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(54) **ELECTRONIC APPARATUS AND POINTING DEVICE FOR IMAGING**

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Related U.S. Application Data

(62) Division of application No. 08/572,092, filed on Dec. 14, 1995.

(30) **Foreign Application Priority Data**

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Publication Classification

(51) **Int. Cl.**[7] **H04N 5/222**

(52) **U.S. Cl.** **348/333.02**

(57) **ABSTRACT**

An electronic apparatus according to this invention has a display unit for displaying an index, an operation unit used for moving the index displayed by the display unit, and an adjustment unit for adjusting the operation unit, so that the moving direction of the index displayed by the display unit matches a moving direction that an operator intended. This invention can provide an effect of matching the moving direction that the operator intended with the actual moving direction of the index.

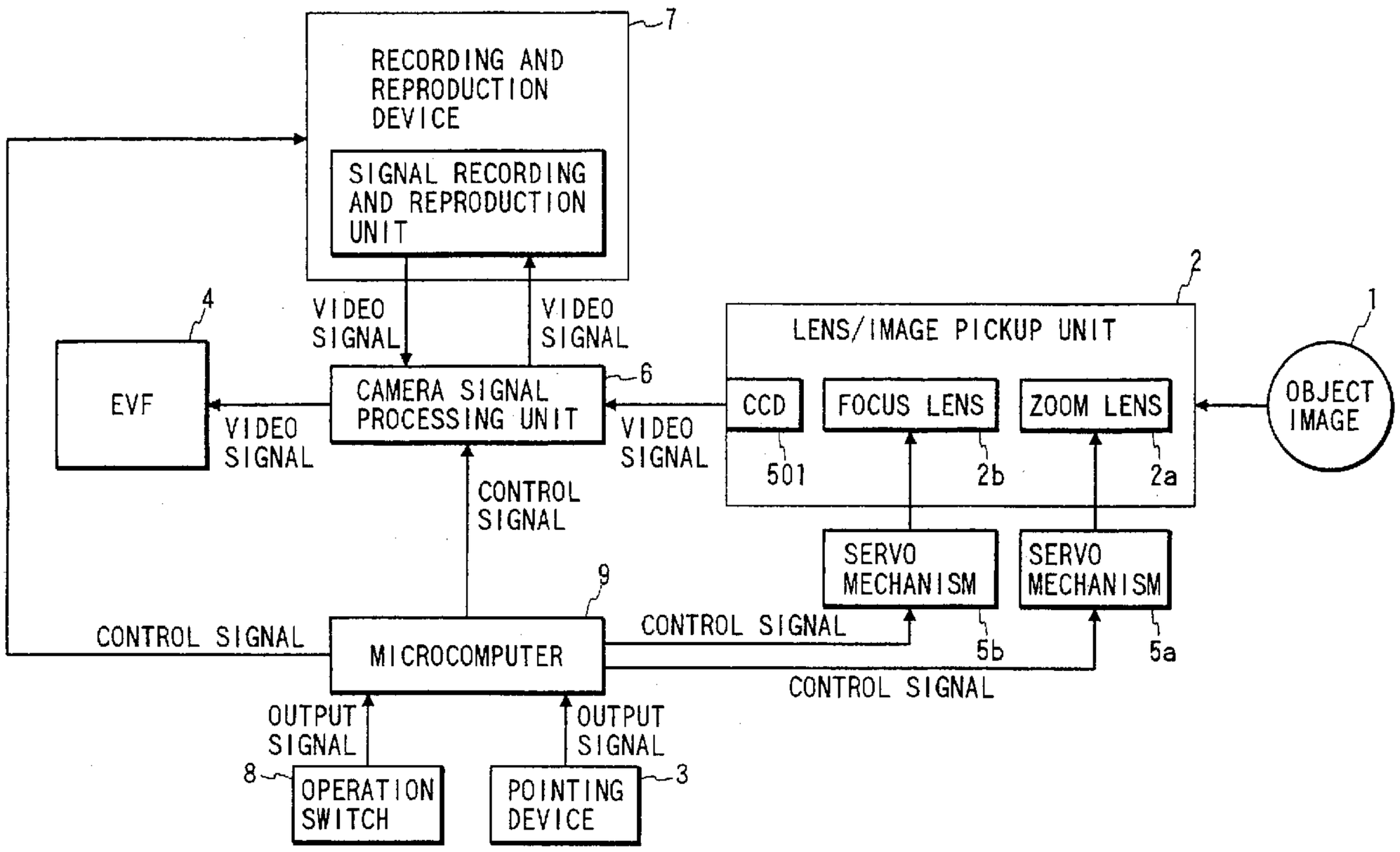
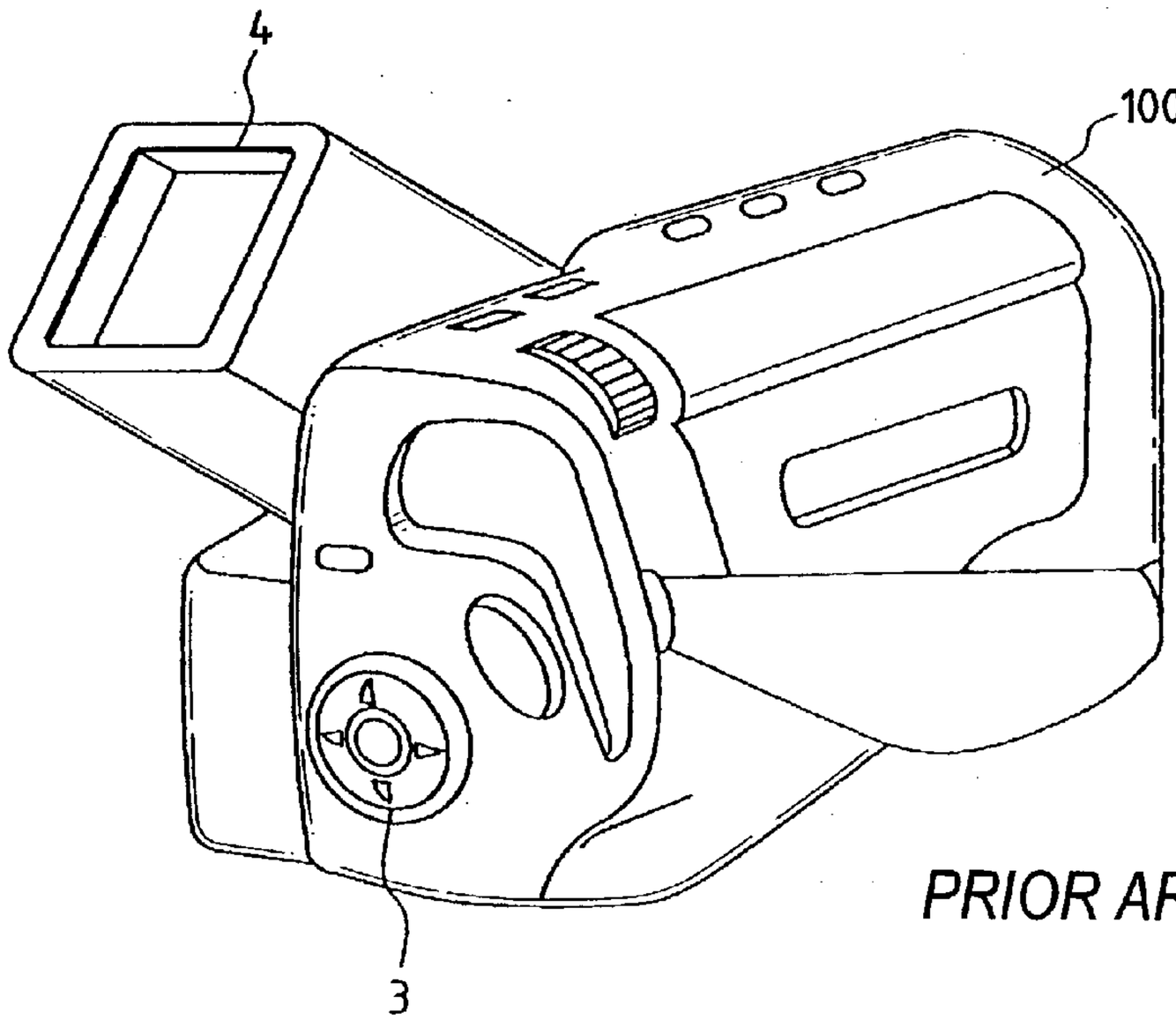
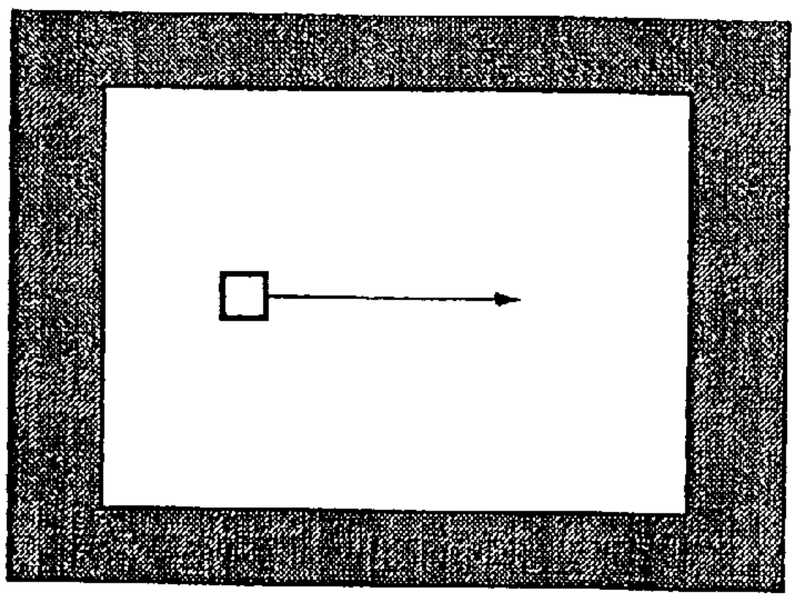


FIG. 1



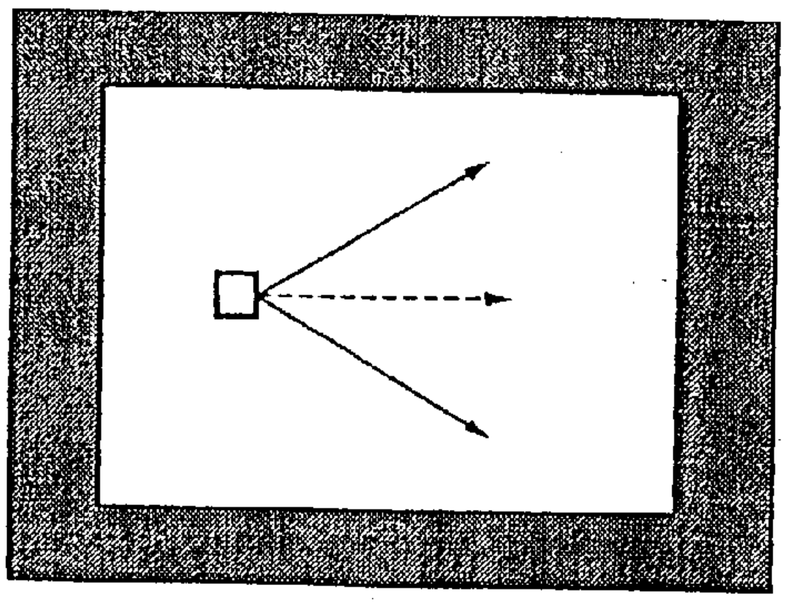
PRIOR ART

FIG. 2A



PRIOR ART

FIG. 2B



PRIOR ART

FIG. 3

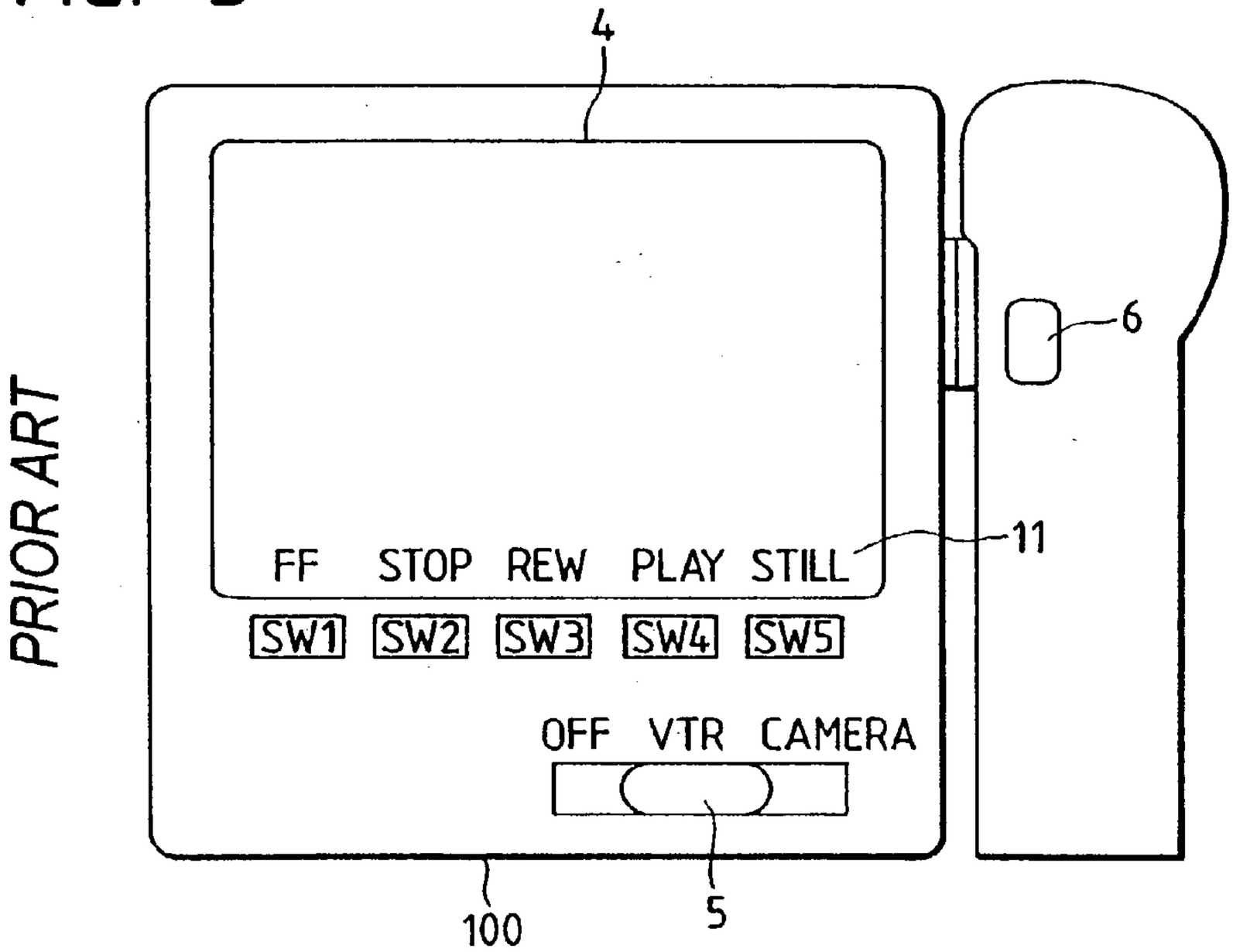

4
6
11
FF
STOP
REW
PLAY
STILL
SW1
SW2
SW3
SW4
SW5
OFF
VTR
CAMERA
100
5
PRIOR ART

FIG. 4

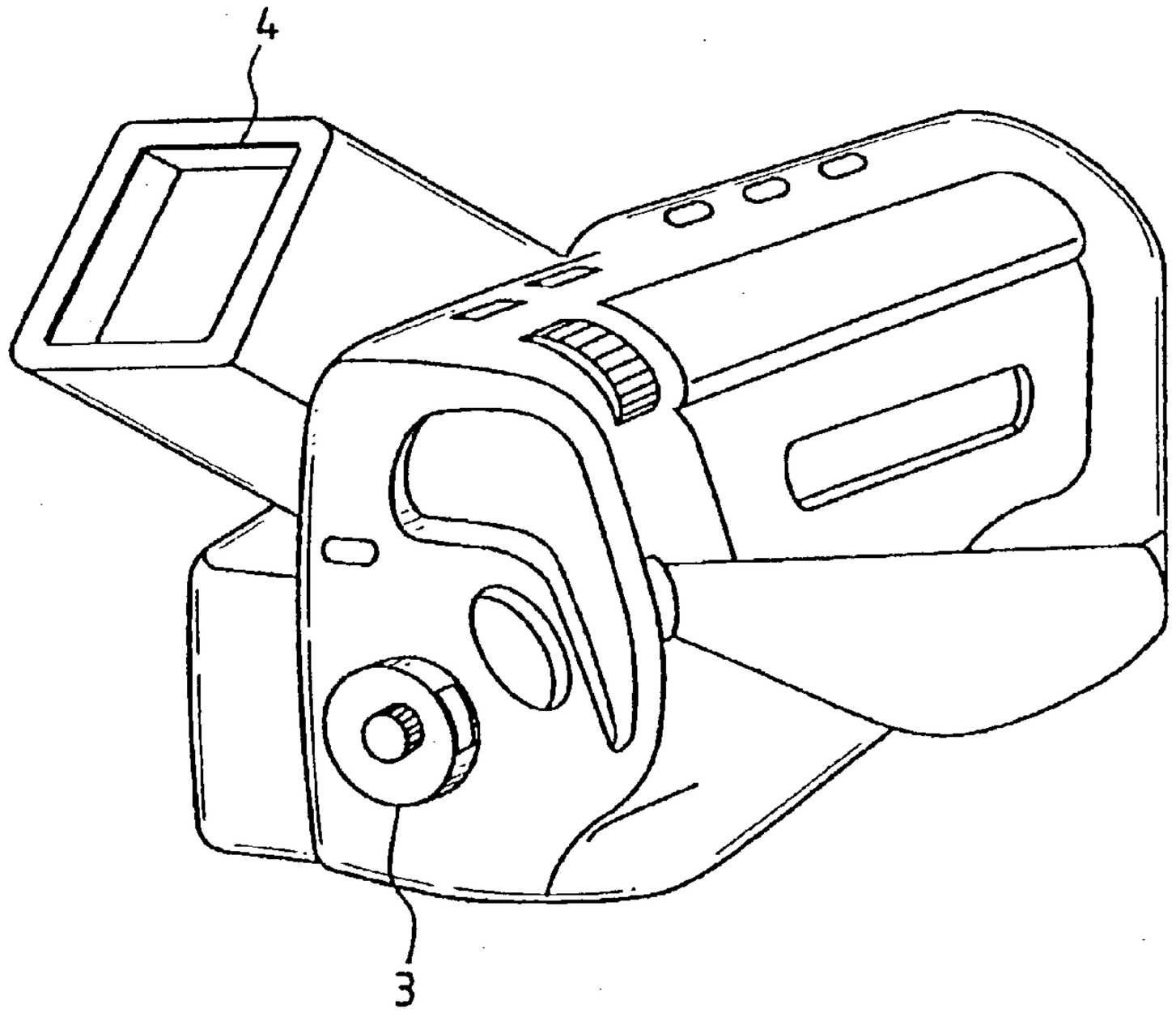

4
3

FIG. 5

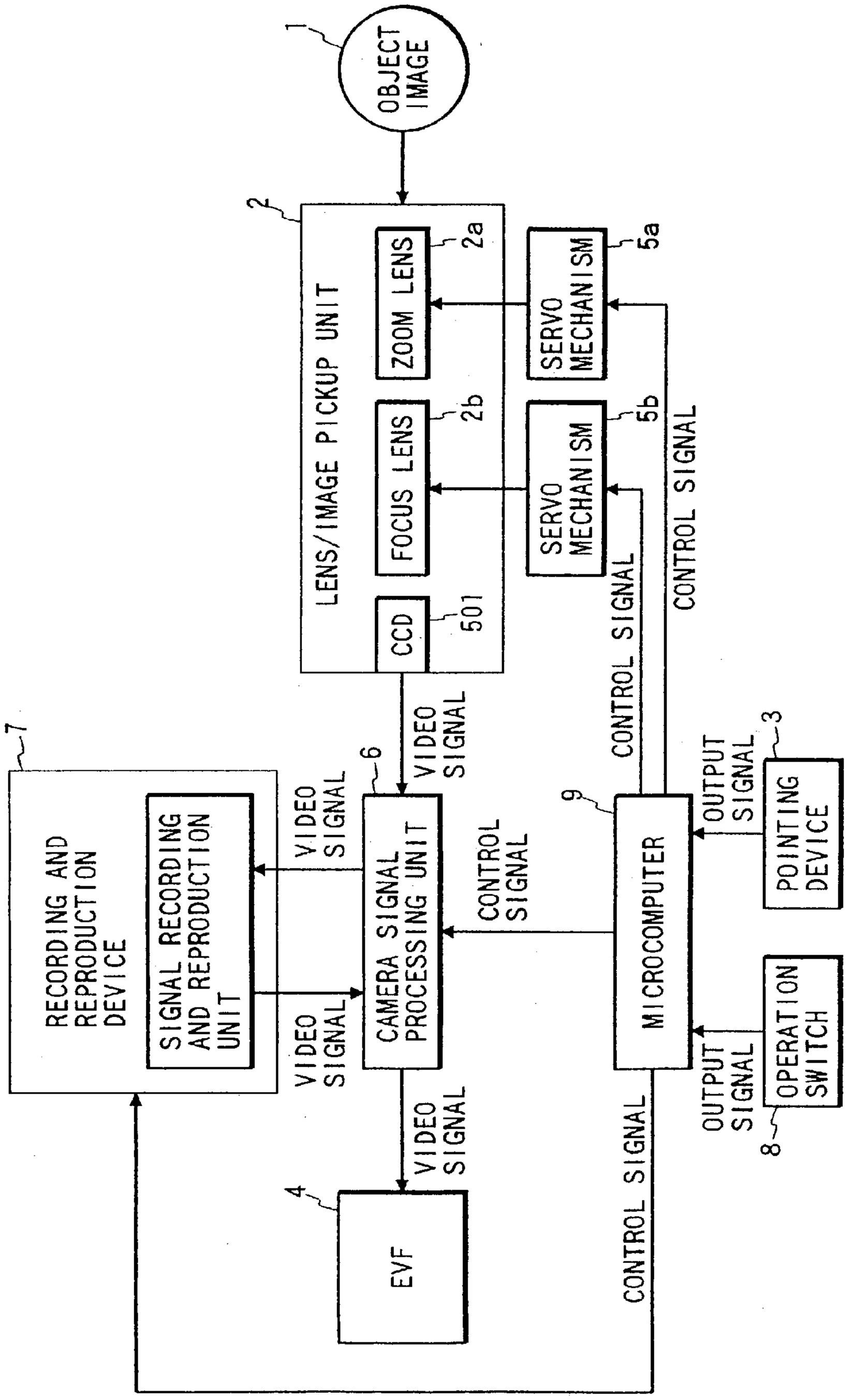

OBJECT IMAGE
1
2
LENS/IMAGE PICKUP UNIT
ZOOM LENS
2a
FOCUS LENS
2b
CCD
501
SERVO MECHANISM
5a
SERVO MECHANISM
5b
CONTROL SIGNAL
CONTROL SIGNAL
VIDEO SIGNAL
7
RECORDING AND REPRODUCTION DEVICE
SIGNAL RECORDING AND REPRODUCTION UNIT
VIDEO SIGNAL
VIDEO SIGNAL
6
CAMERA SIGNAL PROCESSING UNIT
VIDEO SIGNAL
CONTROL SIGNAL
9
MICROCOMPUTER
OUTPUT SIGNAL
3
POINTING DEVICE
OUTPUT SIGNAL
8
OPERATION SWITCH
4
EVF
CONTROL SIGNAL

