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(54) **Cathode ray tube apparatus intended to reduce magnetic fluxes leaked outside the apparatus**

Kathodenstrahlrohrreinrichtung zur Verringerung von magnetischen Streuflüssen ausserhalb der
Einrichtung

Dispositif de tube à rayons cathodiques destiné à réduire les flux magnétiques de dispersion hors du
dispositif

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Description

The present invention relates to a cathode ray tube apparatus and, more particularly, a cathode ray tube apparatus intended to reduce magnetic fluxes leaked outside the apparatus from a horizontal deflection coil unit of the deflection yoke.

As the VDUs (visual display units) become more and more popular in the community of users, dispute has been focused on what influences are added to the human body by magnetic fields leaked from the VDU. It is not concluded yet whether or not the magnetic fluxes leaked add in fact any influence to the human body and what causes the influence, if any, results from. However, the north Europe moves to issue a notice about and attract attention to the influence of the leakage magnetic fluxes which may be added to the human body. The National Council for Metrology and Testing in Sweden, for example, recommends in a guide line (MPR-P 1988) relating to the rule of testing and evaluating the VDUs that the magnetic fields, particularly horizontal deflection magnetic fluxes leaked on a sphere which has a radius of 65 cm (or 50 cm in front of the face plate on the tube axis) around the center of the VDU (or a point separated 15 cm inward from the surface of the face plate along the tube axis) should have a magnetic flux density B equal to and smaller than 50 nT and an induced magnetic flux density dB/dt equal to and smaller than 25 mT/s.

The magnetic fluxes is mainly leaked from a horizontal deflection coil of the deflection yoke attached to the cathode ray tube. The deflection yoke is usually provided with a magnetic core and horizontal and vertical deflection coil units, and magnetic fields shown by broken lines in Fig. 1 are generated by the horizontal deflection coil unit 1 wound like a saddle around the tube. These horizontal deflection magnetic fluxes is generally grouped into effective magnetic fluxes B_a and ineffective magnetic fluxes B_b generated by a flange portions 2 of the horizontal deflection coil unit 1. These deflection magnetic fluxes B_a and B_b are generated in those directions which are reverse to each other. These deflection magnetic fluxes B_a and B_b are particularly complicated adjacent to the deflection yoke 3 but simple, as shown by arrows 4 in Fig. 2A, on a plane separated about 45 cm from the center of the VDU and perpendicular to the tube axis. The simple leakage magnetic fluxes are distributed, as shown by arrows 5 in Fig. 2B, like a distribution of the magnetic fluxes generated from a coil unit 6 which is so located as to generate magnetic fluxes B_c directed in a direction reverse to that of the effective magnetic fluxes B_a in the center of the VDU.

In a cathode ray tube apparatus 9 a pair of compensating coil units for eliminating the leakage horizontal deflection magnetic fluxes $8a$ and $8b$ are arranged on both sides of the horizontal plane aligned with the tube axis Z and on a plane perpendicular to the horizontal plane and passing through the center O of the leakage magnetic fluxes. Horizontal deflection current is applied to the pair of compensating coil units $8a$ and $8b$ to generate magnetic fluxes so as to cancel the magnetic fluxes B_b passing through the coil units $8a$ and $8b$. In other words, magnetic fluxes which are directed in same direction as that of the effective magnetic fluxes B_a are generated to reduce the leakage magnetic fluxes.

In the case of the conventional cathode ray tube apparatus 9, however, a phase difference $\Delta\phi$ or time lag is caused, as shown in Figs. 4A and 4B, between a waveform 10 of the magnetic fluxes generated by the paired compensating coil units and a waveform 11 of the leakage magnetic fluxes, because of the inner magnetic shield, shadow mask and dag-coating which are incorporated in the monochromatic or color cathode ray tube and which are located adjacent to the paired compensating coil units $8a$ and $8b$. This makes it difficult to fully compensate the leakage magnetic fluxes. Further, the impedance of the deflecting circuit is increased and the deflecting power loss is increased accordingly, because horizontal deflection current is applied to the paired compensating coil units. Still further, the paired compensating coil units attached to the tube are left unstable and their attaching to the tube is not easy because they must be attached to the tilted outer face of the center portion of the cone of the tube.

Prior art document IBM Technical Disclosure Bulletin, Vol. 30, No. 12 (May 1988), pages 9 and 10 discloses a cathode ray tube apparatus wherein an undesirable leaked magnetic flux from deflection coils is cancelled by providing two pairs of compensation coils. These compensation coils are located close to a deflection yoke and generate a magnetic flux for cancelling the leaked magnetic flux. A resistor and a capacitor are connected in parallel with the compensation coils to completely cancel the leaked magnetic flux.

It is an object of the present invention to provide a cathode ray tube apparatus capable of more fully compensating the leakage magnetic fluxes magnetic fluxes on the sphere which has a radius of 65 cm around the center of the VCU, more easily reducing particularly the leakage magnetic flux in front of the screen, and reducing the deflecting power loss to a greater extent due to compensating coil units.

To solve this object the present invention provides a cathode ray tube apparatus as specified in claim 1.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 shows a distribution of horizontal deflection leakage magnetic fluxes around the cathode ray tube generated from horizontal deflection coil units of the saddle type for the deflection yoke;

Fig. 2A shows a distribution of horizontal deflection leakage magnetic fluxes on a vertical plane separated by 65 cm from the center of VDU;

Fig. 2B shows a distribution of magnetic fluxes generated when a coil unit is so located around VDU as to generate magnetic fluxes reversely directed from those effective magnetic fluxes which are generated from the horizontal deflection coil unit;

Figs. 3A and 3B are perspective rear and side views showing the conventional cathode ray tube apparatus in which a pair of compensating coil units are arranged on both sides of a horizontal plane including the tube axis and on a plane perpendicular to the tube axis and passing through center of leakage magnetic fluxes;

Fig. 4A shows a waveform of compensating magnetic field generated from the compensating coil unit synchronous with horizontal deflection signal;

Fig. 4B shows a waveform of leakage magnetic fluxes from VDU;

Figs. 5A and 5B are perspective rear and partly-broken side views showing an example of the color cathode ray tube apparatus according to the present invention;

Fig. 6 shows a distribution of compensating magnetic fluxes on a vertical plane separated by 65 cm from the center of VDU in the color cathode ray tube apparatus shown in Figs. 5A and 5B; and

Figs. 7A and 7B show distributions of magnetic fluxes intended to explain how compensating magnetic fluxes add influence to the landing characteristic in the cathode ray tube apparatus shown in Figs. 5A and 5B and provided with two pairs of compensating coil units and how compensating magnetic fluxes add influence to the landing characteristic in the case of the conventional cathode ray tube apparatus provided with a pair of compensating coil units.

