(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 343 675 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
05.11.1997 Bulletin 1997/45

(51) Int Cl.[6]: **H04R 3/00**, H04N 5/232

(21) Application number: **89109485.6**

(22) Date of filing: **26.05.1989**

(54) A microphone apparatus for a video camera

Mikrophonapparat für eine Videokamera

Microphone pour une caméra vidéo

(84) Designated Contracting States:
DE FR GB NL

(30) Priority: **27.05.1988 JP 130675/88**
28.06.1988 JP 160085/88
09.09.1988 JP 227007/88

(43) Date of publication of application:
29.11.1989 Bulletin 1989/48

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EP 0 343 675 B1

Printed by Jouve, 75001 PARIS (FR)

Description

This invention relates to a microphone apparatus for a video camera which is equipped with an optical zoom lens and microphones to provide video and audio signals to a video tape recorder. More particularly, this invention relates to a microphone apparatus according to the preamble of claim 1, the directivity of which can be varied in accordance with the control of the zoom lens to suitably match images and sounds.

Microphone apparatus for producing acoustic zoom effects on the basis of monaural sound recording in which the directivity or both the directivity and the sensitivity of a microphone are varied have been proposed (for example, Y. Ishigaki et al.: "Zoom Microphone" presented at the 67th Convention of the Audio Engineering Society (Oct. 31 to Nov. 3, 1980), pre-print 1713 (A-7), and US-A-3,837,736).

In such microphone apparatus, it is impossible to harmonize the working angle of the microphone with the zooming magnification of the zoom lens, resulting in that reproduced sounds are not adequately matched with reproduced images. This imbalance between the working angle and the zooming magnification will be described below by way of illustrating a video camera having a zoom lens of ten magnification and a microphone having a variable directivity (from omnidirectional to second order pressure gradient unidirectional through unidirectional). The viewing angle of the zoom lens of ten magnification in the telescopic state is very narrow (about 4 degrees), while it is about 40 degrees in the wide viewing angle state. The working angle at half maximum of the variable-directivity microphone is 360 degrees in the omnidirectional state, 180 degrees in the unidirectional state, and 100 degrees in the second order pressure gradient unidirectional state (i.e., the telescopic state). Namely, the working angle of the variable-directivity microphone is very wide in comparison with the viewing angle of the zoom lens. When defining an acoustic zooming magnification of a microphone as the ratio of the distance factor in the wide viewing angle mode to that in the telescopic mode, the acoustic zooming magnification of the above-mentioned variable-directivity microphone is about 2.7, i.e., the acoustic zooming magnification of the microphone is very much smaller than the zooming magnification of the optical zoom lens. The distance factor means a distance from a sound source to a directional microphone which is positioned so as to produce noise and echo signals equivalent to those obtained in an omnidirectional microphone separated from a sound source by a unit distance. The distance factors of an omnidirectional microphone, a unidirectional microphone and a second order pressure-gradient microphone are 1, about 1.7 and about 2.7, respectively (see, for example, "An Anthology of Articles on Microphones" from the pages of the Journal of the Audio Engineering Society vol. 1-vol. 27 (1953-1979)", p.62). To eliminate the above-mentioned imbalance, the development of a superdirectional microphone having an extremely sharp directivity is essential. With the present technology, however, it is impossible to realize a microphone having such a directivity and the capability of being built into a video camera which must be compactly constructed.

A microphone apparatus which can produce acoustic zoom effects on the basis of two-channel stereo sound recording is known. An apparatus of this type is disclosed as a stereo sound processor for television broadcasting, in US-A-4,594,610. This processor is designed to use two microphones to conduct a stereo recording. The two microphones are disposed on the right and left of a stage, separately from a video camera, to generate microphone signals **L** and **R** from which a sum signal **(L+R)** and a difference signal **(L-R)** are produced. In order to produce monophonic sounds in the telescopic mode and stereophonic sounds in the wide viewing mode, the mixing ratio of the sum signal **(L+R)** and the difference signal **(L-R)** is controlled in accordance with the control of the zoom lens of the video camera, so that the monophonic sum signal **(L+R)** is greater than the difference signal **(L-R)** in the telescopic mode, and, to the contrary, the difference signal **(L-R)** is greater than the monophonic sum signal **(L+R)** in the wide viewing angle mode. This apparatus can solve a problem in a two-channel stereo recording and reproducing system in which the sum signal **(L+R)** and the difference signal **(L-R)** are delivered without any processing, which problem is that, when images and sounds are recorded simultaneously by panning the video camera to the left and zooming in, the zoomed subject is displayed largely in the center on the television image, but the sound is delivered only from the left loudspeaker.

In such an apparatus, since the microphone is not installed on the video camera, the pan operation of the video camera is performed regardless of the direction of the principal axis of the directivity of the microphone. When the sound source is positioned in the panned direction, therefore, no problem is caused. But, when the sound source is not in the panned direction, the displayed image and the reproduced sound fail to coincide with each other. Even if the apparatus is installed on the video camera and a microphone having any directivity is employed, as far as the processing is executed on the basis of the two signals **L** and **R**, it is difficult to simultaneously satisfy both the quality (such as the localization, spaciousness and perspective) of stereo sounds required in the wide viewing angle mode and the quality (such as clearness) of monophonic sounds required in the telescopic mode, resulting in that either quality must be ignored.

A conventional microphone apparatus, for example, disclosed in the above-mentioned three prior art references is provided with a signal means for generating a signal corresponding to the zooming magnification of the zoom lens. This signal means comprises a potentiometer the resistance of which can be changed by sliding a contactor which is driven in accordance with the movement of the zoom lens, through a means mechanically interconnecting the contactor and the zoom lens.

A conventional microphone apparatus provided with such a signal means has a problem in that mechanical vibrations propagate through the casing or the space to the microphone to generate noise signals. Since the resistance of the potentiometer must be high in view of the power consumption, the level of the noise electromagnetically induced in the potentiometer is so high that the noise is mixed into the signals of the microphone. In the potentiometer, moreover, ncises are generated when the contactor of the potentiometer is slid, to be mixed into the signals of the microphone. Besides, a pctentiometer, which is a slide-type variable resistor, has problems in reliability and reproducibility, resulting in that a potentiometer is not suitable to be used as a part which is frequently operated.

From GB-A-1,116,746 a microphone apparatus according to the preamble of claim 1 is known. This microphone apparatus includes a potentiometer which regulates the voltage supply to two microphones. This potentiometer controls the amplification of microphone signals in accordance with a position signal which is derived from position sensors arranged in connection with the lens system of a video camera. This position sensor or zoom position detection means functions on the basis of the interaction of mechanical and electrical portions.

It is the object of the present invention to provide a microphone apparatus which is able to measure the values to adjust the sound in accordance to the setting of the zoom lens in an approved manner.

This object is solved by the microphone apparatus according to claim 1. Advantageous embodiments of the microphone apparatus according to the invention are defined by the features listed in the subclaims.

In a preferred embodiment, the zoom position detection means detects the zoom position of said zoom lens without making mechanical contact with said zoom lens.

In a preferred embodiment, the first and second signal means further comprise an analog multiplexer which selects one of channels in accordance with a digital signal, and each of said first and second control signals is a DC signal the level of which corresponds to said selected channel.

In a preferred embodiment, the first and second signal means further comprise: an analog multiplexer which selects one of channels in accordance with a digital signal; a reference voltage source connected to the common terminal of said analog multiplexer; resistors one end of each of which is connected corresponding one of said channels of said analog multiplexer; and a reference resistor, one end of said reference resistor being connected to other end of each of said resistors, and the other end of said reference resistor being grounded.

In a preferred embodiment, at the wide viewing angle zoom position of said zoom lens, the mixing ratio of said stereo sound pickup signals is set to 100%, and the mixing ratio of said superdirectional sound pickup signal is set to 0%, and, at the telescopic zoom position of said zoom lens, the mixing ratio of said stereo sound pickup signals is set to 0%, and the mixing ratio of said superdirectional sound pickup signal is set to 100%, said mixing ratios being varied within said ranges in proportion to the variation of the viewing angle of said zoom lens.

In a preferred embodiment, the first and second sum signals are varied in proportion to a power of a zooming magnification of said zoom lens.

In a preferred embodiment, the first and second sum signals are varied in proportion to a power ranging 0.3 to 0.5 of a zooming magnification of said zoom lens.

In a preferred embodiment, at the wide viewing angle zoom position of said zoom lens, the mixing ratio of said stereo sound pickup signals and is set to 100%, and the mixing ratio of said superdirectional sound pickup signal is set to 0%, and, at the telescopic zoom position of said zoom lens, the mixing ratio of said superdirectional sound pickup signal is set to be larger than the mixing ratios of said stereo sound pickup signals, said mixing ratios being varied within said ranges in proportion to the variation of the viewing angle of said zoom lens.

In a preferred embodiment, the zoom position detection means further comprises: two reflector areas formed on the outer periphery of a zoom ring of said zoom lens, each of said reflector areas being formed by a material of a high reflection index material and having a triangle shape which elongates along the rotation direction of said zoom ring; a light emitting means for irradiating light on said reflector areas; and a light receiving means for detecting light reflected from each reflector areas, and said first and second control signals are analog signals.

Thus, the invention described herein makes possible the objectives of:

(1) to provide a microphone apparatus for a video camera which can record sounds adequately matched with images;

(2) to provide a microphone apparatus for a video camera which can record sounds with excellent acoustic zooming effects;

(3) to provide a microphone apparatus for a video camera in which noise due to the operation of the zoom lens can be prevented from being generated;

(4) to provide a microphone apparatus for a video camera which is excellent in reliability;

(5) to provide a video camera which can record sounds adequately matched with images;

(6) to provide a video camera which can record sounds with excellent acoustic zooming effects;

(7) to provide a video camera in which noise due to the operation of the zoom lens can be prevented from being generated;

(8) to provide a video camera which is excellent in reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawings as follows:

Figure 1 is a block diagram of a microphone apparatus according to the invention.

Figure 2a shows a reflector pattern formed on the zoom ring of the zoom lens in the apparatus of Fig. 1.

Figure 2b is a circuit diagram of the zooming magnification detection means.

Figure 3 is a circuit diagram illustrating the first and second signal means.

Figure 4 is a graph showing the relation between the control voltage and the attenuation in the first, second and third amplifying means.

Figure 5 is a graph showing a preferable relation between a viewing angle of the zoom lens and the mixing ratio of the superdirectional sound pickup signal to the stereo sound pickup signal.

Figure 6 is a graph showing preferable relations between a zooming magnification of the zoom lens and the magnitudes of the sum signals supplied from the first and second adding means.

Figure 7 is a graph showing the relation between the viewing angle of the zoom lens and the rotation angle of the zoom ring.

Figure 8 is a graph showing the relation between the viewing angle and the zooming magnification of the zoom lens.

Figure 9 is a diagram showing the relation between the viewing angle and the mixing levels of the the superdirectional sound pickup signal and stereo sound pickup signal, when the zoom lens having the properties shown in Figs. 7 and 8 and the mixing is conducted under the relations shown in Figs. 5 and 6.

Figure 10 is a graph showing another preferable relation between a viewing angle of the zoom lens and the mixing ratio of the superdirectional sound pickup signal to the stereo sound pickup signal.

Figure 11a is a block diagram of another microphone apparatus according to the invention.

Figure 11b shows a reflector pattern formed on the zoom ring of the zoom lens in the apparatus of Fig. 11a.

Figure 11c is a diagram illustrating the zoom position detection means of the apparatus of Fig. 11a.

Figure 1 is a block diagram of a microphone apparatus for a video camera according to the invention. The microphone apparatus of Fig. 1 comprises an optical zoom lens **1**, a superdirectional sound pickup means **2**, a stereo sound pickup means **3**, a zoom position sensor **4**, first and second mixing control circuits **5** and **6**, and first to third amplifiers **7** - **9**.

The zoom lens **1** incorporates a lens optical system **100** for focusing the light from an object, and a photoelectric converting device **200** for converting the image of the object formed by the lens optical system **100** into electric signals. The lens optical system **100** is a conventional optical system composed cf plural fixed and movable lens elements. A typical example of the photoelectric converting devices **200** is a charge coupled device (CCD). The output signals of the photoelectric converting device **200** are supplied to a video signal processing circuit **300** and processed therein in a usual manner to be converted into image signals such as composite television signals, RGB signals, and two-channel component signals composed of luminance signals and color signals.

