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Kaye et al.

[11] **3,791,728**

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[54] **PORTABLE MICROFILM VIEWER**

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[21] Appl. No.: **194,724**

[52] **U.S. Cl.** **353/26**, 353/75, 353/77

[51] **Int. Cl.** **G03b 21/11**, G03b 21/30

[58] **Field of Search** 353/74–78, 26, 353/95, 96; 352/169, 181, 191

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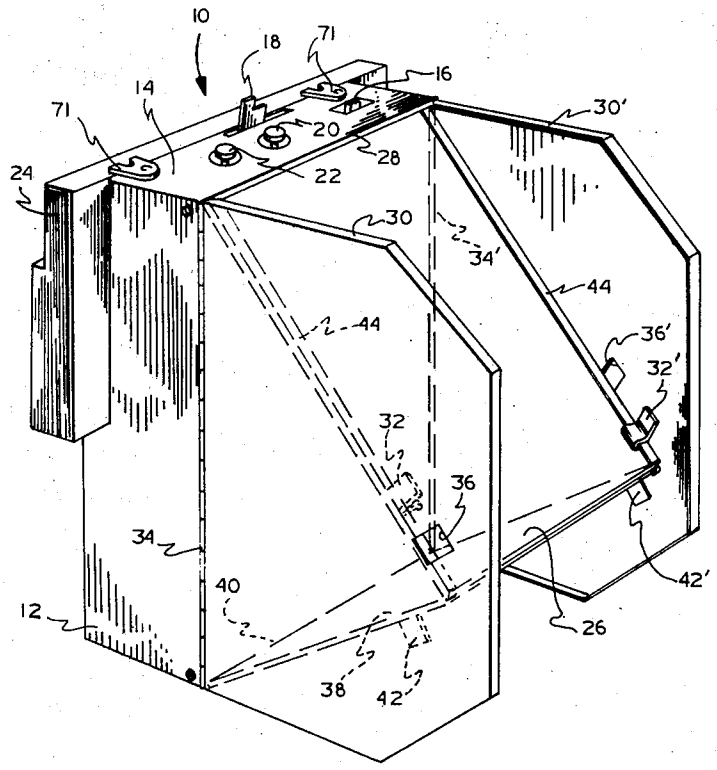
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[57] **ABSTRACT**

A portable microfilm viewer is described, which is of compact structure. The viewer includes a control for advance of the microfilm with a lock-out feature whereby single frame advance is deactivated when continuous rapid film advance is selected. The microfilm viewer is adapted to stand upright on a flat surface, with a fold-out viewing screen supported in reading position by side-located shades. The shades fold protectively over the viewing screen when it is not in use, and provide shading against ambient light interference when the screen is in use.