Figs. 5A and 5B show a color cathode ray tube apparatus according to one embodiment of the present invention. The cathode ray tube apparatus includes a color cathode ray tube 20, a deflection yoke 21 attached to the outer circumference of the tube 20, and a compensating assembly 22 similarly attached to the outer circumference of the tube 20 to generate compensating magnetic fluxes. The color cathode ray tube 20 has an envelope 27 comprising a panel 25 provided with a face plate and a skirt 24 along the outer rim thereof and a funnel 26 integrally connected to the panel 25. Formed on the inner face of the face plate is a phosphor screen 28 comprising three phosphor layers for emitting blue, green and red light rays when electron beams land on these layers. A shadow mask 29 is arranged adjacent to the phosphor screen 28 and inside the panel 25. The shadow mask 29 is provided with apertures through which the electron beams are allowed to pass, and it includes a mask body 30 opposed to the phosphor screen 25 and a mask frame 31 for supporting the outer rim portion of the mask body 30. These components are made of magnetic material such as low carbon steel. An inner magnetic shield 33 also made of magnetic material is attached to the mask frame 31 of the shadow mask 29 and projected from the mask frame 31 into a conical portion 34 of the funnel 26. An electron gun assembly 36 for generating three electron beams is arranged in a neck 35 of the funnel 26. An inner dag-coating 37 is formed on the inner face of the cone 34 of the funnel 26, spreading near to the inner face of the neck, and an outer dag-coating 38 is formed on the outer face of the cone 34.

Reference numeral 39 represents an explosion-proof band for tightening the skirt 24 of the panel 25 and reference numeral 40 denotes a positive electrode terminal located at the cone 34 of the funnel 26.

The deflection yoke 21 is attached to the outer surface of the cone 34 and the neck 35. The deflection yoke 21 comprises a horizontal deflection coil unit for deflecting those three electron beams, which are emitted from the electron gun assembly 36, in the horizontal direction, a vertical deflection coil unit for deflecting the electron beams in the vertical direction, and a magnetic core. Particularly the deflection yoke 21 of the cathode ray tube apparatus shown in Figs. 5A and 5B includes at least the horizontal deflection coil unit wound like a saddle, and the magnetic core.

In the case of the cathode ray tube apparatus shown in Figs. 5A and 5B, the compensating assembly 22 for generating compensating magnetic fields comprises a front side pair of compensating coil units 22a, 22b and a rear side pair of compensating coil units 22c, 22d which are located on both sides of a plane 7 perpendicular to the tube axis and passing through center of horizontal deflection leakage magnetic fluxes generated from the horizontal deflection coil unit of the deflection yoke 21. The front side pair of compensating coil units 22a and 22b are symmetrical relative to a horizontal plane which is aligned with the axis Z of the color cathode ray tube 20, and they are fixed by adhesive, for example, to the outer face of the skirt 24 of the panel 25 in which the shadow mask 29 is arranged or to that of the cone 34 of the funnel 26 in which the inner magnetic shield 33 is arranged, in such a way that they are opposed to each other with the horizontal plane interposed between them. Particularly in the case of fixing them onto the skirt 24 of the panel 25, they can be easily fixed there, using the explosion-proof band 39 which tightens the skirt 24. Similarly, the rear side pair of compensating coil units 22c and 22d are symmetrical relative to the horizontal plane which is on the axis Z of the color cathode ray tube and they are fixed to the magnetic core of the deflection yoke 21 in such a way that they are opposed to each other with the horizontal plane interposed between them. Coil units 22a and 22b are substantially same in size and shape and coil units 22c and 22d are also substantially same in size and shape but it is determined by the distribution of magnetic fields leaked outside the envelope how many turns their coils have and how they are tilted relative to the horizontal plane. They are connected in series or parallel to the horizontal deflection coil unit of the deflection yoke 21 and energized by signal applied from a signal generator 42. The signal

generator 42 includes a horizontal signal generator circuit for generating horizontal deflection current, and current which is proportional to the horizontal deflection current is supplied from this signal generator 42 to the compensating coil units 22a, 22b, 22c and 22d. It may be designed that the signal generator 42 is kept independent of the horizontal signal generator circuit. Current proportional in a level to, synchronous with and same in time change as the horizontal deflection current is supplied from the signal generator 42 to the compensating coil units 22a, 22b, 22c and 22d in this case.

When the front and rear sides pairs of compensating coil units 22a, 22b and 22c, 22d are attached to the the color cathode ray tube as described above, leakage magnetic fluxes can be efficiently compensated as follows.

1) When positions of the front and rear sides pairs of compensating coil units 22a, 22b, 22c and 22d and current applied to these coil units are adjusted, leakage magnetic fluxes can be effectively compensated. Fig. 6 shows compensating magnetic fluxes on a vertical plane located 15 cm inside the outer face of the panel 26 of the color cathode ray tube 20 and separated 65 cm from the center of the VDU according to the examination and evaluation rule for the VDU, and as shown by arrows 44 in Fig. 6, there can be formed compensating magnetic fluxes similar to that of the conventional cathode ray tube apparatus in which a pair of compensating coil units are arranged on the plane passing through centers of horizontal deflection leakage magnetic fluxes.

2) Leakage magnetic fluxes could not be compensated to the full extent by the conventional cathode ray tube apparatus because horizontal deflection leakage magnetic fluxes are different in phase from compensating magnetic fluxes as shown in Figs. 4A and 4B. When the front and rear sides pairs of compensating coil units are arranged as shown in Figs. 5A and 5B, however, compensating magnetic fluxes which are substantially in phase with horizontal deflection leakage magnetic fluxes generated from the deflection yoke 21 can be generated to effectively compensate magnetic fields leaked due to a positional relationship between magnetic materials such as the shadow mask 29 and the inner magnetic shield 33 and the front and rear side pairs of compensating coil units.

3) When the front and rear sides pairs of compensating coil units 22a, 22b and 22c, 22d are arranged as shown in Figs. 5A and 5B and current which is proportional in level to horizontal deflection current is applied to these coil units, the deflection power loss of the deflection yoke 21 can be reduced. Namely, the deflection power usually depends upon the impedance Z of the deflection coil unit and providing that the resistance of deflection and compensating coil units is represented by R and their inductance by L , $|Z| = \sqrt{R^2 + (2\pi fL)^2}$. In order to reduce the deflection power, therefore, the inductance of that compensating coil unit which takes no part in deflection may be lowered. In the case of the compensating coil unit, $R \ll 2\pi fL$ and providing that the number of turns of the coil unit is denoted by N and the level of magnetic flux generated is denoted by ϕ , $L = N\phi/I \propto N^2$. The deflection power therefore becomes larger in proportion to the number N of turns of each coil unit. On the other hand, the level of compensating fluxes generated by plural pairs of compensating coil units is proportional to the total of numbers of turns of these coil units.

When two pairs of compensating coil units 22a, 22b and 22c, 22d are used as seen in the case of the cathode ray tube apparatus shown in Figs. 5A and 5B, therefore, the total of numbers of turns of these coil units becomes substantially same as that of one pair of compensating coil units in the case of the conventional apparatus, but L becomes smaller and the total of inductances of the two paired coil units is made smaller even if compensating magnetic fluxes by the two paired coil units are same in level as that by the one paired coil units. As the result, the power loss can be further reduced by the two paired coil units 22a, 22b and 22c, 22d and the deflection power loss of the yoke can be thus reduced to a greater extent.