FIG. 6

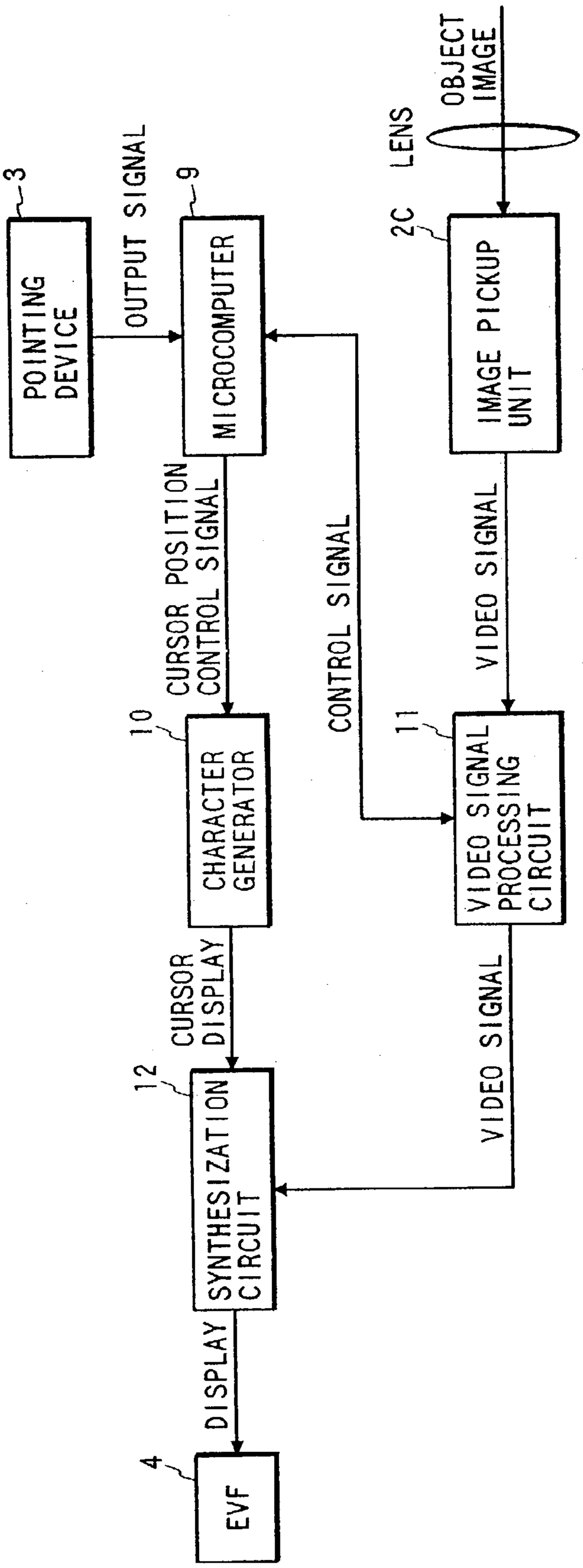

OBJECT IMAGE
LENS
2C
IMAGE PICKUP UNIT
VIDEO SIGNAL
11
VIDEO SIGNAL PROCESSING CIRCUIT
VIDEO SIGNAL
CONTROL SIGNAL
3
POINTING DEVICE
OUTPUT SIGNAL
9
MICROCOMPUTER
CURSOR POSITION CONTROL SIGNAL
10
CHARACTER GENERATOR
CURSOR DISPLAY
12
SYNTHESIZATION CIRCUIT
DISPLAY
4
EVF