1 Claim, 9 Drawing Figures



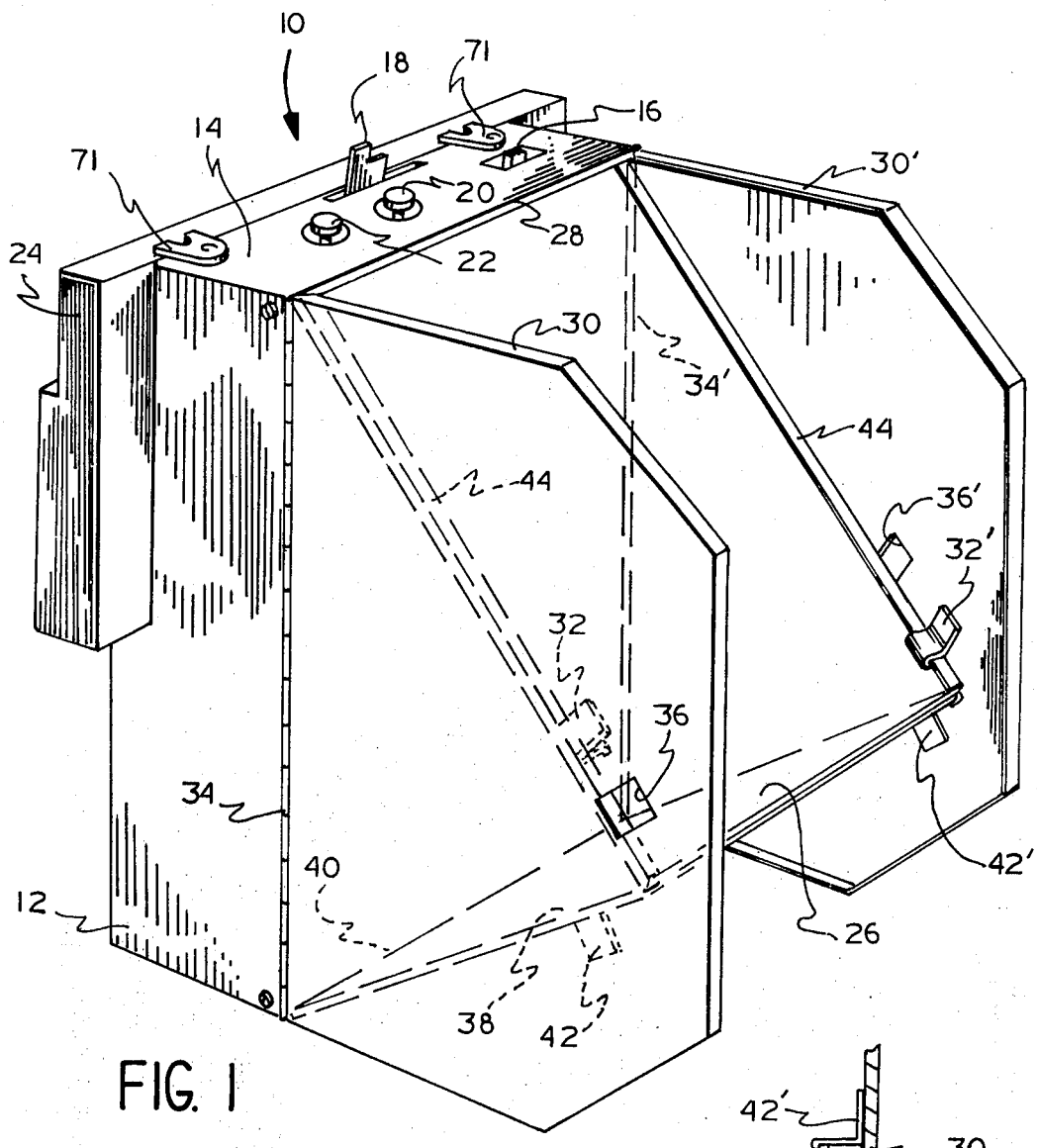


FIG. 1

FIG. 2

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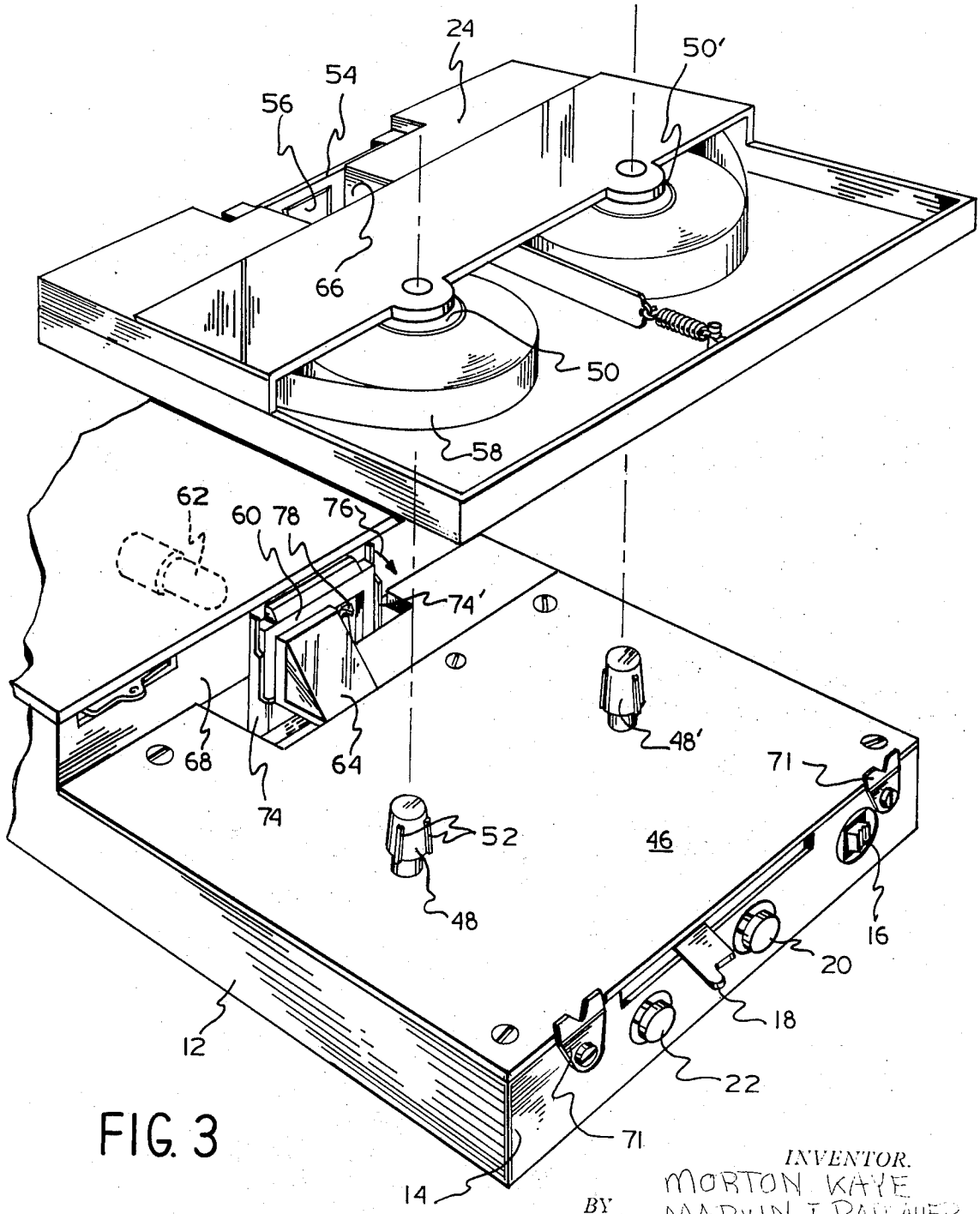