4) In the case of the conventional cathode ray tube apparatus in which one pair of compensating coil units are arranged on the plane which passes through the center of horizontal deflection leakage magnetic fluxes, compensating magnetic fluxes 46 which are directed in same direction as effective magnetic fluxes 45 generated from the horizontal deflection coil unit of the deflection yoke 21 are generated, as shown in Fig. 7B, at that area through which the electron beams pass. The electron beams are thus deflected to a greater extent and their landing is shifted outside the three phosphor layers of the phosphor screen.

In the apparatus wherein the front and rear sides pairs of compensating coil units 22a, 22b and 22c, 22d are arranged, as shown in Fig. 7A, on both sides of the plane perpendicular to the tube axis and passing through the centers of horizontal deflection leakage magnetic fields, the front side pair of compensating coil units 22a and 22b generate compensating magnetic fluxes 46a in a same direction as that of the effective magnetic fluxes 45 in a space in which the electron beams passes by the horizontal deflection coil unit of the deflection yoke 21. However, the rear side pair of compensating coil units 22c and 22d generate compensating magnetic fluxes 46b in an opposite direction as that of the effective magnetic fluxes 45. The total of compensating magnetic fluxes can be thus made substantially zero in the electron-beams-passing space, thereby preventing the electron beams from being landed outside their respective phosphor layers.

5) When the front and rear sides pairs of compensating coil units are arranged, as shown in Figs. 5A and 5B, their attaching positions can be changed more freely and easily.

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Table 1 shows more concrete values of the two pairs of compensating coil units 22a, 22b and 22c, 22d which are employed by the color cathode ray tube apparatus according to the present invention, and those of the one pair of compensating coil units 8a and 8b which are employed by the conventional cathode ray tube apparatus.

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Table 1

	Size of compensating coil unit	Number of turns	Position
Our example	Front side compensating coil unit	9	Adjacent to the panel of the funnel and on the magnetic core of the horizontal deflection yoke
	Rear side compensating coil unit	4	
Conventional one	28 mm x 120 mm	11	A little before the centers of magnetic fluxes and on the funnel

Table 2 shows the comparison of characteristics of the cathode ray tube apparatus, in which the two pairs of compensating coil units 22a, 22b and 22 each having the values shown in Table 1 are included, with those of the

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cathode ray tube apparatus in which only the one pair of compensating coil units 8a and 8b each having the value shown in Table 1 are included. Induced magnetic flux density dB/dt and magnetic flux density B shown in Table 2 are values at the distance of 30 cm before the panel and the maximum values at the distance of 65 cm on the sphere around the center of the VDU and at an angle of $-45^\circ \leq 0 \leq 45^\circ$ relative to the horizontal plane. The increased parts of inductance of the horizontal deflection system are denoted by percentages before and after the horizontal deflection coil unit is connected in series to the compensating coil units.

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Table 2

	Level of magnetic field leaked		Increased part of inductance due to the horizontally-deflecting system comprising compensating coil units
	Induced magnetic flux density dB/dt (mT/s)	Magnetic flux density B (nT)	
Our example	At 30 cm before the panel	6	7.8
	On the sphere having a radius of 65 cm	9	
Conventional one	At 30 cm before the panel	13	9.3
	On the sphere having a radius of 65 cm	9	
No paired compensating coil units provided	At 30 cm before the panel	104	-
	On the sphere having a radius of 65 cm	64	

As shown in Table 2, the induced magnetic flux densities dB/dt are 13 mT/s at the distance of 30 cm before the panel and 9 mT/s on the sphere having a radius of 65 cm around the center of the VDU and the increased part of

inductance is 9.3%, which values are the best achieved by the conventional cathode ray tube apparatus in which the one pair of compensating coil units are included. When the two pairs of compensating coil units are used in such a way that the one pair of them are located adjacent to the panel of the funnel and opposed to each other parallel to and in front of the plane perpendicular to the tube axis and passing through the centers of horizontal deflection leakage magnetic fields and that the other pair of them are located on the magnetic core of the deflection yoke and opposed to each other parallel to and at the back of the plane, however, the induced magnetic flux density dB/dt can be reduced to 6 mT/s at the distance of 30 cm before the panel and the increased part of inductance to 7.8%.

When the compensating assembly for generating compensating magnetic fluxes to reduce horizontal deflection leakage magnetic fluxes includes plural pairs of compensating coil units and at least one pair of them are located on one side of the plane perpendicular to the tube axis and passing through the centers of horizontal deflection leakage magnetic fluxes while at least the other one pair of them on the other side of the plane, as described above, compensating magnetic fluxes generated from the one pair of them on one side of the plane can be made hardly different in phase from horizontal deflection leakage magnetic fields in front of the phosphor screen to effectively compensate the horizontal deflection leakage magnetic fluxes. Thus, horizontal deflection leakage magnetic fluxes can be effectively compensated by compensating magnetic fluxes.

As described above, the present invention can provide a cathode ray tube apparatus capable of fully compensating leakage magnetic fluxes, particularly those leaked in front of the phosphor screen of the VDU.

Claims

1. A cathode ray tube apparatus comprising:

an envelope (27), having an axis, including, a panel (25) provided with a face plate and a skirt continuous to the face plate, a funnel (26) connected to the skirt of the panel (25) and a neck (35) extending from the funnel (26);

an electron gun assembly (36), received in the neck, for generating an electron beam;

a screen (28), formed on the face plate, for generating a light rays when the electron beam is landed thereon;

a deflection yoke (21) including a horizontal deflection yoke, provided at the funnel (26), for generating magnetic fluxes to deflect the electron beam in the horizontal direction and leakage magnetic fluxes outside the envelope (27);

first and second electromagnetic coil units (22a, 22b), located at both sides of a horizontal reference plane parallel to the horizontal direction and aligned with the tube axis, respectively, for generating first compensating magnetic fluxes in a direction reverse to that of the leakage magnetic fluxes outside the envelope; and

third and fourth electromagnetic coil units (22c, 22d), located at both sides of the horizontal reference plane, respectively, for generating second compensating magnetic fluxes in the direction reverse to that of the leakage magnetic fluxes outside the envelope;

characterized in that

said first and second electromagnetic coil units (22a, 22b) are located close to the panel (25), and

said third and fourth electromagnetic coil units (22c, 22d) are located on a magnetic core of said horizontal deflection yoke, respectively.

2. The cathode ray tube apparatus according to claim 1, characterized in that said first and second electromagnetic coil units (22a, 22b) are arranged around the outer circumference of the skirt.

3. The cathode ray tube apparatus according to anyone of claims 1 or 2, characterized in that said electron gun assembly (36) generates first, second and third electron beams and said screen (28) generates different light rays when the first, second and third electron beams are landed thereon.

4. The cathode ray tube apparatus according to any one of claims 1 to 3, characterized by further comprising; a magnetic shield arranged in the envelope (27) to prevent magnetic fields from being leaked in the envelope (27).

5. The cathode ray tube apparatus according to any one of claims 1 to 4, characterized in that said deflection yoke (21) includes a magnetic core and coils wound round the magnetic core and said third and fourth electromagnetic coil units (22c, 22d) are arranged around the magnetic core.