The superdirectional sound pickup means or microphone **2** and the stereo sound pickup means or microphone **3** are disposed so that their front faces are directed along the center line of the viewing angle of the zoom lens **1**. The superdirectional microphone **2** picks up the sound field existing in a narrow range in its frontal direction, and produces a monaural superdirectional sound pickup signal **D**. The stereo microphone **3** picks up the sound field existing in a wide range in its frontal direction, and generates stereo sound pickup signals **L** and **R**.

The zoom lens **1** is provided with a zoom ring **21** which can be rotated to vary the focal length of the zoom lens **1**. The focal length corresponds, as shown in Fig. 7, uniquely to the rotation angle of the zoom ring **21**. Namely, when rotating the zoom ring **21** in one direction, the viewing angle varies from the wide viewing angle to the telescopic, or, to the contrary, when rotating the zoom ring **21** in the reverse direction, the viewing angle changes from the telescopic to the wide viewing angle. The zoom ring **21** can be rotated not only by a manual operation but also by a motor-driven operation. A gear **G1** formed at one end of the zoom ring **21** is meshed with a gear **G2** mounted on the shaft of a driving motor **20** so that the rotation of the driving motor **20** energized by a power source **B1** is transmitted to the zoom ring **21** through the gears **G1** and **G2**. The modes of zoom-in and zoom-out are changed over by switching over the rotation direction of the driving motor **20** by a switch **SW1**.

The circumferential surface of the zoom ring **21** is formed by a black material of a low reflection index. A reflector **22** patterned as shown in Fig. 2a has an elongated rectangular shape and is formed on the surface of the zoom ring **21**. The zoom position sensor **4** comprises three reflection type photosensors which, as shown in Fig. 2b, are arranged so as to face the reflector **22**, and detect the rotation angle of the zoom ring **21** to deliver a 3-bit digital zoom position signal (A0, A1, A2).

The first mixing control circuit **5** is connected to the zoom position sensor **4**, and receives the zoom position signal (A0, A1, A2) to produce a first control signal **Vc1** of a DC voltage the level of which corresponds to the zoom position signal (A0, A1, A2) (Fig. 3). Similarly, the second mixing control circuit **6** is connected to the zoom position sensor 4, and receives the zoom position signal (A0, A1, A2) to produce a second control signal **Vc2** of a DC voltage the level of which corresponds to the zoom position signal (A0, A1, A2).

The first voltage control amplifier **7** has an attenuation-control voltage characteristic shown in Fig. 4. The amplifier **7** is connected to the super-directional microphone **2** and the first mixing control circuit 5 to receive the superdirectional sound pickup signal **D** and the first control signal **Vc1**. The amplifier 7, by using the first control signal **Vc1** as a control signal, multiplies the magnitude of the superdirectional sound pickup signal **D** by **K1**, and outputs the product (**k1·D**). Likewise, the second voltage control amplifier **8** is connected to the stereo microphone **3** and the second mixing control circuit **6** to receive the stereo sound pickup signal **L** and the second control signal **Vc2**. The second amplifier 8, by using the second control signal **Vc2** as a control signal, multiplies the magnitude of the stereo sound pickup signal **L** by **K2**, and outputs the product (**K2·L**). The third voltage control amplifier **9** is linked to the stereo microphone **3** and the second mixing control circuit **6**, and receives the stereo sound pickup signal **R** and the second control signal **Vc2**. The third voltage control amplifier **9**, by using the second control signal **Vc2** as a control signal, multiplies the magnitude of the stereo sound pickup signal **R** by **K2**, and outputs the product (**K2·R**).

The output signal (**K1·D**) of the first amplifier **7** and the output signal (**K2·L**) of the second amplifier **8** are supplied to a first adder **10**, and the output signal (**K1·D**) of the first amplifier **7** and the output signal (**K2·R**) of the third amplifier **9** are supplied to a second adder **11**. The first adder **10** adds the output signal (**K1·D**) and the output signal (**K2·L**) to produce a first sum signal (**K1·D+K2·L**). The second adder **11** adds the output signal (**K1·D**) and the output signal (**K2·R**) to produce a second sum signal (**K1·D+K2·R**).

The construction and operation of the microphone apparatus of Fig. 1 will be described in more details.

Figure 2a shows the pattern of the reflector **22**. The reflector **22** comprises a first reflector area **22a**, a second reflector area **22b** and a third reflector area **22c**. In each of the reflector areas, one or more portions of a high reflection index (black regions in Fig. 2a) and one or more portions of a low reflection index (white regions in Fig. 2a) are arranged along the rotation direction of the zoom ring **21**. The lateral direction in the drawing corresponds to the rotation direction of the zoom ring **21**. The left end corresponds to the wide viewing angle zoom position, and the right end to the telescopic zoom position. The high reflective portions consist of aluminum, and the untreated surface of the zoom ring **21** constitutes the low reflective portions. The three reflector areas **22a** - **22c** which consist of high reflective and low reflective portions are arranged as shown in Fig. 2a, so that 3-bit (i.e., 8-stage) digital data on the rotation angle of the zoom ring **21** can be obtained. In this embodiment, the reflector **22** is patterned so that seven separate data **a** to **g** on the rotation angle of the zoom ring **21** can be obtained in sequence along the direction from the wide viewing angle side to the telescopic side. It is obvious for those skilled in the art that, when the reflector **22** is patterned so as to produce signals of a larger number of bits, more detailed information about the rotation angle of the zoom ring **21** can be obtained, thereby enabling the microphone apparatus to be controlled more precisely.

Figure 2b shows the relation between the zoom position sensor **4** and the reflector areas **22a** - **22c**. Reflection type photosensors **30**, **31**, **32** each of which is provided with a light emitting diode **LED** and a phototransistor **PT** are disposed to face the reflector areas **22a**, **22b**, and **22c**, respectively. Each light emitting diode **LED** is connected to a load resistor **Rs**, and driven by a power source **B2** to emit light the amount of which corresponds to the level of a forward current. Each phototransistor **PT** is connected to a load resistor **Rd**, and driven by the power source **B2** to generate a current the level of which corresponds to the amount of light incident thereon, resulting in that a voltage appears across the load resistor **Rd**. In the photosensor **30**, the light emitting diode **LED** constantly emits light the amount of which corresponds to the forward current level, toward the reflector area **22a**, and the phototransistor **PT** detects the reflected light from the reflector area **22a**, and converts the detected light into electric signals which are then supplied to an amplifier **33**. Since the amount of the reflected light from the reflector area **22a** varies in accordance with the pattern facing the photosensor **30**, the output of the phototransistor **PT** is a binary signal the value of which varies corresponding to the rotation angle of the zoom ring **21**. The amplifier **33** amplifies the signal to produce a zoom position signal **A0**. In the same way, the photosensors **31** and **32** respectively generate electric signals corresponding to the pattern of the reflector areas **22b** and **22c**. Amplifiers **34** and **35** amplify the signals from the photosensors **31** and **32** to produce zoom position signals **A1** and **A2**. The signals **A0**, **A1** and **A2** constitute a 3-bit zoom position signal (**A0**, **A1**, **A2**) which represents the rotation angle of the zoom ring **21** and is supplied to the first and second mixing control circuits **5** and **6**. In this embodiment, the zoom position sensor **4** is designed so as to constantly detect the zoom position. Alternatively, the sensor **4** may be designed so as to detect the zoom position intermittently.

Figure 3 illustrates the first and second mixing control circuits **5** and **6**. The first mixing control circuit **5** supplies a first control voltage **Vc1** to the first voltage control amplifier **7** which controls the mixing level of the superdirectional sound pickup signal **D**. The second mixing control circuit **6** supplies a second control voltage **Vc2** to the second and third voltage control amplifiers **8** and **9** which control the mixing levels of the stereo sound pickup signals **L** and R. A multiplexer **40** of the first mixing control circuit **5** and a multiplexer **41** of the second mixing control circuit **6** can control an eight-channel analog switch in accordance with 3-bit digital signals.

In the first mixing control circuit **5**, a common terminal COM of the multiplexer **40** is connected to a **DC** power source from which a predetermined voltage **B3** is supplied. To terminals **X1** - **X7** of the multiplexer **40**, resistors **R1** - **R7** are connected respectively. The other ends of the resistances **R1** - **R7** are bundled together and connected to a resistor **R0** the other end of which is grounded. The multiplexer **40** receives the 3-bit zoom position signal (A0, A1, A2) from the zoom position sensor **4**, and selects one of the terminals **X1** - **X7** in accordance with the value of the zoom position signal. The multiplexer **40** is designed so as to select the terminal **X1** when receiving the zoom position signal (**A0**, **A1**, **A2**) corresponding to the zoom position a of the reflector **22**, and to select one of the terminals **X2** - **X7** when receiving the zoom position signal (**A0**, **A1**, **A2**) corresponding to one of the zoom positions **b** - **g**. Figure 3 shows the state where the common terminal **COM** is connected to the terminal **X2** corresponding to the zoom position **b**. In this state, the level of the first control signal **Vc1** is given by {**B3**·**R2**/(**R2**+**R0**)} where **R2** and **R0** are resistance values of the resistor **R0** and **R2**, respectively. In this way, one of the resistors **R1** - **R7** is selected in response to the detected one of the zoom positions **a** - **g** so that the level of the first control signal **Vc1** can be selected. Therefore, it is possible to freely set the mixing level of the superdirectional sound pickup signal **D**.

In the second mixing control circuit **6**, similarly, the common terminal **COM** of the multiplexer **41** is connected to the same **DC** power source which supplies the predetermined **DC** voltage **B3**. To terminals **X1** - **X7**, resistors **R11** - **R17** are connected respectively. The other ends of the resistors **R11** - **R17** are bundled together and connected to a resistor **R10** the other end of which is grounded. The multiplexer **41** is designed so as to select one of the terminals **X1** - **X7** when receiving the zoom position signal (**A0**, **A1**, **A2**) corresponding to one of the zoom positions **a** - **g**. The second control signal **Vc2** at each zoom positions, which will be supplied to the second and third voltage control amplifiers **8** and **9**, is given by the division of the voltage **B3** through a combination of the resistor **R10** and one of the resistors **R11** - **R17**, so that the level of the second control signal **Vc2** can be selected. Therefore, it is also possible to freely set the mixing level of the stereo sound pickup signals **L** and **R**.

Figure 4 illustrates the relation between the control voltage and the attenuation in the first, second and third voltage control amplifiers **7**, **8** and **9**. A voltage control amplifier has a control terminal for controlling the amplification factor, and the amplification factor is controlled by applying a DC voltage to the control terminal. In Fig. 4, a curve **200** indicates the attenuation-control voltage characteristic of the amplifiers **7**, **8** and **9**. The axis of abscissas indicates the control voltage in the unit of volts. The axis of ordinates denotes the attenuation expressed in decibels. In these voltage control type amplifiers, when the control voltage is 0V, the attenuation is 0dB. The attenuation is increased with the increase of the control voltage, and the attenuation of 80dB can be achieved at the control voltage of about 2.5V. The gradient of the curve 200 in the straight line region is about -34dB/V. The amplifiers **7**, **8** and **9** having such characteristics can control the mixing ration of the superdirectional sound pickup signal **D** and the stereo sound pickup signals L and **R**, in accordance with the control signals **Vc1** and **Vc2**, which are DC voltages.

Figure 5 shows a preferable example of the mixing ratio between the superdirectional sound pickup signal **D** and the stereo sound pickup signals **L** and **R** with regard to the current viewing angle of the zoom lens **1**. In Fig. 5, a curve **300** represents the mixing ratio-viewing angle relation, and the axis of abscissas denotes the viewing angle of the zoom lens **1**. The left ordinate indicates the mixing ratio {K1/(K1+K2)} of the superdirectional sound pickup signal **D**, and the right ordinates indicates the mixing ratio {K2/(K1+K2)] of the stereo sound pickup signals **L** and **R**. At the wide viewing angle zoom position **301**, the mixing ratio of the stereo sound pickup signals **L** and **R** is 100%, and, at the telescopic zoom position **302**, the mixing ratio of the superdirectional sound pickup signal **D** is 100%. The mixing ratios of the signals are varied from 0% to 100% in proportion to the variation in the viewing angle.