FIG. 3

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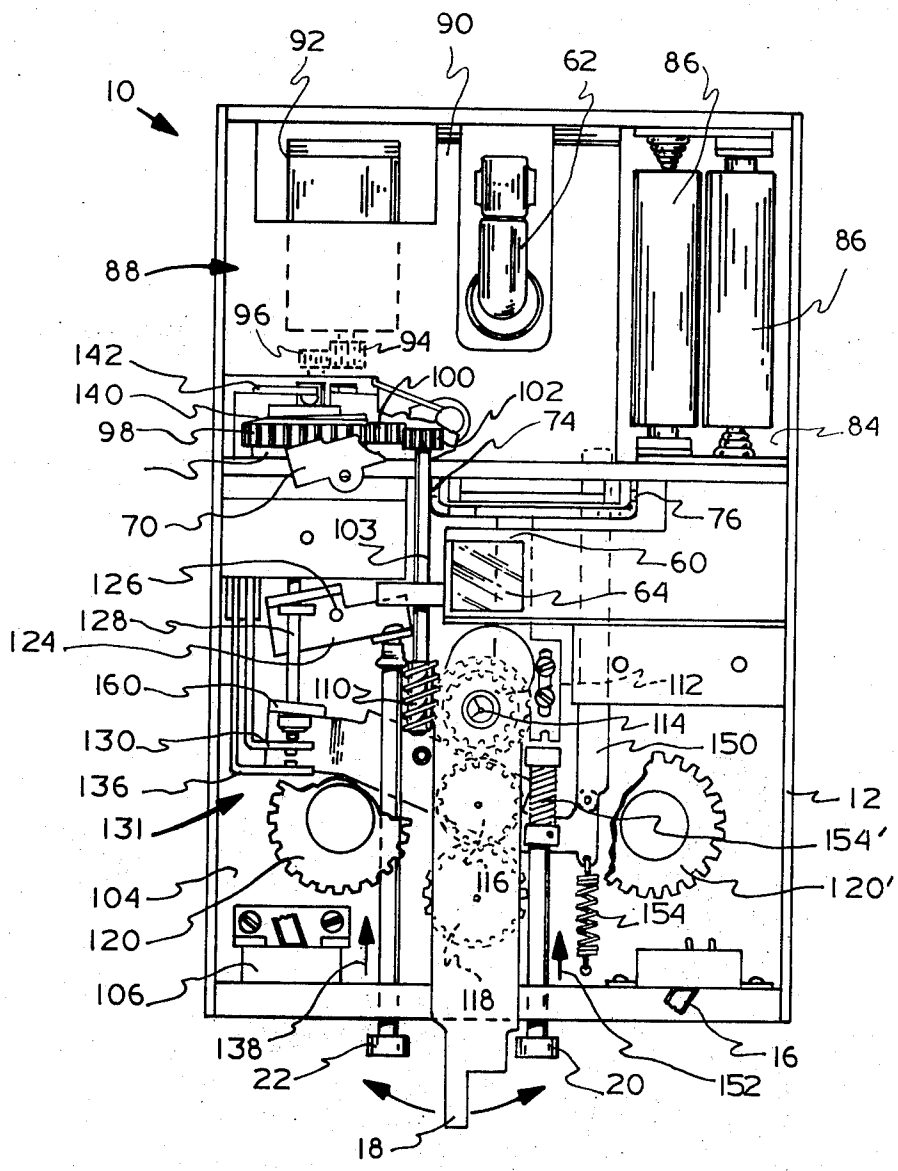