6. The cathode ray tube apparatus according to any one of claims 1 to 5, characterized in that said first, second, third and fourth electromagnetic coil units (22a, 22b; 22c, 22d) are electrically connected in series to the deflection yoke (21).
- 5 7. The cathode ray tube apparatus according to any one of claims 1 to 5, characterized in that said first, second, third and fourth electromagnetic coil units (22a, 22b, 22c, 22d) are electrically connected in parallel to the deflection yoke (21).
- 10 8. The cathode ray tube apparatus according to any one of claims 1 to 7, characterized in that a signal generator means (42) generates horizontal deflection current and supplies the current to the deflection yoke (21) and the first, second, third and fourth electromagnetic coil units (22a, 22b, 22c, 22d) to energize them.
- 15 9. The cathode ray tube apparatus according to any one of claims 1 to 7, characterized in that a signal generator means (42) generates horizontal deflection current and supplies it to the deflection yoke (21) to energize the deflection yoke (21) and said signal generator means (42) also generates first and second compensating currents synchronous to the horizontal deflection current and supplies them to the first, second, third and fourth electromagnetic coil units (22a, 22b, 22c, 22d) to energize them.

20 Patentansprüche

1. Kathodenstrahlröhrengerät mit:

25 einem Kolben (27) mit einer Achse umfassend eine Frontplatte (25), die mit einem Schirmträger und einem mit dem Schirmträger kontinuierlichen Kragen versehen ist, einen Trichter (26), der mit dem Kragen der Frontplatte (25) verbunden ist, und einen Hals (35), der sich von dem Trichter (26) erstreckt, einer Elektronenkanonenanordnung (36), die in den Hals aufgenommen ist, um einen Elektronenstrahl zu erzeugen,
30 einem Schirm (28), der auf dem Schirmträger gebildet ist, um Lichtstrahlen zu erzeugen, wenn der Elektronenstrahl darauf auftrifft, einem Ablenkjoch (21) mit einem in dem Trichter (26) vorgesehenen Horizontalablenkjoch zum Erzeugen von Magnetflüssen, um den Elektronenstrahl in der Horizontalrichtung abzulenken, und Leckmagnetflüssen außerhalb des Kolbens (27),
ersten und zweiten elektromagnetischen Spuleneinheiten (22a, 22b), die auf beiden Seiten einer Horizontalbezugsebene parallel zu der Horizontalrichtung bzw. ausgerichtet mit der Röhrenachse gelegen sind, um erste
35 Kompensiermagnetflüsse in einer Richtung rückwärts zu derjenigen der Leckmagnetflüsse außerhalb des Kolbens zu erzeugen, und
dritten und vierten elektromagnetischen Spuleneinheiten (22c, 22d), die auf beiden Seiten jeweils der Horizontalbezugsebene gelegen sind, um zweite Kompensiermagnetflüsse in der Richtung rückwärts zu derjenigen der Leckmagnetflüsse außerhalb des Kolbens zu erzeugen,
40 dadurch gekennzeichnet, daß

die ersten und zweiten elektromagnetischen Spuleneinheiten (22a, 22b) nahe bei der Frontplatte (25) gelegen sind, und
45 die dritten und vierten elektromagnetischen Spuleneinheiten (22c, 22d) jeweils auf einem Magnetkern des Horizontalablenkjoches gelegen sind.
2. Kathodenstrahlröhrengerät nach Anspruch 1, dadurch gekennzeichnet, daß die ersten und zweiten elektromagnetischen Spuleneinheiten (22a, 22b) um den äußeren Umfang des Kragens angeordnet sind.
- 50 3. Kathodenstrahlröhrengerät nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, daß die Elektronenkanonenanordnung (36) erste, zweite und dritte Elektronenstrahlen erzeugt und der Schirm (28) verschiedene Lichtstrahlen abgibt, wenn darauf die ersten, zweiten und dritten Elektronenstrahlen auftreffen.
- 55 4. Kathodenstrahlröhrengerät nach einem der Ansprüche 1 bis 3, gekennzeichnet durch weiterhin eine Magnetabschirmung, die in dem Kolben (27) angeordnet ist, um ein Lecken der Magnetfelder in den Kolben (27) zu verhindern.

5. Kathodenstrahlröhrengerät nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß das Ablenkjoch (21) einen Magnetkern und um den Magnetkern gewickelte Spulen umfaßt und die dritten und vierten elektromagnetischen Spuleneinheiten (22c, 22d) um den Magnetkern angeordnet sind.
- 5 6. Kathodenstrahlröhrengerät nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die ersten, zweiten, dritten und vierten elektromagnetischen Spuleneinheiten (22a, 22b; 22c, 22d) elektrisch in Reihe mit dem Ablenkjoch (21) verbunden sind.
- 10 7. Kathodenstrahlröhrengerät nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die ersten, zweiten, dritten und vierten elektromagnetischen Spuleneinheiten (22a, 22b, 22c, 22d) elektrisch parallel mit dem Ablenkjoch (21) verbunden sind.
- 15 8. Kathodenstrahlröhrengerät nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß eine Signalgeneratoreinrichtung (42) einen Horizontalablenkstrom erzeugt und den Strom zu dem Ablenkjoch (21) der ersten, zweiten, dritten und vierten elektromagnetischen Spuleneinheiten (22a, 2b, 22c, 22d) speist, um diese zu erregen.
- 20 9. Kathodenstrahlröhrengerät nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß eine Signalgeneratoreinrichtung (42) einen Horizontalablenkstrom erzeugt und diesen zu dem Ablenkjoch (21) speist, um das Ablenkjoch (21) zu erregen, und daß die Signalgeneratoreinrichtung (42) auch erste und zweite Kompensierströme synchron mit dem Horizontalablenkstrom erzeugt und diese zu den ersten, zweiten, dritten und vierten elektromagnetischen Spuleneinheiten (22a, 22b, 22c, 22d) speist, um diese zu erregen.

Revendications

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1. Dispositif de tube à rayons cathodiques comportant :

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une enveloppe (27), présentant un axe, comprenant, un panneau (25) muni d'une plaque faciale et d'une jupe adjacente à la plaque faciale, un entonnoir (26) relié à la jupe du panneau (25) et un col (35) s'étendant depuis l'entonnoir (26);

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un canon à électrons (36) logé dans le col, pour générer un faisceau d'électrons;

un écran (28), formé sur la plaque faciale, pour générer des rayons de lumière lorsque le faisceau d'électrons le frappe;

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un ensemble de déviation (21) comprenant une bobine de déviation horizontale, prévue sur l'entonnoir (26), pour générer des flux magnétiques afin de dévier le faisceau d'électrons dans la direction horizontale et des flux magnétiques de fuite à l'extérieur de l'enveloppe (27);

des première et seconde bobines électromagnétiques (22a, 22b), situées sur les deux côtés d'un plan de référence horizontal parallèle à la direction horizontale et alignées avec l'axe du tube, respectivement, pour générer des premiers flux magnétiques de compensation dans une direction inverse de celle des flux magnétiques de fuite à l'extérieur de l'enveloppe; et

des troisième et quatrième bobines électromagnétiques (22c, 22d), situées sur les deux côtés du plan de référence horizontal, respectivement, pour générer des seconds flux magnétiques de compensation dans la direction opposée à celle des flux magnétiques de fuite à l'extérieur de l'enveloppe;

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caractérisé en ce que

lesdites première et seconde bobines électromagnétiques (22a, 22b) sont disposées à proximité du panneau (25), et

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lesdites troisième et quatrième bobines électromagnétiques (22c, 22d) sont disposées sur un noyau magnétique dudit ensemble de déviation horizontale, respectivement.