In this embodiment, the resistances of the resistors **R1** - **R7** and **R11** - **R17** of the first and second mixing control circuits **5** and **6** can be determined in the following manner: (1) the mixing ratio of the superdirectional sound pickup signal **D** to the signals **R** and **L** is selected from the mixing ratio-viewing angle curve **300** (Fig. 5); (2) the control voltages **Vc1** and **Vc2** of the first, second and third voltage control amplifiers **7**, **8** and **9** are determined from the attenuation-control voltage curve **200** (Fig. 4) so that they correspond to the selected mixing ratio; and (3) the resistances of the resistors **R1** - **R7** and **R11** - **R17** are set so that the control voltages **Vc1** and **Vc2** can be obtained at the zoom positions **a**-**g**. Consequently, the microphone apparatus can realize, in the wide viewing angle mode, the spaciousness, perspective, localization, mobility, separation from background noises and others, which are the features of the stereo sound reproduction, and, in the telescopic mode, record clearly the sound from the object sound source. Therefore, the microphone apparatus can achieve acoustic zoom effects which match well with the images and have psychoacoustical effects.

Figure 6 shows a preferable example of the relation between the current zooming magnification **M** of the zoom lens **1** and the magnitudes of sum signals (K1·D+K2·L) and (K1·D+K2·R) delivered from the first and second adders **10** and **11**. The axis of abscissas indicates zooming magnification **M** in logarithmic form. The axis of ordinates expresses the magnitudes of the sum signals (K1·D+K2·L) and (K1·D+K2·R) in the unit of decibels, which are relative values against the values corresponding to the zooming magnification **M** of one (M=1). A curve **400** is an output level-zooming magnification relation curve obtained by varying the magnitudes of the sum signals in proportion to the 0.5th power of the current zooming magnification M. Curves **401** and **402** show similar relations obtained in the 0.4th power and 0.3th power of the magnification **M**, respectively. According to our experiments in psychoacoustic properties, by controlling the output level in accordance with the curve **400** when zooming-in and in accordance with the curve **402** when zooming-out, sound volumes matching with the variation of the image size can be obtained, and the acoustic zoom effects can be greatly improved. The output level is controlled by the first and second mixing control circuits **5** and 6 shown in Fig. 3. As apparent from the configuration of the first and second mixing control circuits **5** and **6**, the output level and the mixing ratio can be set independently.

Figure 7 shows the relation between the viewing angle and the rotation angle of the zoom ring **21** of the zoom lens **1**. A curve **500** is a viewing angle-rotation angle curve. Figure 8 illustrates the relation between the zooming magnification **M** and the viewing angle of the zoom lens **1**. A curve **600** shown in Fig. 8 is a zooming magnification-viewing angle curve. As mentioned above, the zoom lens **1** has a zooming magnification of ten times at maximum, and hence the viewing angle is about 4.2 degrees in the wide viewing angle mode and is about 42 degrees in the telescopic mode.

Figure 9 is a diagram showing the mixing level of the superdirectional microphone signal **D** and the stereo microphone signals **L** and **R**, at the zoom positions **a** - **g** of the zoom lens **1**. In this case, the zoom lens **1** has characteristics shown in Figs. 7 and 8, the mixing of the superdirectional sound pickup signal **D** and the stereo sound pickup signals **L** and **R** is set so as to satisfy the relations shown by the mixing ratio-viewing angle curve **300** (Fig. 5) and by the output level-zooming magnification curve **401** (Fig. 6). A curve **700** is a reference curve for setting the mixing level of the superdirectional sound pickup signal **D**, and a curve **701** is a reference curve for setting the mixing level of the stereo sound pickup signals L and **R**. In Fig. 9, fine lines extending laterally denote mixing levels of the superdirectional sound pickup signal **D**, and thick lines indicate mixing levels of the stereo sound pickup signals **L** and **R**. The symbols **a** - **g** in the upper portion of Fig. 9 denote the zoom positions of the reflector **22** shown in Fig. 2a.

Figure 10 shows a preferable example of the mixing ratio of the superdirectional sound pickup signal **D** and the stereo sound pickup signals **L** and **R** to the current viewing angle of the zoom lens 1. A curve **800** shows the relation between the mixing ratio and the viewing angle. At the wide viewing angle zoom position **801**, the mixing ratio of the stereo sound pickup signals **L** and **R** is set to 100%, and, at the telescopic zoom position **802**, the mixing ratio of the superdirectional sound pickup signal **D** is set to 70% and that of the stereo sound pickup signals **L** and **R** is 30%. The mixing ratios of the signals are varied within the above-mentioned range in proportion to the variation in the viewing angle. By changing the mixing ratios according to the mixing ratio-viewing angle curve **800**, the microphone apparatus can pick up the background sound even when the telescopic mode is set, resulting in that the presence property is enhanced when reproducing. This is very effective, in particular, in a so-called surround-reproducing system wherein two or three loudspeakers are arranged in the front and one or two speakers in the rear. The mixing ratio of the stereo sound pickup signals **L** and **R** at the telescopic zoom position may be set to 30%, but any level is acceptable as far as the stereo sound pickup signals **L** and **R** are included.

Figure 11a illustrates another microphone apparatus according to the invention. The microphone apparatus of Fig. 11a is a modification of the apparatus of Fig. 1 in which the zoom position sensor **4** is an analog sensor so that the first and second control signal **Vc1** and **Vc2** can be directly obtained (i.e., the mixing control circuits **5** and **6** are omitted). Only the portions different from the apparatus of Fig. 1 will be described below. The outer surface of a zoom ring **21** which is formed by a black or low-reflection index material is covered by a reflector **60**. The lateral direction in Fig. 11b corresponds to the rotation direction of the zoom ring **21**, and the left end corresponds to the wide viewing angle zoom position and the right end to the telescopic zoom position. As shown in Fig. 11b, the reflector **60** comprises first and second reflector areas **60a** and **60b** which are made from aluminum and disposed in a substantially parallel manner. The reflector areas **60a** and **60b** have a shape of a long triangle elongated along the rotation direction, and are disposed in a reverse parallel manner. In other words, with the rotation of zoom ring from the wide viewing position to th telescopic position, the widths **W1** of the reflector area **60a** is gradually decreased, while the widths **W2** of the reflector area **60b** is gradually increased.

The zoom position sensor **4** is similar in structure to that used in the apparatus of Fig. 1, and comprises first and second reflection type photosen sors **30** and **31**. As shown in Fig. 11c, the first photosensor **30** is faced to the first reflector area **60a**, and the second photosensor **31** is faced to the second reflector area **60b**. The first photosensor **30** detects the amount of light reflected from the reflector area **60a** to output the first control signal **Vc1**. The second photosensor **31** detects the amount of light reflected from the reflector area **60b** to output the second control signal **Vc2**. The levels of the signals **Vc1** and **Vc2** respectively correspond to the width **W1** of the first reflector area **60a** and the width **W2** of the second reflector area **60b**. The widths **W1** and **W2** vary as the zoom ring **21** rotates, so that the level of each of the control signals **Vc1** and **Vc2** can be freely changed in accordance with the rotation angle of the zoom ring **21**. For example, in Fig. 11b, the width **W1** of the first reflector area 60a is wide, and the width **W2** of the second reflector area **60b** is narrow, at the wide viewing zoom position, and vice versa at the telescopic position.

At the wide viewing position, therefore, the output signal **Vc1** from the first photosensor **30** is greater than the output signal **Vc2** from the second photosensor **31**. From the attenuation-control voltage curve **200** (Fig. 4), the attenuation of the superdirectional sound pickup signal **D** which depends on the control signal **Vc1** is greater than the attenuation of the stereo sound pickup signals **L** and **R** which depends on the control signal **Vc2**, thereby causing the mixing ratio of the stereo sound pickup signal **L** and **R** to be large. Conversely, at the telescopic position, the mixing ratio of superdirectional sound pickup signal D is large, since the width **W1** of the first reflector area **60a** is narrow and the width **W2** of the second reflector area **60b** is wide. The microphone apparatus of Fig. 11a has advantages that the simplified electric circuit can reduce the manufacturing cost, and that the apparatus can be continuously and finely controlled because the control signals **Vc1** and **Vc2** are not discrete ones.

Claims

1. A microphone apparatus for a video camera having

- at least two sound pickup means (2, 3), one of them being a superdirectional sound pickup means (2) for generating a superdirectional sound pickup signal (D);
- a zoom position detection means (4) for generating at least one zoom position signal (A0, A1, A2) which corresponds to the zoom position of a zoom lens (1);
- at least two amplifying means (7, 8, 9);
- one of the at least two amplifying means is a first amplifying means (7) for generating a first amplified signal (K1·D), said first amplified signal being a product of said superdirectional sound pickup signal (D) and a first value (K1) which corresponds to the zoom position signal (A0, A1, A2);
- one of the at least two amplifying means is a second amplifying means (8) for generating a second amplified signal (K2·L), said second amplified signal being a product of a first signal of one of said sound pickup means (L) and a second value (K2) which corresponds to the zoom position signal (A0, A1, A2);
- a control means includes a first adding means (18) for generating a first sum signal;

characterized by the following features:

- one of the at least two sound pickup means is a stereo sound pickup means (3) for generating stereo sound pickup signals (L, R);
- said first signal (L) is one stereo sound pickup signal;
- a further amplifying means is provided as a third amplifying means (9) for generating a third amplified signal (K2·R), said third amplified signal being a product of another of said stereo sound pickup signals (R) and said second value (K2) which corresponds to the zoom position signal (A0, A1, A2);
- said first sum signal is the sum of said first amplified signal and said second amplified signal;
- said control means further includes a second adding means (11) for generating a second sum signal which is the sum of said first amplified signal and said third amplified signal; and
- said zoom position detection means (4) comprises:
  - a plurality of reflector areas (2a, 22b, 22c) formed on the outer periphery of a zoom ring (21) of said zoom lens (1), each of said reflector areas being composed of a row of one or more high reflection index portions and one or more low reflection index portions;
  - a light emitting means (LED) for irradiating light on said reflector area; and
  - a light receiving means (PT) for detecting light reflected from each reflector areas,
  - said zoom position signal represents the reflection index of said reflector areas.

2. A microphone apparatus according to claim 1, **characterized** in that said zoom position detection means detects the zoom position of said zoom lens without making mechanical contact with said zoom lens.

3. A microphone apparatus according to one of the claims 1 or 2, **characterized** in that said first and second values are determined in accordance with a first control signal (V_c1) and a second control signal (V_c2) which are respectively produced by first and second signal means (5, 6), and said first and second signal means comprise an analog multiplexer which selects one of the channels in accordance with a digital signal, and each of said first and second control signals is a DC signal, the level of which corresponds to said selected channel.

4. A microphone apparatus according to one of the claims 1 to 3, **characterized** in that said first and second values are determined in accordance with a first control signal (V_c1) and a second control signal (V_c2) which are respectively produced by first and second signal means (5, 6), and said first and second signal means comprise:

- an analog multiplexer which selects one of the channels in accordance with a digital signal;
- a reference voltage source connected to the common terminal of said analog multiplexer;
- resistors, one end of each of which is connected to a corresponding one of said channels of said analog multiplexer; and
- a reference resistor, one end of said reference resistor being connected to the other end of each of said resistors, and the other end of said reference resistor being grounded.

5. A microphone apparatus according to one of the claims 1 to 4, **characterized** in that said zoom position signal is a digital signal of two or more bits which is produced from binary signals.

6. A microphone apparatus according to one of claims 1 or 2, wherein said zoom position detection means comprises:

- two reflector areas formed on the outer periphery of a zoom ring of said zoom lens, each of said reflector areas being formed by a material of a high reflection index material and having a triangle shape which elongates along the rotation direction of said zoom ring;
- a light emitting means for irradiating light on said reflector areas; and
- a light receiving means for detecting light reflected from each reflector areas, and
- said first and second values are determined in accordance with a first control signal (V_c1) and a second control signal (V_c2) which are directly obtained from said zoom position detection means (4), and said first and second control signals are analog signals.

7. A microphone apparatus according to one of the claims 1 to 6, **characterized** in that at the wide viewing angle zoom position of said zoom lens, the mixing ratio of said stereo sound pickup signals is set to 100 %, and the mixing ratio of said superdirectional sound pickup signal is set to 0 %, and at the telescopic zoom position of said zoom lens the mixing ratio of said stereo sound pickup signals is set to 0 %, and the mixing ratio of said superdirectional sound pickup signal is set to 100 %, said mixing ratios being varied within said ranges in proportion to the variation of the viewing angle of said zoom lens.