FIG. 4

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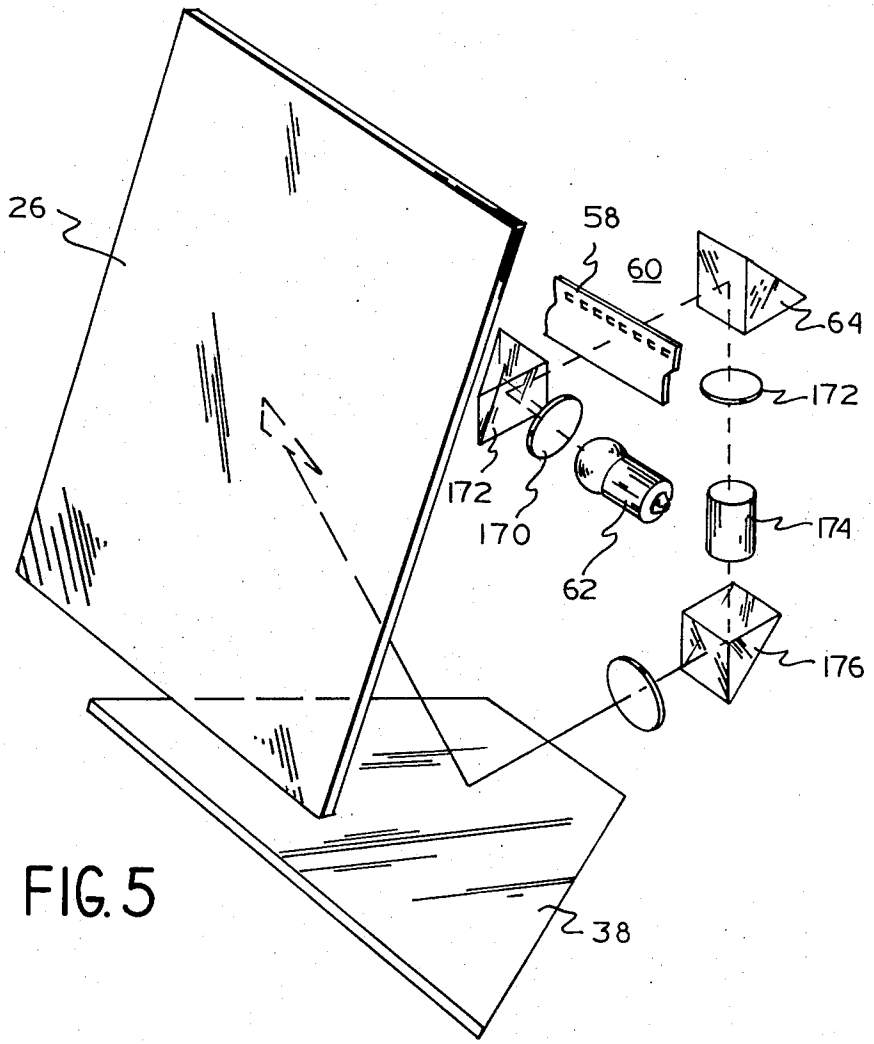
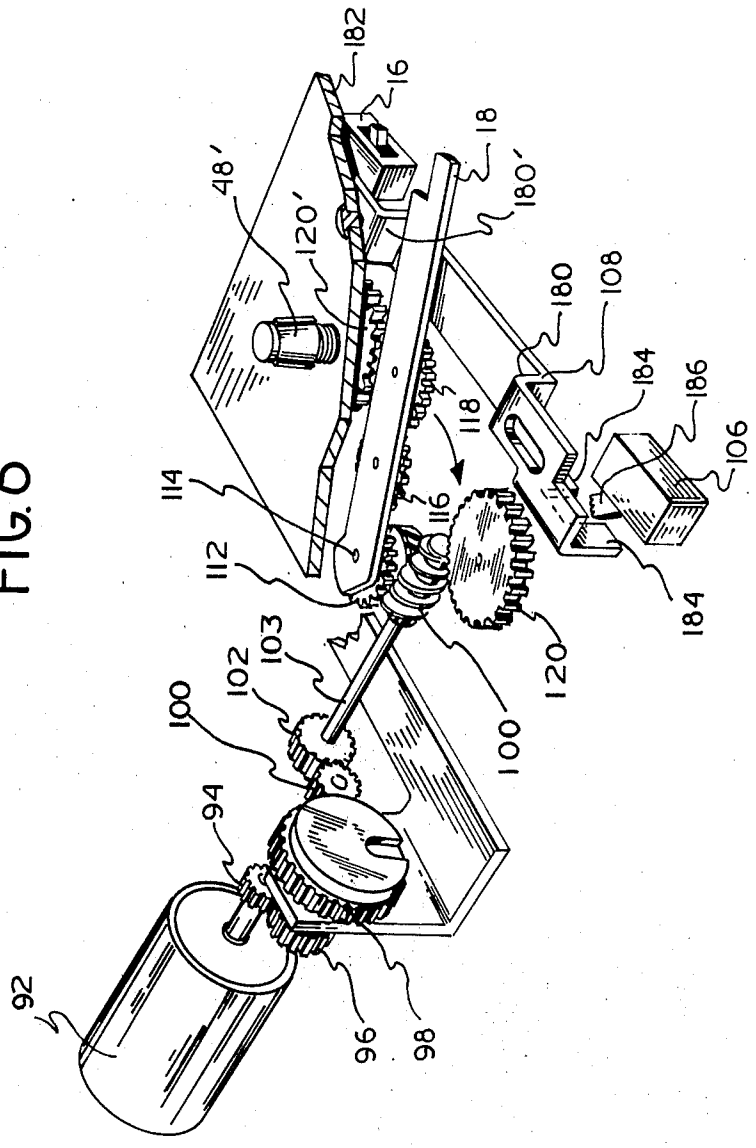