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2. Dispositif de tube à rayons cathodiques selon la revendication 1, caractérisé en ce que lesdites première et seconde bobines électromagnétiques (22a, 22b) sont disposées autour de la circonférence extérieure de la jupe.

3. Dispositif de tube à rayons cathodiques selon l'une quelconque des revendications 1 ou 2, caractérisé en ce que ledit canon à électrons (36) génère des premier, second et troisième faisceaux d'électrons et ledit écrans (28) génère différents rayons lumineux lorsque les premier, second et troisième faisceaux d'électrons le frappent.

4. Dispositif de tube à rayons cathodiques selon l'une quelconque des revendications 1 à 3, caractérisé en ce qu'il comporte en outre un blindage magnétique disposé dans l'enveloppe (27) pour empêcher des champs magnétiques de fuir dans l'enveloppe (27).

5 5. Dispositif de tube à rayons cathodiques selon l'une quelconque des revendications 1 à 4, caractérisé en ce que ledit ensemble de déviation (21) comprend un noyau magnétique et des bobines enroulées autour du noyau magnétique et lesdites troisième et quatrième bobines électromagnétiques (22c, 22d) sont disposées autour du noyau magnétique.

10 6. Dispositif de tube à rayons cathodiques selon l'une quelconque des revendication 1 à 5, caractérisé en ce que lesdites première, seconde, troisième et quatrième bobines électromagnétiques (22a, 22b; 22c, 22d) sont reliées électriquement en série avec l'ensemble de déviation (21).

15 7. Dispositif de tube à rayons cathodiques selon l'une quelconque des revendications 1 à 5, caractérisé en ce que lesdites première, seconde, troisième et quatrième bobines électromagnétiques (22a, 22b, 22c, 22d) sont reliées électriquement en parallèle à l'ensemble de déviation 21.

20 8. Dispositif de tube à rayons cathodiques selon l'une quelconque des revendications 1 à 7, caractérisé en ce qu'un générateur de signaux (42) génère un courant de déviation horizontale et applique le courant à l'ensemble de déviation (21) et les première, seconde, troisième et quatrième bobines électromagnétiques (22a, 22b, 22c, 22d) pour les exciter.

25 9. Dispositif de tube à rayons cathodiques selon l'une quelconque des revendications 1 à 7, caractérisé en ce qu'un générateur de signaux (42) génère un courant de déviation horizontale et l'applique à l'ensemble de déviation (21) pour exciter l'ensemble de déviation (21) et ledit générateur de signaux (42) génère également des premier et second courants de compensation synchrones au courant de déviation horizontale et les applique aux première, seconde, troisième et quatrième bobines électromagnétiques (22a, 22b, 22c, 22d) pour les exciter.

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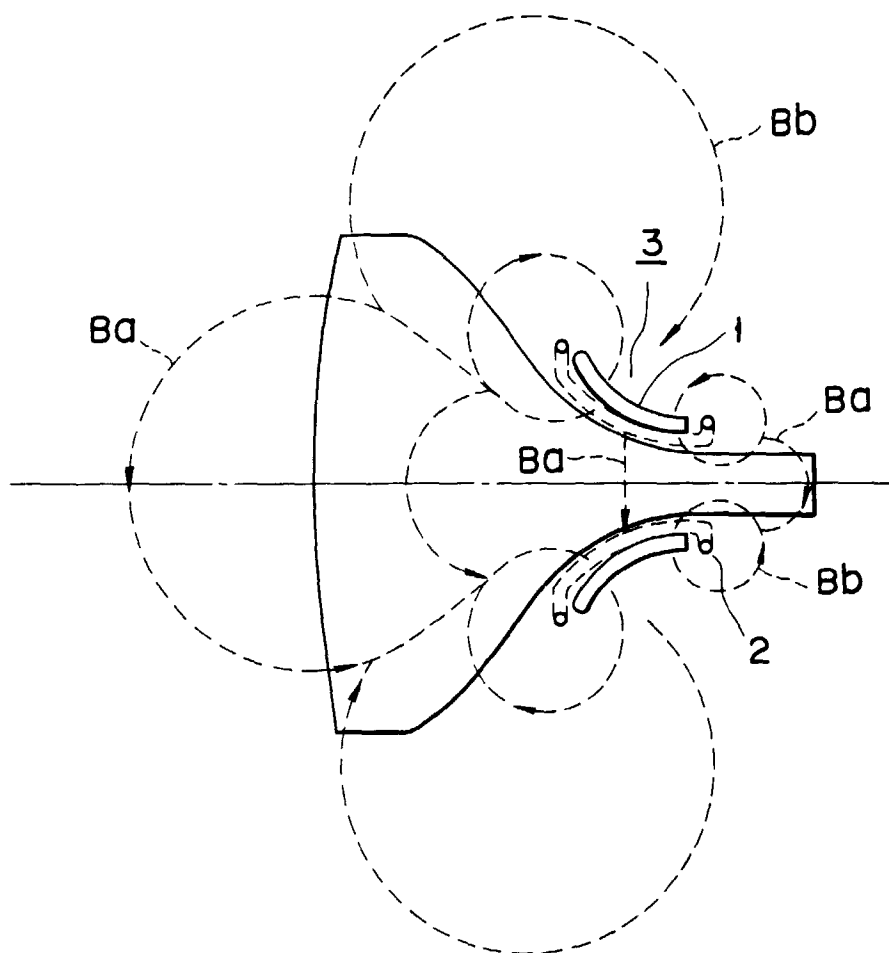


