescent screen 3 of the colour picture tube is formed by optical means while the faceplate 1p and the colour screening structure 5 are held in a fixed positional relation. Therefore, although the colour picture tube having the colour screening structure attached to the tube body by welding the supporting spring plate 7A, 7B and 7C to the pins 9A, 9B and 9C has excellent shock resistance, it is possible that the colour screening structure will be misaligned with the faceplate 1p, and thus with the colour fluorescent screen 3, at the completion of manufacture whereby electron beams will strike the wrong colour phosphor dots to cause so-called chromatic misalignment. Such a colour picture tube is unacceptable.

Japanese Utility Model Publication No. 60-15241 discloses a method of fixing the supporting spring plates to the metallic pins. In this previously proposed method, a supporting spring plate 7 is provided with a hexagonal through hole 8 formed in a shape to receive a metallic pin 9 therethrough so that the metallic pin 9 is in contact with every other side of the hexagonal through hole 8 at positions p1, p2 and p3. The supporting spring plate 7 and the metallic pin 9 are welded together by spot welding at the sides q1, q2 and q3 of the hexagonal through hole 8 which are not in contact with the metallic pin 9 as shown in Figure 11. This known method, however, has practical problems in that the gaps between the sides q1, q2 and q3 and the metallic pin 9 must be very small, for example 0.3 mm or less, to enable satisfactory spot welding; in that, in some cases, the sides q1, q2 and/or q3 of the hexagonal through hole 8 which must be separated from the metallic pin 9 are actually in contact with the metallic pin 9 and in that misalignment of the colour screening structure can occur due to heating of the metallic pin 9 and the supporting spring plate 7 during welding causing the dislocation of the supporting spring plate 7 relative to the metallic pin 9. These problems have become more and more serious with the progressive improvement of the precision of the colour picture tube.

According to the invention there is provided a method of fixing a colour screening structure having first, second and third supporting spring plates to a faceplate of a colour picture tube having first, second and third metallic pins, said first metallic pin being attached on the middle of a lateral side of the faceplate, and said second and

third pins being attached on the right and left sides of the faceplate extending from the opposite ends of the lateral side,

the method comprising the steps of:

mounting the colour screening structure on the faceplate of the colour picture tube;

inserting said first, second and third metallic pins into respective first, second and third polygonal through holes formed respectively in said first, second and third supporting spring plates, the first through hole in said first supporting spring plate being a hexagonal through hole having three alternate sides in contact with said first metallic pin and three alternate sides spaced apart from said first metallic pin when the first metallic pin is inserted into the first through hole, and both the second and the third through holes in said second and said third supporting spring plates being substantially triangular through holes each having three sides in contact with the corresponding second or third metallic pin when the metallic pin is inserted into the through hole;

firstly welding the first supporting spring plate to the first metallic pin, firstly at one of said alternate three sides of the hexagonal through hole in contact with said first metallic pin and then at the opposite side to that side of the hexagonal through hole, secondly at another side of the hexagonal through hole and then at the ^{adjacent} ~~adjacent~~ side to the said other side, and thirdly at a further side and then at the ^{adjacent} ~~adjacent~~ side to the said further side, by laser welding, and secondly welding each of the second and the third supporting spring plates to the corresponding second or third metallic pin at the said three sides of the through hole, in order, firstly at one side of the second through hole, secondly at the side of the third through hole corresponding to the welded side of the second through hole, thirdly at another side of the second through hole, fourthly at another side of the third through hole corresponding to the said other side of the second through hole, fifthly at a further side of the second through hole and sixthly at a further side of the third through hole corresponding to the said further side of the second through hole, by laser welding.

Such a method can almost completely suppress the dislocation of the colour screening structure relative to the faceplate of the colour

picture tube attributable to the laser welding.