FIG. 7A

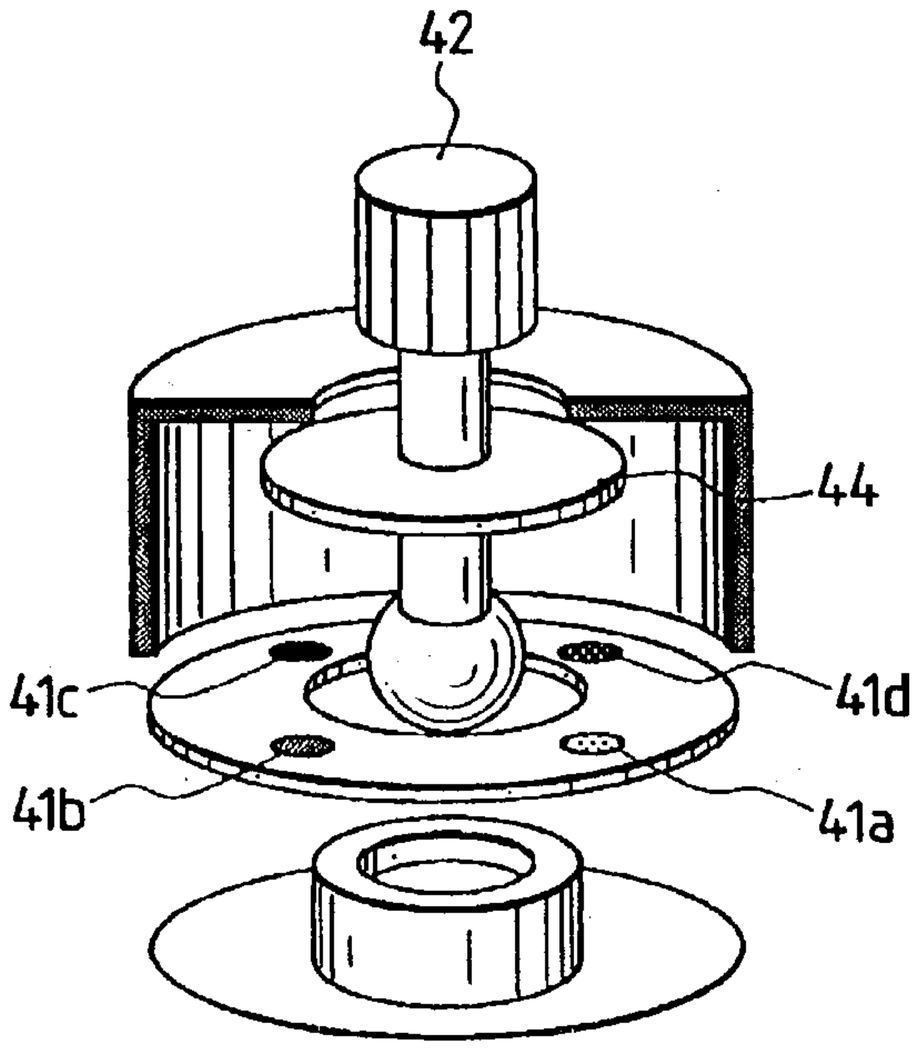


FIG. 7B

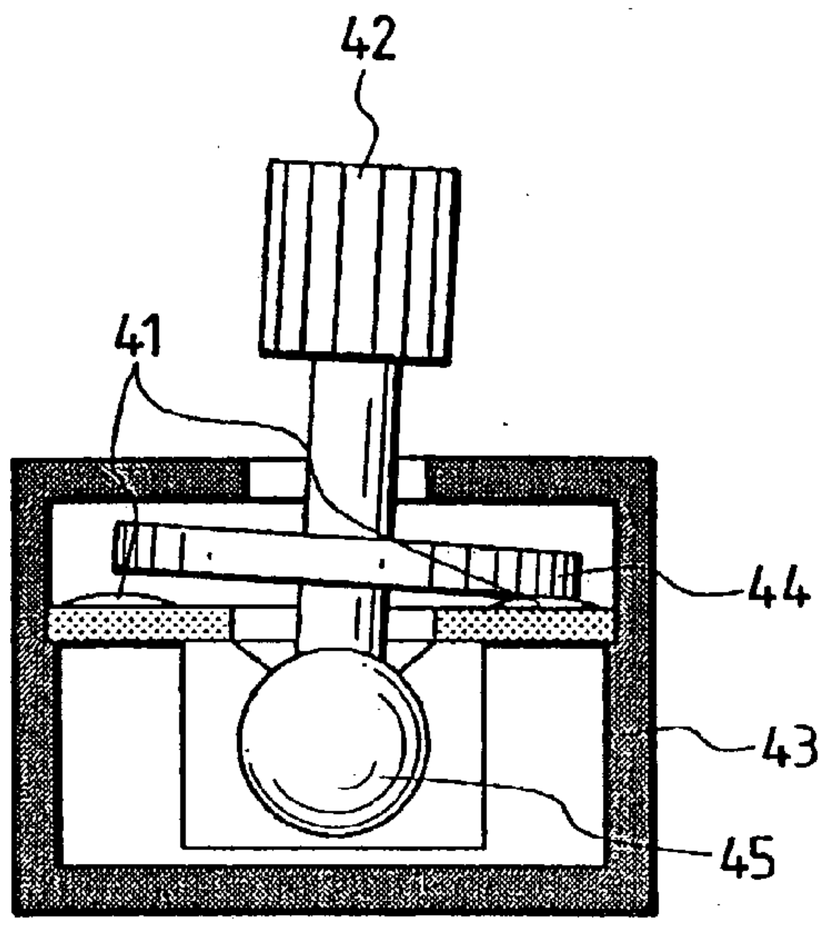


FIG. 9

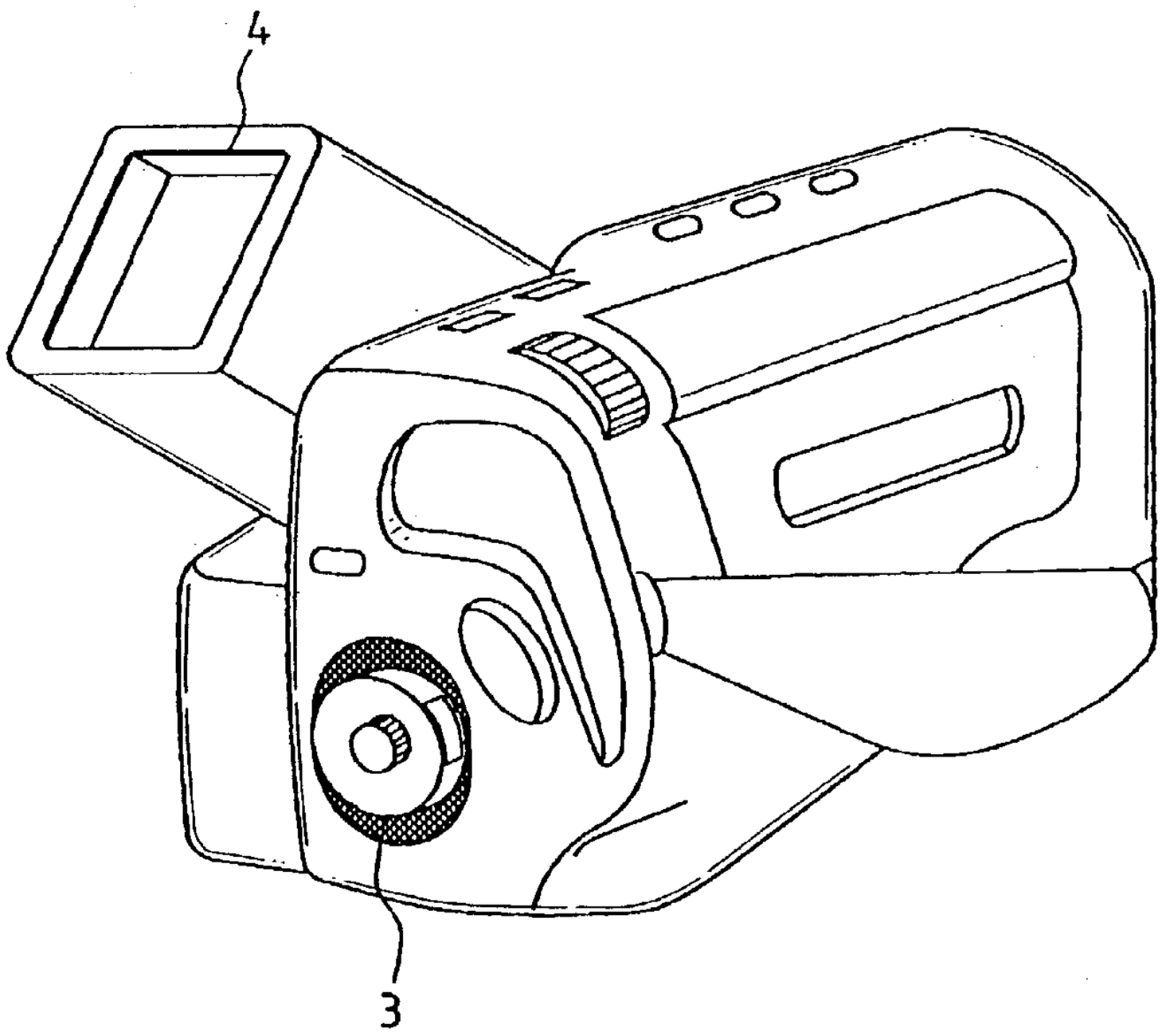


FIG. 8A

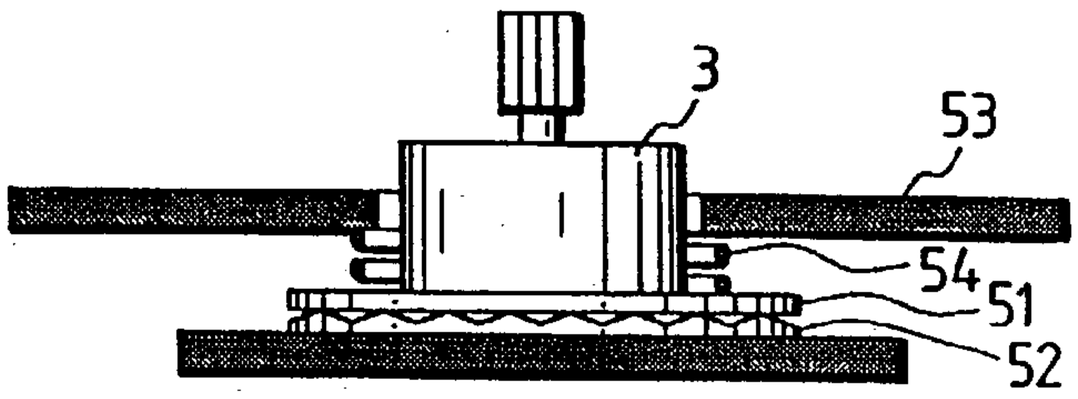


FIG. 8B

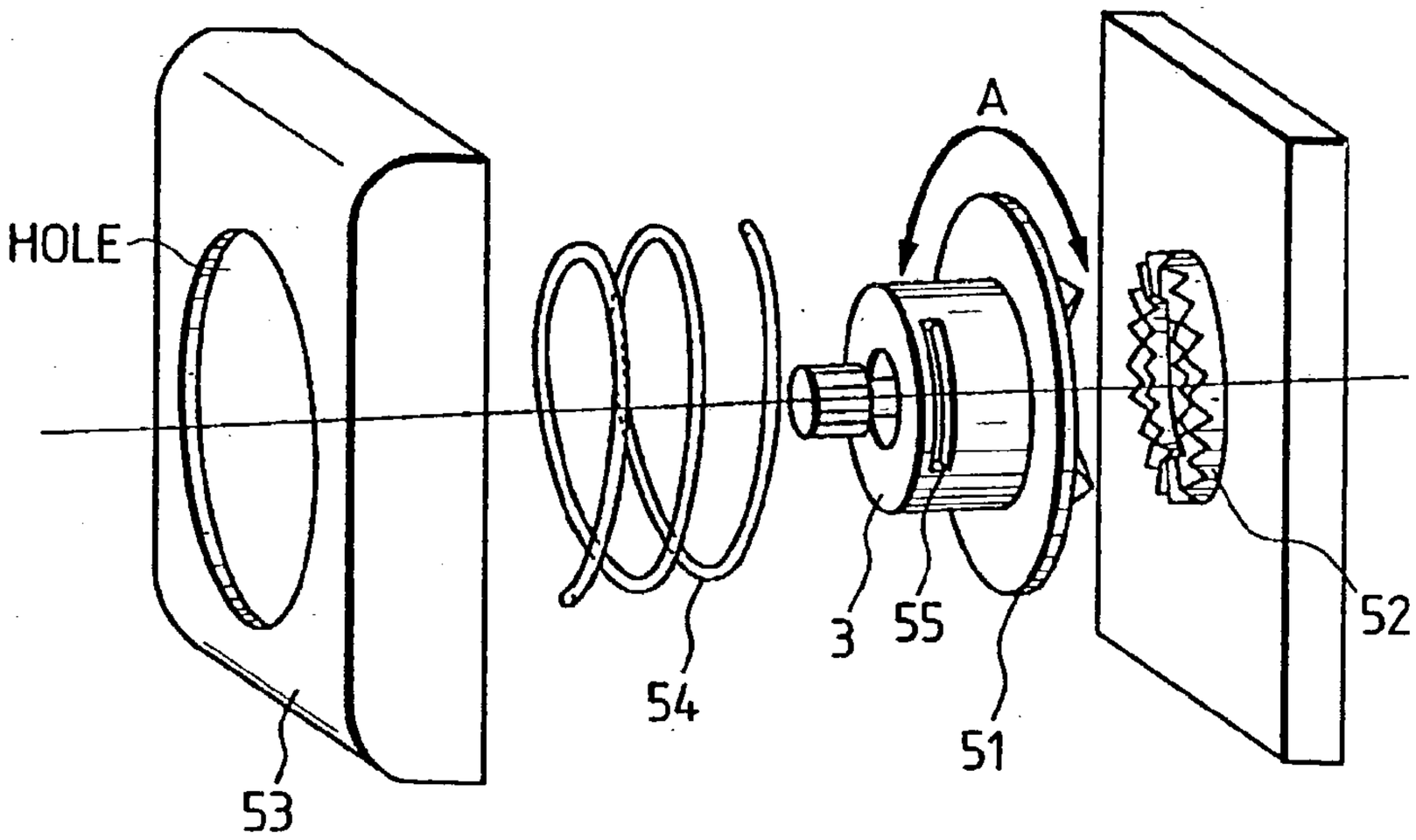


FIG. 8C

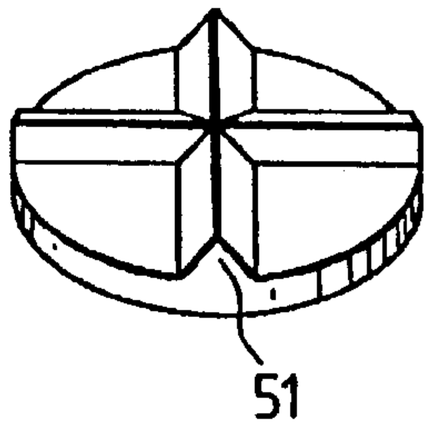


FIG. 10A

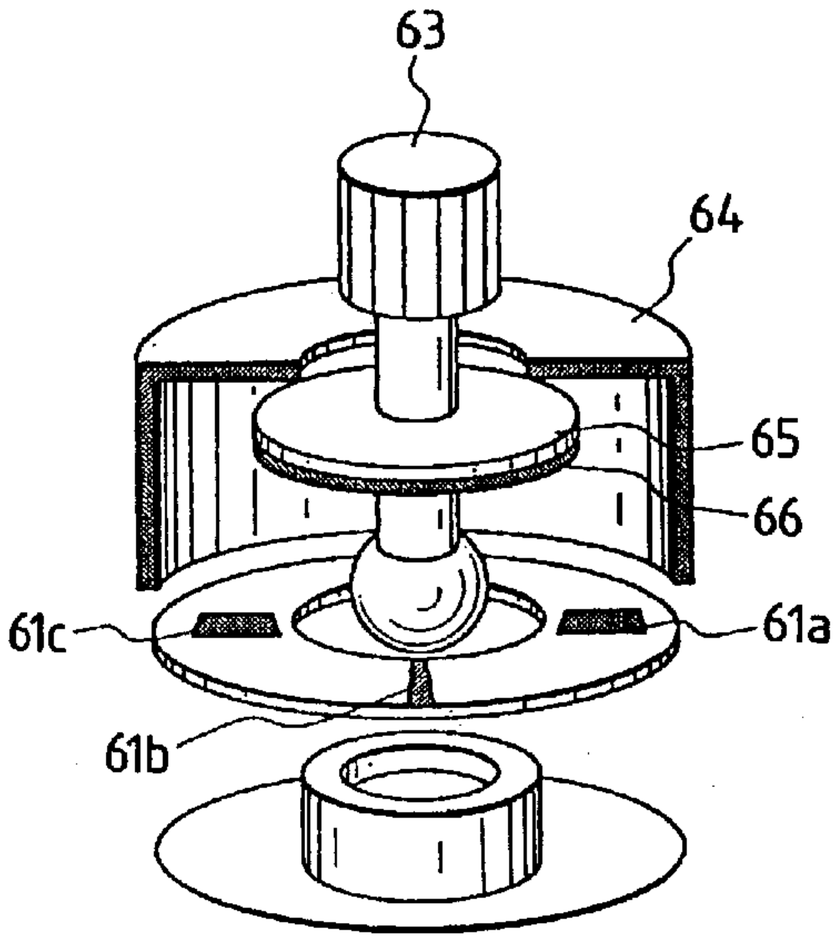


FIG. 10B

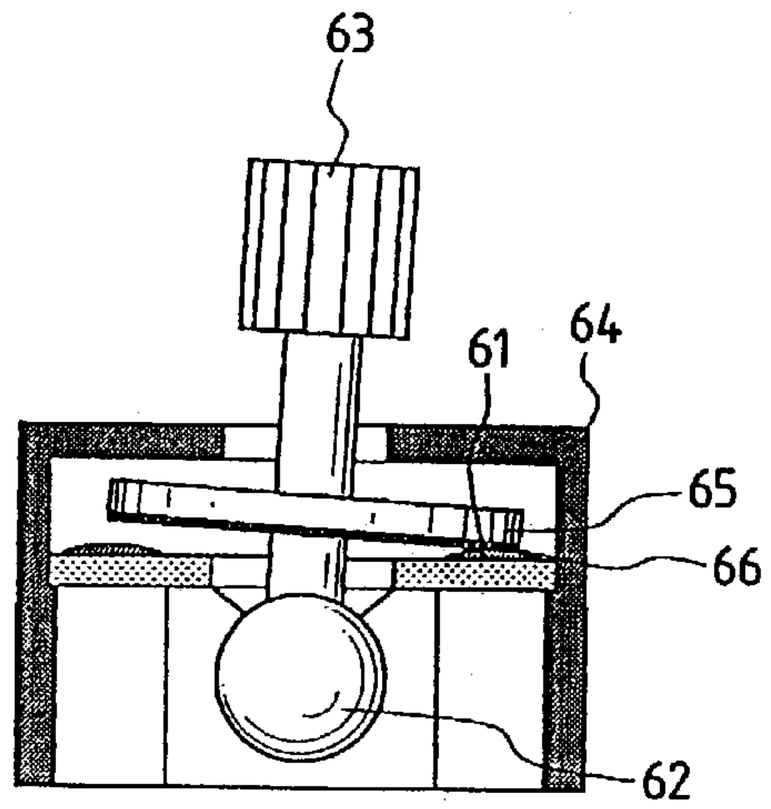


FIG. 12

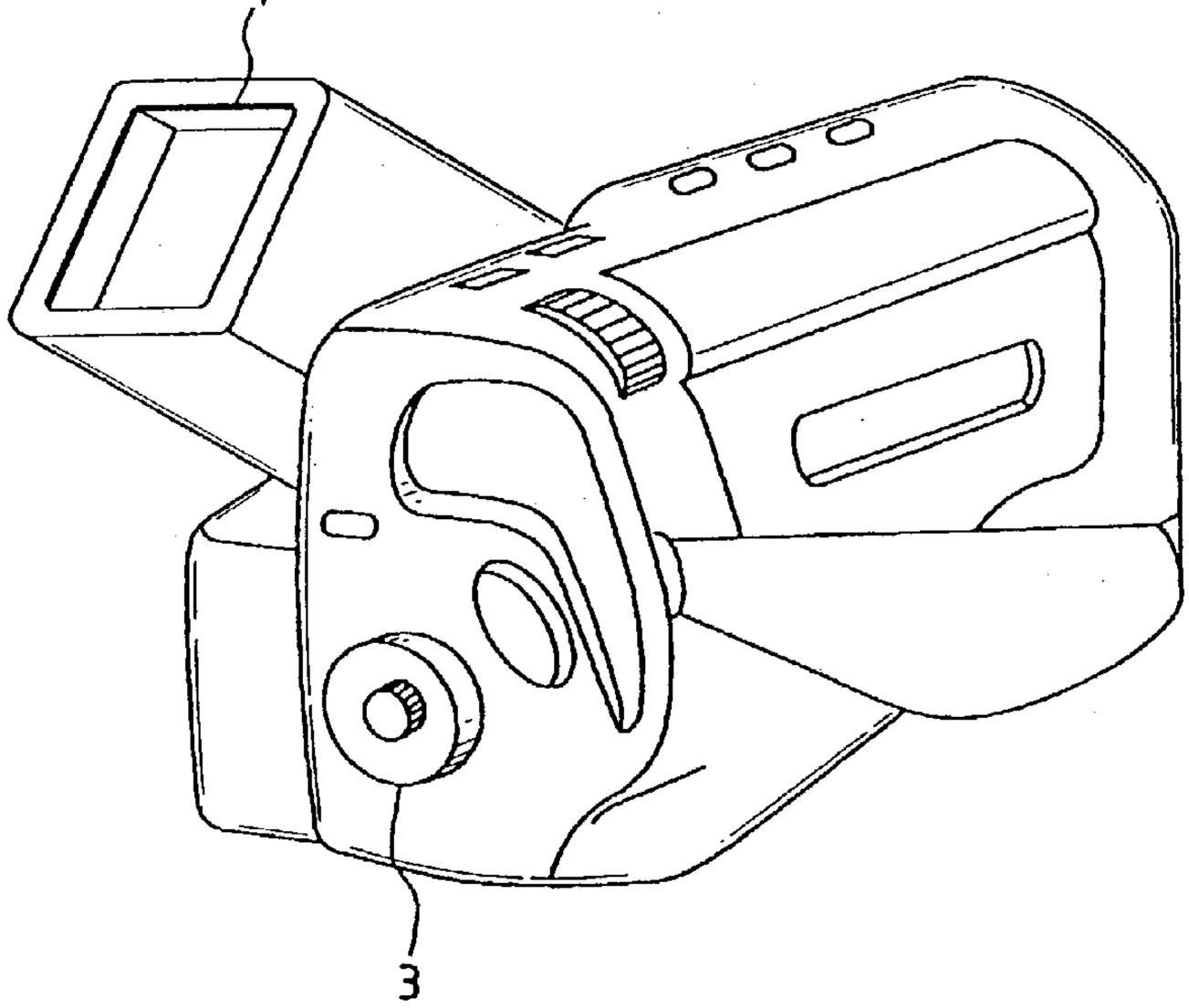


FIG. 11A

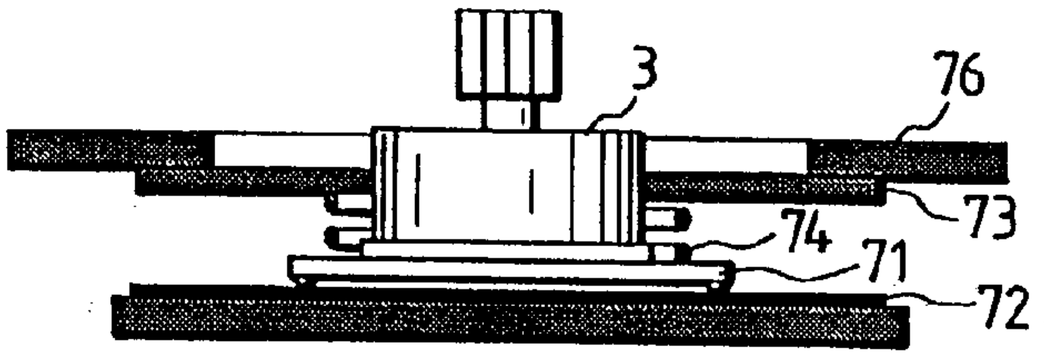


FIG. 11B

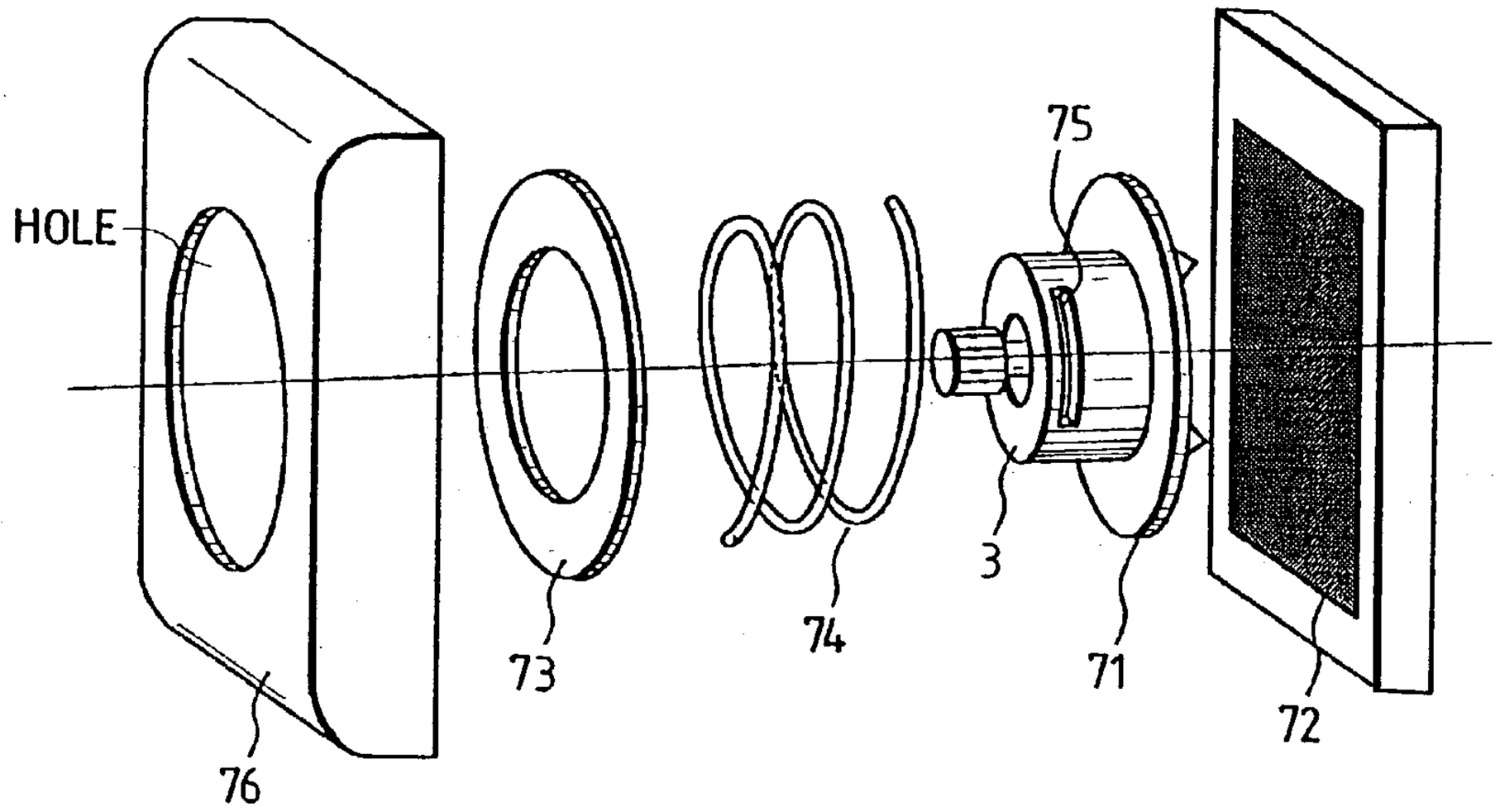


FIG. 11C

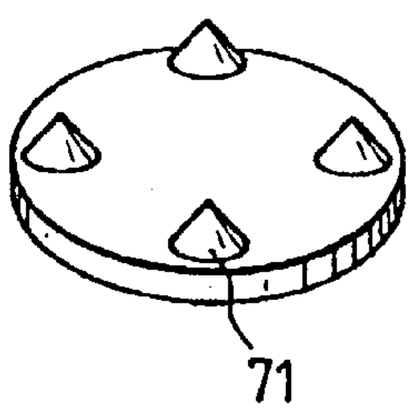


FIG. 13A