FIG. 1

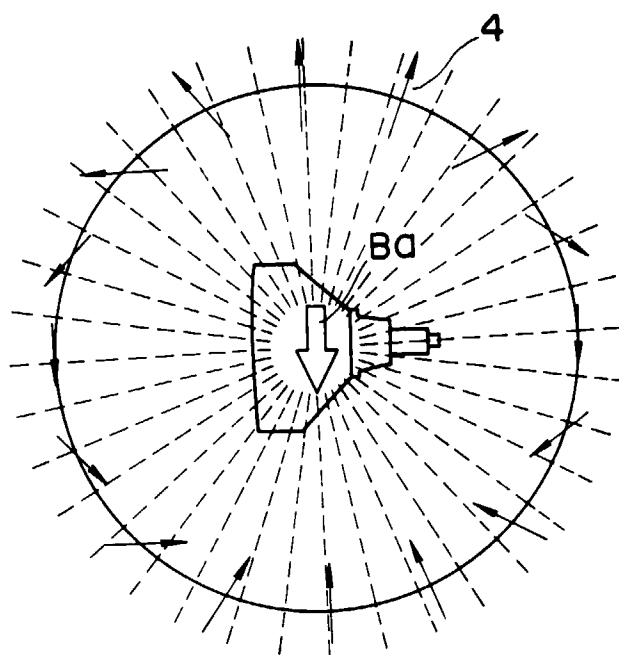


FIG. 2A

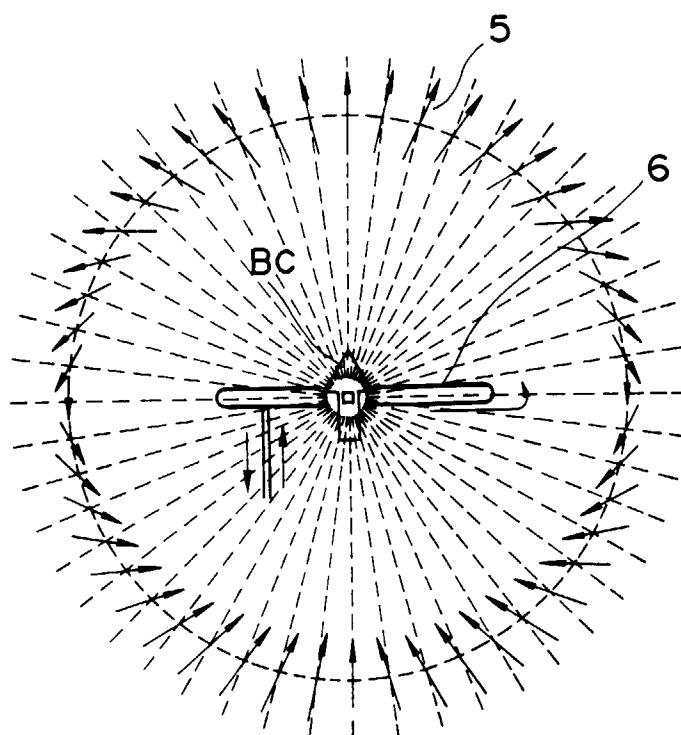


FIG. 2B

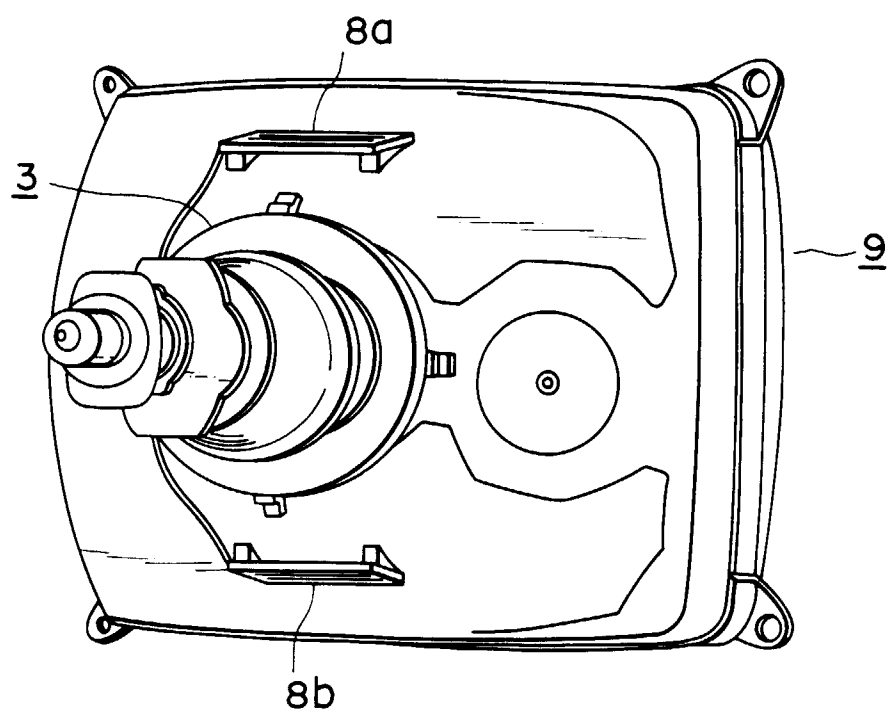


FIG. 3A