The invention arises from an appreciation that there exists a fixed relation between weld position, the direction of movement of the colour screening structure, depth of penetration and the distance of movement of the colour screening structure and that the position of the colour screening structure can correctly be adjusted relative to the faceplate by controlling the welding sequence and depth of penetration, so that the movement of the colour screening structure relative to the faceplate attributable to welding can be restricted to the least extent.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:-

Figure 1 is a partly cutaway schematic perspective view showing the constitution of a laser welding equipment for carrying out the method of the invention;

Figures 2 and 3 are a rear elevation and a side elevation, respectively, of an assembly of a colour screening structure and the faceplate of a colour picture tube assembled by a method of fixing a colour screening structure, in a preferred embodiment, according to the invention;

Figures 4A to 4L are diagrammatic illustrations showing the movement of a colour screening structure at different stages of the

method of the invention;

Figures 5 to 7 are illustrations of assistance in explaining depth of penetration and direction of movement of a supporting spring plate during welding in a method according to the invention;

5 Figure 8 is a diagram showing steps of a method according to the invention;

Figures 9 and 10 are a schematic sectional view and an internal rear elevation, respectively, of a colour picture tube; and

10 Figure 11 is a plan view of assistance in explaining a metallic pin and a supporting spring plate in a colour picture tube of previously proposed kind.

Referring to Figure 1, a colour screening structure 5 is disposed opposite the inner surface of a face plate 1p provided with a colour fluorescent screen over the inner surface thereof. The faceplate 1p and the colour screening structure 5 are held on a table 11. A laser beam emitted by a laser unit 12 is transmitted through an optical fibre cable 13 to a lens unit 14. The lens unit 14 focuses the laser beam on a weld position. A magnetic position detector 15 is incorporated into the lens unit 14 to detect the centres of pins. 15 Five magnetic scales 16x1, 16x2, 16z1, 16z2 and 16z3 are provided to control the distance of movement of the colour screening structure 5. The magnetic scales 16x1 and 16x2 are disposed in contact with the side surface of the side frame member 6d of the frame 6 of the colour screening structure 5 respectively at two different positions to 20 measure the distance of movement of the colour screening structure 5 in the X direction, the magnetic scales 16z1 and 16z2 are disposed in contact with the lower surface of the side frame member 6d of the frame 6 respectively at two different positions to measure the distance of movement of those parts of the colour screening structure 25 5 in the X direction, the magnetic scales 16z1 and 16z2 are disposed in contact with the lower surface of the side frame member 6d of the frame 6 respectively at two different positions to measure the distance of movement of those parts of the colour screening structure 5 in the X direction (a direction along the axis of the colour picture tube), and the magnetic scale 16z3 is disposed in contact with the lower surface of the other side frame member 6c of the frame to 30 measure the distance of movement of that part of the colour screening structure 5 in the Z direction as shown in Figure 2. Values measured by the five magnetic scales 16 are indicated respectively on counters 17. In Figure 1, only the counters 17 for the magnetic scales 16x1, 16x2 and 16z2 are shown and the counters 17 for the rest of the 35

magnetic scales are not shown.

As shown in Figures 2 and 3, the colour screening structure 5 comprises the frame 6 formed by the pair of opposite, parallel frame members 6a and 6b and the pair of opposite, parallel side frame members 6c and 6d extending across the frame members 6a and 6b and interconnecting the frame members 6a and 6b, the grid member 7 having a plurality of slits and extended between the opposite frame members 6a and 6b, and the first supporting spring plate 7A, the second spring plate 7B and the third supporting spring plate 7C welded respectively to the frame member 6a and the side frame members 6c and 6d. The supporting spring plates are provided respectively with through holes 18A, 18B and 18C to engage metallic pins 9A, 9B and 9C attached to the inner surface of the faceplate 1p. The through hole 18A of the first supporting spring plate 7A, in particular, is a hexagonal hole having two opposite sides extending in parallel to the direction of the width of the first supporting spring plate 7A. The first supporting spring plate 7A is in point contact with the metallic pin 9A at three weld positions A1, A4 and A6 respectively on the three alternate sides of the hexagonal through hole 18A to locate the colour screening structure 5 at a correct position relative to the faceplate 1p. the three weld positions A1, A4 and A6 are distributed at regular angular intervals of 120° . The other alternate three sides of the hexagonal through hole 18A are spaced apart from the metallic pin 9A by a fixed small gap respectively at three weld positions A2, A3 and A5 which are distributed at regular angular intervals of 120° . The through holes 18B and 18C of the second supporting spring plate 7B and the third supporting spring plate 7C are substantially triangular holes. The second supporting spring plate 7B and the third supporting spring plate 7C are in point contact with the corresponding metallic pins 9B and 9C respectively at three weld positions B7, B9 and B11 and three weld positions C8, C10 and C12, which are distributed at regular angular intervals of 120° . The metallic pin 9A is attached to the middle of the lower side of the faceplate 1p, while the metallic pins 9B and 9C are attached to the two opposite sides, namely, the right side and the left side, of the faceplate 1p symmetrically with respect to the vertical centre axis, as viewed in Figure 2, of the faceplate 1p.