8. A microphone apparatus according to one of the claims 1 to 7, **characterized** in that said first and second sum signals are varied in proportion to a power of a zooming magnification of said zoom lens.

9. A microphone apparatus according to one of the claims 1 to 8, **characterized** in that said first and second sum signals are varied in proportion to a power ranging 0.3 to 0.5 of a zooming magnification of said zoom lens.

10. A microphone apparatus according to one of the claims 1 to 9, wherein at the wide viewing angle zoom position of said zoom lens the mixing ratio of said stereo sound pickup signals is set to 100 %, and the mixing ratio of said superdirectional sound pickup signal is set to 0 %, and at the telescopic zoom position of said zoom lens the mixing ratio of said superdirection sound pickup signal is set to be larger than the mixing ratios of said stereo sound pickup signals, said mixing ratios being varied within said ranges in proportion to the variation of the viewing angle of said zoom lens.

Patentansprüche

1. Mikrophoneinrichtung für eine Videokamera

- mit zumindest zwei Schallaufnahmemitteln (2, 3), wobei eines von diesen ein Schall-Richtaufnahmemittel (2) ist, um ein Schall-Richtaufnahmesignal (D) zu erzeugen;
- mit einem Zoomstellungserfassungsmittel (4), um zumindest ein Zoomstellungssignal (A0, A1, A2) zu erzeugen, das der Zoomstellung einer Zoomlinse (1) bzw. eines Zoomobjektivs entspricht;
- mit zumindest zwei Verstärkungsmitteln (7, 8, 9);
- wobei eines der zumindest zwei Verstärkungsmittel ein erstes Verstärkungsmittel (7) ist, um ein erstes verstärktes Signal (K1·D) zu erzeugen, wobei das erste verstärkte Signal ein Produkt des Schall-Richtaufnahmesignals (D) und eines ersten Wertes (K1) ist, der dem Zoomstellungssignal (A0, A1, A2) entspricht;
- wobei eines der zumindest zwei Verstärkungsmittel ein zweites Verstärkungsmittel (8) ist, um ein zweites verstärktes Signal (K2·L) zu erzeugen, wobei das zweite verstärkte Signal ein Produkt eines ersten Signals von einem der Schallaufnahmemittel (L) und eines zweiten Wertes (K2) ist, der dem Zoomstellungssignal (A0, A1, A2) entspricht;
- wobei ein Steuermittel ein erstes Addiermittel (18) enthält, um ein erstes Summensignal zu

erzeugen;

gekennzeichnet durch die folgenden Merkmale:

- eines der zumindest zwei Schallaufnahmemittel ist ein Stereo-Schallaufnahmemittel, um Stereo-Schallaufnahmesignale (L, R) zu erzeugen;
- das erste Signal (L) ist ein Stereo-Schallaufnahmesignal;
- ein weiteres Verstärkungsmittel ist als ein drittes Verstärkungsmittel (9) vorgesehen, um ein drittes verstärktes Signal (K2·R) zu erzeugen, wobei das dritte verstärkte Signal ein Produkt eines anderen der Stereo-Schallaufnahmesignale (R) und des zweiten Wertes (K2) ist, der dem Zoomstellungssignal (A0, A1, A2) entspricht;
- wobei das erste Summensignal die Summe des ersten verstärkten Signals und des zweiten verstärkten Signals ist;
- wobei die Steuermittel ferner ein zweites Addiermittel (11) enthalten, um ein zweites Summensignal zu erzeugen, das die Summe des ersten verstärkten Signals und des dritten verstärkten Signals ist; und
- das Zoomstellungserfassungsmittel (4) weist auf:

    - mehrere Reflektorbereiche (2a, 22b, 22c), die auf der äußeren Peripherie eines Zoomringes (21) der Zoomlinse bzw. des Zoomobjektivs (1) ausgebildet sind, wobei jeder der Reflektorbereiche aus einer Zeile von einem oder mehreren Abschnitten mit hohem Reflexionsindex und einem oder mehreren Abschnitten mit niedrigem Reflexionsindex zusammengesetzt ist;
    - ein lichtabstrahlendes Mittel (LED), um den Reflektorbereich mit Licht zu bestrahlen; und
    - ein lichtempfangendes Mittel (PT), um Licht zu erfassen, das von jedem Reflektorbereich reflektiert worden ist,
    - wobei das Zoomstellungssignal den Reflexionsindex der Reflektorbereiche darstellt.

2. Mikrophoneinrichtung nach Anspruch 1, dadurch **gekennzeichnet**, daß die Zoomstellungserfassungsmittel die Zoomstellung der Zoomlinse bzw. des Zoomobjektivs erfassen, ohne einen mechanischen Kontakt zu der Zoomlinse zu haben.

3. Mikrophoneinrichtung gemäß einem der Ansprüche 1 oder 2, dadurch **gekennzeichnet**, daß ein erster und ein zweiter Wert gemäß einem ersten Steuersignal (V_c1) und einem zweiten Steuersignal (V_c2) bestimmt werden, die jeweils durch erste und zweite Signalmittel (5, 6) erzeugt werden, wobei das erste und das zweite Signalmittel einen analogen Multiplexer aufweist, der einen der Kanäle gemäß einem digitalen Signal auswählt, und wobei jedes von dem ersten und dem zweiten Steuersignal ein DC-Signal ist, dessen Pegel dem ausgewählten Kanal entspricht.

4. Mikrophoneinrichtung gemäß einem der Ansprüche 1 bis 3, dadurch **gekennzeichnet**, daß der erste und der zweite Wert gemäß einem ersten Steuersignal (V_c1) und einem zweiten Steuersignal (V_c2) bestimmt werden, die jeweils durch ein erstes und ein zweites Signalmittel (5, 6) erzeugt werden, wobei das erste und das zweite Signalmittel aufweisen:

- einen analogen Multiplexer, der einen der Kanäle gemäß einem digitalen Signal auswählt;
- eine Bezugsspannungsquelle, die an den gemeinsamen Anschluß des analogen Multiplexers angeschlossen ist;
- Widerstände, von denen jeweils ein Ende an einen entsprechenden der Kanäle des analogen Multiplexers angeschlossen ist; und
- ein Bezugswiderstand, wobei ein Ende des Bezugswiderstandes an das andere Ende von jedem der Widerstände angeschlossen ist und das andere Ende des Bezugswiderstandes geerdet ist bzw. auf Erdpotential gelegt ist.

5. Mikrophoneinrichtung gemäß einem der Ansprüche 1 bis 4, dadurch **gekennzeichnet**, daß das Zoomstellungssignal ein digitales Signal von zwei oder mehr Bits ist, das aus binären Signalen erzeugt wird.

6. Mikrophoneinrichtung gemäß einem der Ansprüche 1 oder 2, wobei die Zoomstellungserfassungsmittel aufweisen:

- zwei Reflexionsbereiche, die auf der äußeren Peripherie eines Zoomringes der Zoomlinse bzw. des Zoomobjektivs ausgebildet sind, wobei jeder der Reflektorbereiche durch ein Material mit hohem Reflexionsindex ausgebildet ist, und eine dreieckige bzw. Triangelgestalt hat, die sich entlang der Rotationsrichtung des Zoomringes erstreckt;
- ein Licht abstrahlendes Mittel, um die Reflexionsbereiche mit Licht zu bestrahlen; und
- ein Licht empfangendes Mittel, um Licht zu erfassen, das von jedem der Reflektorbereiche reflektiert ist, wobei
- der erste und der zweite Wert gemäß einem ersten Steuersignal (V_c1) und einem zweiten Steuersignal (V_c2) bestimmt werden, die unmittelbar von den Zoomstellungserfassungsmit-

teln (4) erhalten werden, wobei das erste und das zweite Steuersignal analoge Signale sind.

7. Mikrophoneinrichtung gemäß einem der Ansprüche 1 bis 6, dadurch **gekennzeichnet**, daß die Weitwinkel-Zoomstellung der Zoomlinse bzw. des Zoomobjektivs, das Mischungsverhältnis der Stereo-Schallaufnahmesignale auf 100% eingestellt ist, und das Mischungsverhältnis des Richt-Schallaufnahmesignals auf 0% eingestellt ist, und bei der teleskopischen Zoomstellung der Zoomlinse bzw. des Zoomobjektivs das Mischungsverhältnis des Stereo-Schallaufnahmesignals auf 0% eingestellt ist, und das Mischungsverhältnis des Richt-Schallaufnahmesignals auf 100% eingestellt ist, wobei die Mischverhältnisse innerhalb der Bereiche im Verhältnis zu der Veränderung des Sichtwinkels der Zoomlinse bzw. des Zoomobjektivs verändert werden.

8. Mikrophoneinrichtung gemäß einem der Ansprüche 1 bis 7, dadurch **gekennzeichnet**, daß das erste und das zweite Summensignal im Verhältnis zu einer Leistung bzw. Brennweite einer Zoomvergrößerung einer Zoomlinse bzw. eines Zoomobjektivs verändert werden.

9. Mikrophoneinrichtung gemäß einem der Ansprüche 1 bis 8, dadurch **gekennzeichnet**, daß das erste und das zweite Summensignal im Verhältnis zu der Leistung bzw. Brennweite, die von 0,3 bis 0,5 reicht, einer Zoomvergrößerung der Zoomlinse bzw. des Zoomobjektivs verändert werden.

10. Mikrophoneinrichtung gemäß einem der Ansprüche 1 bis 9, wobei bei der Weitwinkel-Zoomstellung der Zoomlinse bzw. des Zoomobjektivs das Mischungsverhältnis der Stereo-Schallaufnahmesignale auf 100% eingestellt ist, und das Mischungsverhältnis des Richt-Schallaufnahmesignals auf 0% eingestellt ist, und bei der teleskopischen Zoomstellung der Zoomlinse bzw. des Zoomobjektivs das Mischungsverhältnis des Richt-Schallaufnahmesignals eingestellt ist, um größer als die Mischungsverhältnisse der Stereo-Schallaufnahmesignale zu sein, wobei die Mischungsverhältnisse innerhalb der Bereiche im Verhältnis zu der Veränderung des Sichtwinkels der Zoomlinse bzw. des Zoomobjektivs verändert werden.

Revendications

1. Dispositif de microphone destiné à une caméra vidéo comprenant :

   au moins deux moyens de saisie de son (2,3), l'un d'entre eux étant un moyen de saisie de son superdirectionnel (2) destiné à créer un signal de saisie de son superdirectionnel (D) ;
   un moyen de détection de position de changement de plan (4) destiné à créer au moins un signal de position de changement de plan (A0, A1, A2), lequel correspond à la position de changement de plan d'une lentille à focale variable (1) :
   au moins deux moyens d'amplification (7,8,9) :
   l'un des au moins deux moyens d'amplification est un premier moyen d'amplification (7), destiné à créer un premier signal amplifié (K1.D), ledit premier signal amplifié étant le produit dudit signal de son superdirectionnel (D) par une première valeur (K1) qui correspond au signal de position de changement de plan (A0, A1, A2) ;
   l'un des au moins deux moyens d'amplification est un deuxième moyen d'amplification 8 destiné à créer un deuxième signal amplifié (K2.L), ledit second signal amplifié étant le produit d'un premier signal de l'un desdits moyens de saisie de son (L) par une seconde valeur (K2) qui correspond au signal de position de changement de plan (A0, A1, A2) ;
   un moyen de commande comprenant un premier moyen d'addition (18) destiné à créer un premier signal de somme ;

caractérisé par les particularités qui suivent :

   l'un des au moins deux moyens de saisie de son est un moyen de saisie de son stéréophonique (3) destiné à créer des signaux de saisie de son stéréophonique (L,R) ;
   ledit premier signal (L) est un signal de saisie de son stéréophonique ;
   un autre moyen d'amplification est prévu en tant que troisième moyen d'amplification (9) pour créer un troisième signal amplifié (K2.R), ledit troisième signal amplifié étant le produit de l'autre desdits signaux de saisie de son stéréophonique (R) et de ladite seconde valeur (K2) qui correspond au signal de position de changement de plan (A0,A1,A2) ;
   ledit premier signal de somme est la somme dudit premier signal amplifié et dudit deuxième signal amplifié ;
   ledit moyen de commande comprend en outre un second moyen d'addition (11) destiné à créer un second signal de somme qui est la somme dudit premier signal amplifié et dudit troisième signal amplifié ; et
   ledit moyen de détection de position de changement de plan (4) comprend :
   Une pluralité de zones réfléchissantes (2a,22b, 22c) formées sur la périphérie extérieure de la bague de changement de plan (21) de ladite

lentille à focale variable (1), chacune desdites zones réfléchissantes étant constituées par une rangée de une ou plusieurs parties à indice de réflexion élevé et d'une ou plusieurs parties à indice de réflexion faible ;
un moyen électroluminescent (LED) destiné à irradier de la lumière sur ladite zone réfléchissante ; et
un moyen de réception de lumière (PT) destiné à détecter la lumière réfléchie à partir de chaque zone réfléchissante ;
ledit signal de position de changement de plan représente l'indice de réflexion desdites zones réfléchissantes.