FIG. 5

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FIG. 6



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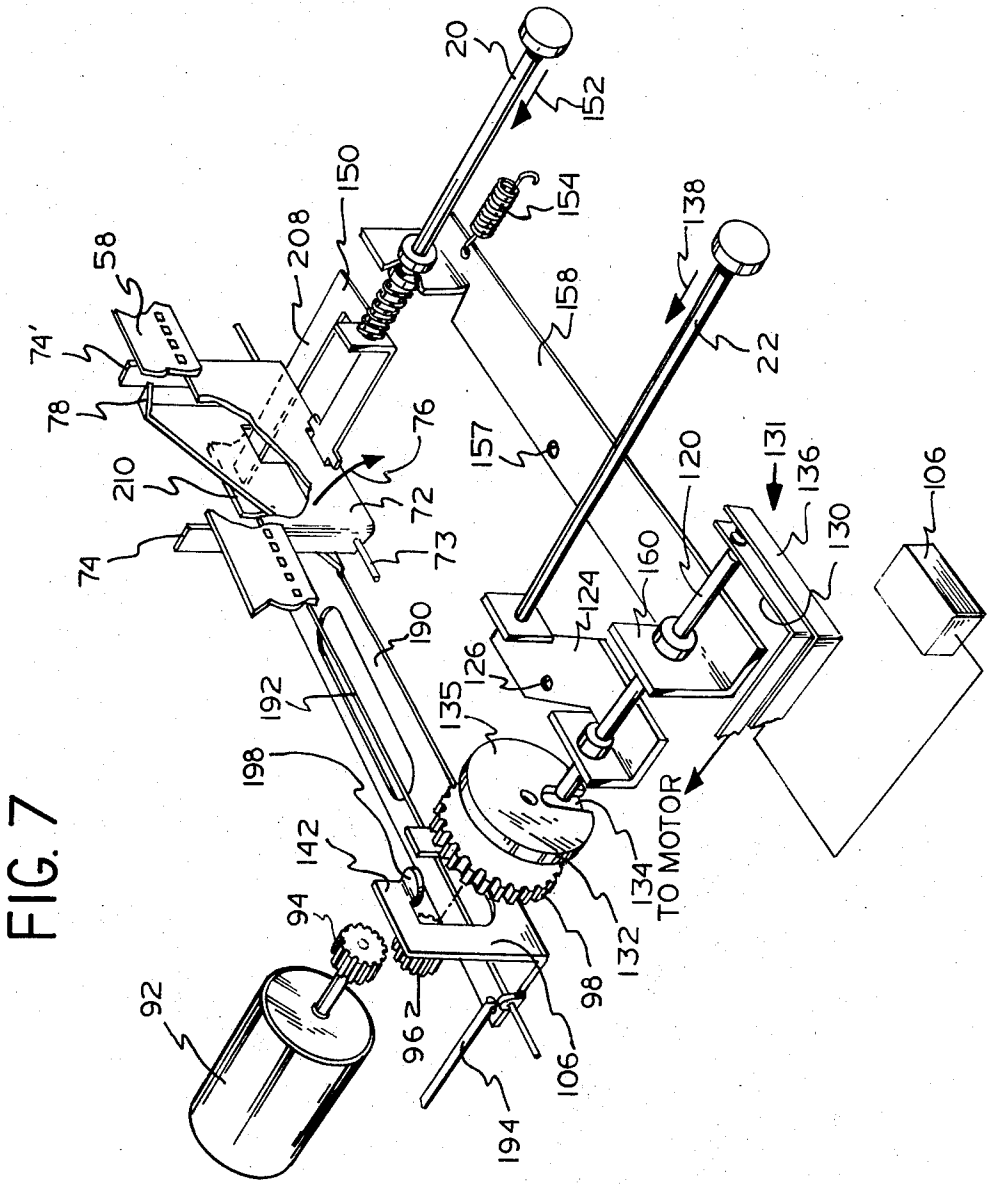


FIG. 7

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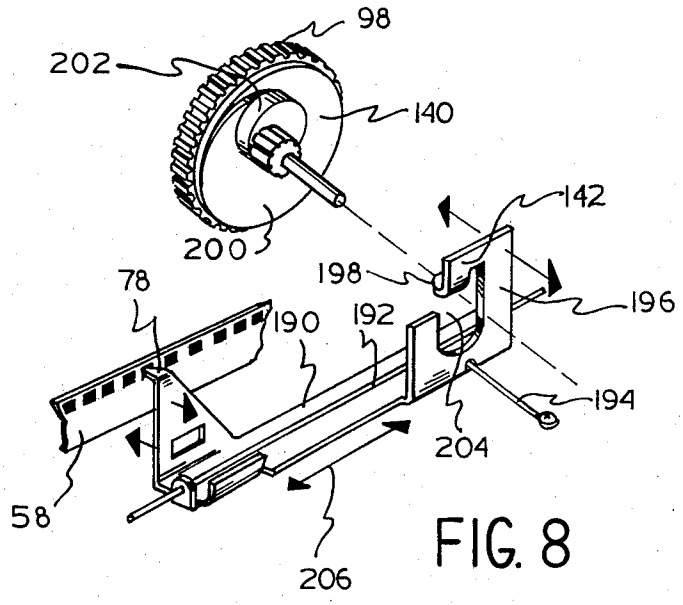


FIG. 8

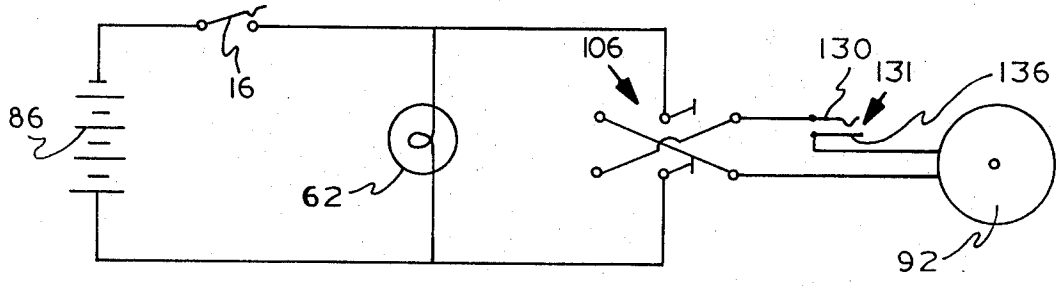


FIG. 9

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PORTABLE MICROFILM VIEWER

FIELD OF THE INVENTION

This invention relates to a film viewer and more specifically to a portable microfilm viewer for use at any desired location.