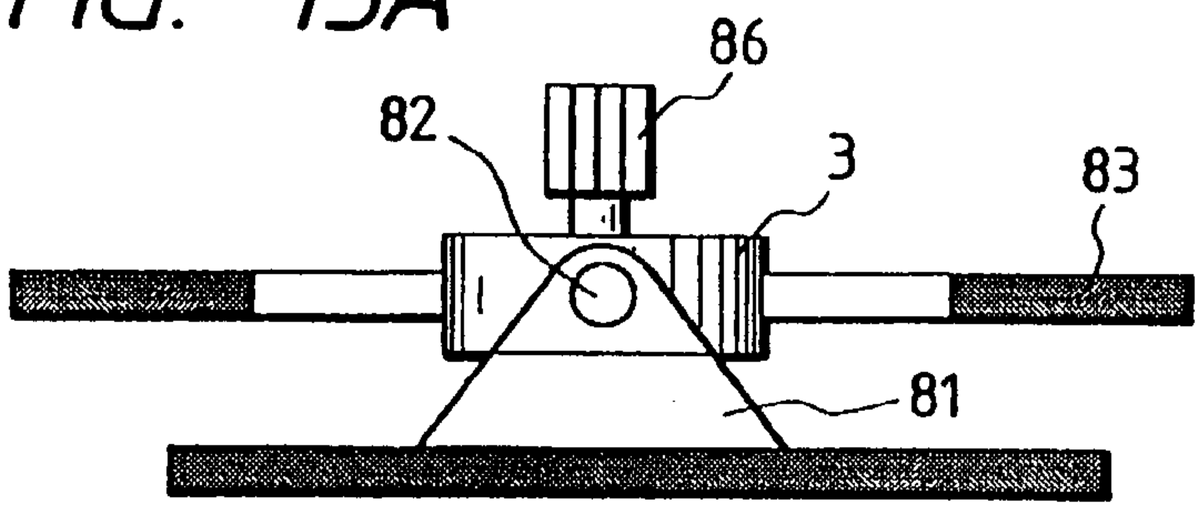


FIG. 13B

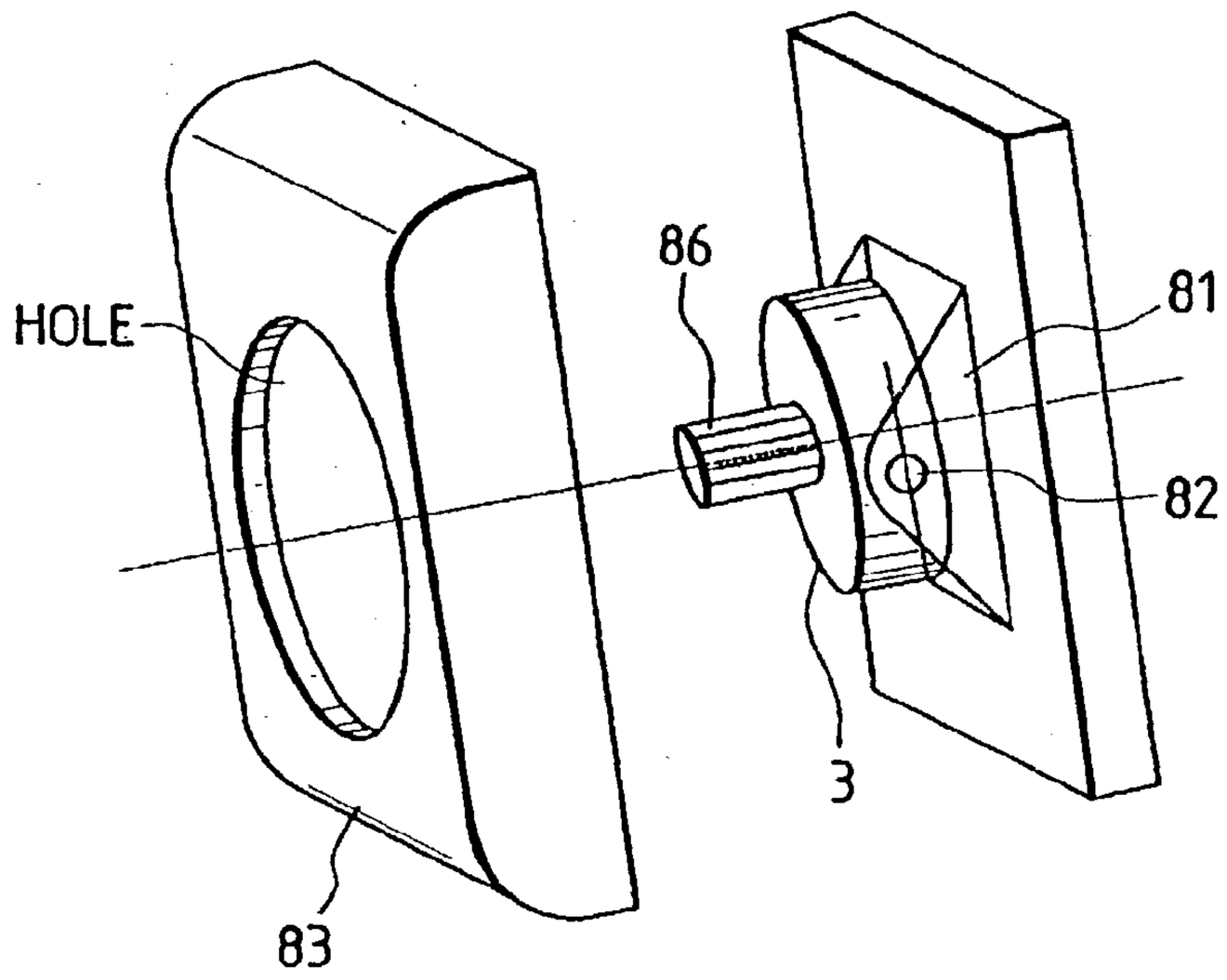


FIG. 13C

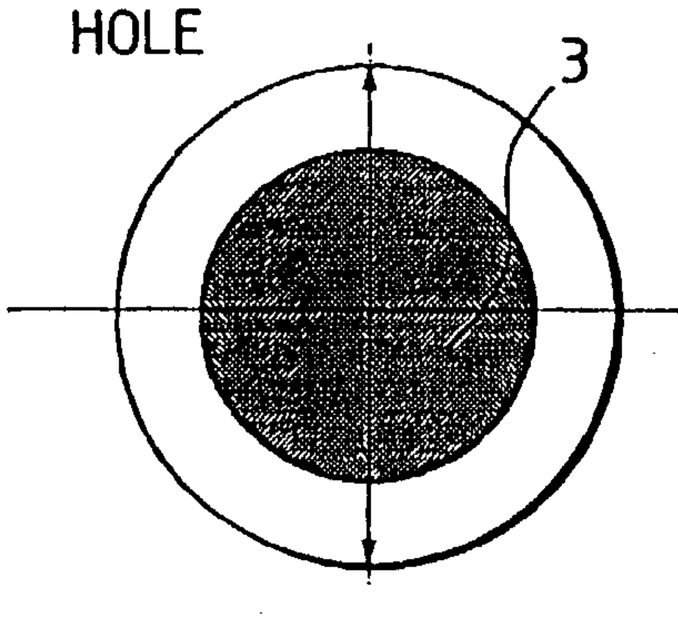


FIG. 13D

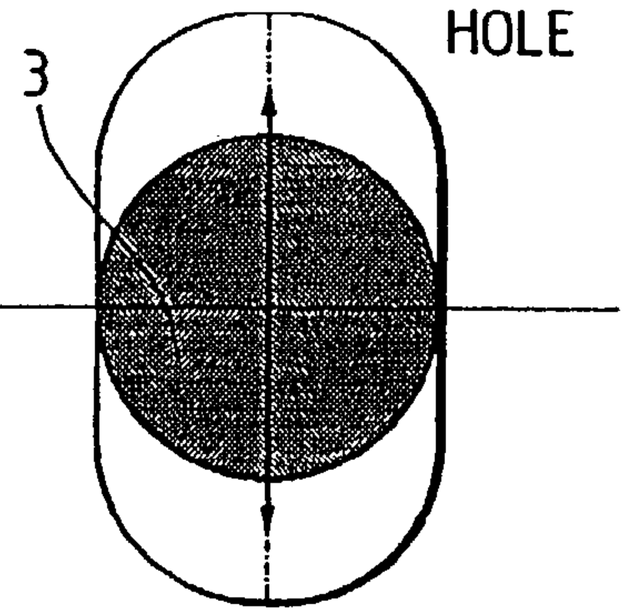


FIG. 14A

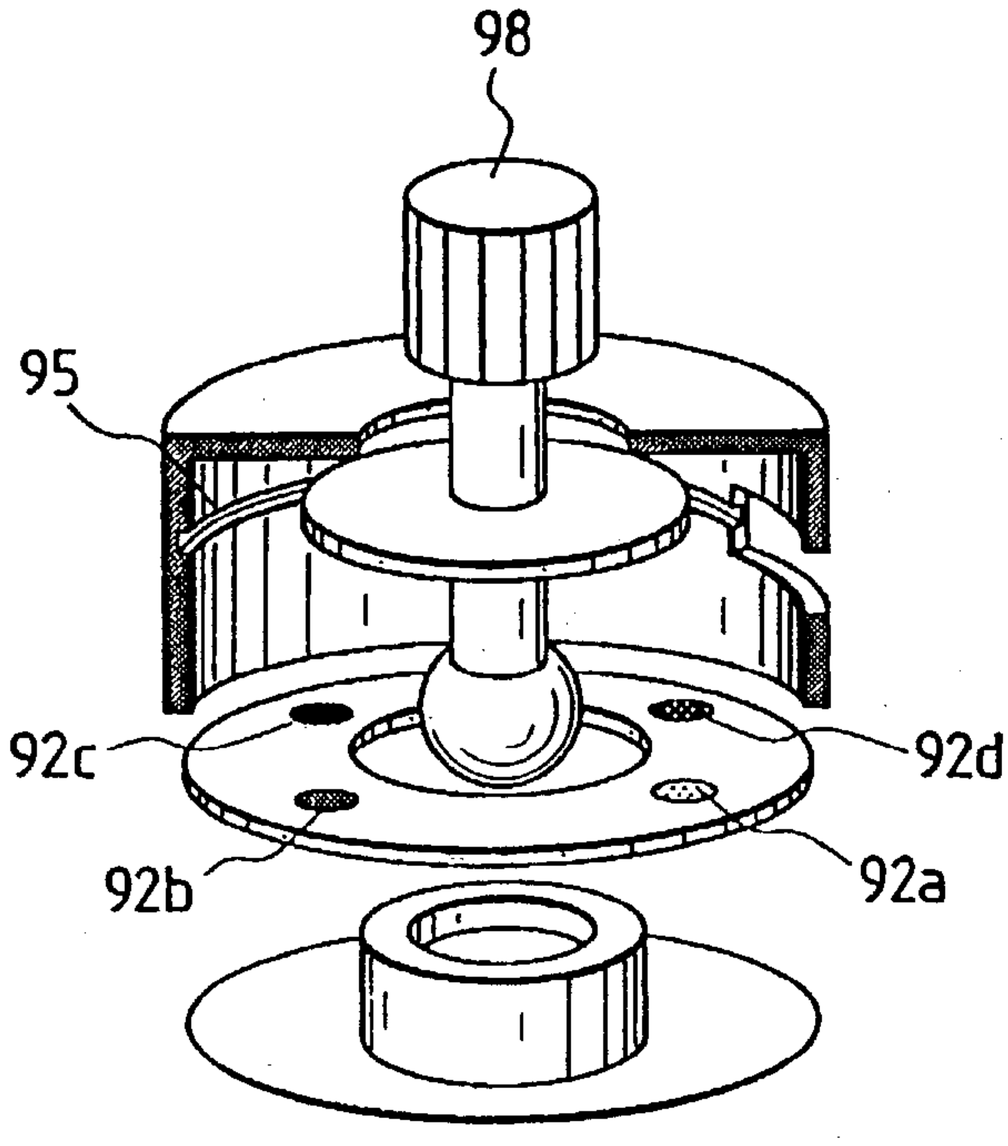


FIG. 14B

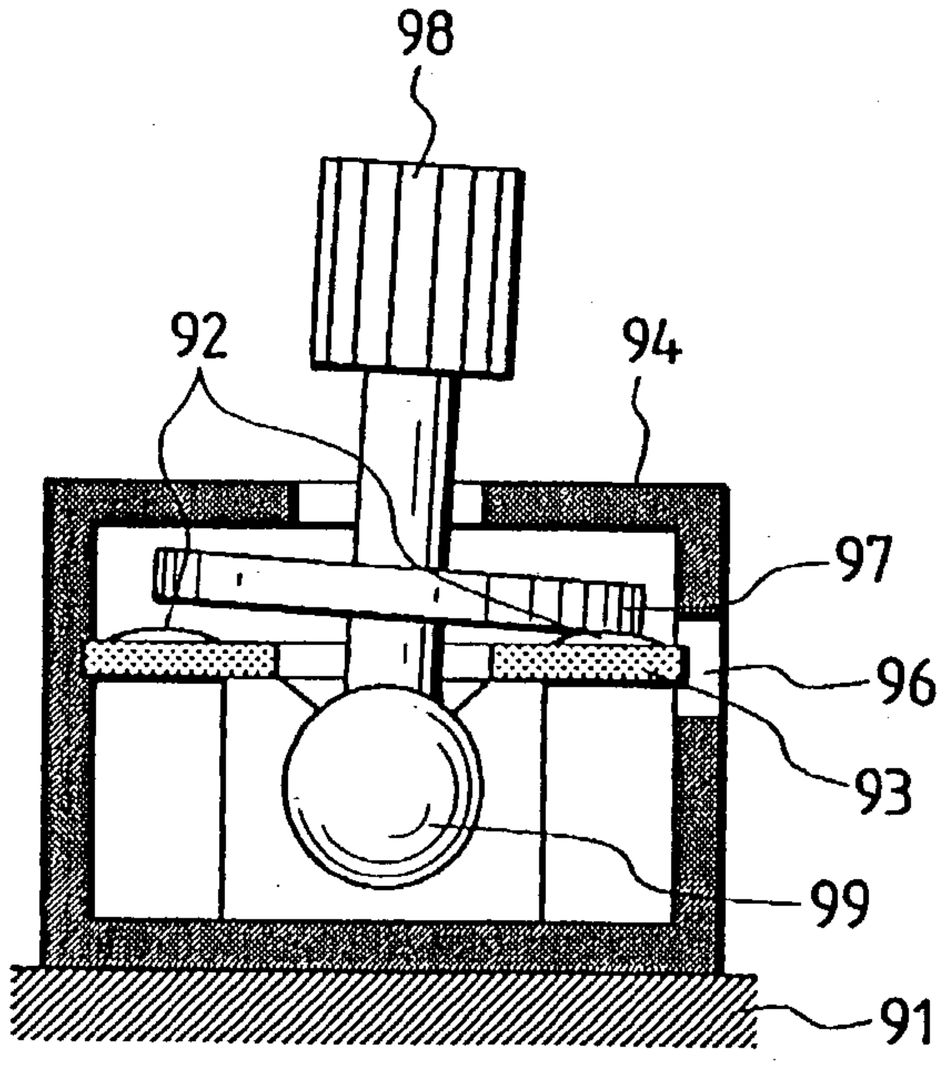


FIG. 15A

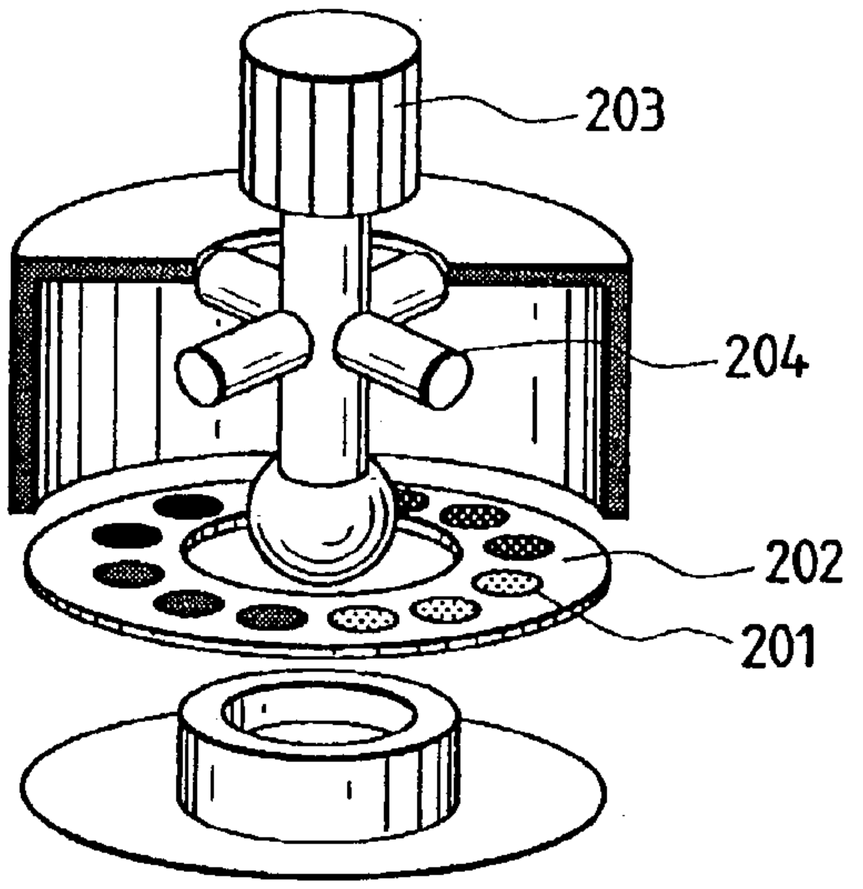


FIG. 15B

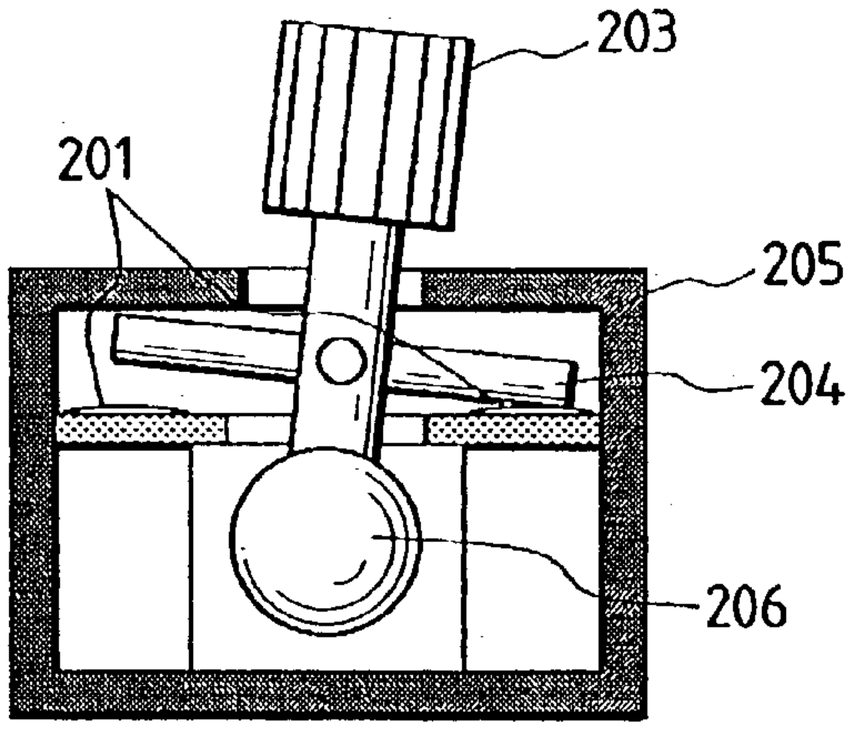


FIG. 15C

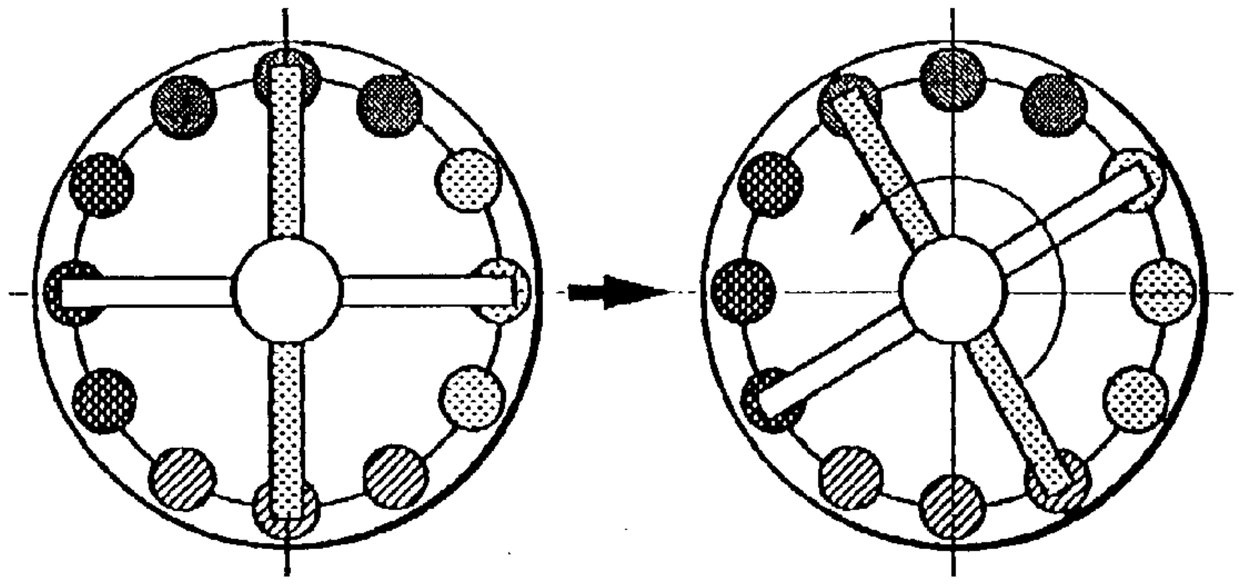


FIG. 16A

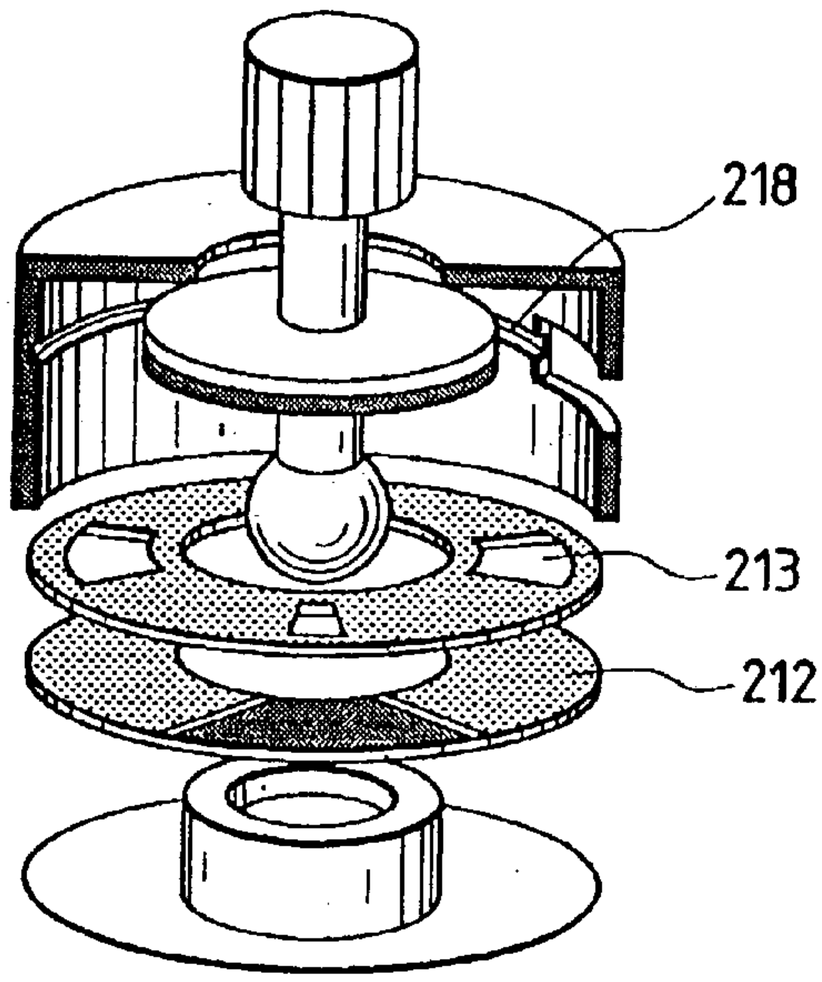


FIG. 16B

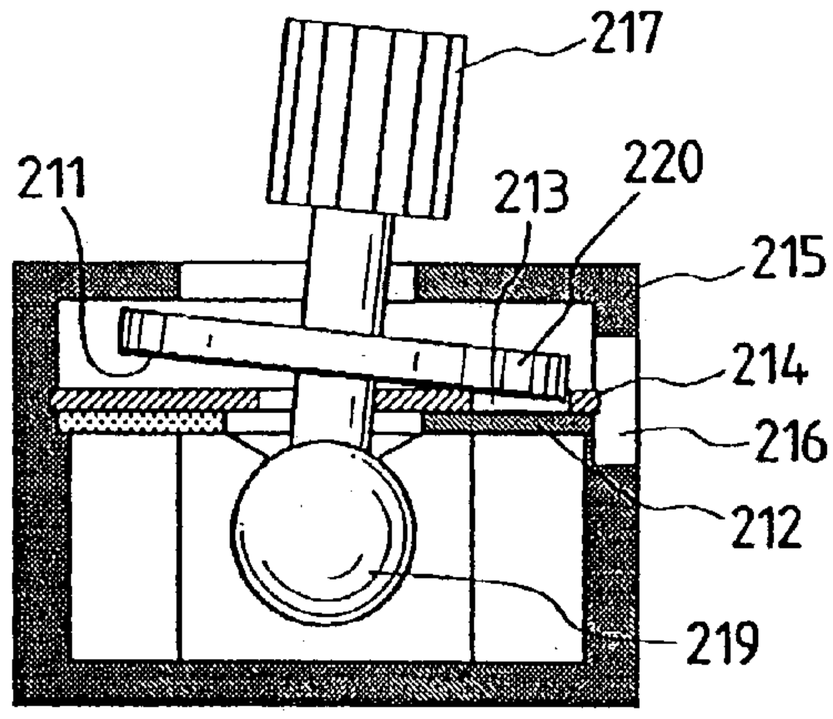


FIG. 16C

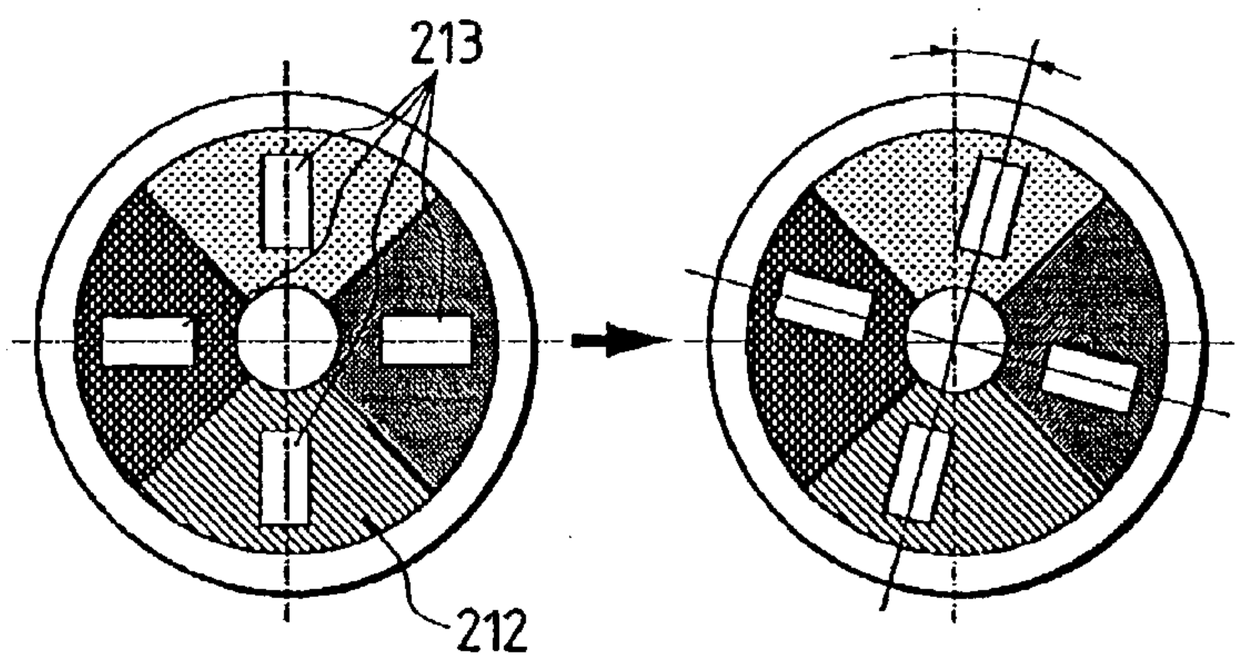


FIG. 17A

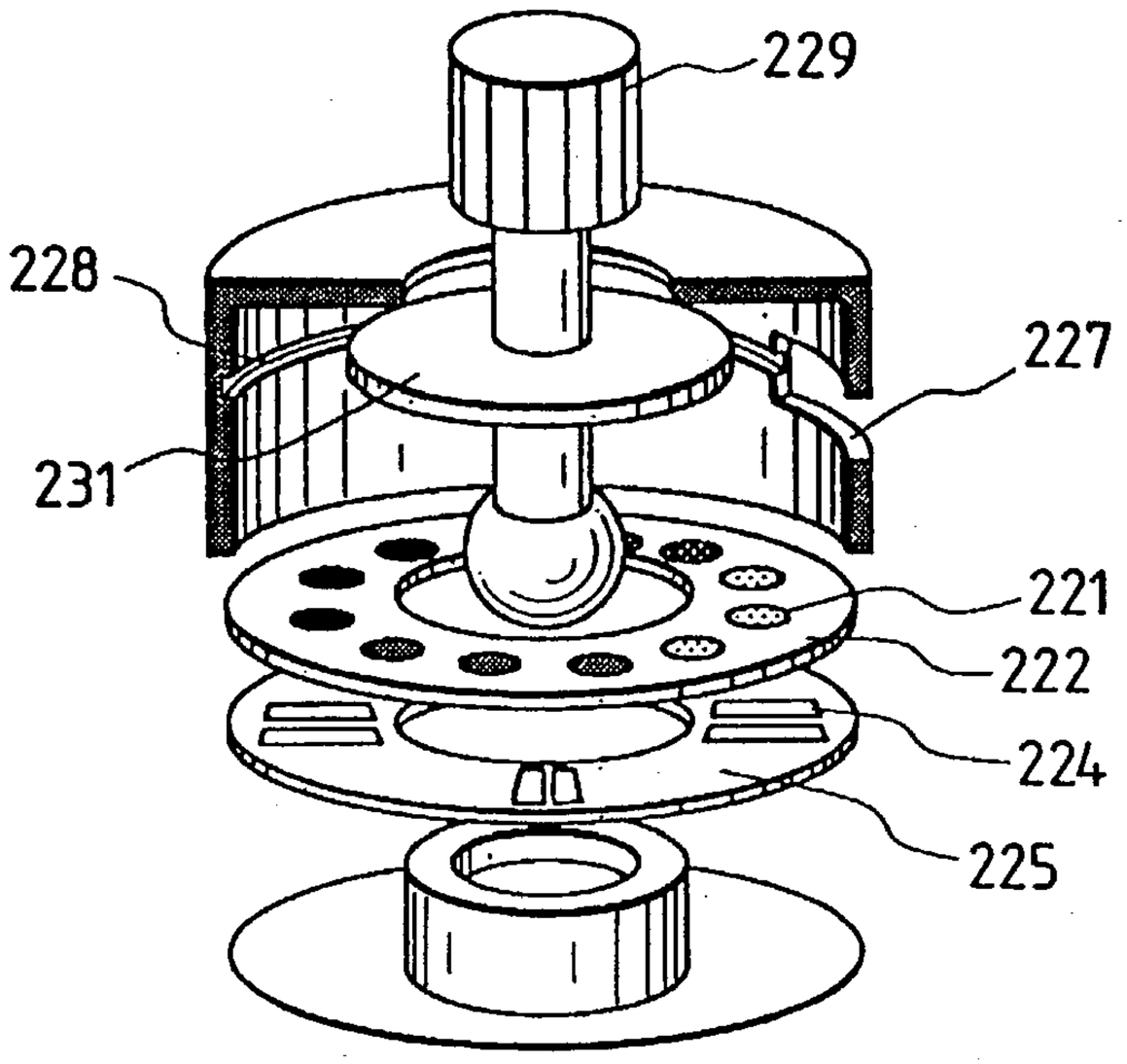