2. Dispositif de microphone selon la revendication 1, caractérisé en ce que ledit moyen de détection de position de changement de plan détecte la position de changement de plan de ladite lentille à focale variable sans réaliser un contact mécanique avec ladite lentille à focale variable.

3. Dispositif de microphone selon l'une des revendications 1 ou 2, caractérisé en ce que lesdites première et seconde valeurs sont déterminées en fonction d'un premier signal de commande (Vc1) et d'un second signal de commande (Vc2), lesquels sont produits respectivement par les premier et second moyens de signal (5,6) et en ce que lesdits premier et second moyens de signal comprennent un multiplexeur analogique, lequel sélectionne l'un des canaux en fonction d'un signal numérique, et en ce que chacun desdits premier et second signaux de commande est un signal DC, dont le niveau correspond audit canal sélectionné.

4. Dispositif de microphone selon l'une des revendications 1 à 3, caractérisé en ce que lesdites première et seconde valeurs sont déterminées en fonction d'un premier signal de commande (Vc1) et d'un second signal de commande (Vc2), lesquels sont produits respectivement par les premier et second moyens de signal (5,6), et en ce que lesdits premiers et seconds moyens de signal comprennent :

un multiplexeur analogique qui sélectionne l'un des canaux en fonction d'un signal numérique ;
une source de tension de référence connectée à la borne commune dudit multiplexeur analogique ;
des résistances, dont une extrémité de chacune d'entre elles est connectée à une extrémité correspondante desdits canaux dudit multiplexeur analogique ; et
une résistance de référence, une extrémité de ladite résistance de référence étant connectée à l'autre extrémité de chacune desdites résistances, et l'autre extrémité de ladite résistance de référence étant mise à la terre.

5. Dispositif de microphone selon l'une des revendications 1 à 4, caractérisé en ce que ledit signal de position de changement de plan est un signal numérique à deux ou plusieurs bits, lequel est produit à partir de signaux binaires.

6. Dispositif de microphone selon l'une des revendications 1 ou 2, dans lequel ledit moyen de détection de position de changement de plan comprend :

deux zones réfléchissantes formées sur la périphérie extérieure de la bague de changement de plan de ladite lentille à focale variable, chacune desdites zones réfléchissantes étant constituée par un matériau à indice de réflexion élevé et présentant une forme triangulaire, laquelle s'allonge suivant le sens de rotation de la bague de changement de plan ;
un moyen électroluminescent destiné à irradier de la lumière sur lesdites zones réfléchissantes ; et
un moyen de réception de lumière destiné à détecter la lumière réfléchie à partir de chaque zone réfléchissante, et
lesdites première et seconde valeurs étant déterminées en fonction d'un premier signal de commande (Vc1) et d'un second signal de commande (Vc2), lesquels sont obtenus directement à partir dudit moyen de détection de position de changement de plan (4) et lesdits premier et second signaux de commande étant des signaux analogiques.

7. Dispositif de microphone selon l'une quelconque des revendications 1 à 6, caractérisé en ce que à la position de changement de plan à grand angle de vue de ladite lentille à focale variable, le rapport de mélange desdits signaux de saisie de son stéréophonique est établi à 100%, et le rapport de mélange dudit signal de saisie de son superdirectionnel est établi à 0%, et en ce que à la position de changement de plan télescopique de ladite lentille à focale variable le rapport de mélange desdits signaux de saisie de son stéréo est établi à 0%, et le rapport de mélange dudit signal de saisie de son superdirectionnel est établi à 100%, lesdits rapports de mélange étant modifiés dans lesdites plages, proportionnellement à la variation de l'angle de vue de ladite lentille à focale variable.

8. Dispositif de microphone selon l'une quelconque des revendications 1 à 7, caractérisé en ce que lesdits premier et second signaux de somme sont modifiés proportionnellement à la puissance de l'agrandissement de changement de plan de ladite lentille à focale variable.

9. Dispositif de microphone selon l'une des revendications 1 à 8, caractérisé en ce que lesdits premier et second signaux de somme sont modifiés proportionnellement à une puissance dans une plage allant de 0,3 à 0,5 de l'agrandissement de changement de plan de ladite lentille à focale variable.

10. Dispositif de microphone selon l'une quelconque des revendications 1 à 9, dans lequel à la position de changement de plan au grand angle de vue de ladite lentille à focale variable le rapport de mélange desdits signaux de saisie de son stéréophonique est établi à 100%, et le rapport de mélange dudit signal de saisie de son superdirectionnel est établi à 0%, et en ce qu'à la position de changement de plan télescopique de ladite lentille à focale variable le rapport de mélange dudit signal de saisie de son superdirectionnel est établi pour être plus important que le rapport de mélange desdits signaux de saisie de son stéréophonique, lesdits rapports de mélange étant modifiés dans lesdites plages, proportionnellement à la variation de l'angle de vue de ladite lentille à focale variable.

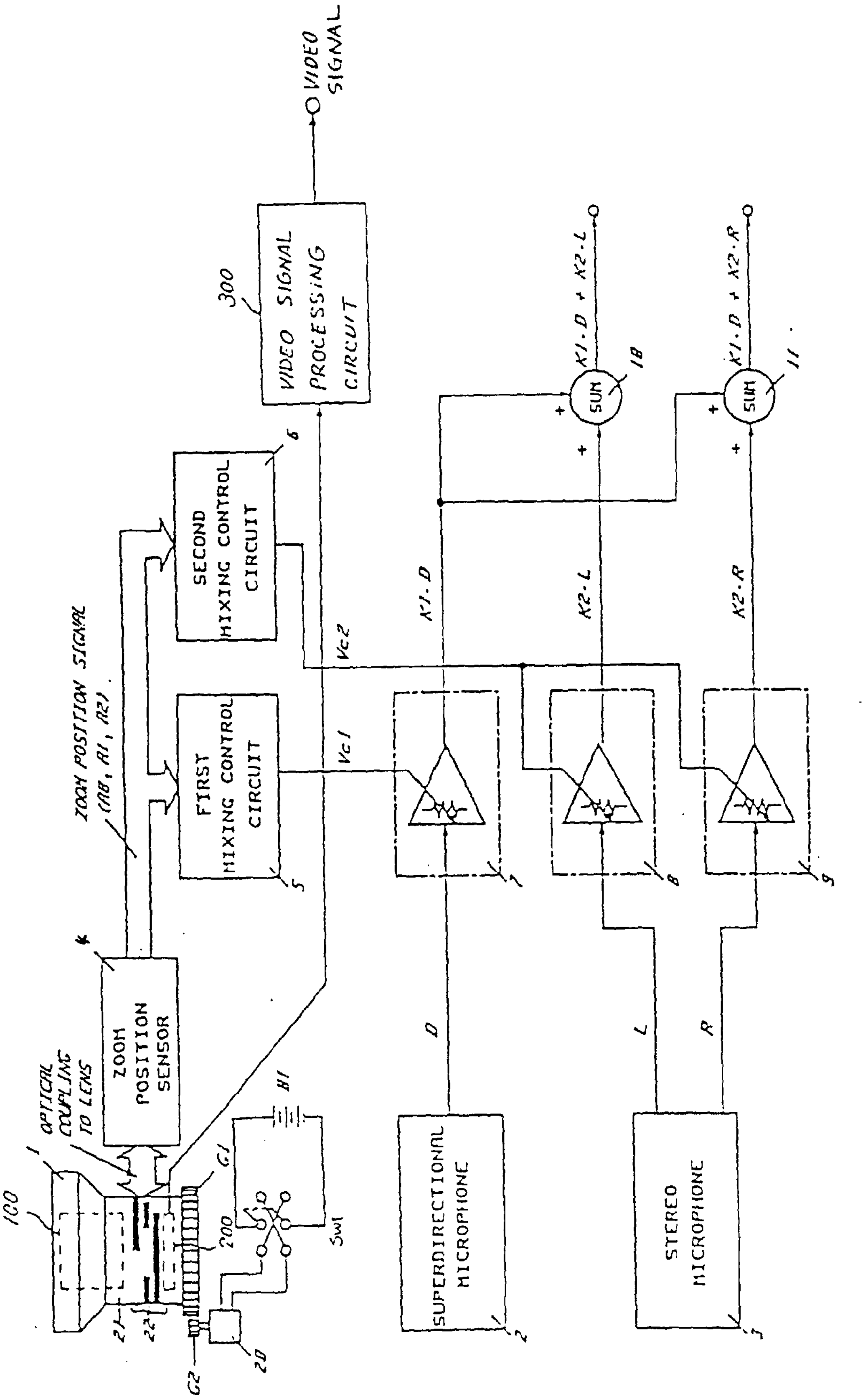

VIDEO SIGNAL
300
VIDEO SIGNAL PROCESSING CIRCUIT
6
SECOND MIXING CONTROL CIRCUIT
FIRST MIXING CONTROL CIRCUIT
5
ZOOM POSITION SIGNAL (A0, A1, A2)
4
ZOOM POSITION SENSOR
OPTICAL COUPLING TO LENS
100
1
200
G1
G2
21
22
20
B1
SW1
Vc1
Vc2
K1.D
K2.L
K2.R
SUM
10
11
K1.D + K2.L
K1.D + K2.R
7
8
9
D
L
R
SUPERDIRECTIONAL MICROPHONE
2
STEREO MICROPHONE
3

FIG. 1

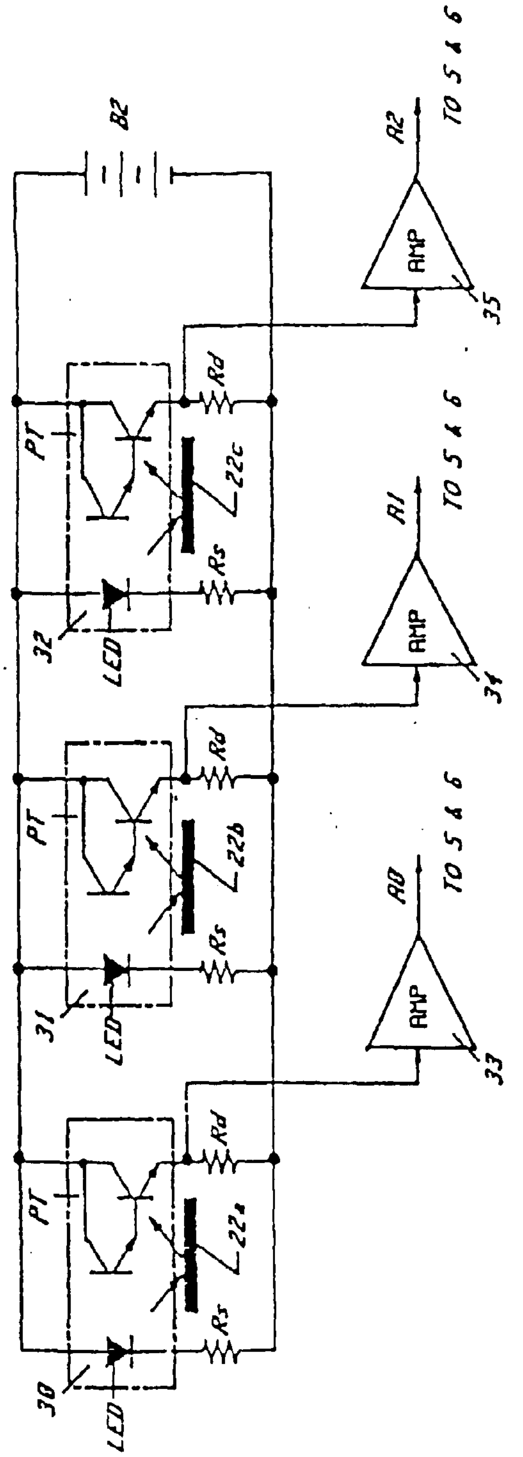

B2
AMP
AMP
AMP
R0
R1
R2
TO 5 & 6
TO 5 & 6
TO 5 & 6
30
31
32
33
34
35
LED
LED
LED
PT
PT
PT
Rs
Rs
Rs
Rd
Rd
Rd
22a
22b
22c

FIG. 2b

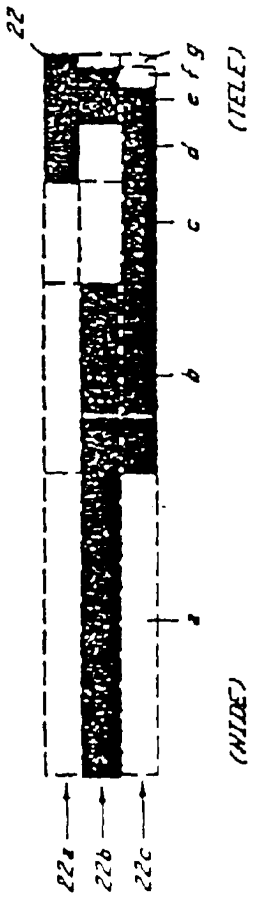

22
22a
22b
22c
a
b
c
d
e
f
g
(WIDE)
(TELE)

