United States Patent [19]

Taylor

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[54] **AUDIO VISUAL DEVICE**

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[21] Appl. No.: **354,012**

[52] **U.S. Cl.** **353/15,** 353/108, 353/111, 353/120

[51] **Int. Cl.** **G03b 31/06,** G03b 23/12

[58] **Field of Search** 353/15-19, 353/26, 27, 108, 111, 120

[56] **References Cited**

UNITED STATES PATENTS

1,482,387	2/1924	Donaldson	353/111
2,491,944	12/1949	Abrahams	353/18
3,138,061	6/1964	Greenawy	353/17
3,207,033	9/1965	Guber	353/17
3,297,398	1/1967	Donofrio	353/18
3,556,654	1/1971	Stapleton	353/15
3,583,808	6/1971	Glass	353/15
3,751,153	8/1973	Naito	353/120

Primary Examiner—Richard E. Aegerter
Assistant Examiner—A. J. Mirahita
Attorney, Agent, or Firm—Kane, Dalsimer, Kane, Sullivan and Kurucz

[57] **ABSTRACT**

An audio visual device for viewing pictures, symbols, reading material and like material synchronized with sound. The device includes a housing having audio and viewing passageways therein. A lens system is in the housing aligned with the material to be viewed. Supporting structure along with a gravity feed advance mechanism are in the housing in position to engage with the visual material introduced to the housing and to advance the visual material automatically in a predetermined manner. An audio system is in the housing adapted to receive and transmit an audio program. A power source is associated with the housing along with audio control circuitry responsive to the power source to operate the audio receiving structure. Finally, visual control structure is present which is responsive to a predetermined audio signal to automatically activate the advance mechanism to advance the visual material under the force of gravity in synchronization with the audio program.