FIG. 17B

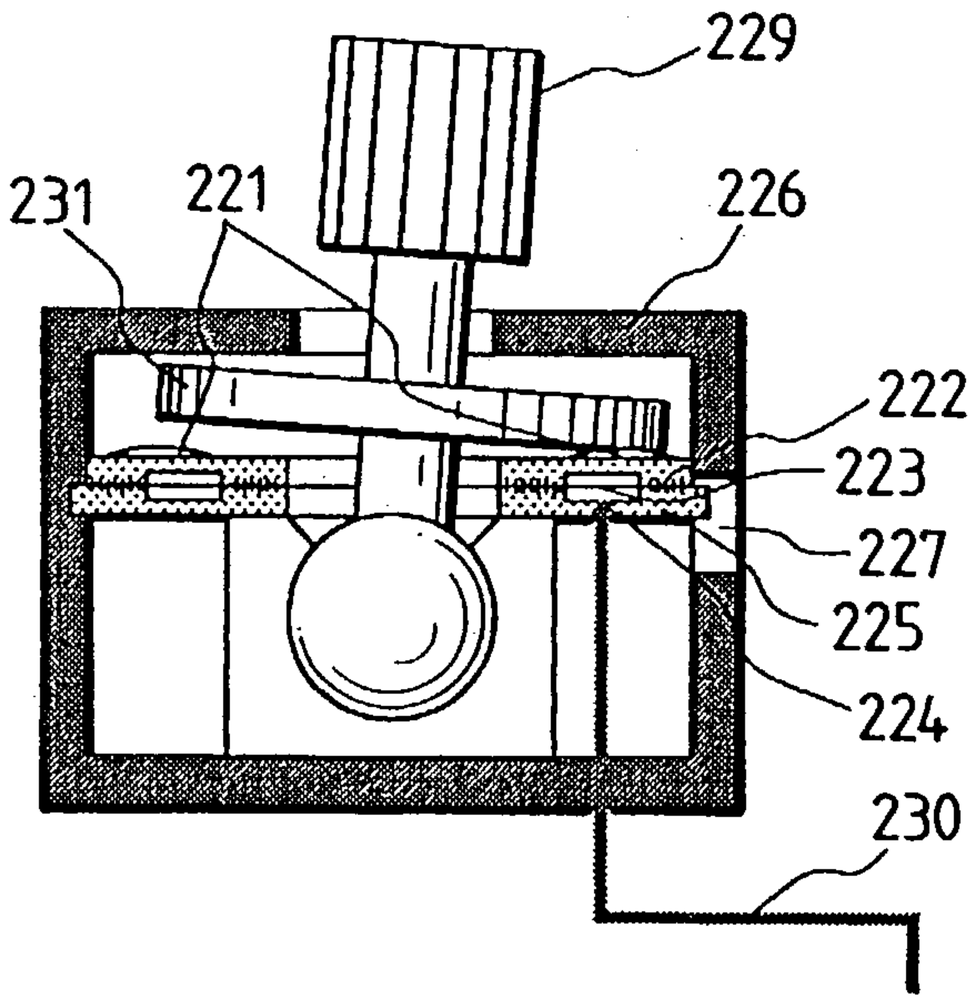


FIG. 18A

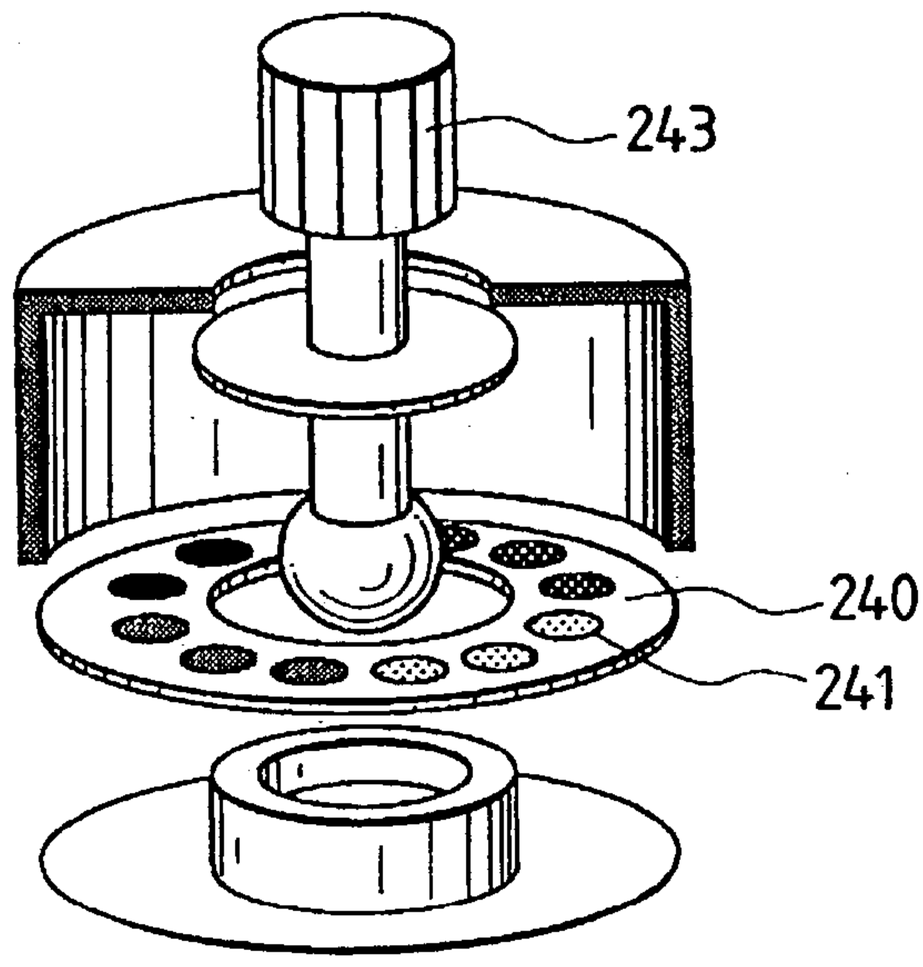


FIG. 18B

FIG. 19A

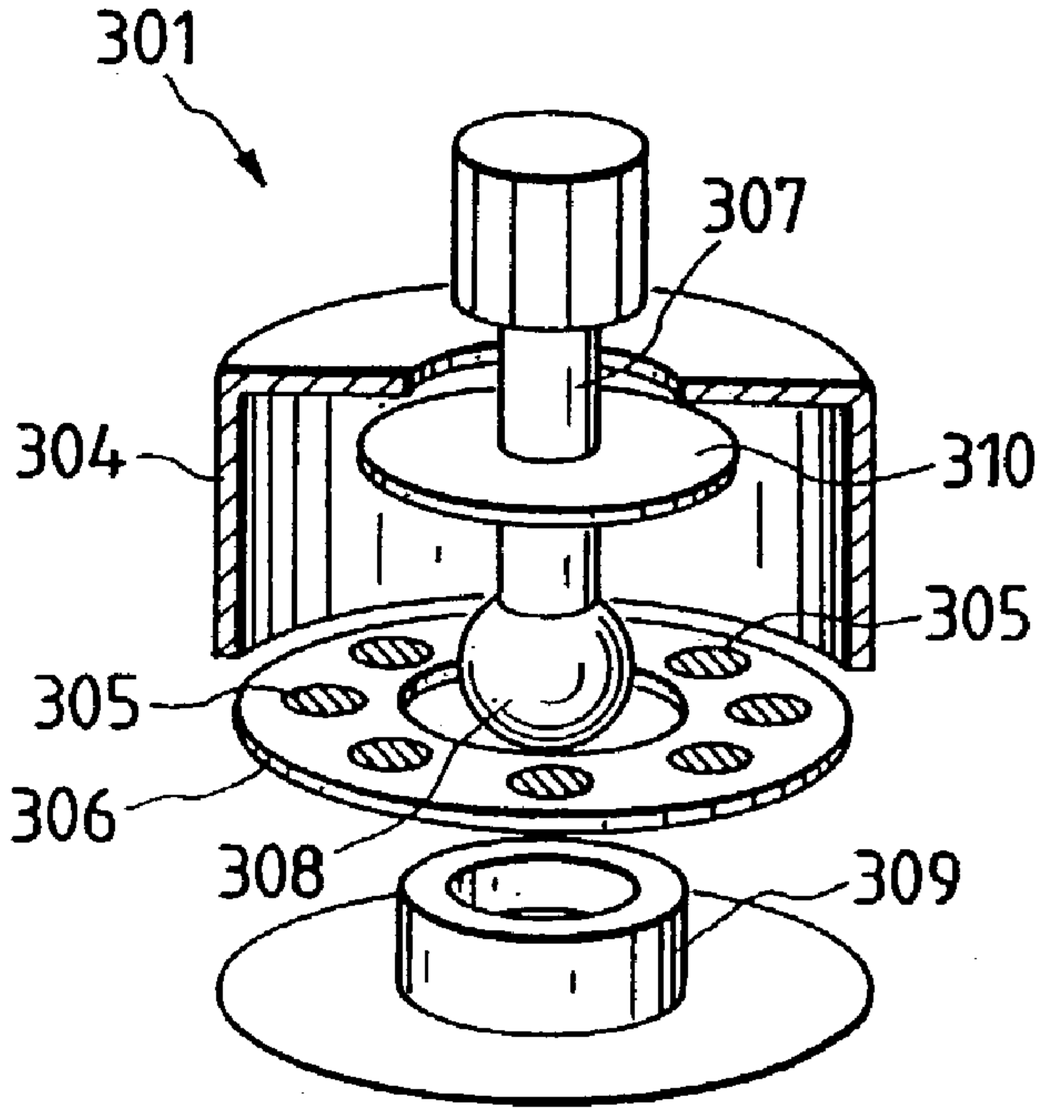


FIG. 19B

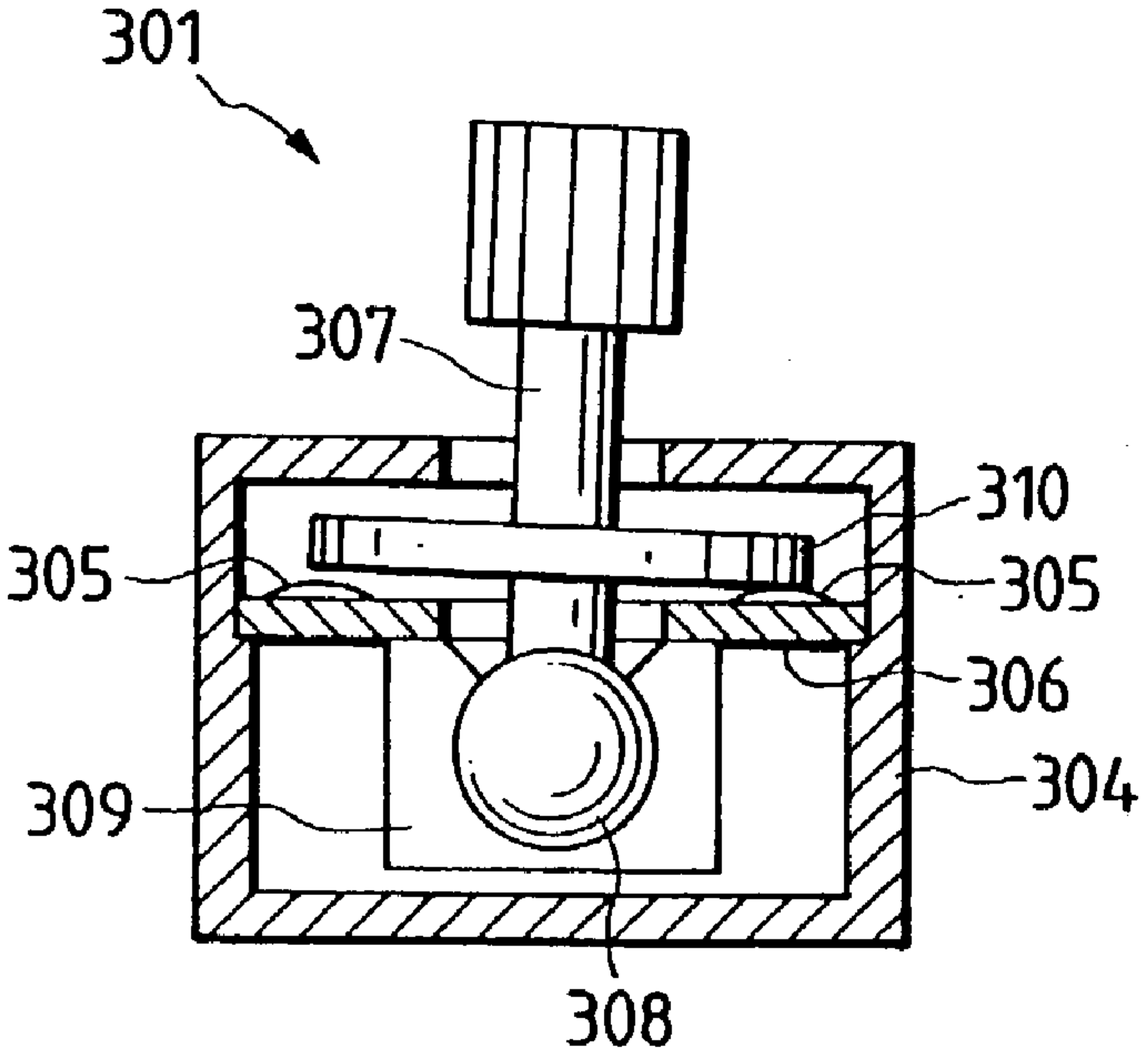


FIG. 20

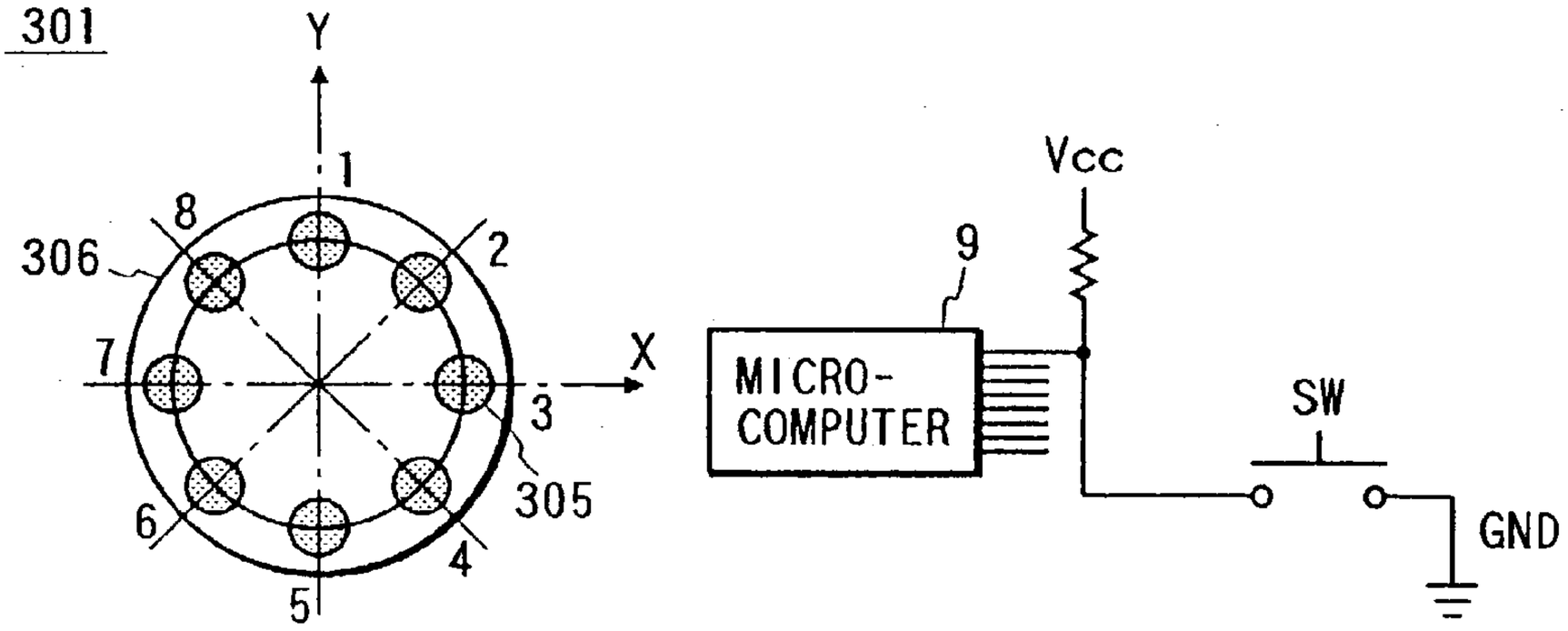
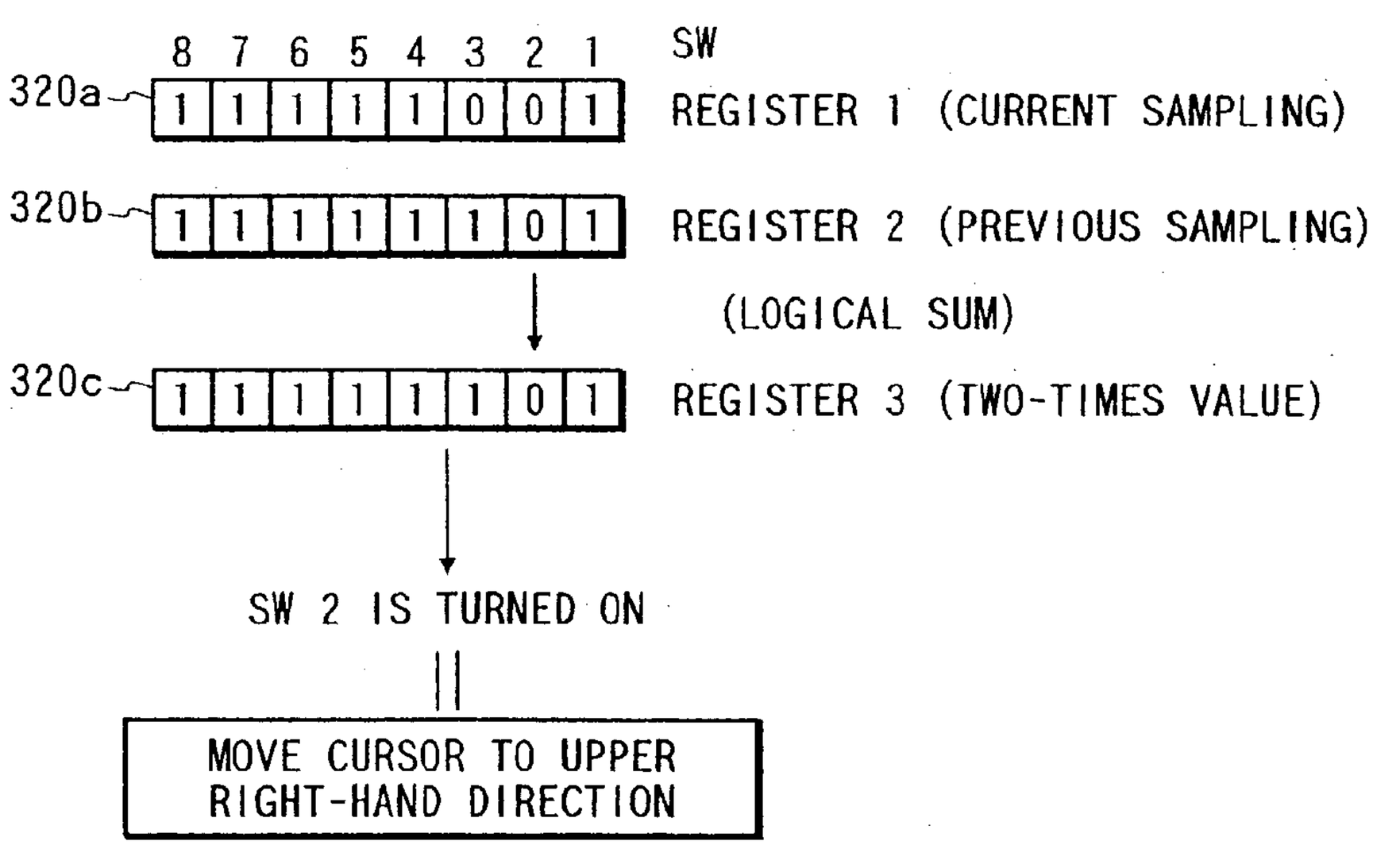

301
Y
X
1
2
3
4
5
6
7
8
306
305
Vcc
9
MICRO-
COMPUTER
SW
GND

FIG. 21


8 7 6 5 4 3 2 1
SW
320a
1 1 1 1 1 0 0 1
REGISTER 1 (CURRENT SAMPLING)
320b
1 1 1 1 1 1 0 1
REGISTER 2 (PREVIOUS SAMPLING)
(LOGICAL SUM)
320c
1 1 1 1 1 1 0 1
REGISTER 3 (TWO-TIMES VALUE)
SW 2 IS TURNED ON
MOVE CURSOR TO UPPER
RIGHT-HAND DIRECTION