BACKGROUND AND SUMMARY OF THE INVENTION

Portable microfilm viewers have been previously described as for example in the patents to Allen U.S. Pat. No. 3,498,707, Stoothoff 3,234,848, and Rondas et al. 3,319,517. In general, such prior art devices have left much to be desired from the standpoint of compactness, place or position of utility, and versatility and ease of selection of such control functions as rapid, continuous film advance versus single frame advance, forward versus reverse film motion, etc.

In a portable microfilm reading device in accordance with the invention a compact film viewer for displaying images of a microfilm mounted on a cassette may be used at any convenient location. The film cassette includes a microfilm which bears a large number of frames spaced at regular intervals along the film. A desired frame may be selected for display by advancing the microfilm past a viewing port at a rapid speed towards a general film region which is known to include the desired frame. When this film region appears, a frame by frame film advancing control is provided to enable the operator to select the desired frame for display. The control for advancing the microfilm includes a lock-out feature whereby the single frame advance is deactivated when the microfilm is rapidly advanced.

The micro-film viewer in accordance with the invention has a compact structure adapted to stand upright on a flat surface such as a reading table, with a foldout viewing screen supported in a reading position by side located shades. The side shades are foldably mounted to wrap protectively around the viewing screen when it is not in use. The side shades conveniently retain the screen in a reading position while reducing interference from ambient light.

These advantages and others may be appreciated from the following description of a preferred embodiment of the microfilm viewer in accordance with the invention.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of a microfilm viewing device in accordance with the invention and shown in an operative position.

FIG. 2 is a section view of a support bracket employed to retain the viewing screen.

FIG. 3 is a perspective exploded view of the microfilm viewing device with the microfilm cassette shown disposed over its mounting area.

FIG. 4 is a top plan view of the microfilm viewer with its cover removed.

FIG. 5 is a perspective view of optical elements employed in the microfilm viewer of FIG. 1.

FIG. 6 is a perspective partially broken away view of the film drive employed in the microfilm viewer of FIG. 1.

FIG. 7 is a perspective view of a control mechanism used in the microfilm viewer of FIG. 1.

FIG. 8 is a perspective exploded view of a cam and microfilm viewer of FIG. 1.

FIG. 9 is an electrical schematic of the circuitry used in the microfilm viewer of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIG. 1 a microfilm viewing device **10** is shown in operative film image displaying position. The microfilm viewer has a housing **12** of a generally rectangular shape to enable the housing to stand upright on a table. The housing **12** has an upper surface **14** from which control elements project. The control elements include an on/off power switch **16**, a reversing lever **18**, a continuous film advance lever **20** and a single frame film advance lever **22**. The rear housing **12** supports a microfilm cassette **24**. The housing **12** encloses film image projecting optics which projects images on a translucent viewing screen **26** located at a frontal side of the housing. The translucent screen **26** is horizontally hinged at **28** to fold out as shown into an operative reading position where it is held by side located shade plates **30–30'** having suitable retaining brackets **32–32'**. The shade plates **30–30'** are vertically hinged at **34–34'** respectively and fold over the screen **26** to protect the screen and made the portable film viewer compact when folded down. The viewing screen **26** is provided with cut-outs **36–36'** which are located to receive brackets **32–32'** respectively when the side shades are folded down over the viewing screen **26.**

A mirror **38** is horizontally hinged at **40** to the housing **12** and when folded out rests on tabs **42–42'** located on side shades **30–30'** respectively. The brackets **32** and tabs **42** are carefully located to obtain a desired angular relationship between the screen **26** and mirror **38,** and achieve an undistorted display of images on the screen **26.** The retaining brackets **32,** as shown in FIG. **2,** each include a U-shaped member **44** sized to frictionally receive and retain an outer edge of the viewing screen **26.**

As shown in FIG. **2** the rear surface of housing **12** includes a cassette support area **46** shaped to receive the microfilm cassette **24.** The area **46** includes a pair of reel hubs **48–48'** which respectively engage reels **50–50'** on the cassette **24.** The reels **50–50'** may be designated as wind-up and take-up reels depending upon the desired direction of movement of the microfilm. The reel hubs **48–48'** are provided with ribs such as **52** for positive engagement with the cassette mounted reels **50–50'** in a manner which is commonly used in cassette drives.

The cassette **24** has a viewing frame **54** with an aperture **56** aligned with the microfilm **58** to view its frames. The microfilm **58** is wound around reels **50–50'** and threaded with the viewing frame **54** to fit in a space **60** formed between portions of an optical projection system such as a light source **62** and a reflector prism **64.** When the cassette **24** is mounted in area **46** of housing **12** the prism **64** protrudes into a recess **66** behind the viewing frame **54.** The cassette **24** seats against a wall **68** of housing **12** in alignment with the microfilm frames and beneath a spring biased retainer **70** so that the microfilm **58** and viewing frame **54** are accurately located with reference to the optical projection system. Cassette supporting tabs **71** maintain the cassette **24** in operative position relative to the optical projection system. A film gate **72,** formed by a pair of upright members **74–74',** is located in front of wall **68.** The film gate **72** is mounted for pivoting movement

about a pin 73 (see FIG. 7) and when actuated pivots away from wall 68 in the direction of the arrow 76 to enable a film claw 78 to separate itself from sprocket holes in the microfilm. The film claw 78 is employed to provide incremental film advance during frame by frame display of the microfilm 58.