2 Claims, 13 Drawing Figures

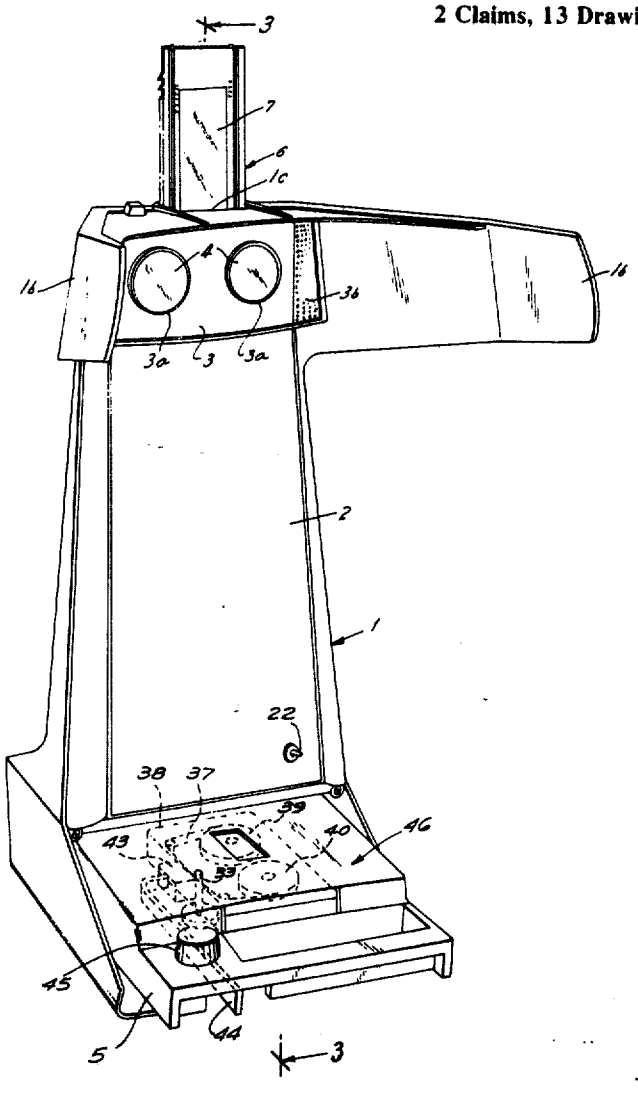


FIG. 1

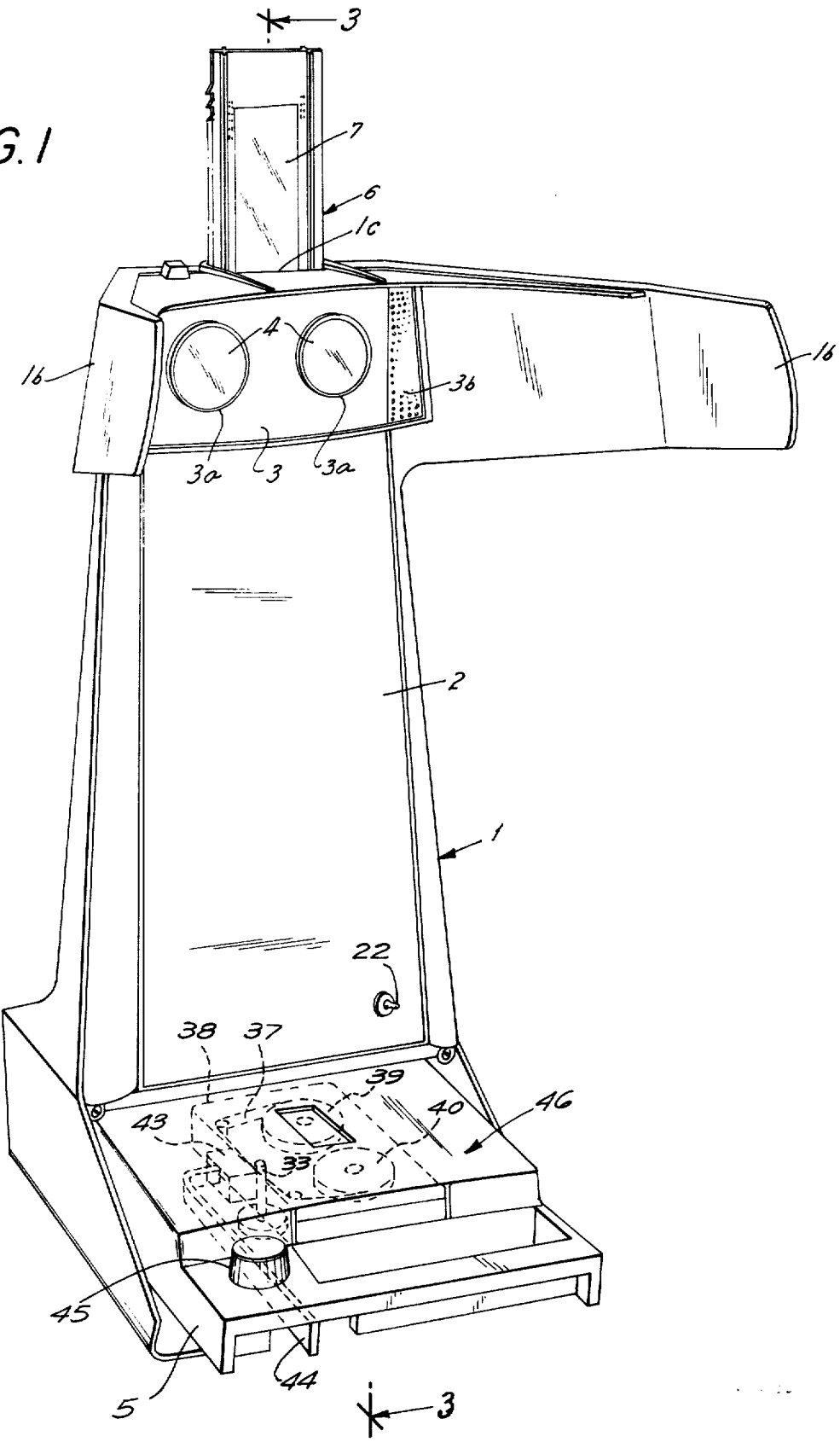
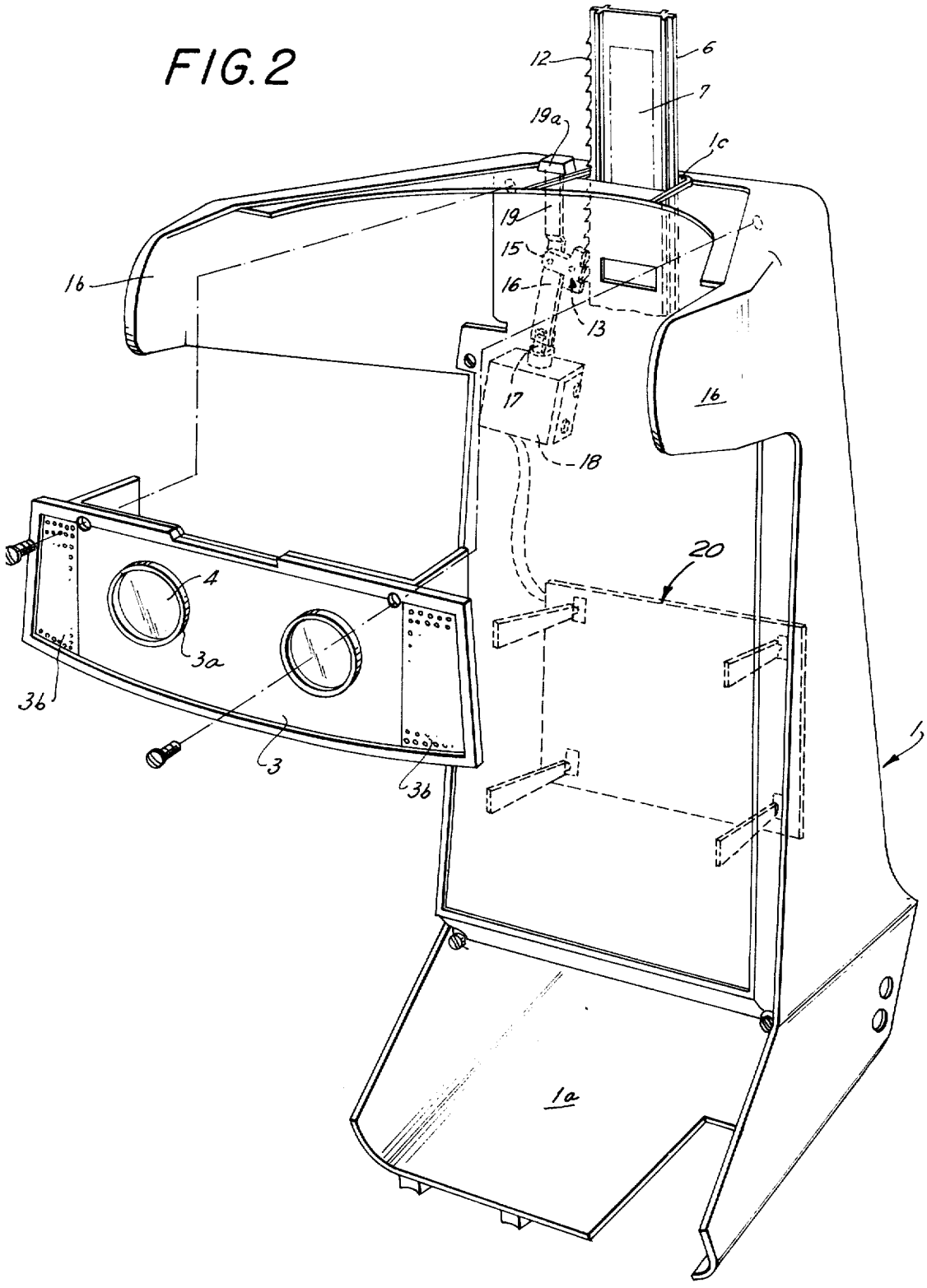