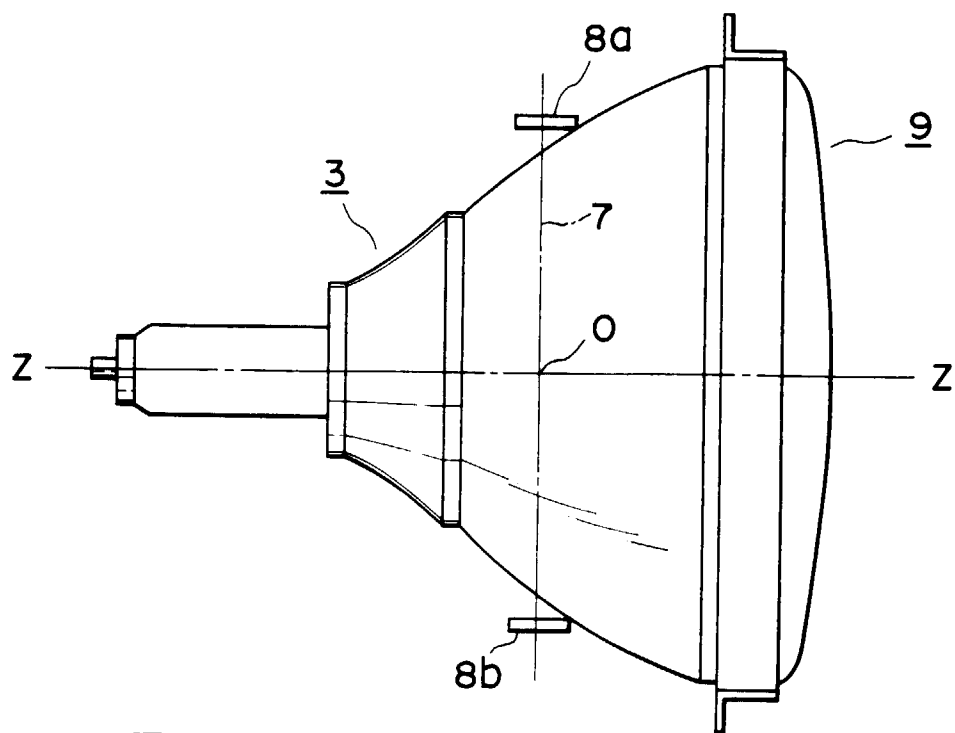


FIG. 3B

FIG. 4A

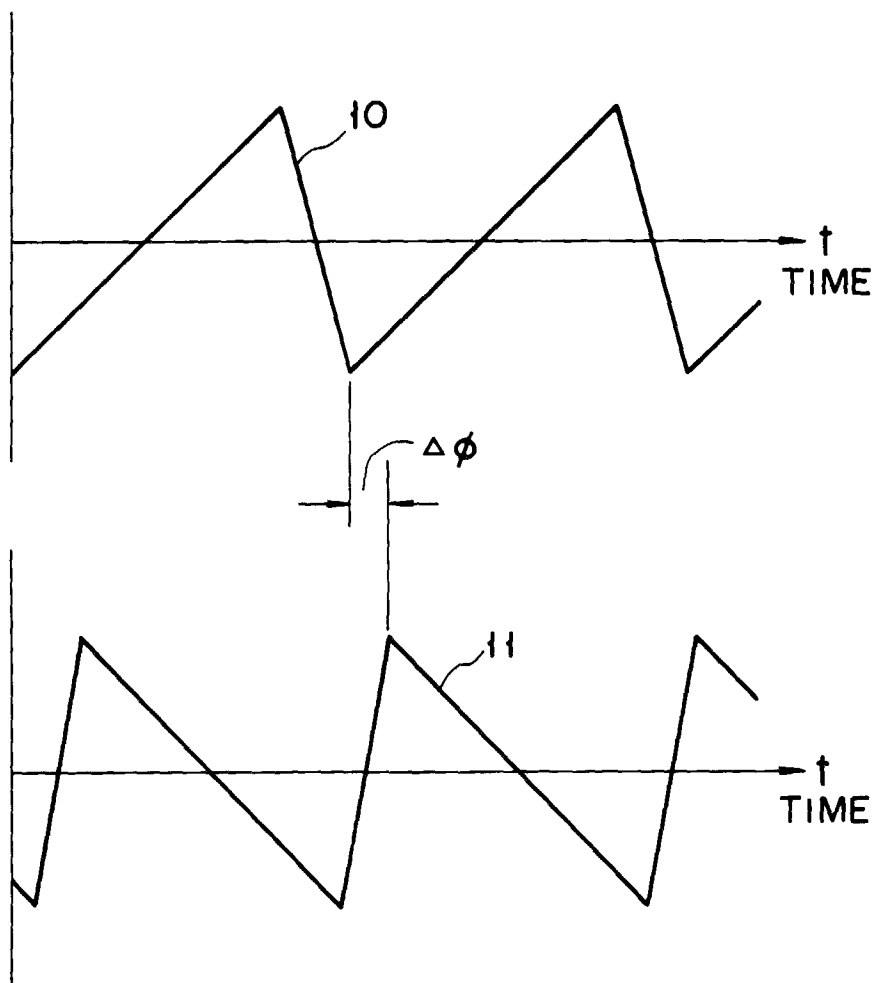


FIG. 4B

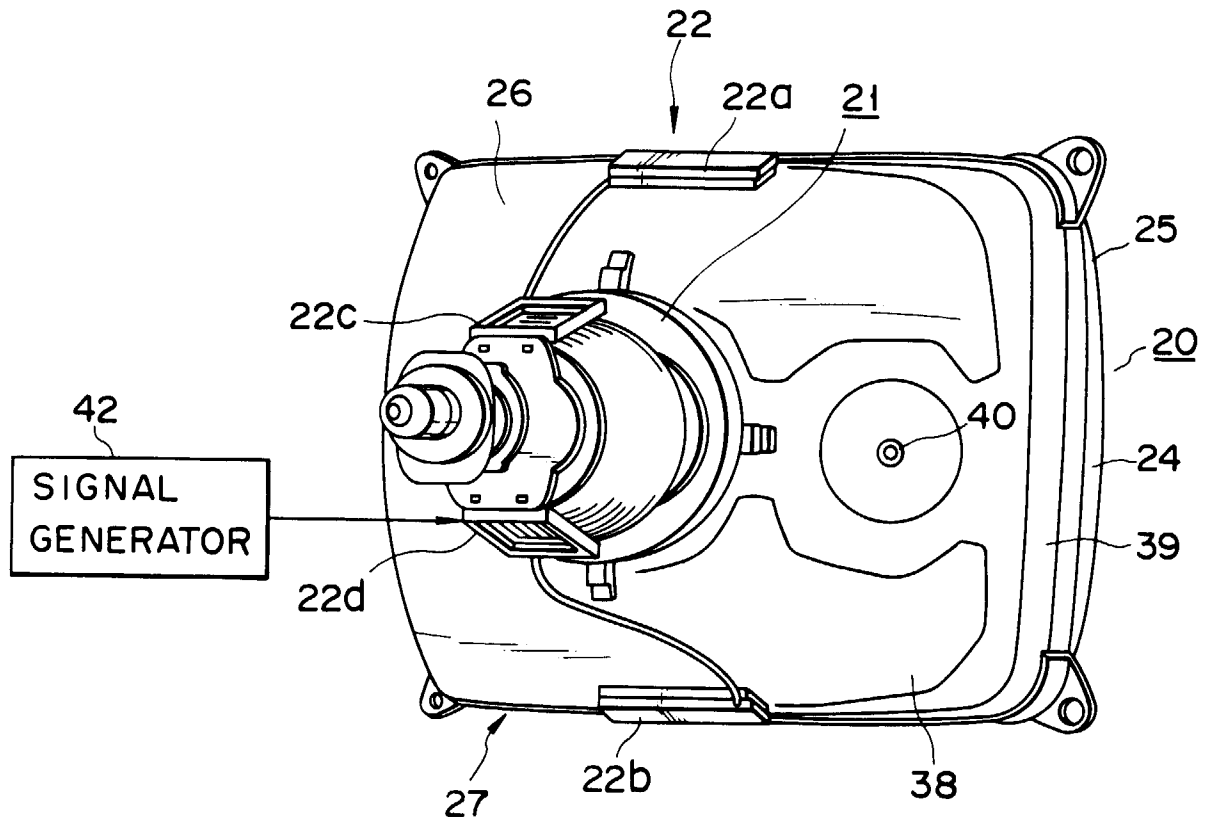


FIG. 5A

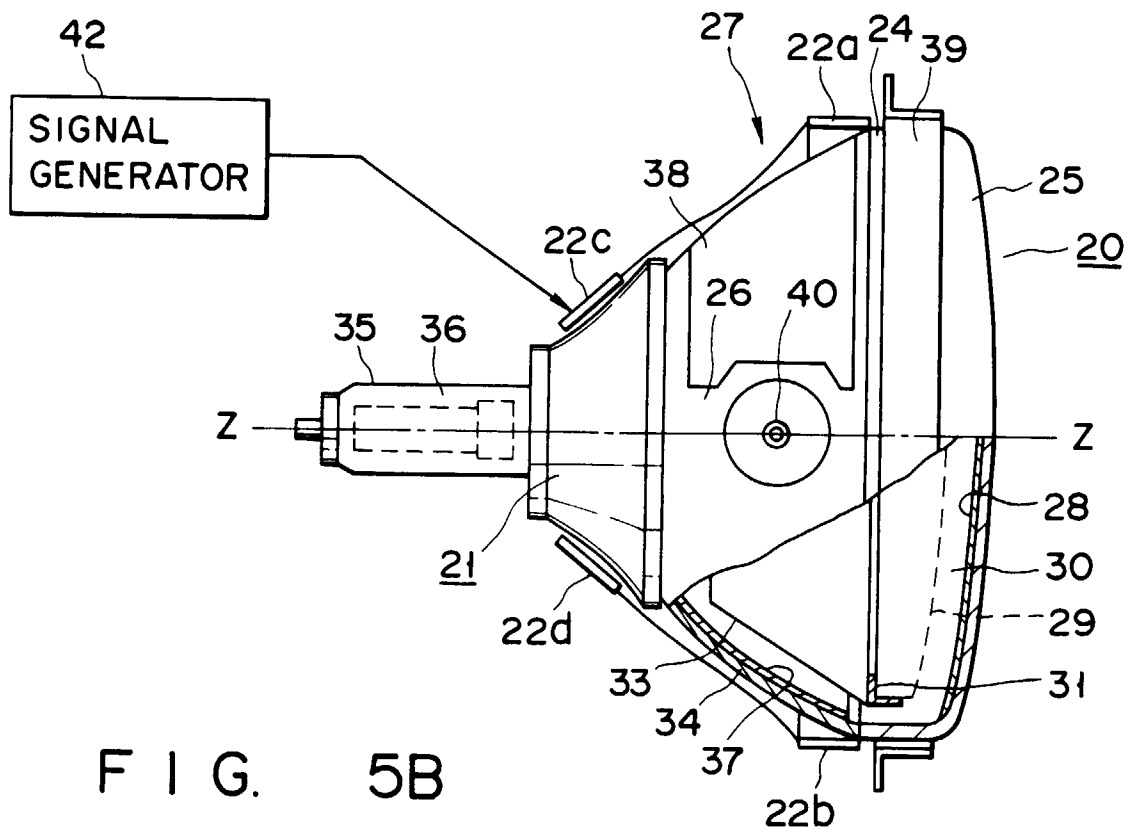