The colour fluorescent screen is formed over the inner surface of the faceplate 1p. The colour screening structure 5 is fixed to the faceplate 1p opposite to the colour fluorescent screen. In fixing the colour screening structure 5 to the faceplate 1p, the faceplate 1p is placed on the table 11, the magnetic detector pins 15 incorporated into the lens unit 14 are moved in the X directions and in the Z directions to locate the respective centres of the metallic pins 9A, 9B and 9C, the colour screening structure 5 is fixedly mounted on the faceplate 1p by receiving the metallic pins 9A, 9B and 9C respectively in the corresponding through holes 18A, 18B and 18C of the supporting spring plates 7A, 7B and 7C, weld positions are located with reference to the centres of the metallic pins 9A, 9B and 9C, and then the supporting spring plates 7A, 7B and 7C are welded by laser welding to the corresponding metallic pins 9A, 9B and 9C. The first supporting spring plate 7A is welded to the first metallic pin 9A at the six weld positions A1 to A6, the second supporting spring plate 7B is welded to the second metallic pin 9B at the three weld positions B7, B9 and B11, and the third supporting spring plate 7C is welded to the third metallic pin 9C at the three weld positions C8, C10 and C12. The supporting spring plates 7A, 7B and 7C are welded to the metallic pins 9A, 9B and 9C in a welding sequence as shown in Figure 8. First, the first supporting spring plate 7A is welded to the first metallic pin 9A at the weld positions in the order of the weld positions A1, A2, A3, A4, A5 and A6. Then, the second supporting spring plate 7B and the third supporting spring plate 7C are welded alternately to the second metallic pin 9B and the third metallic pin 9C at the weld positions in the order of the weld positions B7, C8, B9, C10, B11 and C12. The depth of penetration is controlled according to the welding sequence for laser welding. The final positional deviation of the colour screening structure 5 from the correct position, namely, the displacement of the colour screening structure 5, is monitored by the counters 17.

The movement of the colour screening structure 5 relative to the faceplate 1p during laser welding will be explained to facilitate understanding of the invention.

The distance and direction of movement of the colour screening structure 5 during laser welding is greatly dependent on the following

two factors.

(1) Depth of penetration

(2) Influence of the welded and fixed part, namely, the degree of freedom of movement.

5 Depth of penetration is dependent on the power density of the laser beam (input voltage, input current, pulse width) and weld position (focusing condition, striking position) and affects weld strength and the displacement of the colour screening structure 5. The depth of the nugget is dependent on the power density of the laser
10 beam, while the area of the nugget is dependent on the spot size of the laser beam. Accordingly, the displacement of the colour screening structure 5 and the weld strength of the welded parts increase with the input voltage, the pulse width and the power density of the laser beam when the laser beam is defocused within an allowable range. On
15 the contrary, the displacement of the colour screening structure 5 can be limited to a small extent by reducing the depth of penetration in the supporting spring plates 7 and the metallic pins 9. The greater the depth of the nugget controlled by reducing the power density and spot size of the laser beam and by dislocating the striking position,
20 the greater the contraction and the displacement of the colour screening structure 5 will be. Accordingly, the depth of penetration is kept small and the area of the nugget is kept large.

The depth of the nugget can be regulated by controlling the spot size and power density of the laser beam. When the input conditions
25 of the laser welding equipment are fixed, the power density of the laser beam is increased and hence the depth of penetration is large when the laser beam is in an optimum focus as indicated at 21 in Figure 5, while the power density of the laser beam is reduced and hence the depth of penetration is small when the laser beam is
30 defocused as indicated at 22 in Figure 5. It is also possible to increase the depth of penetration by increasing the power density of the laser beam. However, excessive momentary increase in the power density of the laser beam entails increase in the possibility of burn through and increase in spatters.