FIG. 2



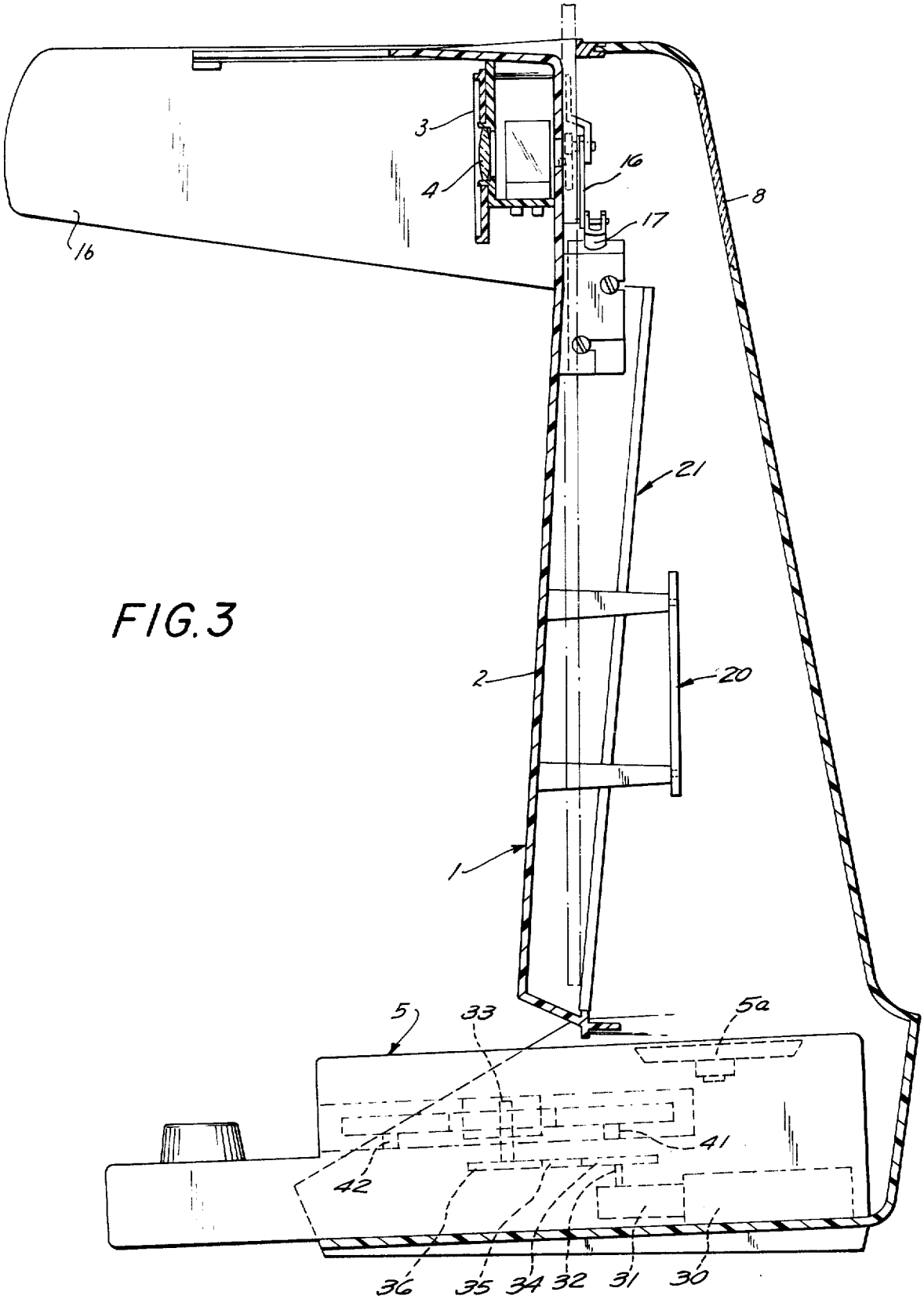


FIG. 3

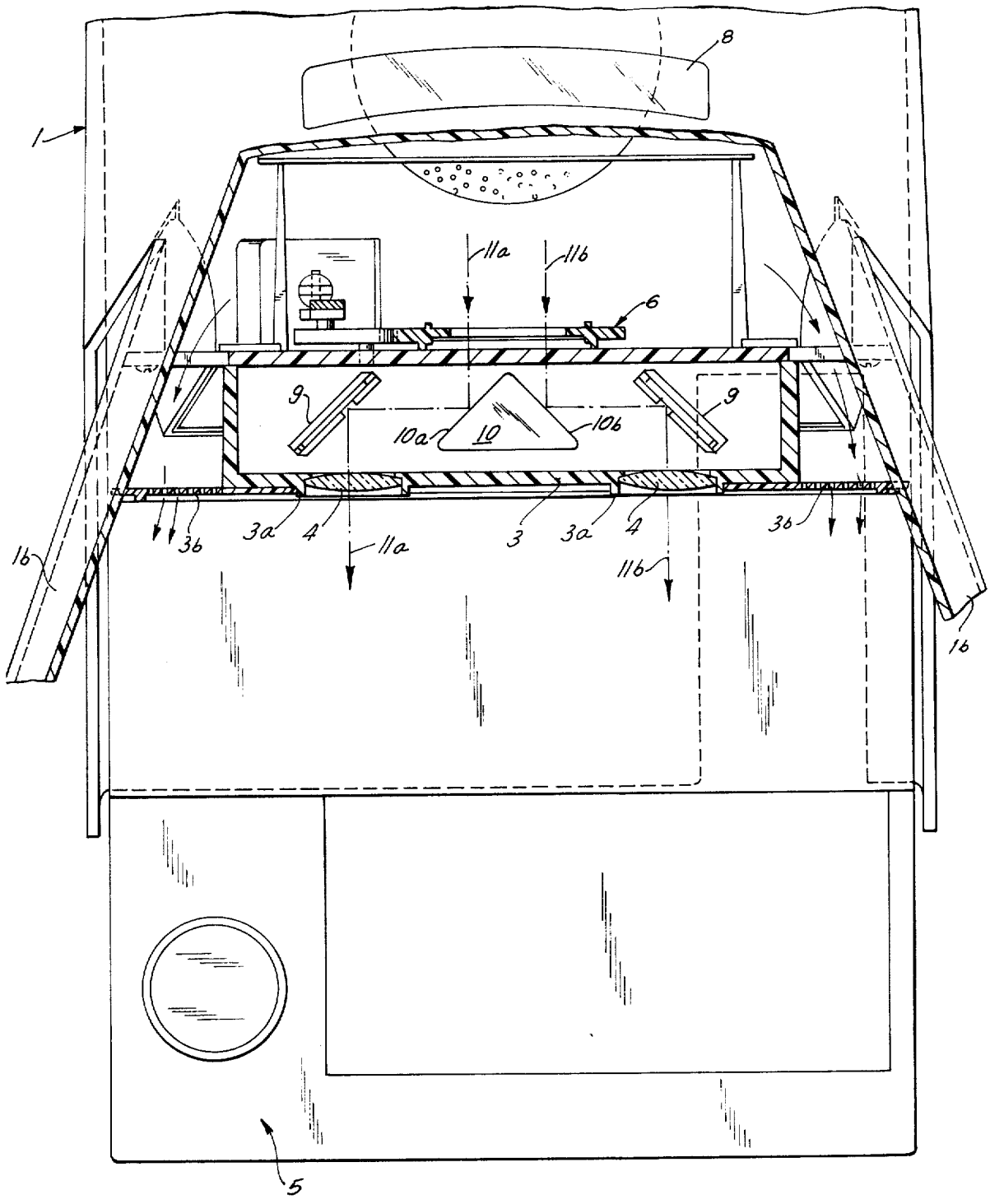


FIG. 4

FIG.7

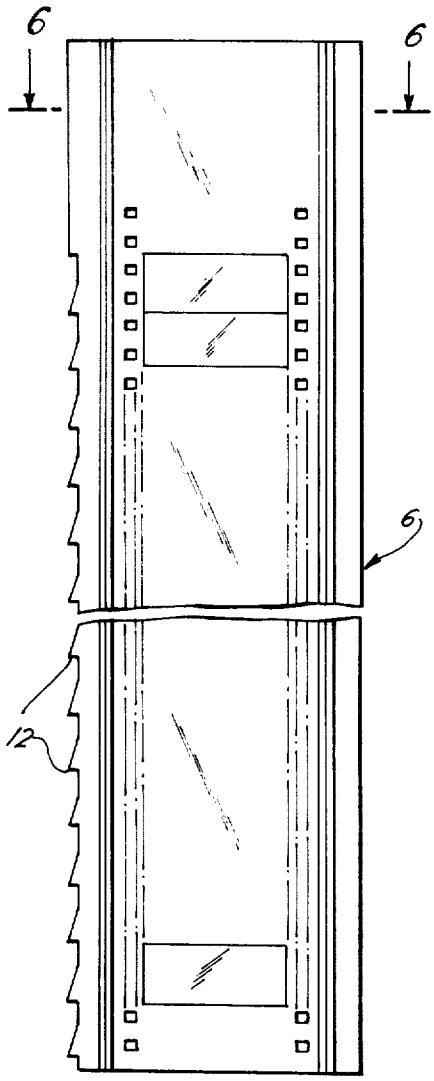
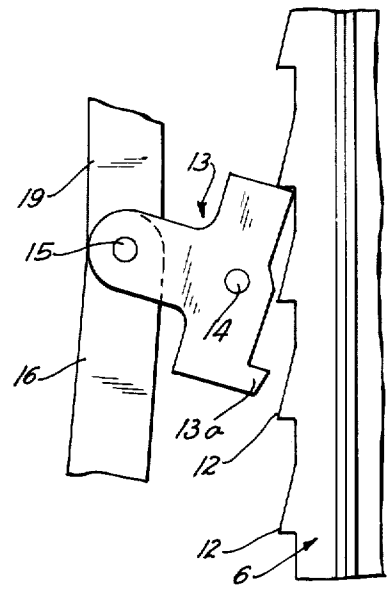