FIG. 2a

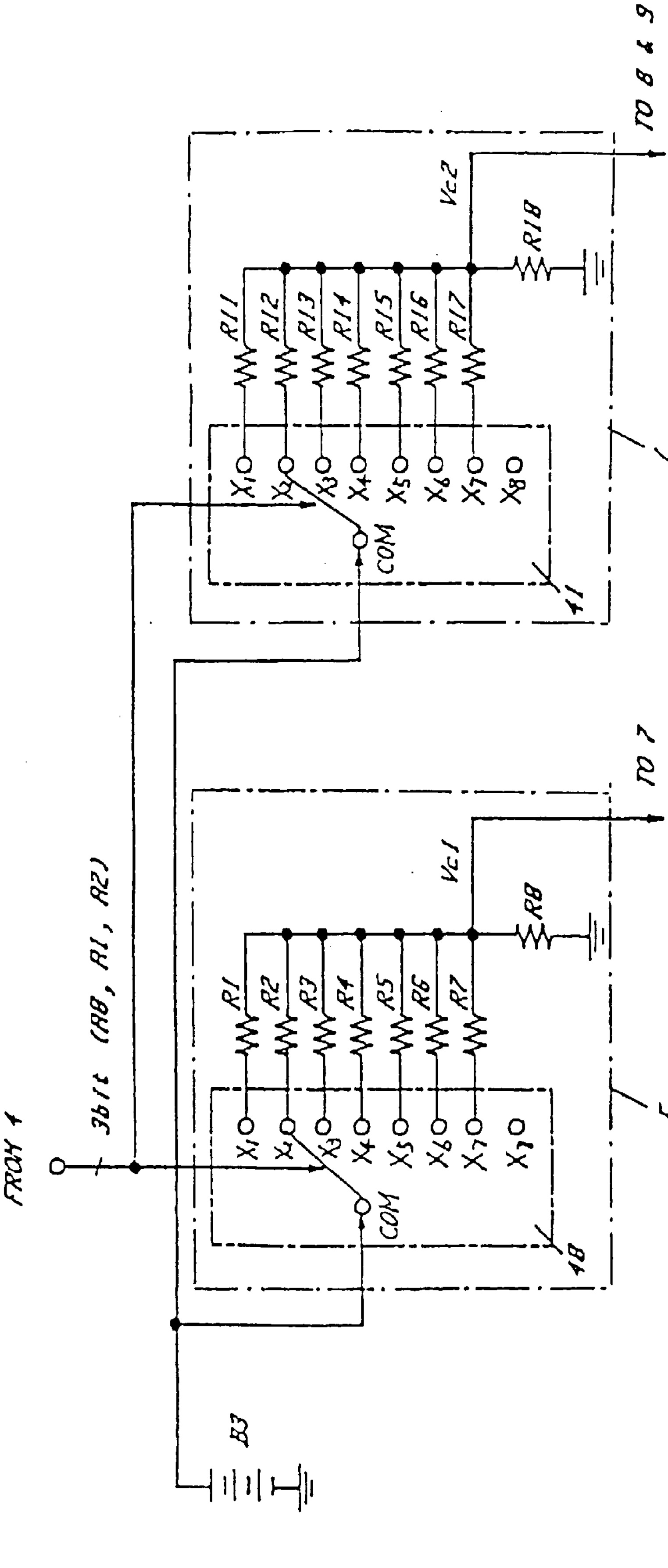
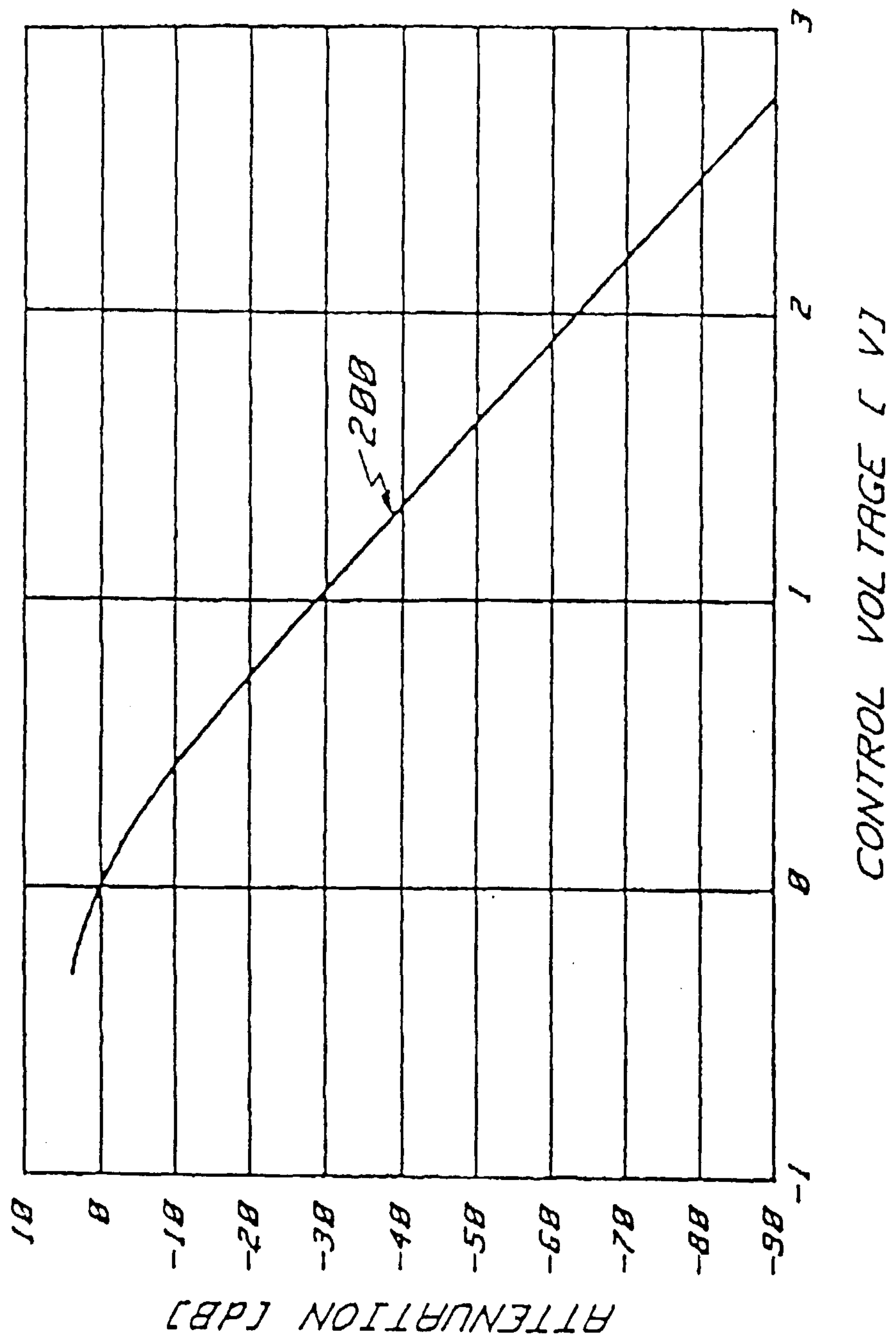

FROM 4
3bit (R8, R1, R2)
TO 8 & 9
TO 7
Vc2
Vc1
R11
R12
R13
R14
R15
R16
R17
R18
R1
R2
R3
R4
R5
R6
R7
R8
X1
X2
X3
X4
X5
X6
X7
X8
X7
COM
COM
41
48
5
6
B3

FIG. 3



200
-1
0
1
2
3
CONTROL VOLTAGE [V]
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
ATTENUATION [dB]

FIG. 4

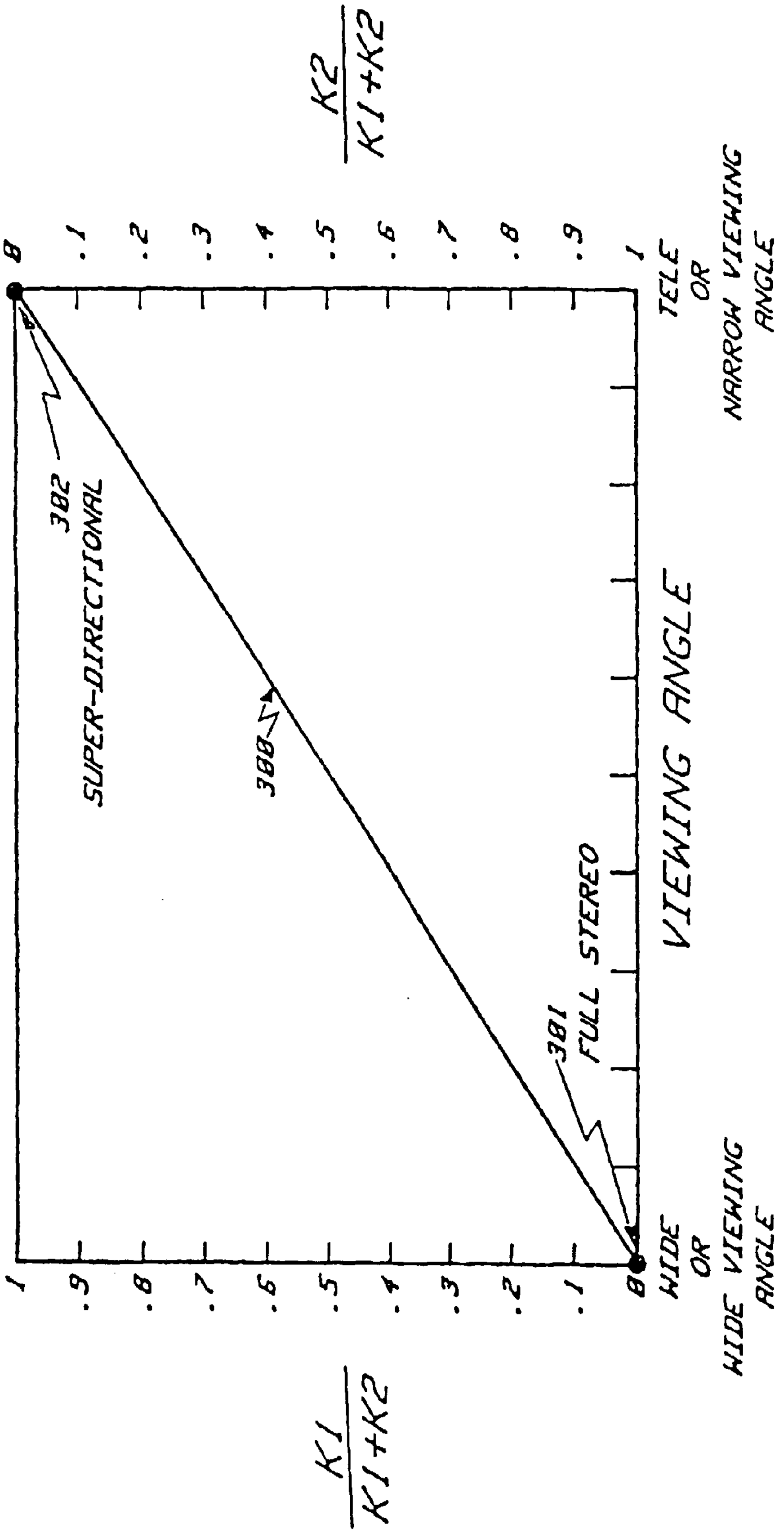

K2 / K1+K2
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1
TELE
OR
NARROW VIEWING
ANGLE
382
SUPER-DIRECTIONAL
380
381
FULL STEREO
VIEWING ANGLE
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
WIDE
OR
WIDE VIEWING
ANGLE
K1 / K1+K2