35 The area of the nugget can be controlled by deviating the striking position of the laser beam. Figure 6A illustrates an appropriate striking position and Figure 6B illustrates a deviated

striking position. When the striking position of the laser beam is deviated as shown in Figure 6B, useless penetration 23 increases in the supporting spring plate 7 while insufficient penetration 24 occurs in the metallic pin 9. The depth of penetration in the metallic pin 9 affects the distance of movement of the colour screening structure 5.

Since the distance of movement is dependent on the depth of penetration, the distance of movement can be controlled by selectively deciding the weld position, namely, by deviating the striking position to increase useless penetration. The area of the nugget can be controlled by regulating the spot size.

The effect of a fixed point on the direction of movement of the colour screening structure 5 will be described hereinafter. Basically, the direction of movement of the colour screening structure 5 due to welding coincides with a direction indicated by arrow F in Figure 7. However, in practical welding operation, the ratio of the component in the direction of arrow A and the component in the direction of arrow B (Figure 7) varies due to resilient pressure that acts on the weld position and increase in the supporting positions and fixed positions (welded positions). For example, when the supporting plate 7 is welded previously to the metallic pin 9 at the weld positions A1 and A2, it is difficult for the weld positions A3 to move in the direction of the arrow A. Consequently, the component in the direction of the arrow B increases relative to the component in the direction of the arrow A, and hence the lower left-hand corner, as viewed in Figure 2, of the colour screening structure moves in the -Z direction (a direction directed away from the faceplate 1p) and the lower right-hand corner of the same moves in the +Z direction (a direction directed toward the faceplate 1p). When the first supporting spring plate 7A is welded first at the weld position A3 to the metallic pin 9A, the component in the direction of the arrow A increases relative to the component in the direction of the arrow B, consequently, both the lower right-hand corner and lower left-hand corner of the colour screening structure 5 move in the +Z direction.

The reason for the welding sequence (A1 to C12) will be described hereinafter.

The sequence and adjustment of welding is decided taking the following five factors into consideration.

- (i) Conditions of the supporting system: Arrangement of the supporting spring plates, balance of weight distribution, etc..
- 5 (ii) Dependence on external force: Weight of the colour screening structure, spring pressure, etc..
- (iii) Directionality of movement: Condition whether the directions of the arrows A and B (Figure 7) are two-dimensional or three-dimensional.
- 10 (iv) Effect of the fixed position on the distance of movement of the colour screening structure and cancellation between the distances of movement: Estimation of the direction of movement and reduction of the distance of movement.
- (v) Requisite criteria of the finished colour picture tube:
- 15 Allowance in the direction of movement and the control of the distance of movement.

The factor (v) concerns the following facts. After the colour screening structure has been welded to the faceplate and the faceplate has been connected to the tube body, the assembly of the colour screening structure, the faceplate and the tube body is subjected to

20 heat treatment at a high temperature in the range of 370° to 430°C for frit-sealing and evacuation, which causes the dislocation of the colour screening structure resulting in faulty beam landing such as twisted landing or figure-8 landing. Since the distances of movement

25 of the colour screening structures using parts of the same batch are distributed within a substantially fixed range, it has been usual to correct faulty landing by means of a correction lens in forming the colour fluorescent screen. However, in some cases, when the parts are changed for those of another batch, the mode of faulty landing varies.

30 In such a case, it is more simple to change welding conditions for previous backward correction than to change the correction lens.

The welding sequence is decided on the basis of the factors (i) to (v). The steps of the welding sequence will be explained sequentially with reference to Figure 8 and Figures 4A to 4L.

- 35 (1) First, the first supporting spring plate 7A is welded to the metallic pin 9A in view of the control of the balance of the three-pin supporting system (factors (i) and (v)).

(2) The first supporting spring plate 7A is welded at the weld positions A1 and A2 to the metallic pin 9A before being welded at the weld positions A3 to A6, because the directionality of movement is two-dimensional (the directions A and B in Figure 7 are affected little by the Z-component), positional correction in the X direction of the colour screening structure in the finished colour picture tube is necessary, and the displacement of the first supporting spring plate 7A at the weld positions A3 to A6 can be suppressed by fixing the first supporting spring plate 7A to the metallic pin 9A at the weld positions at which the directionality of movement of the first supporting spring plate 7A is exactly known (factors (iii), (iv) and (v)).