FIG. 5



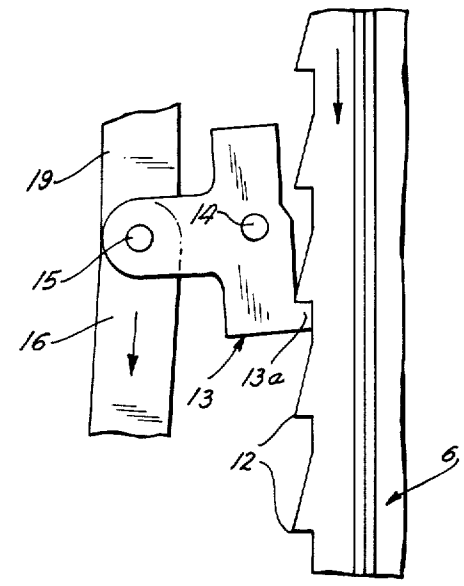


FIG.8

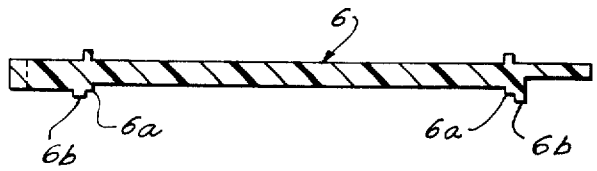


FIG.6

FIG. 9

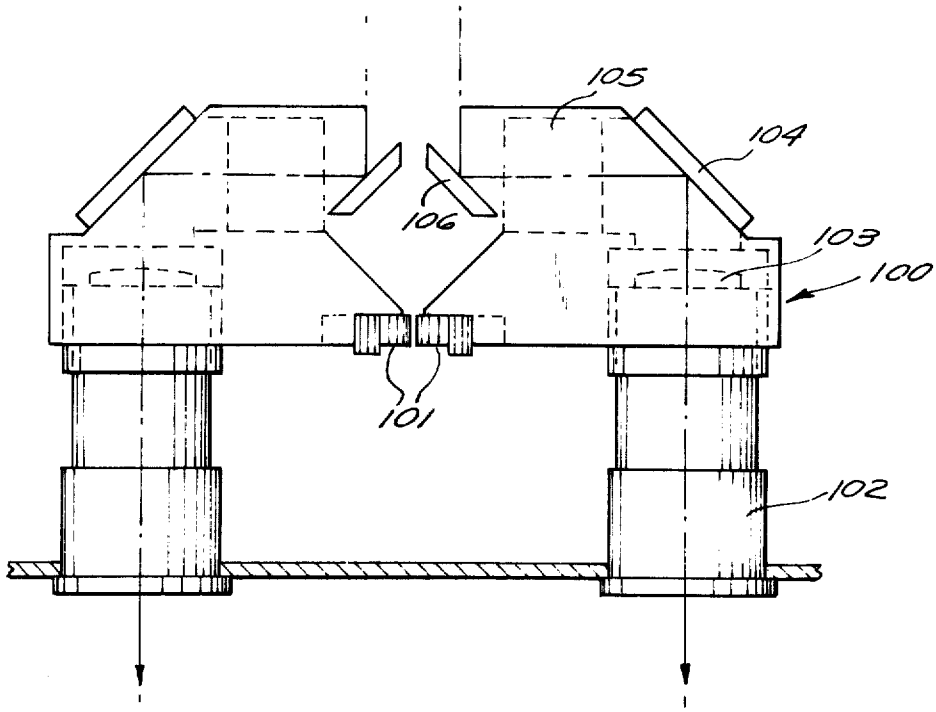


FIG. 10

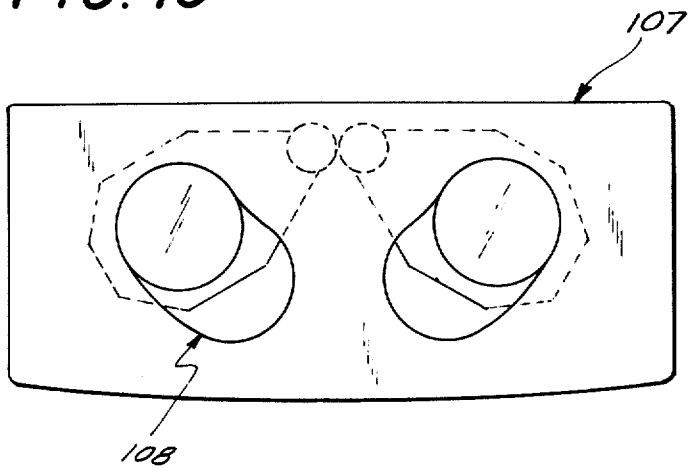
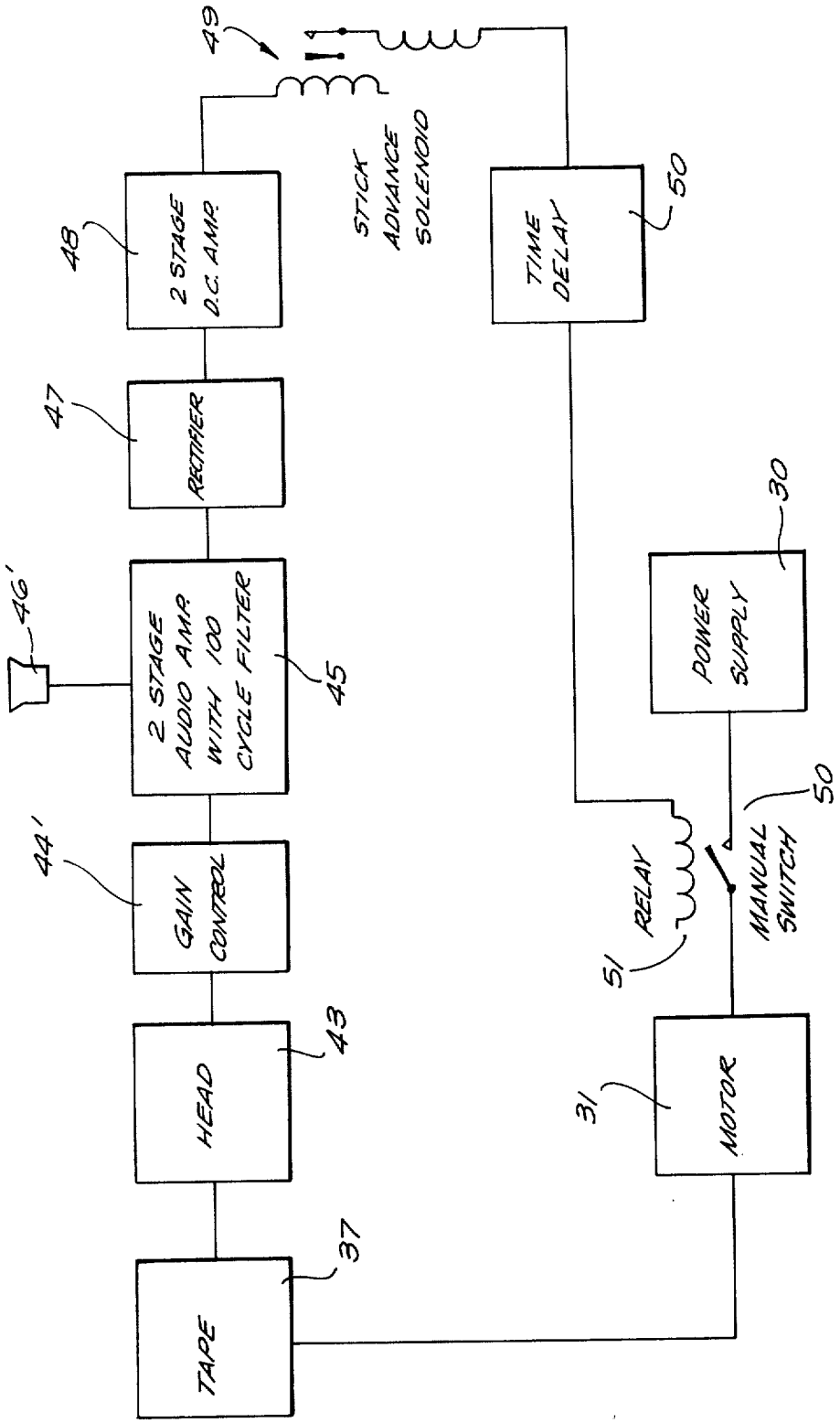


FIG. 11


49
STICK ADVANCE SOLENOID
48
2 STAGE D.C. AMP
47
RECTIFIER
46'
2 STAGE AUDIO AMP WITH 100 CYCLE FILTER
45
44'
GAIN CONTROL
43
HEAD
37
TAPE
TIME DELAY
50
POWER SUPPLY
30
RELAY
51
MANUAL SWITCH
50
31
MOTOR

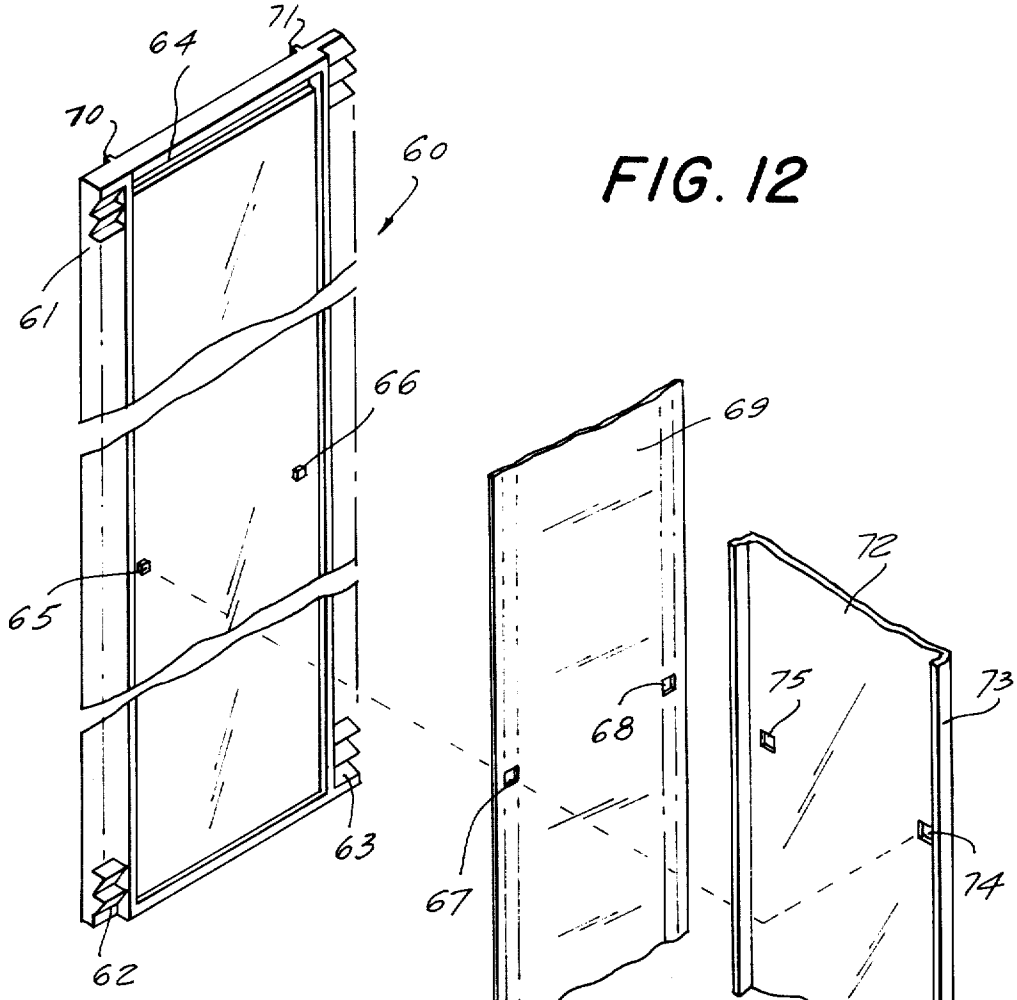

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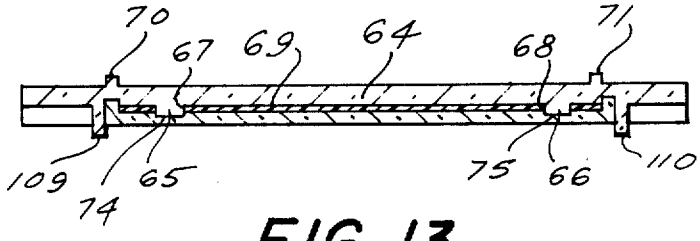
FIG. 12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109
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75
66
110

FIG. 13

AUDIO VISUAL DEVICE

BACKGROUND OF THE INVENTION

In the audio visual field it is quite common to employ combined visual and audio programs for simultaneous benefit. It is also of significance to be able to present an audio and visual program where the audio portion is presented in stereophonic fashion and the visual portion in stereoptical fashion. For mass use, it is difficult to provide the above features to a large mass of consumers in an economical and efficient fashion.