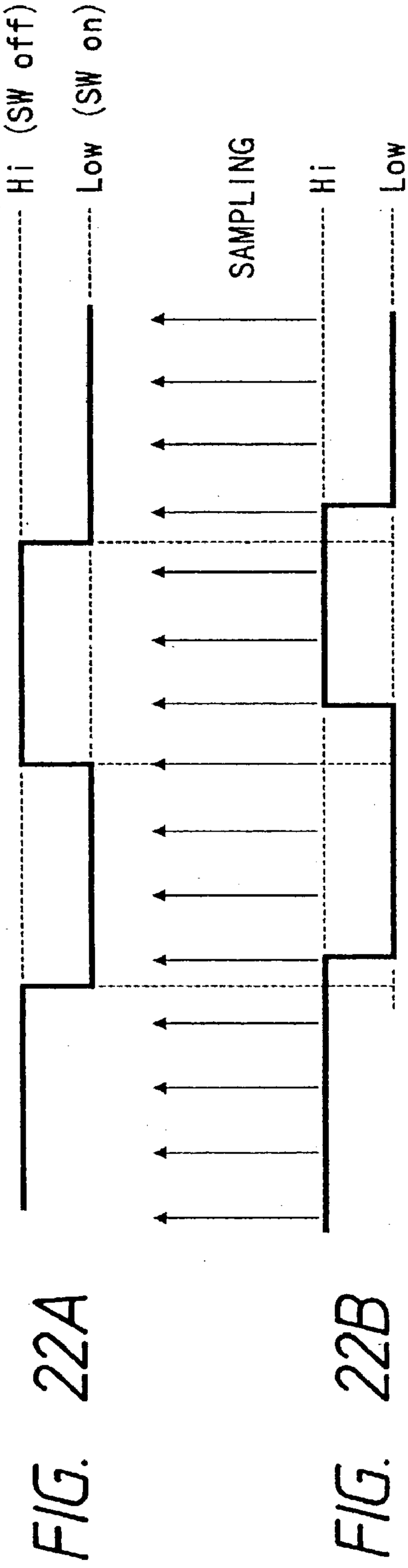


FIG. 22A

FIG. 22B

FIG. 23A

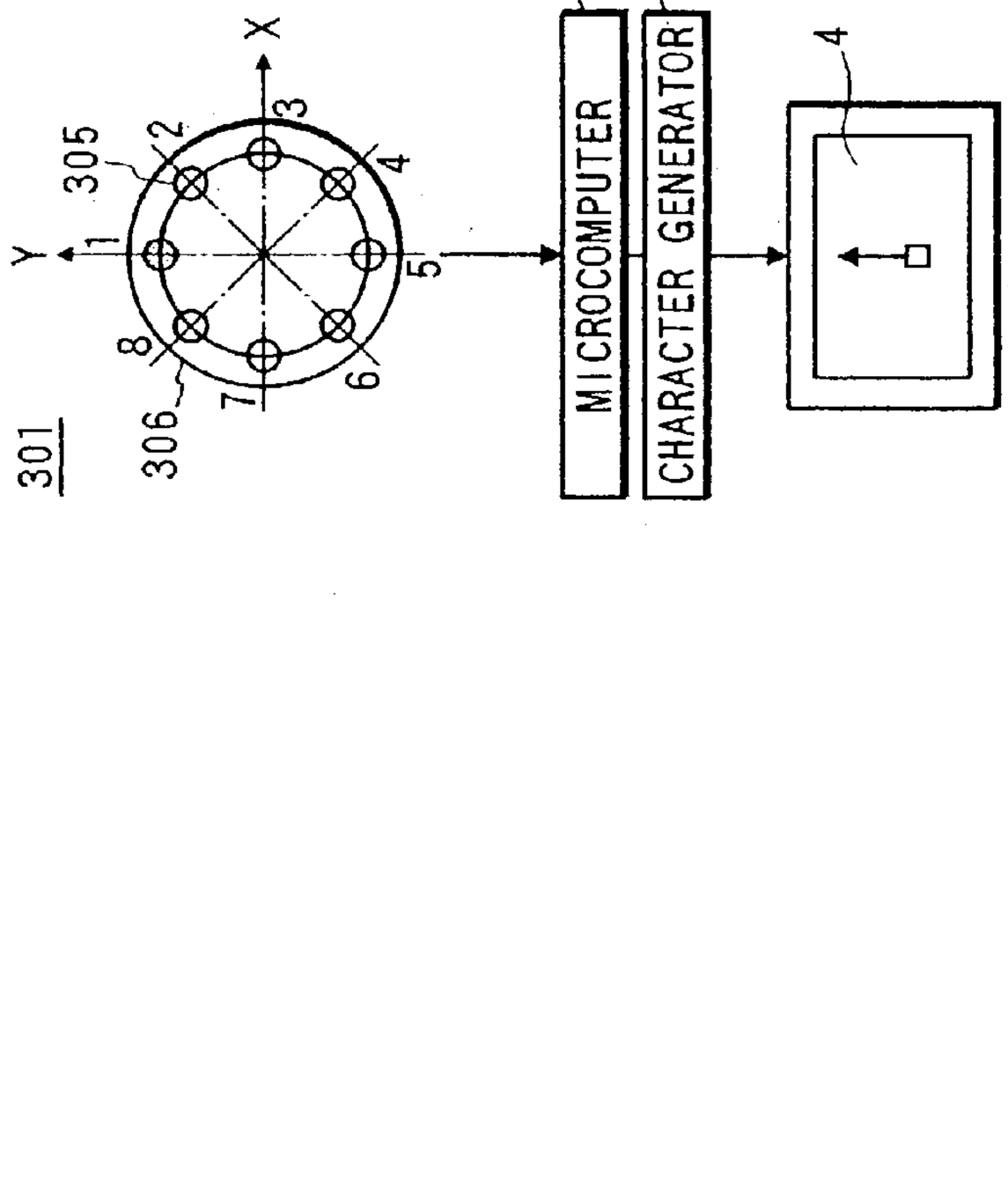


FIG. 23B

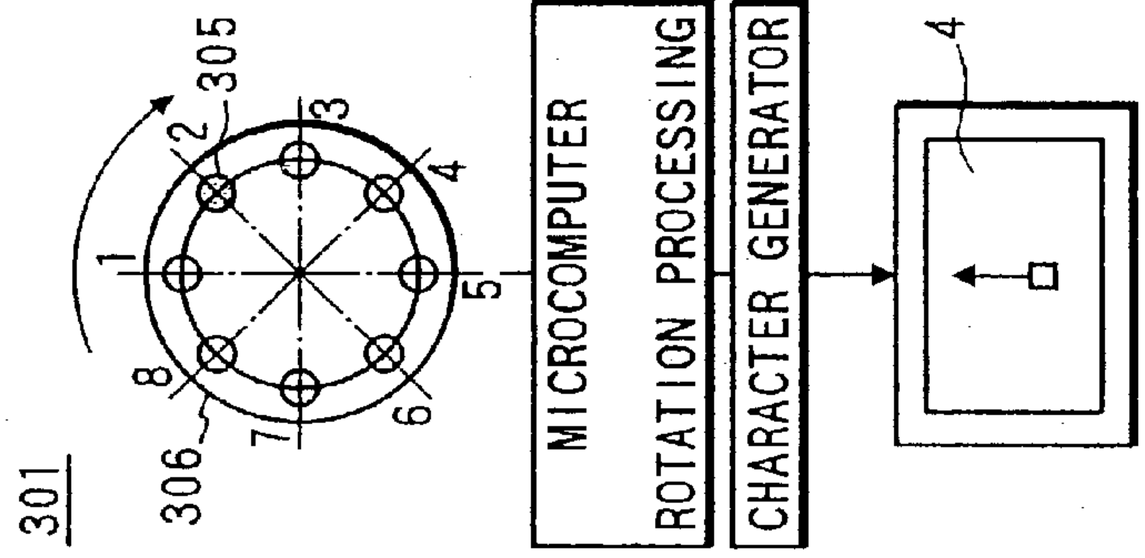


FIG. 23C

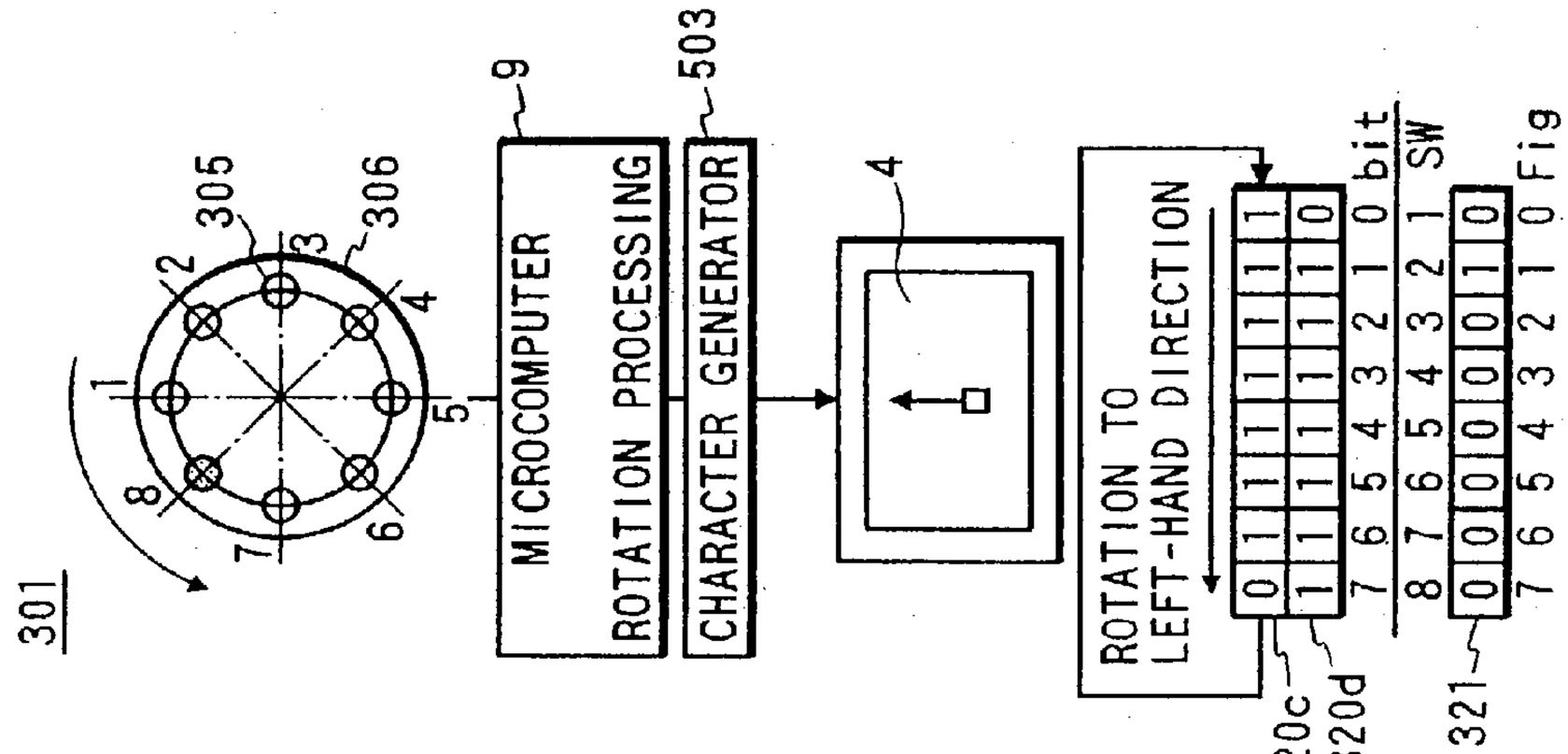


FIG. 24

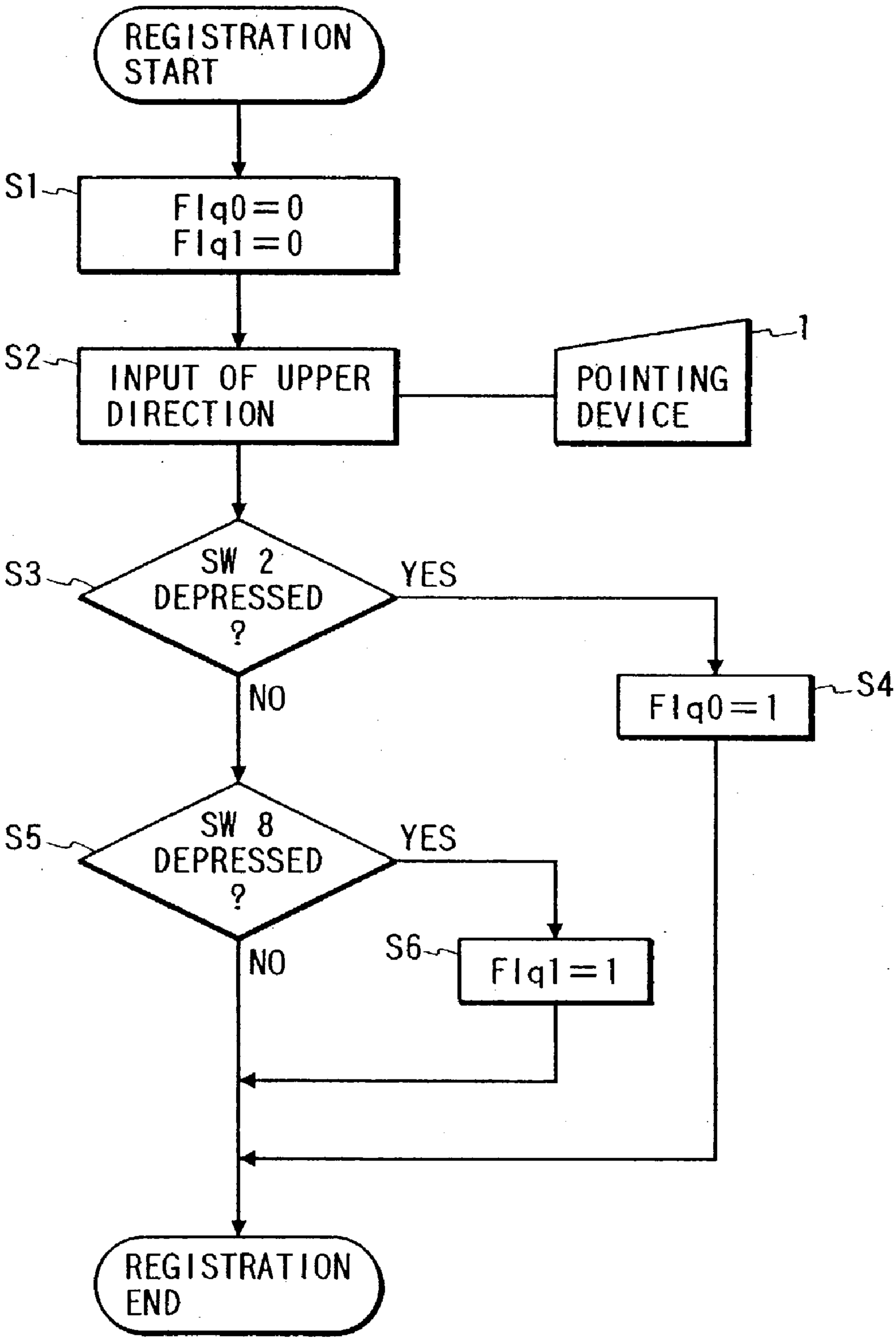

REGISTRATION START
S1
Flq0=0
Flq1=0
S2
INPUT OF UPPER DIRECTION
POINTING DEVICE
1
S3
SW 2 DEPRESSED ?
YES
NO
Flq0=1
S4
S5
SW 8 DEPRESSED ?
YES
NO
S6
Flq1=1
REGISTRATION END

FIG. 25

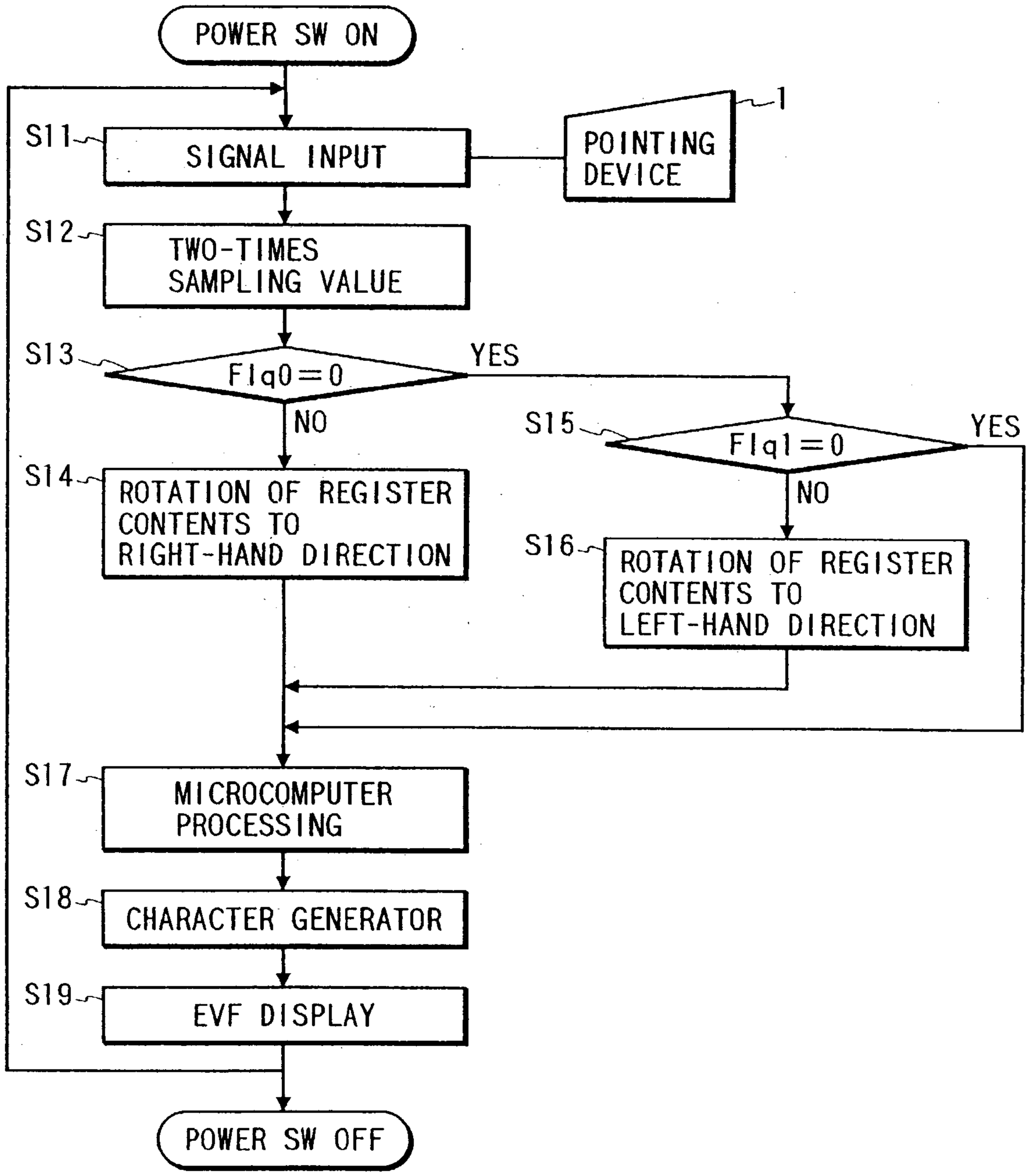

POWER SW ON
S11
SIGNAL INPUT
POINTING DEVICE
1
S12
TWO-TIMES SAMPLING VALUE
S13
Flq0=0
YES
NO
S15
Flq1=0
YES
NO
S14
ROTATION OF REGISTER CONTENTS TO RIGHT-HAND DIRECTION
S16
ROTATION OF REGISTER CONTENTS TO LEFT-HAND DIRECTION
S17
MICROCOMPUTER PROCESSING
S18
CHARACTER GENERATOR
S19
EVF DISPLAY
POWER SW OFF

FIG. 26

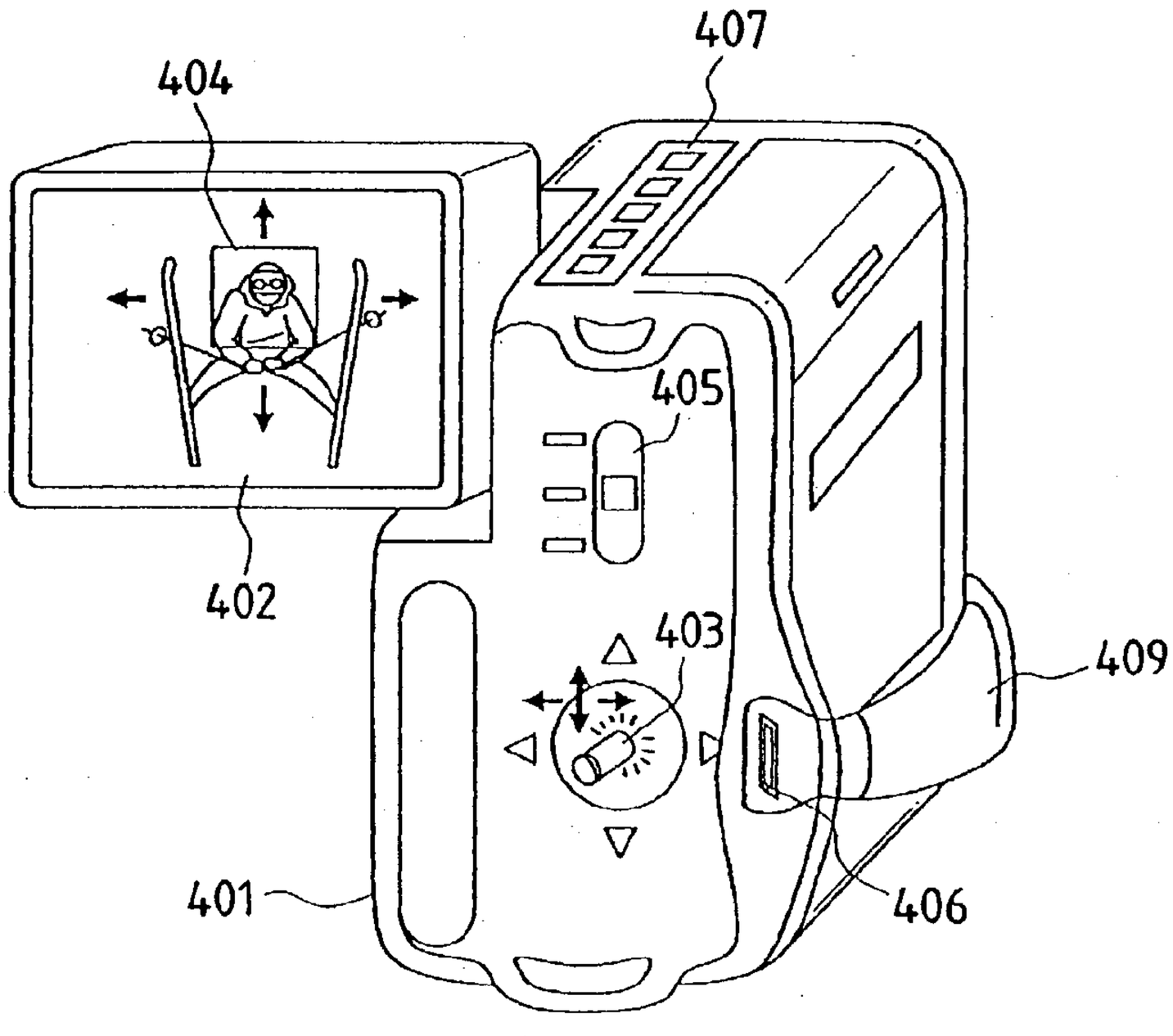


FIG. 28

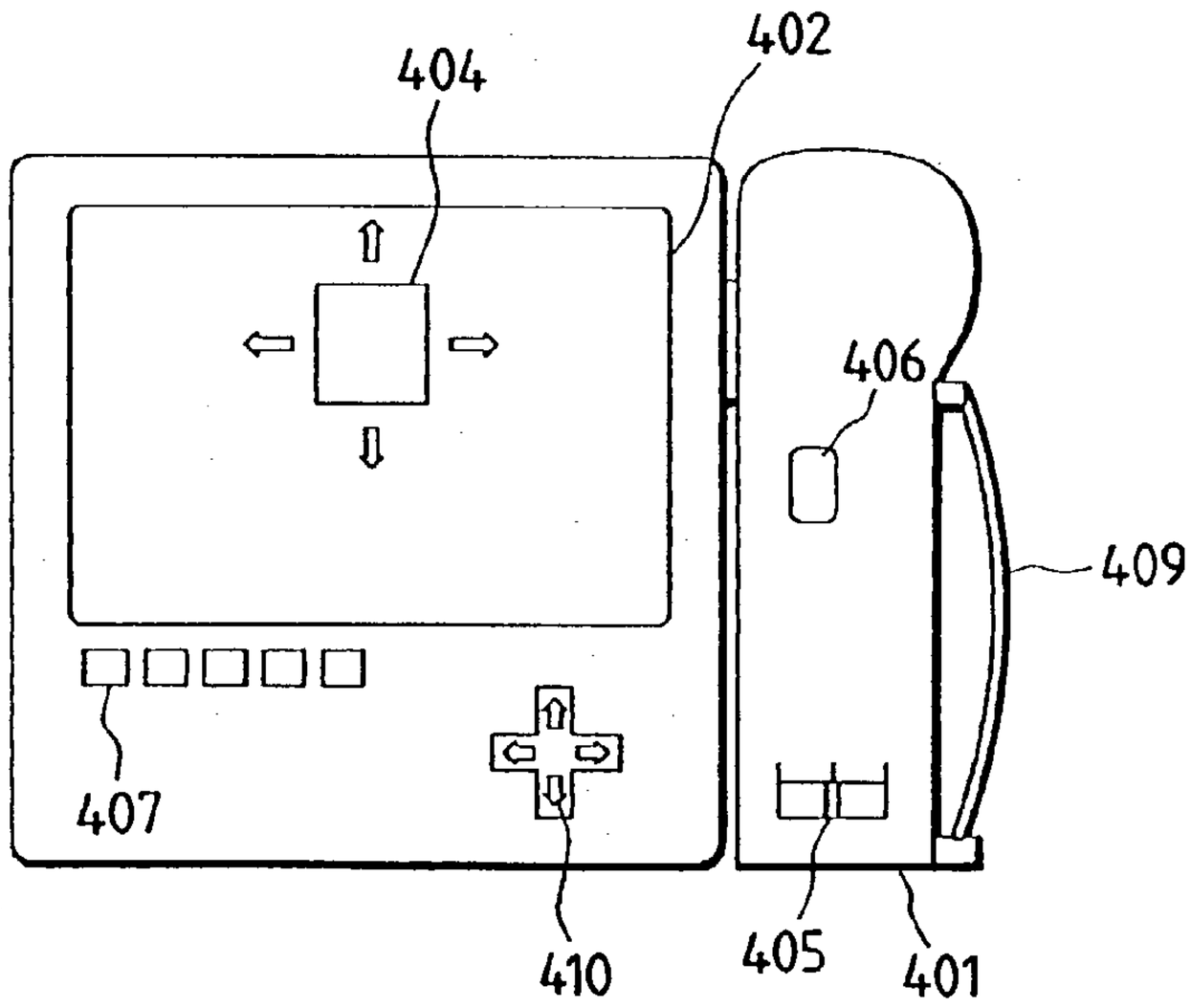


FIG. 27

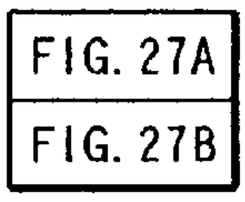


FIG. 27A

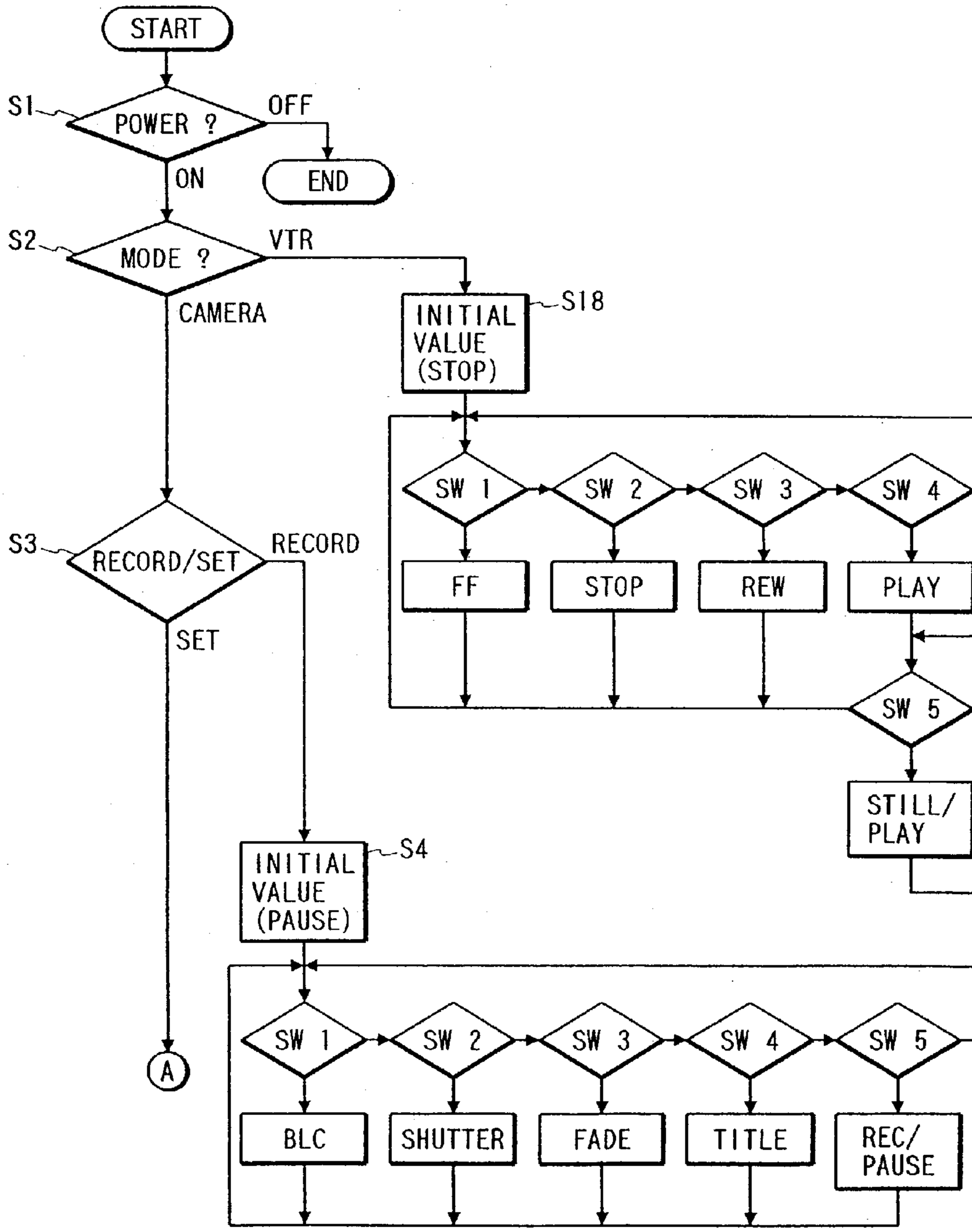
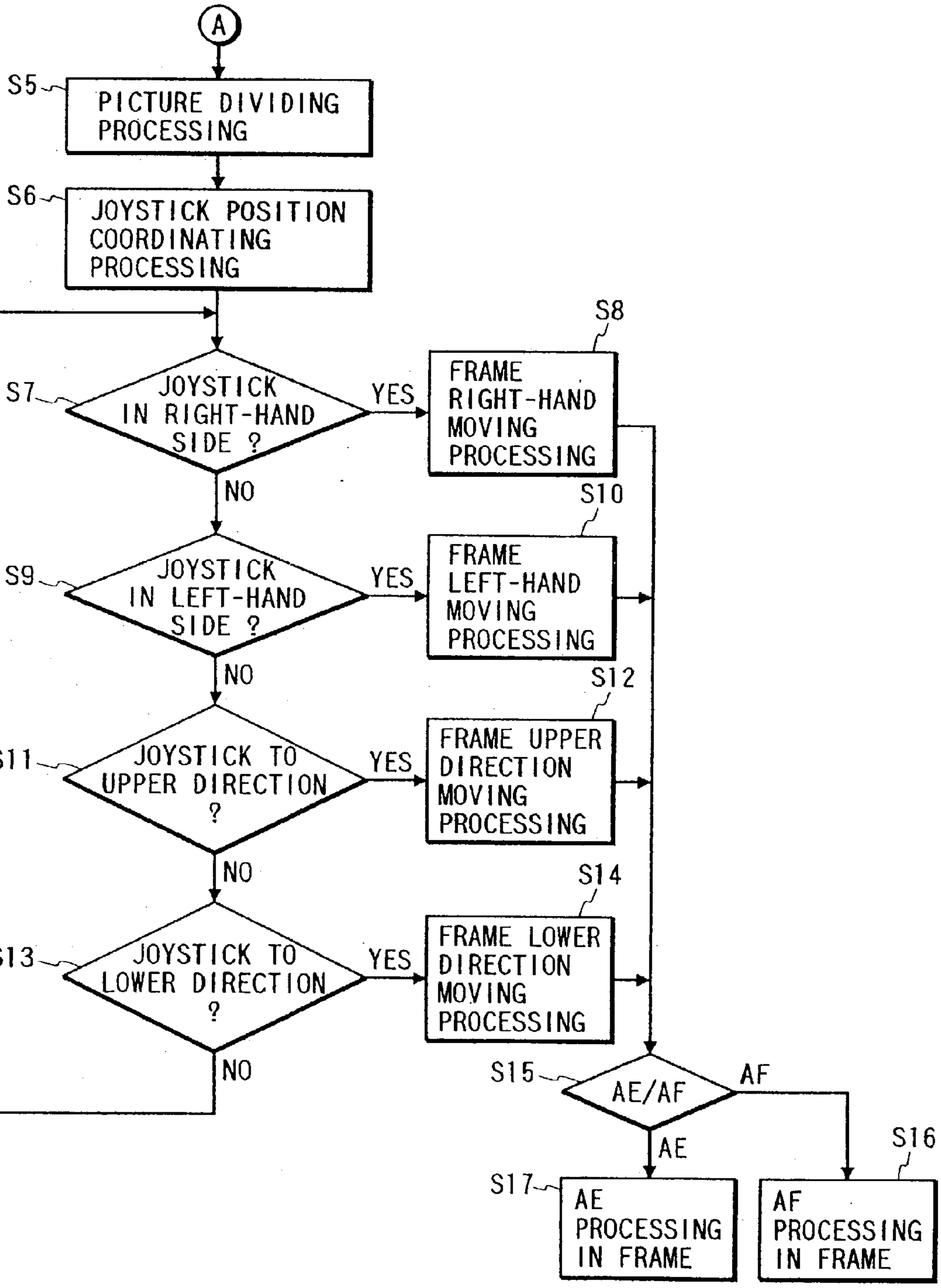