(3) The first supporting spring plate 7A is welded at the weld position A1 to the metallic pin before welding the same at the weld position A2 to the metallic pin, because the colour screening structure must be shifted in the +X direction in the finished colour picture tube, the distance of movement at a position welded earliest is greater than those at positions welded afterward, and the weld position A2 is separated from the metallic pin and hence it is difficult to control the distance of movement at the weld position A2 unless the first supporting spring plate 7A is fixed at the weld position A1 prior to welding the first supporting spring plate at the weld position A2 and variation in the distance of movement is large at the weld position A2 (factors (iv) and (v)).

(4) The first supporting spring plate 7A is welded to the metallic pin 9A at the weld positions A3 and A4 prior to welding the same at the weld positions A5 and A6 in consideration of the relation between the direction of movement of the colour screening structure and the direction of action of the weight of the colour screening structure, and the cancellation between the distances of movement (factors (ii) and (iv)).

(5) The second and third supporting spring plates 7B and 7C are welded respectively to the metallic pins 9B and 9C at the weld positions B7 and C8 prior to welding the same at the weld positions B9 to C12, because the directionality of movement is two-dimensional, the distance of movement of the second and third supporting spring plates 7B and 7C at the weld positions B9 to C12 must be suppressed, and the

centre twist 02 in the finished colour picture tube must be corrected (factors (iii) and (v)).

(6) The distance of movement of the colour screening structure at the weld position C8 is greater than that at the weld position B7 owing to the relation between the supporting system and the spring pressure when a laser beam of the same power is used for welding the second and third supporting spring plates 7B and 7C at the weld positions B7 and C8. Accordingly, the welding is carried out in the order of B7 and then C8 in consideration of cancellation between the distances of movement and the control of the distance of movement (factors (i), (ii), (iv) and (v)).

(7) For the same reason stated in (4), the second and third supporting spring plates 7B and 7C are welded respectively to the metallic pins 9B and 9C at the weld positions B9 and C10 prior to welding the same at the weld positions B11 and C12 (factors (ii) and (iv)).

(8) A welding order of B9, C10, B11 and C12 enables cancellation between the distances of movement. The second supporting spring plate 7B and the third supporting spring plate 7C are welded alternately to prevent the change in the engagement of one of the second and third supporting spring plates 7B and 7C with the corresponding metallic pin due to completion of welding of the other supporting spring plate before welding the former, because the completion of welding of one of the supporting spring plates 7B and 7C induces such an adverse change in the engagement of the other supporting spring plate with the corresponding metallic pin (factor (iv)).

Figures 4A to 4L show measured data representing the movement of the colour screening structure when the colour screening structure is fixed to the faceplate by welding the supporting spring plates to the corresponding metallic pins in the foregoing welding sequence, in which the movement of the colour screening structure is shown qualitatively. In Figures 4A to 4L, the measured deviation (the distance of movement) of six points on the colour screening structure respectively corresponding to six reference points 01, 02, 03, 04, 05 and 06 on the surface of the faceplate 1p in the X directions (directions parallel to the surface of the faceplate 1p) and the Z

directions (directions perpendicular to the surface of the faceplate 1p) is indicated with respect to the six reference points 01 to 06. Arrow f attached to the weld position indicates the direction of movement which is dependent on the component in the direction A (Figure 7), arrow g indicates the direction of rotation which is dependent on the component in the direction of the arrow B (Figure 7) (the rotative component of the supporting spring plate).

As is obvious from Figure 4F, at the completion of welding the first supporting spring plate 7A to the first metallic pin 9A at the weld position A6, the colour screening structure is aligned correctly with the colour fluorescent screen and, at the end of the welding of the third supporting spring plate 7C to the third metallic pin 9C at the weld position C12, namely, at the completion of alternately welding the supporting spring plates 7B and 7C respectively to the second metallic pin 9B and the third metallic pin 9C, the colour screening structure is dislocated very slightly relative to the colour fluorescent screen.