Therefore, a low cost, compact, portable audio visual device which provides the user with stereophonic-like audio programing in synchronization with stereoptic viewing programing would be extremely desirable.

It should be kept in mind that known synchronization procedures for advancing the audio and visual programs are often quite complicated and complex and expensive in design. Naturally a simplified system for advancement of the combined synchronized programs would be of great value in the art. Additionally, in known systems, often separate component parts are required as attachments with an audio visual device to achieve all of the above advantageous features. For example, often separate headphones are required to achieve the stereophonic audio effect. Furthermore, often separate complicated lens attachments are required to obtain the desired visual effect.

In regard to the synchronization of the visual with the audio portions of the program, the complicated drive mechanisms which are necessary to assure synchronization and unified operation are complicated, expensive and bulky. Also adding to the size and weight of an audio visual system of this type is the normally used film handling mechanisms to transport the film along a desired path past the viewing point. It is readily apparent that simplicity in the above discussed areas would provide an audio visual system for mass distribution and use in a portable ready-to-use form and would be of great value in the art.

SUMMARY OF THE INVENTION

With the above considerations in mind, it is among the objectives of the present invention to provide a compact portable audio visual device which provides synchronized stereophonic-like audio and stereoscopic visual programs in a simplified portable low cost unit.

The audio visual device provides for viewing material on a stick slide with a simplified mechanism for advancing the material from one position to the next automatically in response to signals received from a continuous audio program. The material on the stick slide is fed by gravity into the device and the slide is moved downwardly by an audio tape signal initiating mechanism combined with an electronic logic circuit to trigger movement of the stick slide from a first to a second position. The audio tape signal initiating mechanism energizes a solenoid which actuates a pawl mechanism engaging ratchet teeth on the stick slide to move the slide and material from position to position. The device includes a cabinet having flap structures adjacent the eyepieces to permit the sound from the cartridge tape to be reflected into the ears of the viewer in a stereophonic manner without the necessity of earphones. The device includes an optical arrangement for viewing of stereoscopic or binocular views on the stick slide. A device is compact, inexpensive to manufacture, simple in operation, and durable in use.

To summarize the invention in general, an audio visual device is provided for viewing pictures, symbols, reading material and similar material synchronized with sound. The device includes a housing having audio and visual passageways therein. A lens system is in the housing aligned with the material to be viewed. Support means and a gravity feed advance mechanism is in the housing positioned to engage with visual material introduced to the housing and to advance the visual material automatically in a predetermined manner. Audio means are in the housing and are adapted to receive and transmit an audio program. A power source is associated with the housing and audio control means are in the housing responsive to said power source to operate the audio receiving means. Finally, visual control means are present and are responsive to predetermined audio signals from the audio means to automatically activate the advance mechanism to advance the visual material under the force of gravity in synchronization with the audio program.

With the above discussed objectives, among others, in mind, reference is had to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is a perspective view of the device of the present invention;

FIG. **2** is a perspective view from a different angle with portions removed to show the inside of the device;

FIG. **3** is a sectional view taken along the line **3—3** of FIG. **1**;

FIG. **4** is a top view, partially broken away, of the device;

FIG. **5** is a front view of the stick slide;

FIG. **6** is a sectional view taken along the line **6—6** of FIG. **5**;

FIGS. **7** and **8** are side views of the pawl engaging the ratchet teeth of the slide stick;

FIG. **9** is a sectional view of the optics layout where the interpupilary distance is adjustable;

FIG. **10** is a front elevation of the lens plate to be used for the optics layout of FIG. **9**;

FIG. **11** is a block diagram of the circuitry employed with the device of the invention;

FIG. **12** is a fragmentary exploded perspective view of an alternate embodiment of the slide stick; and

FIG. **13** is a sectional side view of the alternate embodiment of the slide stick.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, there is shown in FIG. **1** and **2** a housing **1** which can be of any suitable material such as plastic or metal. The front of the housing has a cover plate **2** and a lens plate and grill **3** which are removable for ready access to the equipment mounted inside the device. The plate **3** has apertures **3***a* into which are mounted lenses **4** and grills **3***b* for the sounds emanating from the device. Housing **1** has a cavity **1***a* at the base for insertion of a tape player **5**. Housing **1** is shaped at its upper end adjacent the grills **3***b* to provide wings **1***b* which serve to reflect into the ears of the viewer the sound coming from the device through the grills. The top of housing **1** has a slot **1***c* into which stick slide **6**, bearing the material **7** to be viewed can be in-

serted. The back of the housing has an opening **8** (FIGS. **3** and **4**) for the admission of light behind the stick slide.

The optical arrangement, shown in FIG. **4**, is mounted on the lens plate **3** and consists of a pair of mirrors **9**, which are lined up with the lenses **4**, and a three-sided prism **10**. The two rear faces **10***a* and **10***b* of the prism **10** are aluminized and act like mirrors. This arrangement provides separate light beams **11***a* and **11***b* for the two lenses **4** and permits viewing of stereoscopic or binocular views mounted on the stick slide **6**. The stick slide and material to be viewed are so aligned that the light beams coming through the opening **8** in the housing will pass through the material, to prism **10**, to mirrors **9** and then through lenses **4**.

FIGS. **9** and **10** show an optional optics layout which can be used to adjust the interpupilary distance for children and adults. This layout has two lens and mirror arrangements **100** with a pair of gears **101** intermeshing between the arrangements so that the two halves will move together to vary the eye spacing most suitable for the viewer. Each half consists of a microscopic eyepiece **102**, a field flattener **103**, a mirror **104**, a field lens **105** and a mirror **106**. With this layout the lens plate **107** (FIG. **10**) is substituted for the lens plate **3** (FIG. **2**). Lens plate **107** has a pair of elongated openings **108** through which eyepieces **102** extend. By rotating each half of the lens assembly with respect to one another through intermeshed gears **101** each eyepiece **102** and its respective half will shift an equal amount along the length of a respective slot **108**. Gears **101** which are intermeshed provide for the equal displacement of each half of the lens assembly. By providing elongated openings **108** which slant toward one another approximately a 45 percent angle, the eyepiece **102** can be moved along the slot toward one another by movement in one direction and away from one another by movement in the other direction. In this manner, the different spacing between children and adult's eyes can be accommodated by appropriate shifting of the eyepieces. Gears **101** are rotatably mounted to the housing so as to fix the position of the lens assembly while permitting movement of the eyepieces within slots **108**.

In each case, the optical system gives approximately between five and 10 times magnification of the stick image. The two halves of the optical system are aligned so that the viewer sees a single image in three dimension or in binocular manner. The images on the slide stick are positioned for each half so that viewing through the optical system shows a single three dimensional picture or two views to be fused in a binocular manner.