FIG. 5B

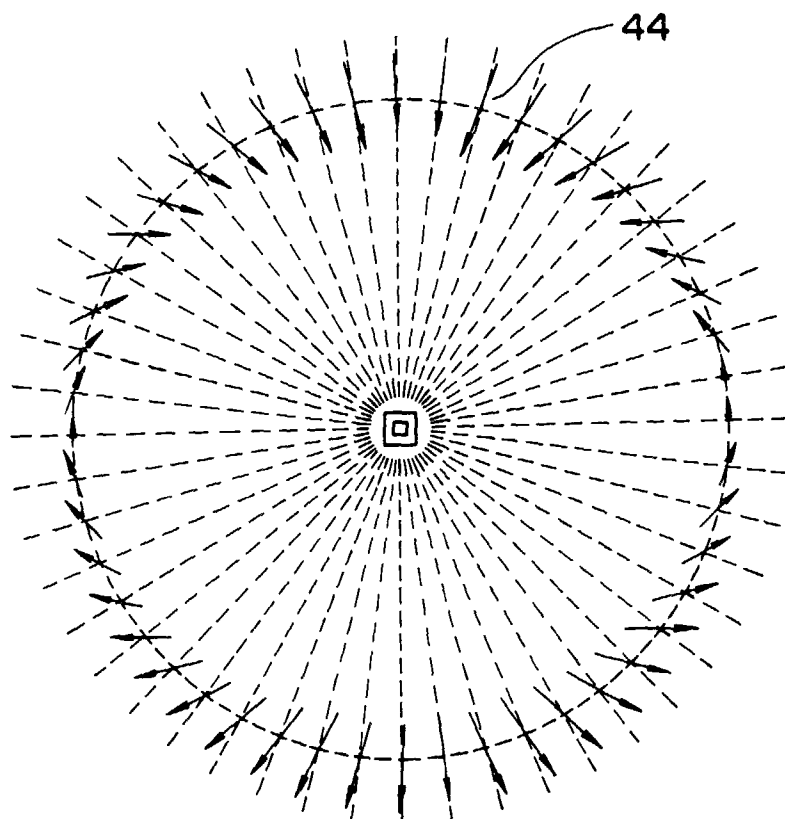


FIG. 6

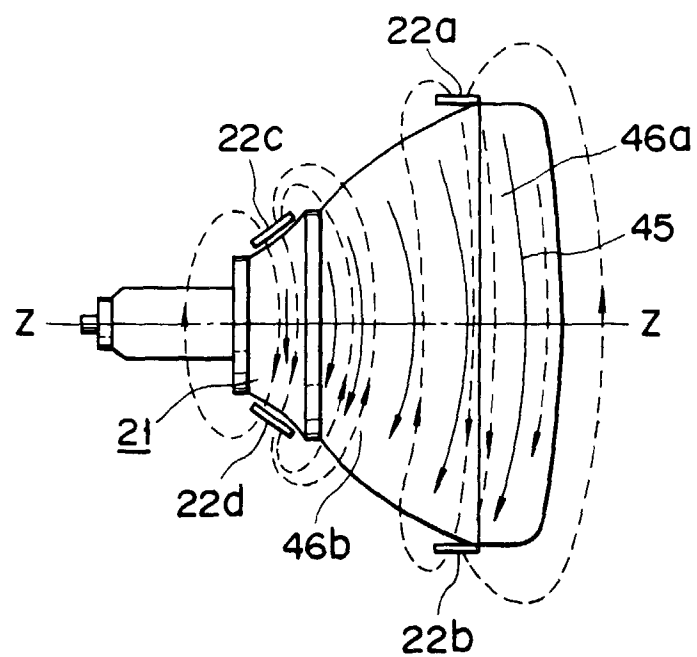


FIG. 7A

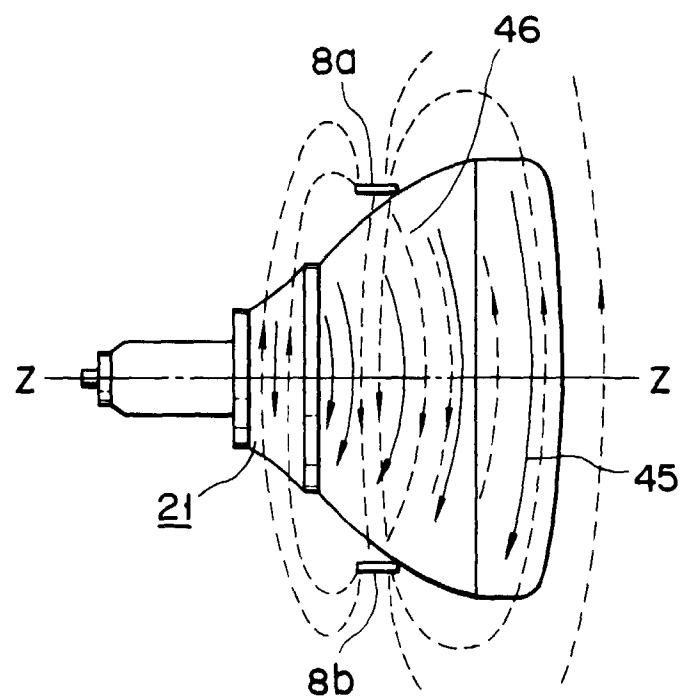


FIG. 7B