FIG. 5

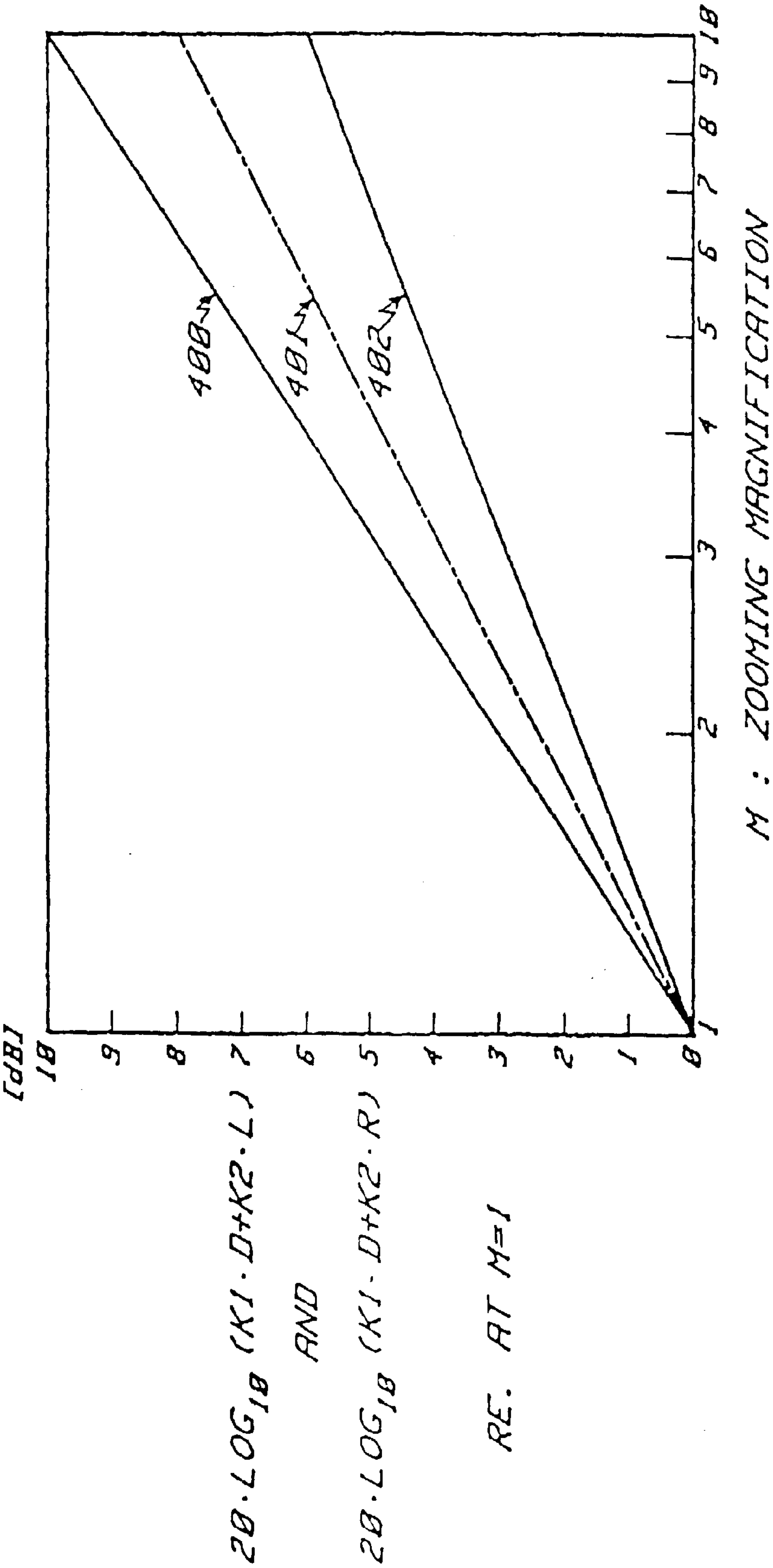

[dB]
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
400
401
402
M : ZOOMING MAGNIFICATION
20·LOG10 (K1·D+K2·L)
AND
20·LOG10 (K1·D+K2·R)
RE. AT M=1

FIG. 6

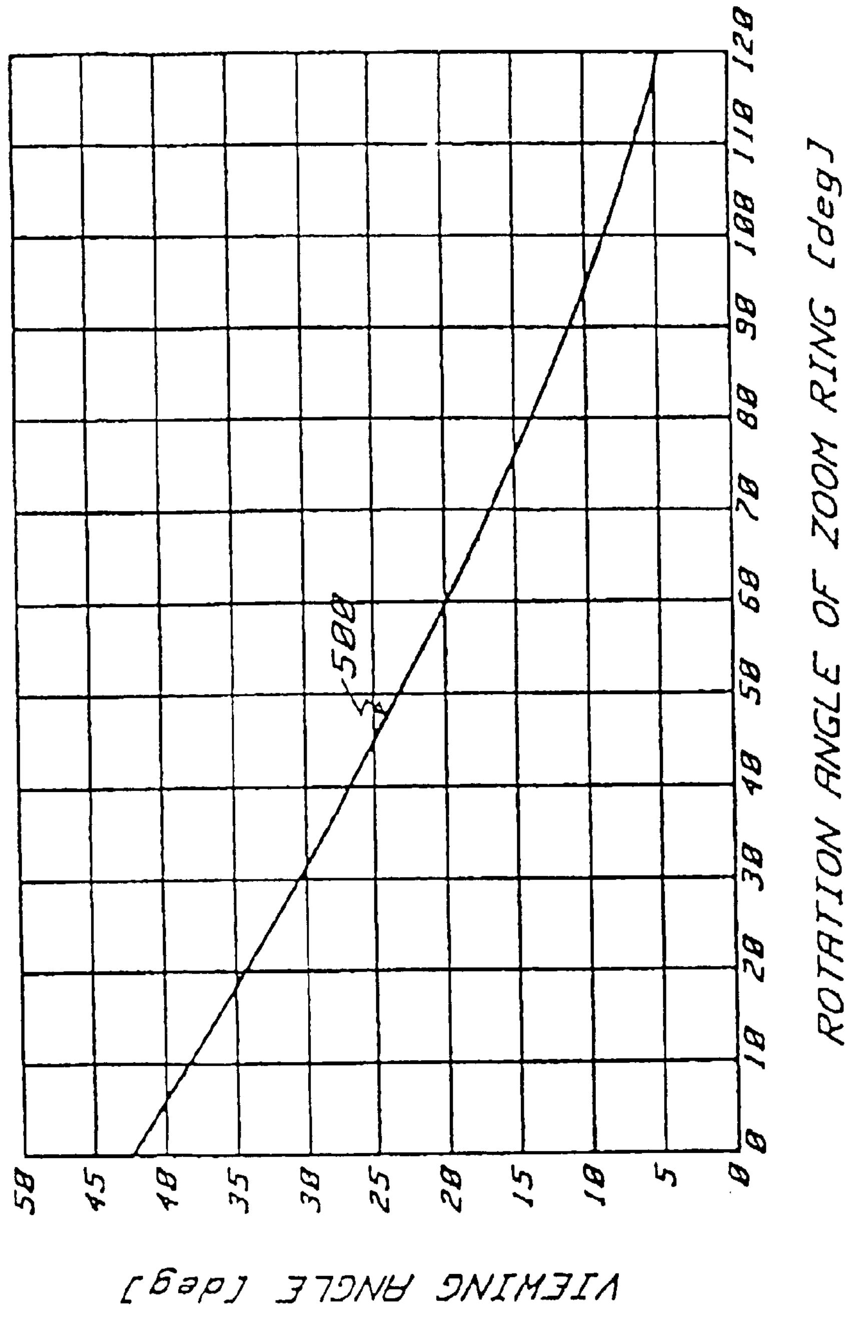

VIEWING ANGLE [deg]
ROTATION ANGLE OF ZOOM RING [deg]
500
50
45
40
35
30
25
20
15
10
5
0
10
20
30
40
50
60
70
80
90
100
110
120