Referring to FIG. **5**, slide stick **6** has a series of ratchet teeth along one side of the slide. The slide is inserted into slot **1***c* with the teeth **12**, which point downwardly with their lower edge at right angles to the vertical axis and positioned to engage a pawl **13** mounted on a fixed pivot **14**. The pawl is T-shaped with a toe **13***a* projecting from one end of the cross bar of the T. The bottom end of the T of the pawl is connected by a pin **15** to a solenoid bar **16**, which is in turn connected to a solenoid rod **17** projecting from a solenoid **18**. Also connected to the end of the T of the pawl by pin **15** is a manual control bar **19**, which projects through the top of the housing and is provided with a knob **19***a*.

The pawl mechanism is designed to operate as shown in FIGS. **7** and **8** to advance the slide stick by gravity. Normally, the one end of the cross bar of the spring loaded pawl engages the lower edge of a ratchet tooth (FIG. **7**). When the solenoid is activated, it pulls rod **17** and bar **16** downwardly so as to rotate pawl **13** in a counterclockwise direction as viewed in FIGS. **7** and **8** and disengage the end of the cross bar from the ratchet tooth. This releases the slide stick and permits the slide to move downward by gravity. Simultaneously with this releasing movement, the toe **13***a* projecting from the pawl is rotated against the slide and in position to catch the next lower ratchet tooth which has just been released by the other end of the cross bar of the T of the pawl. Upon deactivation of the solenoid, bar **16** shifts upwardly so as to rotate the pawl in a clockwise direction and pull the toe **13***a* away from contact with the ratchet tooth and simultaneously bring the other end of the cross bar of the T of the pawl into position for engagement with the next tooth on the ratchet. In this manner, the pictures on the stick slide will successively be brought into position for viewing. It will be appreciated that solenoid **18** is of the type that when it is disengaged, rod **17** is in an elevated position and when it is activated, rod **17** is shifted downwardly. To accomplish this in common types of solenoids, an electric impulse will shift the solenoid in one direction and a spring or similar device is required to return the solenoid arm into its original position upon termination of the electrical impulse. If desired, the knob **19** on the manual control bar can likewise be operated manually to successively bring the the pictures into position.

The stick slide **6** is of translucent or transparent material and is provided with tracks or lips **6***a* (FIG. **6**) spaced the width of a filmstrip mounted thereon, to assure proper positioning of the filmstrip on the slide. Thus, the filmstrip is assured of being in proper alignment when the slide stick is inserted in the slot at the top of the device. The filmstrip can be secured to the slide stick in any conventional manner such as adhesive, transparent tape, clips, lamination, projections matching the slots in the film, or combinations thereof. If desired, studs can be provided on the stick to register with openings in the film to assure proper indexing of the film when the studs are introduced into the device. Furthermore, it is possible to sensitize the stick and print on the stick photographically. The stick slide is also provided with track or lips **6***b* which ride in the slot **1***c* to insure that the slide will move downwardly easily in the correct path and be maintained in focal position. The ratchet teeth on the stick slide are evenly spaced with the distance between teeth equal to the height of the pictures across the filmstrip. Views may be employed which will call for two images to be mounted side by side across the filmstrip. Although the ratchet teeth are shown on one edge of the slide stick it will be understood that such teeth or notches may be on the front or back faces of the slide which will only necessitate repositioning of the pawl and the members connected to it so that the pawl can engage the lower edges of the teeth of the slide. Additionally, it should be kept in mind that it is possible to provide the pawl mechanism on the slide stick and the ratchet teeth on the housing in position to cooperate with the pawl mechanism in a similar manner to advance the stick with the assistance of gravity.

An alternate form of the slide stick is shown in FIGS. **12** and **13**. Operation of slide stick **60**, the alternate form, is identical to that of the slide stick described

above. However, the design of stick **60** includes a base plate **61** having a forward face with a pair of parallel rows of ratchet teeth **62** and **63** extending along the peripheral longitudinal edges of the stick. The recess **64** extends around the peripheral edge of the entire face of the stick with the longitudinal portion of peripheral recess **64** being inside the ratchet teeth row **62** and **63.** A pair of studs **65** and **66** are positioned on the face of face **61** and are spaced inwardly from the peripheral recess or groove **64.** Studs **65** and **66** are designed to receive aligned openings **67** and **68** respectively in a filmstrip **69** to properly register the filmstrip on stick **60.** In this manner, the frames of filmstrip **69** are properly positioned with respect to the ratchet teeth in rows **62** and **63** so that as the stick **60** advances the strip will be properly framed in the device.

Additionally, on the front and rear faces are pairs of longitudinal ribs **70** and **71,** and **109** and **110** which reduce friction of stick and protect the plastic surface. A cover plate **72** is provided to assist in protecting and retaining filmstrip **69** within stick **60.** Cover plate **72** has a peripheral flange **73** which mates with peripheral groove **64** on the face of base **61.** Additionally, there are a pair of detents **74** and **75** on the inner face of cover **72** spaced inwardly from flange **73** and positioned so that when flange **73** is positioned in groove **64** the detent **74** and **75** will receive studs **65** and **66** thereby completing the capture of the filmstrip **69** on stick **60.** Furthermore, the base **61,** the filmstrip **69** and the cover **72** can be hermitically sealed in a common manner such as by ultrasonic welding or chemical bonding to insure the integrity of the filmstrip in stick **60** and thereby protect it from physical damage such as dust or scratches. Face **61** and cover **72** may be constructed of any conventional transparent plastic material.

The tape player **5** is of conventional construction, but the wiring of the player is modified and augmented by a supplemental printed circuit **20** (FIG. **3**) mounted within the housing **1.** The purpose of the modification and supplemental circuit is to trigger the solenoid **18** for advance of the slide stick, to provide means to stop the instrument at a predetermined point, and to restart with a manual reset button. The instrument is battery powered with conventional dry cell or nickel cadmium rechargeable batteries being housed in compartment **30** as shown in FIG. **3.** An AC plug-in adapter can likewise be used to provide power in place of the batteries.

The driving mechanism activated by the batteries in compartment **30** is of a conventional type. Motor **31** has its drive shaft **32** interconnected with capstan **33** through the intermeshed arrangement of gears **34, 35** and **36.** Capstan **33** which is rotated in the manner described above extends upwardly into engagement with the tape **37** of a conventional two reel audio cassette **38.** Cassette **38** engages with the tape in a conventional manner and by bearing the tape against the conventional surface drives it from spools **39** to spool **40** within cassette **38** in a conventional manner. Spools **39** and **40** are mounted on spindles **41** and **42** respectively when cassette **38** is positioned within the housing as shown. After the tape has been driven by the capstan **33** it comes into contact with an audio pick-up head **43** which is interconnected with the circuitry of the device to transmit the audio signal contained thereon. Pick-up head **43** can be moved manually into and out of engagement with tape **37** by means of manual lever **44** interconnected therewith. Lever **44** extends out of the housing as shown and is permitted reciprocal movement to permit movement of the head **43** connected to the interior end thereof. A conventional off-on and volume control knob **45** is provided on the housing for operation of the device and is interconnected in the normal circuitry of the system which primarily is housed in the base of player portion **45** with the exception of the portion housed on circuit board **20.** Cabinet top **46** may be hinged to open and permit ready access to spindles **41** and **42** for placing and removing the cassette into and out of position prior to and after use. Cassette **38** contains both the regular audio program thereon as well as the signal for advancing the slide stick by means of the solenoid at synchronized intervals with the audio program.