FIG. 27B


A
S5
PICTURE DIVIDING PROCESSING
S6
JOYSTICK POSITION COORDINATING PROCESSING
S7
JOYSTICK IN RIGHT-HAND SIDE ?
YES
S8
FRAME RIGHT-HAND MOVING PROCESSING
NO
S9
JOYSTICK IN LEFT-HAND SIDE ?
YES
S10
FRAME LEFT-HAND MOVING PROCESSING
NO
S11
JOYSTICK TO UPPER DIRECTION ?
YES
S12
FRAME UPPER DIRECTION MOVING PROCESSING
NO
S13
JOYSTICK TO LOWER DIRECTION ?
YES
S14
FRAME LOWER DIRECTION MOVING PROCESSING
NO
S15
AE/AF
AF
AE
S16
S17
AE PROCESSING IN FRAME
AF PROCESSING IN FRAME

ELECTRONIC APPARATUS AND POINTING DEVICE FOR IMAGING

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an electronic apparatus and, more particularly, to its operation.

[0003] 2. Related Background Art

[0004] In a conventional electronic apparatus such as a personal computer, a pointing device such as a track ball is popularly used for performing operations for moving a cursor displayed on a monitor screen, selecting one of a plurality of items, and so on.

[0005] **FIG. 1** shows an example in which a pointing device **3** is arranged on the main body of a video camera **100**. Note that the video camera **100** comprises an EVF (electronic viewfinder) as a monitor **4**.

[0006] With such a pointing device, since operations for a plurality of functions of the apparatus can be assigned to a single operation member, a simple operation unit can be realized, thus contributing to a size reduction of the apparatus. Since two or more switches can be assigned to a single operation member, an operator can perform two or more switch operations by selecting only the operation direction of the pointing device without releasing his or her hand from a key. For this reason, as compared to a case wherein one function is assigned to one key, the pointing device is easy to operate since a user need not fumble for or visually confirm an operation member.

[0007] However, the operation feeling of a conventional compact pointing device, which is operated by a finger tip and has a base portion fixed to the apparatus main body, varies depending on the size of the operator's hand, the posture of the main body, and the like. For example, the position of the finger tip does not match the position of the pointing device due to personal differences of, e.g., the size of the hand, the length of the finger, and the like, resulting in a restrained operation and hence, poor operability.

[0008] For this reason, as shown in, e.g., **FIGS. 2A and 2B**, when the cursor displayed on the monitor **4** is moved by operating a pointing device with a finger tip, even though an operator wants to move the cursor in the right-hand direction, as shown in **FIG. 2A**, the operation direction deviates due to a delicate position deviation of the finger tip, and the cursor is undesirably moved in an obliquely upper or lower right-hand direction, as shown in **FIG. 2B**.

[0009] When movement of the cursor or selection of a menu item displayed on the EVF as the monitor **4** is performed using the pointing device **3** shown in **FIG. 1**, an operator looks into the EVF while bringing his or her face close to the main body of the video camera **100**, and operates the pointing device **3** with his or her finger tip. Therefore, it is difficult for the operator to operate the pointing device **3** while visually confirming its position and operation direction, and the operator must operate the pointing device while fumbling for it. For this reason, the operability is often impaired depending on the size of the hand or the length of the finger of the operator, the holding position of the video camera **100**, or the like. As a result, the operator cannot attain movement of the cursor or selection of a menu item, that he or she intended.

[0010] Furthermore, as shown in **FIG. 3, a** method of displaying the operation contents using a liquid crystal display screen or the like is available. Referring to **FIG. 3**, operation contents **11** are displayed on the lower portion of the screen of an electronic viewfinder **4** comprising a liquid crystal display, and an operator depresses one of switches arranged below the operation contents **11** to attain the displayed operation. The displayed contents are switched in synchronism with a mode switch **10**, and operation contents corresponding to a selected mode are displayed. In the case of **FIG. 3, a** VTR mode is selected, and a fast feed (FF) operation, a stop (STOP) operation, and the like are displayed.

[0011] However, in the prior art shown in **FIG. 3**, AE, AF, and the like cannot be set at an arbitrary position on the screen.

SUMMARY OF THE INVENTION

[0012] It is an object of the present invention to provide an electronic apparatus which is easy to operate.

[0013] It is another object of the present invention to provide an operation device with good operability for an electronic apparatus.

[0014] It is still another object of the present invention to provide an image pickup apparatus which is easy to operate, and has good operability.

[0015] In order to achieve the above-mentioned objects, according to an embodiment of the present invention, an electronic apparatus which can be used in a hand-held state, comprises display means for displaying an index, operation means used for moving the index displayed by the display means, and adjustment means for adjusting an attachment state of the operation means to the electronic apparatus to at least a first attachment state and a second attachment state different from the first attachment state, and in the first and second attachment states, an operation for moving the index using the operation means can be performed.

[0016] According to another embodiment of the present invention, an electronic apparatus comprises display means for displaying an index, operation means used for moving the index displayed by the display means, and adjustment means for adjusting an attachment position of the operation means to the electronic apparatus by sliding the operation means at least from a first attachment position to a second attachment position different from the first attachment position, and at the first and second attachment positions, an operation for moving the index using the operation means can be performed.

[0017] With the above-mentioned arrangement, when the electronic apparatus is used in a hand-held state, the mounting state of the operation means to the apparatus main body can be adjusted in correspondence with personal differences of, e.g., the size of a hand and the length of a finger, a specific way of operation, or the like of an operator. For this reason, the electronic apparatus can be reliably operated.

[0018] Furthermore, according to still another embodiment of the present invention, an electronic apparatus comprises display means for displaying an index, operation means used for moving the index displayed by the display means, and adjustment means for adjusting the operation

means so that a moving direction of the index displayed by the display means matches a moving direction that an operator intended.

[0019] With this arrangement, the moving direction that an operator intended matches the actual moving direction of the index.

[0020] According to still another embodiment of the present invention, an operation device for an electronic apparatus, comprises a plurality of switch means, operation means for turning on a predetermined one of the plurality of switch means in correspondence with an operation direction thereof, and changing means for changing a relative positional relationship between the operation direction of the operation means and the switch means to be turned on.

[0021] With this arrangement, the relative relationship between the operation direction of the operation means and a switch to be actually turned on can be arbitrarily changed as needed. Thus, the operability of the electronic apparatus can be greatly improved.

[0022] Furthermore, according to still another embodiment of the present invention, a image pickup apparatus comprises image pickup means for picking up an object image, operation means used for determining an image pickup condition of the image pickup means, and adjustment means for adjusting an attachment position of the operation means to the image pickup means.

[0023] With this arrangement, the attachment position of the operation means can be adjusted to the best one for an operator, thus greatly reducing the load on the image pickup operation.

[0024] According to still another embodiment of the present invention, an operation device for an electronic apparatus, comprises operation means which is movable in a plurality of operation directions, a plurality of switch means which are selectively operated in correspondence with the operation direction of the operation means, and changing means for electrically changing a relative positional relationship between the operation directions of the operation means and the plurality of switch means.

[0025] With this arrangement, the layout of the operation contents can be modified or the operation contents can be rotated in accordance with a user's favor, thus improving the operability.

[0026] According to still another embodiment of the present invention, an image pickup apparatus comprises image pickup means for picking up an image of an object, display means for displaying the image picked up by the image pickup means for a reproduced image, and operation means for moving a display frame, which indicates a setting range of an image pickup condition of the image pickup means on a screen of the display means, to a desired position on the screen, and the operation means is arranged on a plane including the screen of the display means.

[0027] With this arrangement, when the image pickup condition is set by the operation means, the operability can be improved. Since the operation means is disposed on a plane including the screen, the image pickup condition can be set with only one finger while confirming the image displayed on the screen. Furthermore, since the operation direction such as the upper, lower, right, or left direction matches the movement of the display frame of the screen, a smooth operation can be realized.

[0028] Other objects and features of the present invention will become apparent from the following specification and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] **FIG. 1** is a perspective view showing the outer appearance of a conventional video camera;

[0030] **FIGS. 2A and 2B** are views showing the movement of a cursor of the video camera;

[0031] **FIG. 3** is a schematic view showing the outer appearance of another conventional video camera;

[0032] **FIG. 4** is a perspective view showing the outer appearance of a video camera according to the first embodiment of the present invention;

[0033] **FIG. 5** is a block diagram showing the arrangement of the video camera of the first embodiment;

[0034] **FIG. 6** is a block diagram showing the arrangement of the video camera of the first embodiment;

[0035] **FIGS. 7A and 7B** are schematic views showing the structure of a pointing device in the first embodiment;

[0036] **FIGS. 8A** to **8**C are schematic views showing the arrangement of a pivot mechanism of the pointing device in the first embodiment;

[0037] **FIG. 9** is a perspective view showing the outer appearance of a video camera according to the second embodiment of the present invention;

[0038] **FIGS. 10A and 10B** are schematic views showing the structure of a pointing device in the second embodiment;

[0039] **FIGS. 11A** to **11**C are schematic views showing the arrangement of a slide mechanism of the pointing device in the second embodiment;

[0040] **FIG. 12** is a perspective view showing the outer appearance of a video camera according to the third embodiment of the present invention;

[0041] **FIGS. 13A** to **13**D are schematic views showing the arrangement of a tilt mechanism of a pointing device in the third embodiment;

[0042] **FIGS. 14A and 14B** are schematic views showing the structure of a pointing device according to the fourth embodiment of the present invention;

[0043] **FIGS. 15A** to **15**C are schematic views showing the structure of a pointing device according to the fifth embodiment of the present invention;

[0044] **FIGS. 16A** to **16**C are schematic views showing the structure of a pointing device according to the sixth embodiment of the present invention;

[0045] **FIGS. 17A and 17B** are schematic views showing the structure of a pointing device according to the seventh embodiment of the present invention;

[0046] **FIGS. 18A and 18B** are schematic views showing the structure of a pointing device according to the eighth embodiment of the present invention;

[0047] **FIGS. 19A and 19B** are respectively an exploded perspective view and a side sectional view of a pointing device according to the ninth embodiment of the present invention;

[0048] **FIG. 20** is a circuit diagram of the pointing device;

[0049] **FIG. 21** is a view for explaining the method of discriminating a depressed switch;

[0050] **FIGS. 22A and 22B** are timing charts showing the operation for sampling the switch state;

[0051] **FIGS. 23A** to **23**C are views for explaining the method of realizing rotation of switches in a software manner according to the ninth embodiment;

[0052] **FIG. 24** is a flow chart showing the operation for registering a rotation of the switches;

[0053] **FIG. 25** is a flow chart showing the operation for realizing the rotation of the switches;

[0054] **FIG. 26** is a perspective view showing a camera built-in type VTR according to the **10**th embodiment of the present invention;

[0055] **FIG. 27** is comprised of **FIGS. 27A and 27B** showing flow charts for explaining the operation of the **10**th embodiment; and

[0056] **FIG. 28** is a perspective view showing another camera built-in type VTR according to the 10th embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0057] The preferred embodiments of the present invention will be described hereinafter with reference to the accompanying drawings.

[0058] **FIG. 4** is a perspective view showing the outer appearance of a video camera as an electronic apparatus according to the first embodiment of the present invention. The video camera of this embodiment has substantially the same arrangement as that shown in **FIG. 1**, except for the structure of a pointing device **3**. The structure of the pointing device **3** will be described later. Note that this embodiment exemplifies a video camera. However, the present invention is not limited to this, but may be applied to any other electronic apparatuses.

[0059] **FIG. 5** is a block diagram showing the system of the video camera, and **FIG. 6** is a block diagram showing in detail a camera signal processing unit shown in **FIG. 5**. More specifically, **FIGS. 5 and 6** show the system which controls the position of a cursor as an index upon displaying the position for AF (automatic focal length control) or AE (automatic exposure control) on a display unit of an EVF **4** as display means using the pointing device **3** provided to the video camera. The system will be described below with reference to **FIGS. 5 and 6**. Note that such an index may be used for other operations in addition to AE and AF.

[0060] Referring to **FIG. 5**, an object image **1** is picked up, and is input to a lens/image pickup unit **2** as image pickup means. A zoom lens **2***a* and a focus lens **2***b* in the lens/image pickup unit **2** are driven by servo mechanisms **5***a* and **5***b*, which are controlled by a microcomputer **9**. A video signal output from the lens/image pickup unit **2** is converted by a camera signal processing unit **6** into a signal to be displayed on the EVF **4** and a signal to be suitably recorded on a magnetic tape, a disk, or the like in a recording and reproduction device **7**. A signal output upon operation of the pointing device **3** is input to the microcomputer **9** in parallel with signals output upon operation of other operation switches **8** (a camera operation switch, a recorder operation switch, and the like).

[0061] Referring to **FIG. 6**, upon reception of the output signal from the pointing device **3**, the microcomputer **9** discriminates the operation direction of the pointing device **3**, and outputs a cursor display/moving command to a character generator **10**. The output from the character generator **10** is input to a synthesization (or synthesis) circuit **12**. A video signal output from an image pickup unit **2***c* is subjected to predetermined signal processing in a video signal processing circuit **11**, and the processed signal is input to the synthesization circuit **12**. The synthesization circuit **12** synthesizes a cursor display signal generated by the character generator **10** and the video signal processed by the video signal processing circuit **11**, and the synthesized signal is displayed on the EVF **4**. Note that the image pickup unit **2***c*, the video signal processing circuit **11**, the character generator **10**, and the synthesization circuit **12** correspond to the camera signal processing unit **6** shown in **FIG. 5**.

[0062] **FIGS. 7A and 7B** show the structure of the pointing device **3** in the first embodiment. The pointing device **3** of this embodiment is constituted by four tact switches **41** (**41***a* to **41***d*), a lever **42** which can be tilted in every direction within a certain angle range to have a fulcrum **45** as the center, and a cover **43**. A disk-shaped pressing plate **44** is attached to the lever **42** to depress one tact switch **41** when the lever **42** is tilted.

[0063] When the lever **42** is tilted in one direction, the pressing plate **44** tilts together and comes into contact with one tact switch **41**. When the lever **42** is further tilted, the pressing plate **44** presses the tact switch **41** to turn it on. Note that the tact switches **41** are disposed, so that the four switches are located at the vertices of a cross pattern, and a different switch is depressed and turned on by the pressing plate **44** depending on the tilt direction of the lever **42**. In this case, different switch functions are assigned to the four switches.

[0064] **FIG. 8A** shows the arrangement of a pivot mechanism as the feature of the pointing device **3** of the first embodiment.

[0065] A projection member **51** having a cross-shaped ridge shown in **FIG. 8C** is attached to the attachment base portion side of the pointing device **3**. A recess member **52**, which has a crown-gear shape and is formed with a plurality of grooves, is attached to the video camera main body side. In a normal state wherein the ridges of the projection member **51** mesh with the grooves of the recess member **52**, as shown in **FIG. 8A**, the projection member **51** is pressed against the recess member **52** by the biasing force of a spring **54** inserted between an outer cover **53** and the projection member **51**, thus fixing the position of the pointing device **3**.

[0066] When the pointing device **3** is pulled up from the fixed state against the biasing force of the spring **54** by hooking a pawl **55** formed on the pointing device **3**, the ridges of the projection member **51** disengage from the

grooves of the recess member **52**, and the pointing device **3** is free to rotate about its central axis, as indicated by a double-headed arrow A. When the pointing device **3** is released at an arbitrary position in a state wherein the pointing device **3** is free to rotate, the projection member **51** is pressed against the recess member **52** by the biasing force of the spring **54** again, and the ridges of the projection member **51** mesh with the grooves, different from those meshed previously, of the recess member **52**, thus fixing the pointing device **3** in position again. In this embodiment, the projection member **51**, the recess member **52**, the spring **54**, and the pawl **55** constitute adjustment means.

[**0067**] As described above, according to this embodiment, since the pointing device **3** is pivotal with respect to the apparatus main body, and can be fixed at an optimal position where the directions that an operator intended match the movements of the cursor, the operator can desirably perform the movement of the cursor and selection of a menu item without impairing the operability depending on the size of the hand and the length of the finger of the operator or the way of holding the camera. Note that the structure of the pointing device **3** is not limited to one described in this embodiment.

[**0068**] **FIG. 9** is a perspective view showing the outer appearance of a video camera according to the second embodiment of the present invention. The video camera of this embodiment has substantially the same arrangement as that of the conventional camera shown in **FIG. 1**, except for the structure of a pointing device **3**. The structure of the pointing device **3** will be described later.

[**0069**] **FIGS. 10A and 10B** show the structure of the pointing device **3** of this embodiment. The pointing device **3** shown in **FIGS. 10A and 10B** is constituted by four switch contacts **61** (**61***a* to **61***d*), a lever **63** which can be tilted in every direction within a certain angle range to have a fulcrum **62** as the center, and a cover **64**, and a disk-shaped pressing plate **65** is attached to the lever **63**. When the lever **63** is tilted in one direction, the pressing plate **65** tilts together, and a contact **66** formed on the pressing plate **65** comes into contact with and electrically connected to one of the switch contacts **61**, thus turning on a switch. The switch contact to be turned on by contact varies depending on the tilt direction of the lever **63**, and different switch functions are assigned to the four switch contacts in this case as well.

[**0070**] **FIGS. 11A** to **11**C show the arrangement of a slide mechanism as the feature of the pointing device **3** according to the third embodiment of the present invention.

[**0071**] Referring to **FIG. 11B, a** projection member **71** having some conical projections shown in **FIG. 11C** is attached to the attachment base portion side of the pointing device **3**. A rubber sheet **72** is attached to the video camera main body side. By the biasing force of a spring **74** inserted between a pressing plate **73** and the projection member **71**, the projections of the projection member **71** are pressed against the rubber sheet **72**, so that the pointing device **3** does not inadvertently move, thus fixing the pointing device **3** in position.

[**0072**] From this fixing state, when the pointing device **3** is perpendicularly pulled up against the biasing force of the spring **74** by hooking a pawl **75** formed on the pointing device **3**, the projections of the projection member **71** are released from the rubber sheet **72**, and the pointing device **3** becomes free to translate within the area of the opening portion of an outer cover **76**.

[**0073**] In a state wherein the pointing device **3** is free to translate, the pointing device **3** is moved to an arbitrary position together with the pressing plate **73** and the spring **74**, and thereafter, is released. As a result, the projection member **71** is pressed against the rubber sheet **72** again by the biasing force of the spring **74**, and the projections of the projection member **71** presses against the rubber sheet **72**, thus fixing the pointing device **3** at a new position. In this embodiment, the projection member **71**, the rubber sheet **72**, the pressing plate **73**, the spring **74**, and the pawl **75** constitute adjustment means.

[**0074**] As described above, according to this embodiment, since the pointing device is slidable within the range in which the pointing device does not protrude from the video camera, the pointing device does not disturb the holding operation of the camera, and an image pickup operation can be performed at the position, suitable for an operator, of the pointing device.

[**0075**] Note that the system arrangement of the video camera main body and the arrangement of the cursor display system of this embodiment are the same as those shown in **FIGS. 5 and 6** in the first embodiment, and a detailed description thereof will be omitted.

[**0076**] This embodiment exemplifies the slide mechanism of the pointing device. However, the present invention is not limited to this. For example, switches of other forms may be slidably arranged. Furthermore, in this embodiment, since no mechanical structure for restricting rotation of the pointing device **3** about its central axis is arranged, the pointing device may be moved by rotating it.

[**0077**] **FIG. 12** is a perspective view showing the outer appearance of a video camera according to the third embodiment of the present invention. The video camera of this embodiment has substantially the same arrangement as that shown in **FIG. 1**, except for the structure of a pointing device **3**. The structure of the pointing device **3** will be described later.

[**0078**] **FIGS. 13A** to **13**D show the arrangement of a tilt mechanism of the pointing device **3** in the third embodiment of the present invention.

[**0079**] Referring to **FIGS. 13A** to **13**D, the pointing device **3** is attached to a U-shaped base **81**, attached to the video camera main body, via a rotation shaft **82** extending in a direction perpendicular to the central axis of a lever **86**. The pointing device **3** is pivotal about the shaft **82**. A hole having a diameter larger than the outer diameter of the pointing device is formed on an outer cover **83**, as shown in **FIGS. 13C and 13D**. The pointing device **3** is swung in directions determined by the mechanism within the range of the hole, and can be fixed at the position of an arbitrary attachment angle. For example, a screw may be provided to the rotation shaft **82**, so that the screw is loosened when the attachment angle is changed, and is tightened in other states, thereby fixing the pointing device **3**. In this embodiment, the base and the rotation shaft **82** constitute adjustment means.