As shown in FIG. 4 the housing 12 is divided into a battery compartment 84 sized to retain batteries 86 which provide electrical power for drive train 88 located in a compartment 90, and for a light source 62. The drive train 88 includes motor 92 and gears 94, 96, 98, 100 and 102. The pinion 102 is mounted on a worm shaft 103 which protrudes into a control compartment 104 to deliver rotation drive. The control compartment 104 includes control elements such as the single frame advance lever 22, the continuous frame advance lever 20, the on/off power switch 16, the reversing lever 18 and a reversing switch 106. The reversing switch 106 and reversing lever 18 are coupled to one another by a bracket 108 (see FIG. 6). The light source 62, which is powered by batteries 86 through the on/off switch 16, shines a beam of light onto the reflecting prism 64 through the space 60 where the microfilm passes by.

The worm shaft 103 has a worm 110 which engages a worm wheel 112 mounted on the reversing lever 18. The latter is pivotally mounted to the housing by a pivot pin 114 which also serves as an axis of rotation for the worm wheel 112. The worm wheel 112 in turn drives a first pinion 116 coupled to a second pinion 118, both of which are mounted on the reversing lever 18. Pinion 118 may engage either one of drive wheels 120–120′ depending upon which direction the reversing lever is pivoted. Drive wheels 120–120′ are respectively and coaxially coupled to the reel hubs 48–48′ (see FIG. 3) so that the microfilm 58 may be moved in the desired direction.

The single frame advance control lever 22 engages a first control link 124 which is pivotally mounted to the housing 12 at 126. This link 124 in turn is coupled to a stop shaft 128 which is normally biased by a spring loaded switch contact 130 of a control switch 131 against a stop wheel 132. The stop wheel 132 is coaxially mounted on gear 98. The stop shaft 128 normally engages a recess or slot 134 (see FIG. 7) in the stop wheel 132 to prevent the latter's rotation. Another contact 136 of the control switch 131 is operatively disposed opposite the contact 130 to provide a normally open control switch in series with the electrical power line to motor 92.

Thus, when the single frame advancing control lever is actuated in the direction indicated by arrow 138, the link 124 is pivoted counter-clockwise and moves the stop shaft 128 away from the stop wheel and against contact 130 of control switch 131 to cause the latter to close and provide electrical power to motor 92. As soon as the motor receives electrical power it causes a full rotation of stop wheel 132. After one full rotation the stop shaft 128 re-engages the stop 134 in the control wheel 132 to prevent further rotation and re-open the control switch 131.

During a single control wheel rotation a cam 140 is engaged by a cam follower 142 to operate film claw 78. The cam is coaxially mounted with the gear 98 and control wheel 132, and operation of the cam and film claw will be explained with reference to FIG. 7.

The continuous film advance control lever 20 as shown in FIG. 4 is coupled to a control member 150 which in turn engages the film claw 78 and the film gate 72. When lever 20 is moved in the direction of arrow 152 against the bias from springs 154–154′, the film claw 78 disengages from the film 58. The continuous film advance control lever 20 is also connected to a second control link 156 which is pivotally mounted to the housing 12 at 157 and has an end 160 connected to the stop shaft 128. Thus, when the continuous film advance control lever 20 is actuated, link 158 is rotated counter-clockwise to move the stop shaft 128 to close the control switch 131 and release the stop wheel 132. The motor 92 may then be continuously actuated to advance the microfilm 58 for rapid movement to a desired region of the microfilm.

The optical viewing system employed with the microfilm viewer is shown in FIG. 5. The electrical light source 62 must operate at a voltage compatible with the voltage generated by batteries 86. A suitable focusing lens 170 is mounted in front of the light source 62 and directs the focused light onto a prism 172 located to reflect the light through the microfilm 58, prisms 64, lenses 172 and 174 and prism 176 to reflecting mirror plate 38 and then to translucent screen 26. An optical system as thus generally described is of conventional design and conveniently fits in the compact housing 12.

With reference to FIGS. 6 and 9 the drive and reversing control of the microfilm viewer 10 may be explained with greater clarity. As shown in FIG. 9, the electrical power from batteries 96 is coupled through power switch 16 to light source 62 and the motor 92. Electrical power to the motor may be reversed in polarity by reversing switch 106. Motor power, however, cannot be provided unless the control switch 131 is closed. Motor rotation reversal is accomplished by the lever 18 which is mounted to pass between a pair of spaced elbows 180–180′ of reversing bracket 108. The reversing bracket 108 is slidably mounted below a cover plate 182 which normally encloses the control compartment 104. The reversing bracket 108 is provided with a pair of downwardly extending switch button engaging members 184 which are so spaced to enable them to embrace the actuating button 186 of the reversing switch 106. When the reversing lever 18 is pivoted in the direction of arrow 188 the elbow 180 of bracket 108 is engaged and the bracket 108 is moved to force the switch button 186 to its other position and cause a reversal of voltage polarity to the drive motor, along with a corresponding change in the motor drive train from the reel pinion 120′ to the reel pinion 120.