The particular circuitry employed in operation of the audio visual device is of a conventional type and is shown in block diagram form in FIG. **11** of the drawings. The power supply or batteries **30** supplies power through normally closed switch **50** to motor **31.** Motor **31** drives tape **37** and pick-up head **43** in engagement with tape **37** picks up the audio program from the tape. The audio program includes the standard audio transmission as well as an additional 100 cycle pulse which appears at predetermined intervals on the tape. Naturally, the system is adaptable for use within a cycle range so that other than a 100 Hz signal can be chosen for the signal pulse. The pulse is positioned on the tape so that operation of advancement of the visual material is synchronized with the audio program. The combined audio program and **100** cycle pulses are subjected to gain at point **44'** and then are passed into a two stage audio amplifier with a 100 cycle filter **45'.** The amplified audio program is transmitted to speaker **46'** for audible reception. The filtered out 100 cycle pulse which has also been amplified by amplifier **45** is filtered out and rectified to DC by rectifier components **47.** The DC pulse is then amplified by a two stage DC amplifier **48** at which time it will activate relay **49** to operate stick advance solenoid **18.**

If the recorded pulse is longer than 2 seconds, timed delay means **50** is activated which operates relay **51** and opens switch **50** to cut off the motor drive. This stops the tape and the program on that tape at the particular point recorded. Manual operation of switch **50** is then required to reconnect the power source to the motor and restart the tape. In this manner, a longer pulse at a predetermined point may be utilized to shut off a recorded program on the tape at a desired point for any desired reason. The program can then be restarted by manually closing switch **50.** This feature is of greatest use in the educational field as a teaching aid.

The sound from the tape can emanate directly from the speaker which may be positioned in the cabinet so that the sound is directed outside of the housing **1.** On the other hand, the speaker **46** can be positioned in the housing so that the sound is directed within the housing **1** (FIG. **3**). In such a case, a sound deflection board **21** can be positioned in the housing to deflect the sound to the top of the housing so that it will emanate from the upper two grills **3***b*. The wings **1***b* on each side of the upper portion of the housing **1** serve to reflect the sound from the grill **3***b* into the ears of the viewer in a stereophonic-like manner. Wings **1***b* also shield the listener for distracting ambient or exterior disturbing noises. The instrument can also be used with ear plugs

or phones. In all cases, the volume is controlled through the circuitry in the cabinet.

There is a separate tape track or cassette side for each stick slide or series of stick slides bearing viewing material. Each cassette is provided with a sound track of narration describing or commenting on each picture as it comes into view. In addition, the cassette is provided with signals to advance the picture frame in synchronization with the narration. The signals or pulses trigger the solenoid **18** which actuates the pawl **13** and the stick advance (FIGS. **7** and **8**). The tape and the cassette also carries extra long pulses or signals at such positions at which it is felt that the viewer will need the instrument to stop in order to take notes, answer questions, or complete mounting activities away from the instrument. When these signals occur, the complete circuit and instrument are shut off and are only put into play again by pressing manual reset button **50** (FIG. **1**) which overrides the stopping mechanism. An extra long stop signal or pulse is also inserted at the end of the tape to shut off the instrument when the stick slide is completed.

The operator inserts the stick slide **6** bearing the material to be viewed into the slot **1**e of the device and the matching tape or tape cassette into the housing on spindles **41** and **42.** Both the tape and the slide are started at their beginning to assure that the sound and picture will be in synchronization. The instrument will then operate automatically from start to finish with audio visual synchronization. Only at such times as the instrument is shut off by the extra long pulses or signals will it be necessary to push the reset button to start the instrument again.

Uses of the device should be apparent from the foregoing description. Thus, the aforenoted objectives and advantages are most effectively attained. Although the preferred embodiment of the invention has been disclosed and described herein, it should be understood that this invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

Having thus described the invention, what is claimed is:

1. An audio visual device for viewing pictures, symbols, reading material and like material synchronized with sound comprising:

a housing having audio and viewing passageways therein;

a lens system in the housing aligned with the material to be viewed;

support means and a gravity feed advance mechanism in said housing positioned to engage with visual material introduced to said housing and to advance said visual material automatically in a predetermined manner;

audio means in said housing adapted to receive and transmit an audio program;

a power source associated with said housing;

audio control means in said housing responsive to said power source to operate said audio receiving means;

visual control means responsive to predetermined audio signals from the audio means to automatically activate said advance mechanism to advance the visual material under the force of gravity in synchronization with the audio program;

a drive motor being in the housing connected to the power source;

a tape containing an audio program and a number of spaced audio signals thereon;

drive means connected to the drive motor to receive an audio programmed tape and drive said tape;

an audio pick-up head in said housing and adapted to be brought into engagement with the tape so that the audio program and the audio signals can be picked up by said head;

a first two-stage amplifier system connected to said pick-up head to amplify the audio program and the audio signals;

filter means in said first two-stage amplifier to separate the audio signals from the audio program;

a speaker connected to the first two-stage audio amplifier to receive the audio program therefrom and transmit the program to the listener;

a rectifier connected to the first two-stage amplifier to receive the filtered audio signals and to rectify the signals;

a second two-stage amplifier connected to the rectifier to amplify the rectifier audio signals;

a relay connected to the second two-stage amplifier and to a solenoid with the solenoid being connected to the advance mechanism for the visual material so that when an amplified audio signal is received by the relay, the solenoid will be actuated to advance the visual material in a predetermined manner;

a time delaying amplifier connected to said relay and responsive to an audio signal of predetermined length to receive that signal and activate a second relay which opens a switch between the power source and the motor, stopping operation of the device; and

the switch adapted to be manually closed to restart the device upon demand.

2. An audio visual device for viewing pictures, symbols, reading material and like material synchronized with sound comprising:

a housing having audio and viewing passageways therein;

a lens system in the housing aligned with the material to be viewed;

support means and a gravity feed advance mechanism in said housing positioned to engage with visual material introduced to said housing and to advance said visual material automatically in a predetermined manner;

audio means in said housing adapted to receive and transmit an audio program;

a power source associated with said housing;

audio control means in said housing responsive to said power source to operate said audio receiving means;

visual control means responsive to predetermined audio signals from the audio means to automatically activate said advance mechanism to advance the visual material under the force of gravity in synchronization with the audio program;

an audio pick-up head being in the housing for engagement with the audio program vehicle for reception and transmittal of said audio program; and

a manual pick-up head lever connected to said audio pick-up head and extending externally from said housing for gripping by the operator and shifting of the pick-up head into and away from engagement with the audio program vehicle.

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