[**0080**] With this arrangement, the attachment angle of the operation means can be adjusted in correspondence with the

size of the hand, the length of the finger, a specific way of operation, or the like of an operator.

[0081] Note that the system arrangement of the video camera main body and the arrangement of the cursor display system of this embodiment are the same as those shown in **FIGS. 5 and 6** in the first embodiment, and a detailed description thereof will be omitted. Also, the structure of the pointing device **3** is the same as that shown in **FIGS. 7A and 7B** or **FIGS. 10A and 10B** in the first or second embodiment, and a detailed description thereof will be omitted.

[0082] **FIGS. 14A and 14B** show the structure of a pointing device according to the fourth embodiment of the present invention. Unlike in the first to third embodiments in which the pointing device itself is movable, the pointing device of this embodiment has its base portion fixed to an apparatus main body **91**, and its position relative to the apparatus main body does not change. A circuit board **93** is disposed inside the pointing device **3** and has tact switches **92** (**92***a* to **92***d*). The circuit board **93** is fitted in an attachment groove **95** formed on the inner wall of a cover **94**. The cover **94** has a window **96** with an appropriate size, so that a portion of the circuit **93** is externally exposed therefrom.

[0083] The circuit board **93** is slidable with respect to the attachment groove **95**, and can be rotated inside the pointing device **3** when the portion of the circuit board **93** exposed from the window **96** is moved. In this manner, when the circuit board **93** is rotated to change the relative positional relationship between the tact switches **92** and the apparatus main body **91**, the relative positional relationship between the operation directions of a lever **98** of the pointing device **3** and the switches to be turned on can be changed. Even when the positions of the tact switches **92** are changed by rotating the circuit board **93**, since a pressing plate **97** has a disk shape, it can depress the tact switch **92** by a corresponding peripheral portion when the lever **98** is tilted. In this embodiment, the pressing plate **97** and the lever **98** constitute operation means, and the circuit board **93**, the attachment groove **95**, and the window **96** constitute changing means.

[0084] As described above, in this embodiment, although the pointing device itself is fixed to the apparatus main body, the positions of the tact switches can be changed in the device, thereby improving the operability of the pointing device.

[0085] Note that the system arrangement of the video camera main body and the arrangement of the cursor display system of this embodiment are the same as those shown in **FIGS. 5 and 6** in the first embodiment, and a detailed description thereof will be omitted.

[0086] **FIGS. 15A** to **15**C show the structure of a pointing device according to the fifth embodiment of the present invention. The pointing device of this embodiment has its base portion fixed to an apparatus main body, and its position relative to the apparatus main body does not change. As shown in **FIGS. 15A** to **15**C, the pointing device **3** incorporates **12** tact switches **201**, which are arranged at equal angular intervals on a single perimeter of a board **202**. Of the **12** tact switches, each three switches correspond to the same operation purposes (the switches having the same operation purposes are indicated by the same patterns in **FIG. 15C**), and four sets of tact switches, each set including three switches corresponding to the same operation purpose, are incorporated in the pointing device **3** to be arranged in turn.

[0087] Arms **204** for pressing the tact switches **201** extend in a cross pattern from a lever **203**, and can press the tact switches of different operation purposes. In order to change the relative positional relationship between the operation directions of the lever **203** and the switches to be turned on in the above arrangement, the lever **203** is rotated about its central axis to select a switch to be pressed by the arm **204** from the three tact switches **201** having the same operation purpose. In this manner, the relative positional relationship between the operation directions of the lever **203** and the switches to be turned on can be changed in correspondence with the three switches. In this embodiment, the lever **203**, the arms **204**, and a fulcrum **206** constitute operation means and changing means.

[0088] As described above, even when the lever **203** is rotated, the arms **204** have a one-to-one correspondence with the tact switches **201** having different operation purposes, and the four operation directions can attain functions of different operation purposes who do not overlap each other.

[0089] **FIGS. 16A** to **16**C show the structure of a pointing device according to the sixth embodiment of the present invention. The pointing device of this embodiment has its base portion fixed to an apparatus main body, and its position relative to the apparatus main body does not change. As shown in **FIGS. 16A** to **16**C, in the pointing device **3**, an insulating sheet **214** with four notches **213** is inserted between contacts **211** and **212**, and the contacts **211** and **212** contact via one of the notches **213**, and are electrically connected to each other, thereby turning on a corresponding switch.

[0090] Since the insulating sheet **214** is slidably attached to an attachment groove **218** formed on the inner wall of a cover **215**, it is rotatable about the central axis of a lever **217**. When a portion of the insulating sheet **214**, which is exposed from a window **216** formed on the cover **215**, is moved to rotate the insulating sheet **214**, the positions of the notches **213** with respect to the contact **212** change to change the positions where the contacts **211** and **212** contact each other and are electrically connected to each other, thereby changing the relative positional relationship between the operation direction of the lever and switches to be turned on. In this embodiment, the lever **217**, a pressing plate **220**, and a fulcrum **219** constitute operation means, and the insulating sheet **214** and the window **216** constitute changing means.

[0091] **FIGS. 17A and 17B** show the structure of a pointing device according to the seventh embodiment of the present invention. The pointing device of this embodiment has its base portion fixed to an apparatus main body, and its position relative to the apparatus main body does not change. As shown in **FIGS. 17A and 17B**, 12 tact switches **221** are arranged at equal angular intervals on a single perimeter of a switch board **222**, and switch terminals **223** of the tact switches **221** are exposed to the rear surface of the switch board **222**.

[0092] A contact board **225** on which four contact terminals **224** are arranged is stacked under the switch board **222**. A portion of the contact board **225** is exposed from a

window **227** formed on a cover **226**, and the contact board **225** itself is slidably attached to a groove **228** on the inner wall of the cover. Thus, when the portion of the contact board **225**, which is exposed from the window **227**, is moved, the board **225** can be rotated about the central axis of a lever **229**. Output signal lines **230** extend from the terminals **224** on the contact board **225** toward a portion outside the pointing device **3**.

[**0093**] The tact switches **221** on the switch board **222** are independent from each other, and have no electrical contact with an external portion. When the switch board **222** and the contact board **225** are stacked on each other, and the switch terminal **223** contacts the terminal **224** on the contact board **225**, only a corresponding switch has an electrical contact with an external portion.

[**0094**] Since the contact board **225** is rotatable, the tact switches to be operated by pressing of a pressing plate **231** when the lever **229** is tilted can be selected by rotating the contact board **225** to change the switch terminals **223** which contact the contact terminals **224** on the contact board, thereby changing the relative positional relationship between the operation directions of the lever **229** and the switches to be turned on. In this embodiment, the lever **229** and the pressing plate **231** constitute operation means, and the contact board **225**, the window **227**, and the attachment groove **228** constitute changing means.

[**0095**] **FIGS. 18A and 18B** show the structure of a pointing device according to the eighth embodiment of the present invention. The pointing device of this embodiment has its base portion fixed to an apparatus main body, and its position relative to the apparatus main body does not change. As shown in **FIGS. 18A and 18B**, the pointing device has **12** switch contacts **241**, which are arranged at equal angular intervals on a single perimeter on a board. Of the **12** switch contacts **241**, each three switches correspond to the same operation purpose, and four sets each consisting of three switches are arranged adjacent to each other.

[**0096**] In the pointing device **3** of this embodiment, four sets of switch contacts **241** corresponding to the same operation purposes are sequentially arranged on a single perimeter. Signal lines **242** extend from the switch contacts **241** toward an external portion. As shown in **FIGS. 18A and 18B**, the signal lines extending from a total of four terminals which output signals for different purposes and are arranged at equal angular intervals are bundled outside the pointing device. In this embodiment, three sets (pairs) of signal lines are formed. Of the sets of signal lines for outputting signals for the same purpose in the respective sets of signal lines, a set to be electrically connected to an external portion is arbitrarily selected by changing means, thereby selecting a set of switch contacts **241** whose operations can be detected. Therefore, the relative positional relationship between the operation directions of a lever **243** and the switches to be turned on can be changed.

[**0097**] **FIGS. 19A and 19B** are respectively a perspective view and a side sectional view showing the arrangement of a pointing device according to the ninth embodiment of the present invention.

[**0098**] Referring to **FIGS. 19A and 19B**, in a cover **304**, a switch plate **306** on which eight tact switches **305** are arranged on a single perimeter is arranged, and an operation lever **307** is supported by a support member **308** having a spherical shape. The support member **308** is pivotally held by a holding member **309**. A disk-shaped pressing plate **310** for pressing the tact switch **305** is arranged on the operation lever **307**.

[**0099**] With the above arrangement, the operation lever **307** can be tilted in 360° directions within a predetermined angle range to have the support member **308** as a fulcrum. When an operator tilts the operation lever **307** in a certain direction, the pressing plate **310** also tilts, and one of the tact switches **305**, corresponding to the operation direction, is pressed and turned on by the pressing plate **310**. Therefore, by selecting the tilt direction (operation direction) of the operation lever **307**, one of the eight tact switches **305** can be selectively turned on.

[**0100**] Note that different switch functions are assigned to the eight tact switches **305**. In the following description, the eight tact switches **305** will be referred to as switches SW**1**, SW**2**, . . . , SW**8**, as needed.

[**0101**] Since the arrangement of a video camera **100** using a pointing device **301** described above is the same as that shown in **FIG. 5, a** detailed description thereof will be omitted.

[**0102**] **FIG. 20** is a circuit diagram of the pointing device **301**.

[**0103**] Referring to **FIG. 20**, when one of the tact switches **305** is depressed, the switch SW shown in **FIG. 20** is turned on and grounded, and an L-level output signal is supplied to a microcomputer **9**. Since the switch SW includes eight switches SW**1** to SW**8**, the microcomputer **9** always sequentially samples the output signals from these eight switches at a predetermined cycle. The sampling results (H level or L level) are sequentially stored in an 8-bit register.

[**0104**] **FIG. 21** shows the contents of a register **320** as a result of the sampling. The current sampling results are stored in a register **320***a*, and the previous sampling results are stored in a register **320***b*. Then, the contents of the registers **320***a* and **320***b* are logically ORed in units of bits, and the results are stored in a register **320***c*. In the example shown in **FIG. 21**, since the second bit corresponds to L level (0) with reference to the contents of the register **320***c*, it is determined that the switch SW**2** is ON. As a result, the microcomputer **9** controls a character generator **10** to generate a cursor which moves in the upper right-hand direction.

[**0105**] By repeating the series of processing operations described above, the waveform of the output signal from a given tact switch **305** shown in **FIG. 22A** finally becomes one shown in **FIG. 22B**. In **FIG. 22**B, when the signal is at L level, the microcomputer **9** performs processing corresponding to the ON tact switch **305**.

[**0106**] In the pointing device **301** according to the above-mentioned embodiment, the relative positional relationship between the operation directions of the levers **307** and the switches SW**1** to SW**8** can be changed in a software manner.

[**0107**] **FIGS. 23A** to **23**C are views for explaining the changing operation.

[**0108**] In **FIGS. 23A** to **23**C, an 8-bit flag register **321** is arranged, and the contents of the register **320***c* (see **FIG. 21**)

are rotated in the right- or left-hand direction with reference to the contents of the register **321**.

[**0109**] In the case of **FIG. 23**A, since all the bits of the flag register **321** are at L level, no rotation is performed, and it is determined in accordance with the contents (the first bit is "0" in **FIG. 23A**) of the register **320***c* that the switch SW**1** is ON, thus moving a cursor on a monitor **4** in the upper direction.

[**0110**] In the case of **FIG. 23**B, since the first bit of the flag register **321** is "1", the contents of the register **320***c* are rotated by one bit in the right-hand direction, as indicated by a register **320***d*. With this processing, a bit "0" corresponding to the switch SW**2** corresponds to the switch SW**1**. As a result, when the switch SW**2** is depressed, the cursor is moved in the direction assigned to the switch SW**1**. More specifically, when the switch SW**2** for normally moving the cursor in the upper right-hand direction is depressed, the cursor is moved in the upper direction.

[**0111**] In the case of **FIG. 23**C, since the second bit of the flag register **321** is "1", the contents of the register **320***c* are rotated by one bit in the left-hand direction to obtain the contents of the register **320***d*. As a result, when the switch SW**8** is depressed, the cursor is moved in the direction assigned to the switch SW**1**.

[**0112**] As described above, since the contents of the register **320***c* are rotated by at least one bit in accordance with the position of "1" in the flag register **321**, the switches SW**1** to SW**8** can be substantially replaced by other switches.

[**0113**] With this processing, an operator can change the layout of the switches SW**1** to SW**8** to one that he or she can most easily operate, in correspondence with the size of the hand, the length of the finger, the holding position of the video camera **100**, or the like.

[**0114**] **FIG. 24** is a flow chart showing the operation for registering a flag in the flag register **321**.

[**0115**] In step S**1**, both flags **0** and **1** are set to be "0". In step S**2**, the pointing device **301** is operated to move the cursor in the upper direction (the Y direction in **FIGS. 23A** to **23**C). At this time, if the switch SW**1** is depressed, steps S**3** and S**5** are skipped, and no processing is performed. If it is determined in step S**3** that the switch SW**2** is depressed, flag **0** is set to be "1" in step S**4** to form the flag register **321** shown in **FIG. 23B**. On the other hand, if it is determined in step S**5** that the switch SW**8** is depressed, flag **1** is set to be "1" in step S**6** to form the flag register **321** shown in **FIG. 23C**. The contents of the flag register **321** are preserved until the next changing operation is performed in the same procedure.

[**0116**] **FIG. 25** is a flow chart showing the operation when the pointing device **301** is used after the flag is registered, as described above.

[**0117**] After the power switch is turned on, if the pointing device **301** is operated in step S**11**, the contents of the registers **320***a* and **320***b* are logically ORed, and the calculation results are stored in the register **320***c*, in step S**12**. In step S**13**, flag **0** of the flag register **321** is checked. If flag **0** is not "0", the contents of the register **320***c* are rotated in the right-hand direction in step S**14**, and thereafter, the flow advances to step S**17**.

[**0118**] On the other hand, if it is determined in step S**13** that flag **0** is "0", flag **1** is checked in step S**15**. If flag **1** is "0", the flow advances to step S**17**; otherwise, the contents of the register **320***c* are rotated in the left-hand direction in step S**16**, and thereafter, the flow advances to step S**17**. In step S**17**, the microcomputer **9** performs processing in correspondence with the presence/absence of rotation in the left- or right-hand direction, and supplies a control signal for moving the cursor to the character generator **10**. In step S**18**, the character generator **10** generates a character signal for moving the cursor. In step S**19**, the cursor is displayed on the monitor **4** via a synthesization circuit **12**.

[**0119**] The above-mentioned processing is repetitively performed until the power switch is turned off.

[**0120**] **FIG. 26** shows a camera built-in type VTR as an image pickup apparatus of the 10th embodiment when viewed from the operator side. A camera built-in type VTR main body **401** has a camera unit for picking up an image of an object, a recording unit as recording means for recording the picked-up image, and a reproduction unit as reproduction means for reproducing the recorded image. An electronic viewfinder (to be abbreviated as an EVF hereinafter) **402** comprises a liquid crystal display, and serves as display means for displaying the picked-up image. A joystick **403** serves as operation means for selecting an arbitrary position on the screen of the EVF **402**.

[**0121**] A display frame **404** moves to an arbitrary position on the screen of the EVF **402** in accordance with the operation of the joystick **403**, so that the setting operation for, e.g., AE, AF, and the like is performed at that position. A mode selection switch **405** is used for switching the operation mode between a camera mode and a VTR mode. An image pickup start/still trigger button **406** is used for starting/stopping an image pickup operation. Reproduction switches **407** are used in the VTR mode. A side strap **409** is used for holding the apparatus during the image pickup operation.

[**0122**] The operation of this embodiment will be described below with reference to the flow chart shown in **FIGS. 27A and 27B**. It is checked in step S**1** if the power switch is ON. If the power switch is ON, the flow advances to step S**2**, and the operation mode is selected by the mode selection switch **405**. If the camera mode is selected, the flow advances to step S**3** to determine whether AE·AF processing is performed or a display selection is to be made. If a display selection is to be made, the flow advances to step S**4** to set an initial value (PAUSE), and operations corresponding to the respective switches are performed. If the AE•AF processing is selected in step S**3**, the flow advances to step S**5**, and picture dividing processing is performed. The flow advances to step S**6**, and coordinating processing of the position designated by the joystick **403** is performed.

[**0123**] It is checked in step S**7** if the joystick is moved to the right-hand side. If Y (YES) in step S**7**, the flow advances to step S**8**, and the display frame is moved to the right-hand side on the screen. If N (NO) in step S**7**, the flow advances to step S**9** to check if the joystick is moved to the left-hand side. If Y in step S**9**, the flow advances to step S**10**, and the display frame is moved to the left-hand side on the screen. If N in step S**9**, the flow advances to step S**11** to check if the joystick is moved in the upper direction. If Y in step S**11**, the flow advances to step S**12**, and the display frame is moved

in the upper direction on the frame. If N in step **S11**, the flow advances to step **S13** to check if the joystick is moved in the lower direction. If Y in step **S13**, the flow advances to step **S14**, and the display frame is moved in the lower direction on the frame. If N in step **S13**, the flow returns to step **S7**.

[0124] If the display frame is moved in step **S8**, **S10**, **S12**, or **S14**, the flow advances to step **S15** to select the contents to be set in the display frame. If AF processing is performed, the flow advances to step **S16**, and an optical system (not shown) is controlled to be in focus with an object within the moved frame. On the other hand, if AE processing is performed, the flow advances to step **S17** to perform control for obtaining appropriate exposure in the moved frame.

[0125] If it is determined in step **S2** that the operation mode is the VTR mode, the flow advances to step **S18** to set an initial value (STOP) in the apparatus. Thereafter, operations corresponding the respective switches are performed.

[0126] As described above, when the display frame used for setting an image pickup condition for AE, AF, or the like is set at an arbitrary position on the image display screen using the joystick **403**, AF precision and AE precision can be improved. Since complicated setting procedures and operations can be omitted, the operability can be improved.

[0127] Since the operation key as operation means is arranged on the rear surface of the camera built-in type VTR, i.e., in the same plane as the screen, an operation can be attained with only one finger while confirming the image displayed on the screen. Since the operation directions, i.e., the upper, lower, right, and left directions, match the movement of the screen, a smooth operation is allowed.

[0128] In this embodiment, the joystick is used as an operation key. Alternatively, as shown in **FIG. 28, a** cross-shaped key may be used as means for moving the frame on the screen, thus obtaining the same effect described above.

What is claimed is:

1. An electronic apparatus which can be used in a hand-held state, comprising:

a) display means for displaying an index;

b) operation means used for moving the index displayed by said display means; and

c) adjustment means for adjusting an attachment state of said operation means to said electronic apparatus to at least a first attachment state and a second attachment state different from the first attachment state,

wherein in the first and second attachment states, an operation for moving the index using said operation means can be performed.

2. An apparatus according to claim 1, wherein said adjustment means adjusts the attachment state by pivoting said operation means with respect to said electronic apparatus.

3. An apparatus according to claim 1, wherein said adjustment means adjusts the attachment state by changing an attachment angle of said operation means with respect to said electronic apparatus.

4. An electronic apparatus comprising:

a) display means for displaying an index;

b) operation means used for moving the index displayed by said display means; and

c) adjustment means for adjusting an attachment position of said operation means to said electronic apparatus by sliding said operation means at least from a first attachment position to a second attachment position different from the first attachment position,

wherein at the first and second attachment positions, an operation for moving the index using said operation means can be performed.

5. An electronic apparatus comprising:

a) display means for displaying an index;

b) operation means used for moving the index displayed by said display means; and

c) adjustment means for adjusting said operation means so that a moving direction of the index displayed by said display means matches a moving direction that an operator intended.

6. An operation device for an electronic apparatus, comprising:

a) a plurality of switch means;

b) operation means for turning on a predetermined one of said plurality of switch means in correspondence with an operation direction thereof; and

c) changing means for changing a relative positional relationship between the operation direction of said operation means and the switch means to be turned on.

7. A device according to claim 6, wherein said plurality of switch means are arranged on a pivotal substrate, and said changing means changes the relative positional relationship between the operation direction of said operation means and the switch means to be turned on by pivoting said substrate.

8. A device according to claim 6, wherein said operation means is pivotal, and said changing means changes the relative positional relationship between the operation direction of said operation means and the switch means to be turned on by pivoting said operation means.

9. A device according to claim 6, further comprising limiting means for limiting turn-on operations of said plurality of switch means, and wherein said changing means changes the relative positional relationship between the operation direction of said operation means and the switch means to be turned on by limiting the turn-on operations of said plurality of switch means using said limiting means.

10. A device according to claim 9, wherein said limiting means comprises an insulating member.

11. A device according to claim 9, wherein said limiting means disconnects electrical connections of predetermined switch outputs of said plurality of switch means.

12. An image pickup apparatus comprising:

a) image pickup means for picking up an object image;

b) operation means used for determining an image pickup condition of said image pickup means; and

c) adjustment means for adjusting an attachment position of said operation means to said image pickup means.

13. An apparatus according to claim 12, wherein the image pickup condition of said image pickup means is an exposure amount.

14. An apparatus according to claim 12, wherein the image pickup condition of said image pickup means is a focal length.

15. An apparatus according to claim 12, further comprising display means for displaying the object image picked up by said image pickup means.

16. An apparatus according to claim 15, wherein the image pickup condition of said image pickup means is an exposure amount.

17. An apparatus according to claim 15, wherein the image pickup condition of said image pickup means is a focal length.

18. An apparatus according to claim 15, wherein said display means displays an index for determining the image pickup condition of said image pickup means, and said operation means moves the index displayed by said display means.

19. An apparatus according to claim 18, wherein the image pickup condition of said image pickup means is an exposure amount.

20. An apparatus according to claim 18, wherein the image pickup condition of said image pickup means is a focal length.

21. An operation device for an electronic apparatus, comprising:

a) operation means which is movable in a plurality of operation directions;

b) a plurality of switch means which are selectively operated in correspondence with the operation direction of said operation means; and

c) changing means for electrically changing a relative positional relationship between the operation directions of said operation means and said plurality of switch means.

22. A device according to claim 21, further comprising storage means for storing states of said plurality of switch means, and wherein said changing means changes storage contents of said storage means.

23. A device according to claim 21, further comprising registration means for registering, in advance, a change in relative positional relationship by said changing means.

24. A device according to claim 23, wherein said changing means changes the relative positional relationship between the operation directions of said operation means and said plurality of switch means so that the relationship is regularly rotated.

25. A device according to claim 22, wherein said changing means changes the relative positional relationship by regularly rotating the storage contents of said storage means.

26. A device according to claim 21, further comprising display means for displaying an index, and wherein said operation means moves the index displayed by said display means.

27. An image pickup apparatus comprising:

a) image pickup means for picking up an image of an object;

b) display means for displaying the image picked up by said image pickup means for a reproduced image; and

c) operation means for moving a display frame, which indicates a setting range of an image pickup condition of said image pickup means on a screen of said display means, to a desired position on the screen,

wherein said operation means is arranged on a plane including the screen of said display means.

28. An apparatus according to claim 27, wherein the image pickup condition of said image pickup means is an exposure amount.

29. An apparatus according to claim 27, wherein the image pickup condition of said image pickup means is a focal length.

30. An apparatus according to claim 27, wherein the screen of said display means comprises a liquid crystal screen.

31. An apparatus according to claim 27, wherein said operation means comprises a joystick.

32. An apparatus according to claim 27, wherein said operation means comprises a cross-shaped key.

* * * * *