Thus, the method of the invention can weld the supporting spring plates 7A, 7B and 7C respectively to the metallic pins 9A, 9B and 9C by using the laser welding equipment shown in Figure 1, according to fixed optimum conditions determined on the basis of measured data for the depth of penetration appropriate to the foregoing welding sequence to mass-produce colour picture tubes. During the mass production of colour picture tubes, the depth of penetration can be controlled by measuring the position of each colour screening structure by the magnetic scales at every welding operation for welding the supporting spring plate to the pin at each weld position, and processing the measured position of the colour screening structure by a computer.

The method of fixing a colour screening structure of the invention can be capable of fixing a colour screening structure of a three-pin supporting system to a faceplate with the least deviation of the colour screening structure from the correct position relative to the colour fluorescent screen formed in the inner surface of the faceplate by welding the supporting spring plates 7A, 7B and 7C respectively to the metallic pins 9A, 9B and 9C in the special welding sequence and controlling the depth of penetration. Furthermore, the method of the invention can correct faulty landing, such as twist or

figure-8, simply by changing the welding conditions instead of changing the correction lens. Consequently, the shock resistance of the colour picture tube can be improved, faulty landing is reduced and the yield of colour picture tubes can be improved.

- 5 As apparent from the foregoing description, in fixedly mounting the colour screening structure of the three-pin supporting system on the faceplate by welding the supporting spring plates engaging respectively with the metallic pins attached to the faceplate to the metallic pins by laser welding, the colour screening structure can be
- 10 fixed to the faceplate with the least resultant deviation by controlling the depth of penetration, first welding the first supporting spring plate attached to the middle of one of the frame members of the colour screening structure to the first metallic pin and alternately welding the second and third supporting spring plates
- 15 attached respectively to the opposite side frame members respectively to the second and third metallic pins at the weld positions. The invention can be particularly effective when applied to manufacturing super precision colour picture tubes.

CLAIMS

1. A method of fixing a colour screening structure having first, second and third supporting spring plates to a faceplate of a colour picture tube having first, second and third metallic pins, said first metallic pin being attached on the middle of a lateral side of the faceplate, and said second and third pins being attached on the right and left sides of the faceplate extending from the opposite ends of the lateral side,
- the method comprising the steps of:
 - mounting the colour screening structure on the faceplate of the colour picture tube;
 - inserting said first, second and third metallic pins into respective first, second and third polygonal through holes formed respectively in said first, second and third supporting spring plates, the first through hole in said first supporting spring plate being a hexagonal through hole having three alternate sides in contact with said first metallic pin and three alternate sides spaced apart from said first metallic pin when the first metallic pin is inserted into the first through hole, and both the second and the third through holes in said second and said third supporting spring plates being substantially triangular through holes each having three sides in contact with the corresponding second or third metallic pin when the metallic pin is inserted into the through hole;
 - firstly welding the first supporting spring plate to the first metallic pin, firstly at one of said alternate three sides of the hexagonal through hole in contact with said first metallic pin and then at the opposite side to that side of the hexagonal through hole, secondly at another side of the hexagonal through hole and then at the ^{adjacent} side to the said other side, and thirdly at a further side and then at the ^{adjacent} side to the said further side, by laser welding, and secondly welding each of the second and the third supporting spring plates to the corresponding second or third metallic pin at the said three sides of the through hole, in order, firstly at one side of the second through hole, secondly at the side of the third through hole corresponding to the welded side of the second through hole, thirdly at another side of the second through hole, fourthly at another side of



the third through hole corresponding to the said other side of the second through hole, fifthly at a further side of the second through hole and sixthly at a further side of the third through hole corresponding to the said further side of the second through hole, by
5 laser welding.

2. A method according to claim 1, wherein the sides of the hexagonal through hole of the first supporting spring plate which contact the first metallic pin are welded to the pin at weld positions distributed
10 at regular angular intervals of 120° , and the sides of the hexagonal through hole of the first supporting spring plate which are spaced from the first metallic pin are welded to the pin at weld positions distributed at regular angular intervals of 120° .

15 3. A method of fixing a colour screening structure substantially as hereinbefore described with reference to Figures 1 to 8 of the accompanying drawings.

4. A colour picture tube having a colour screening structure mounted
20 on the faceplate thereof by a method according to any one of claims 1 to 3.