Either single film frame advance or continuous film motion is obtained with the interlocked control illustrated in FIGS. 7 and 8 in greater detail. The film claw 78 is used to provide an incremental film advance corresponding to the spacing between successive microfilm frames. The microfilm engaging claw 78 is located on a common bracket 190 with the cam follower 142. Bracket 190 is pivotally mounted to the housing by a pin 192 which is oriented parallel to the direction of movement of the microfilm 58. The bracket 190 further is mounted to slide along the pin 192 and is held in a preferred position and orientation on pin 192 by a leaf spring 194.

In the single frame advance mode the film claw 78 executes a generally rectangular path, a portion of which is obtained with the claw 78 pivoted towards the film 58 (for film advance), and the remainder obtained with the claw pivoted away from film 58 (for claw re-

turn without retracting the film). This film claw motion is produced by the interaction between the cam follower **142** and cam **140** as more particularly illustrated in FIG. **8.**

As shown in FIG. **8** the cam follower **142** is formed of a generally U-shaped extension **196** with a rounded tip **198.** The tip **198** extends towards an annular cam surface **200** which varies in height to cause a pivotal motion of the cam follower **142** and thus also the film claw **78.** The cam **140** is provided with an eccentrically located hub **202** protruding into the aperture **204** formed by the U-shaped extension **196.** Hence, rotation of cam **140** produces sliding movement of bracket **190** along the pivot pin **192** as indicated by arrow **206.**

The combined effect of the cam surface **200** and hub **202** is a three dimensional movement of the film claw **78.** The first motion provides engagement of the film claw **78** with a microfilm sprocket hole, and this is followed by a movement along the pivot pin **192** to advance the film. The claw **78** then is separated or pivoted away from the microfilm **58** and returned to an initial position after a complete revolution of the cam **140.**

When one desires to advance the film by a single frame, the lever **22,** as shown in FIG. **7,** is momentarily actuated in the direction of arrow **139.** This causes the stop shaft **120** to move out of the stop recess **134** against contact **130** and close the control switch **131** to energize the motor **92.** The cam **140** is now rotated while the stop shaft **120** rides over the surface **135** of stop wheel **132.** During this cam rotation the film claw **78** is actuated through its frame advancing motion. When the stop recess **134** has again rotated opposite the stop shaft **120,** the latter is moved away from switch **131** (under spring action from contact **130**) to open the control switch **131** and prevent further rotation of the cam **140.** The angular position of the stop recess **134** relative to the cam **140** is so selected that the film claw **78** is returned to the beginning of a single frame advancing position each time the stop shaft **120** engages the recess **134.**

When one desires continuous film advance, the lever **20** is moved in the direction of arrow **152** to effect both a release of stop shaft **120** from the stop wheel **132** and a pivoting away of claw **78** and the cam follower **142.** This pivotal movement is obtained by control member **150** which has an arm **208** to seat against a lip **210** extending upwardly from bracket **190.** Since the claw **78** may at times tend to pull the film **58** during a backward pivot motion, the film gate **72** is actuated by arm **212** of control member **150** and thereby made to pivot in the direction of arrow **76** to assure claw separation from the microfilm **58.**

It will now be appreciated that the present device folds compactly when not in use, and has provision for forward or reverse rapid and continuous film advance as well as single frame operation, all governed by convenient, interlocked function control levers located atop the housing for ready access during table-top use.

Since the foregoing description and drawings are merely illustrative, the scope of protection of the invention has been more broadly stated in the following claims; and these should be liberally interpreted so as to obtain the benefit of all equivalents to which the invention is fairly entitled.

We claim:

1. A pocketable microfilm viewer adapted to occupy minimal area when set up for use upon a horizontal surface, said viewer comprising:

a portable housing having a generally rectangular configuration defining a longer dimension and a shorter dimension;

one surface of said housing providing a substantially planar base for setting said viewer upon said horizontal surface;

said housing being arranged so that said longer dimension is substantially normal to said base surface so that said viewer stands upright upon said horizontal surface whereby to occupy a minimum of area thereon;

a retractable viewing screen formed of a translucent material;

means pivotally securing said viewing screen to a portion of said housing which is near the upper margin of a vertical surface of said viewer when the latter is set upright on said housing base surface, whereby said viewing screen is pivotable about a horizontal axis from a position of storage against said vertical surface to an operating position at an angle to said vertical side;

a reflecting member; means pivotally securing said reflecting member to a portion of

said housing which is near the lower margin of said vertical surface, whereby said reflecting member is pivotable about a horizontal axis from a position of storage against said vertical surface to an operating position at an angle to said vertical side;

a pair of spaced support shades on opposite sides of said viewing screen and reflecting member;

means pivotally securing said shades to a portion of said housing which is near the side margins of said vertical surface, whereby said shades are pivotable about a vertical axis from a stored position in which they fold over and enclose said viewing screen and reflecting member, to an operative position projecting outwardly from said vertical surface;

said shades each having an edge substantially coplanar with said housing base surface whereby to help stabilize said viewer in said upright position during operation;

means on another vertical surface of said viewer for operatively mounting a microfilm cassette;

means in said housing and projecting therefrom to engage said cassette for film transport purposes;

a projection system arranged in operative relation to said film cassette to project images from said film through the lower portion of said vertical surface;

means on said shades engaging and thereby maintaining said viewing screen and reflecting member in their respective operating positions whereby said images are reflected by said reflecting member to said viewing screen;

and means for governing the operation of said film transport means, and including downwardly actuable manual control means projecting from the portion of said housing which is uppermost when said viewer is in said upright position.

* * * * *