FIG. 7

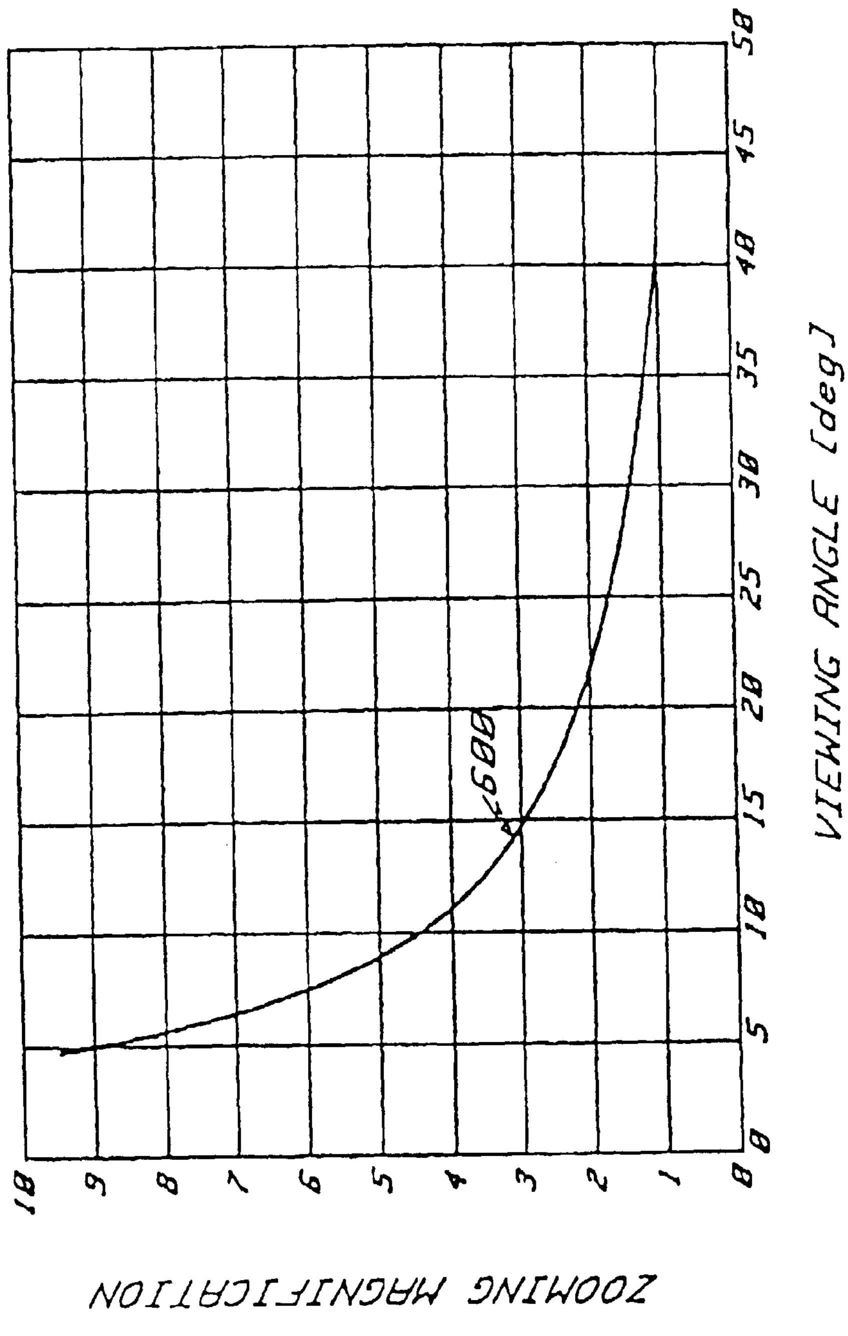

VIEWING ANGLE [deg]
ZOOMING MAGNIFICATION
600
0
5
10
15
20
25
30
35
40
45
50
0
1
2
3
4
5
6
7
8
9
10

FIG. 8

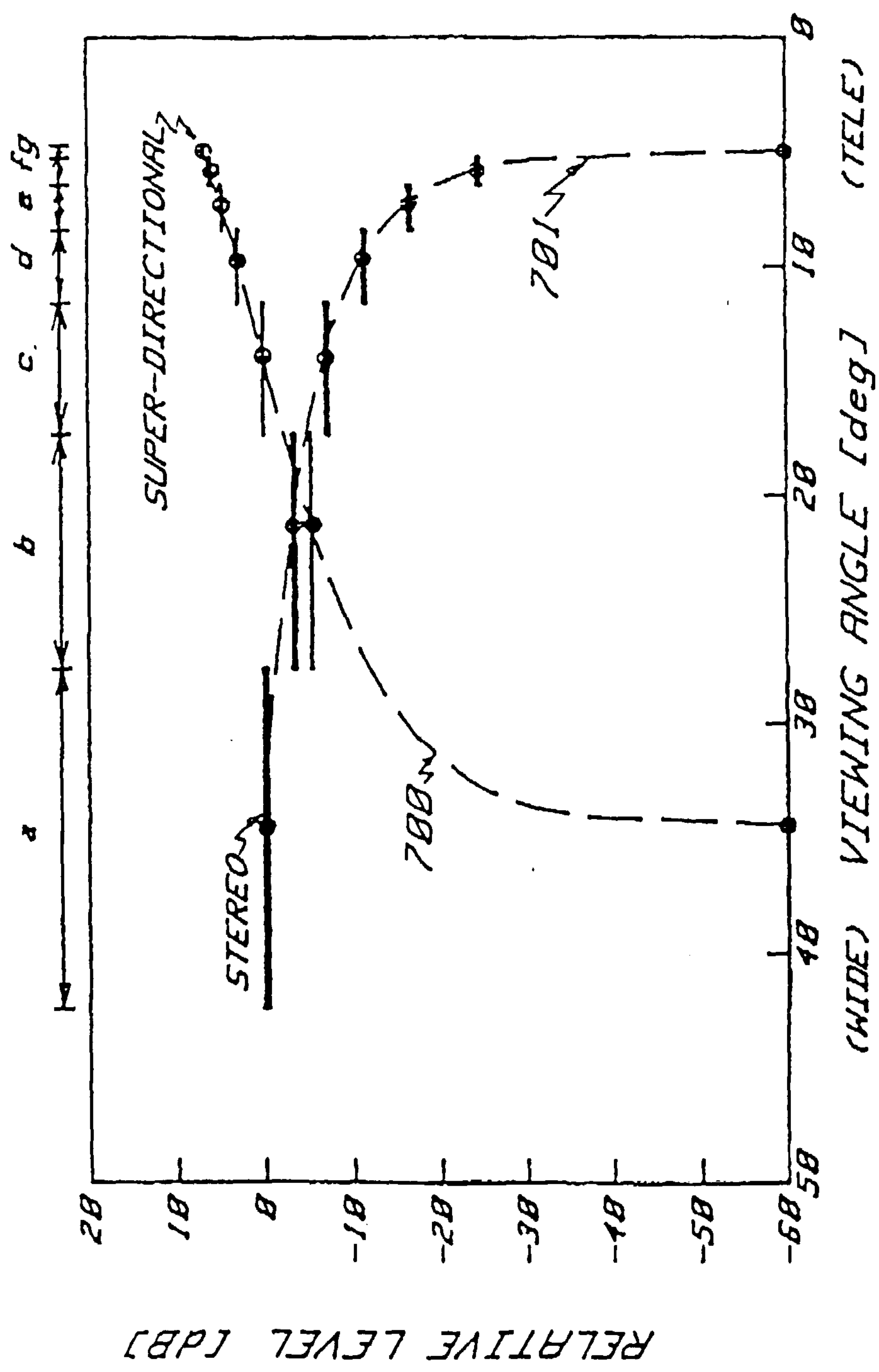

RELATIVE LEVEL [dB]
20
10
0
-10
-20
-30
-40
-50
-60
50
40
30
20
10
0
(WIDE) VIEWING ANGLE [deg] (TELE)
SUPER-DIRECTIONAL
STEREO
700
701
a
b
c.
d
e
f g

FIG. 9

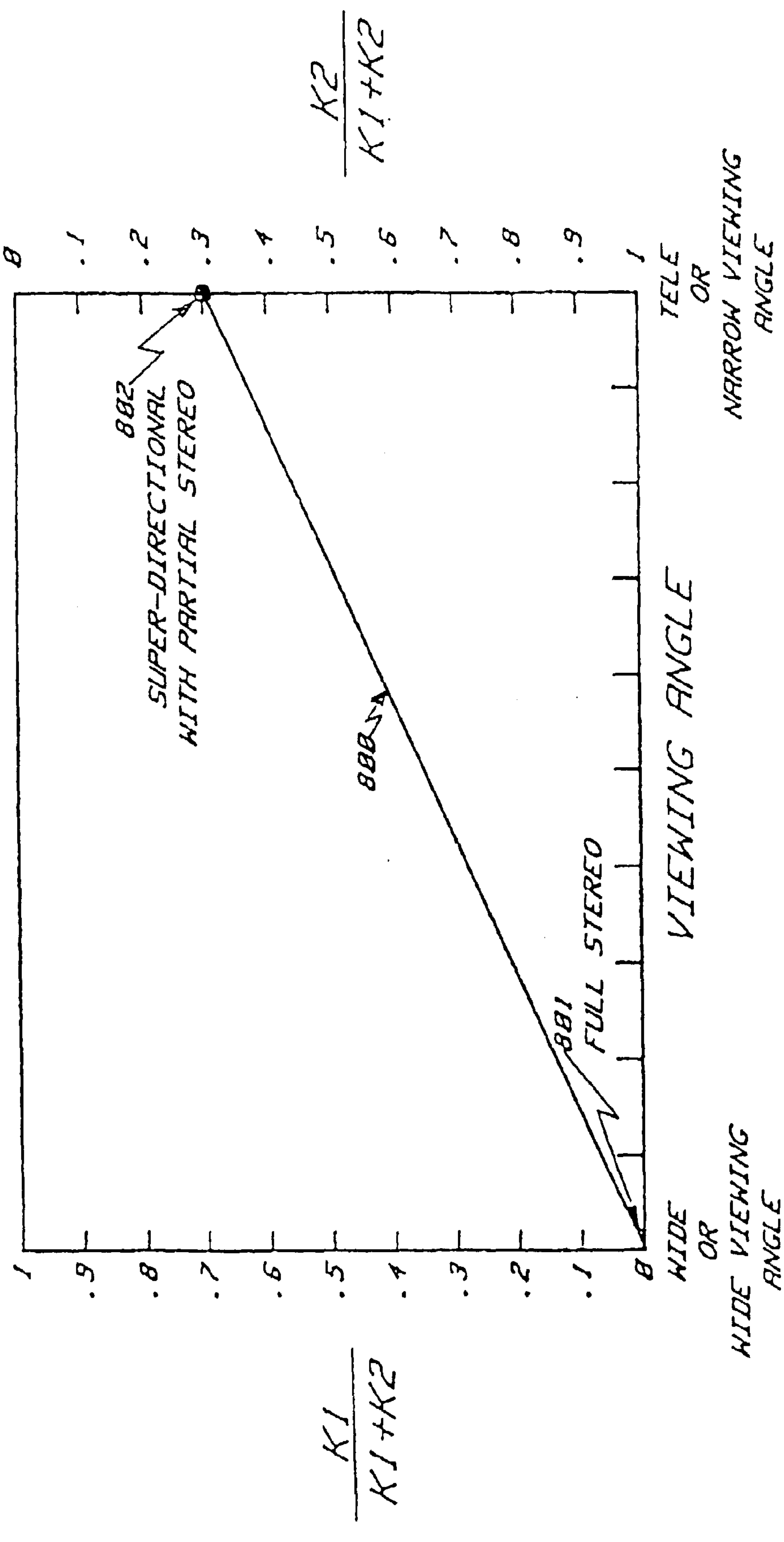

K2 / K1+K2
K1 / K1+K2
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1
1 .9 .8 .7 .6 .5 .4 .3 .2 .1 0
882
SUPER-DIRECTIONAL
WITH PARTIAL STEREO
880
881
FULL STEREO
VIEWING ANGLE
WIDE
OR
WIDE VIEWING
ANGLE
TELE
OR
NARROW VIEWING
ANGLE

FIG. 10

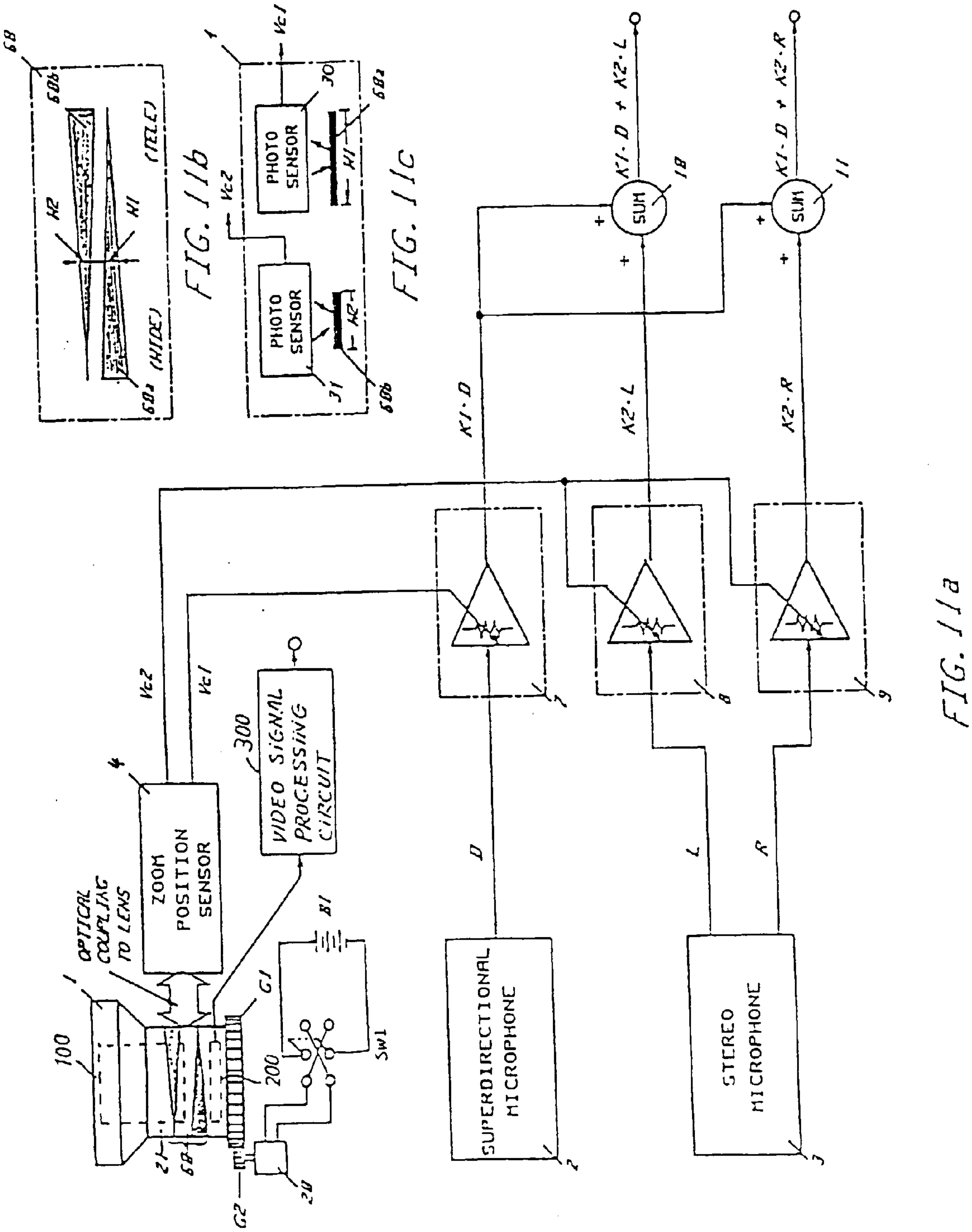


FIG. 11a

FIG. 11b

FIG. 11c