

[54] MICROFICHE READER WITH INDEXED
FICHE MAGAZINE

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[51] Int. Cl. G03b 23/08

[58] Field of Search..... 353/26, 27, 25

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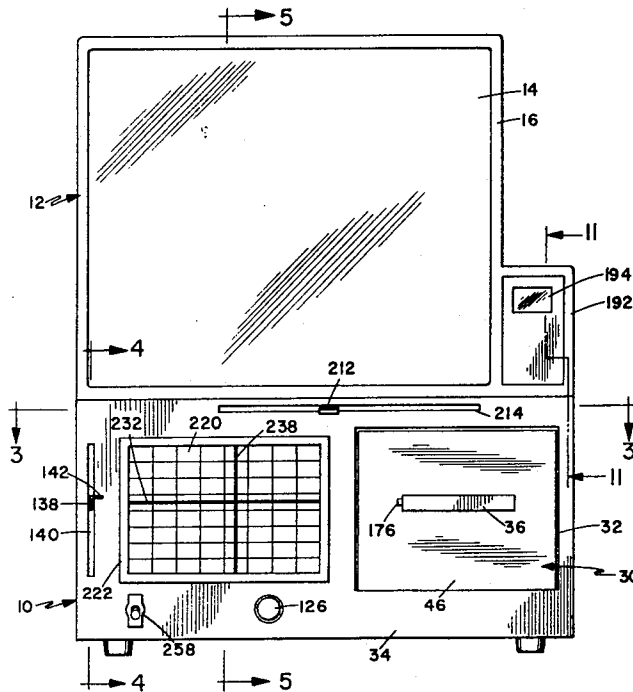
Attorney, Agent, or Firm—Brown & Martin

[57]

ABSTRACT

A microfiche reader incorporating an indexed magazine from which fiche cards are selectively extracted, positioned horizontally for viewing and returned to the magazine, all with a single lever. A second lever moves the projection lens and lamp assembly vertically relative to the fiche card, a position indicating grid showing the frame of the fiche card in projection position. The image is projected on a large viewing screen, at the side of which is a small screen showing the identification of the fiche card being viewed. An index frame carrying the contents of the specific magazine, can be moved into projection position to facilitate selection of individual cards and frames.

4 Claims, 12 Drawing Figures



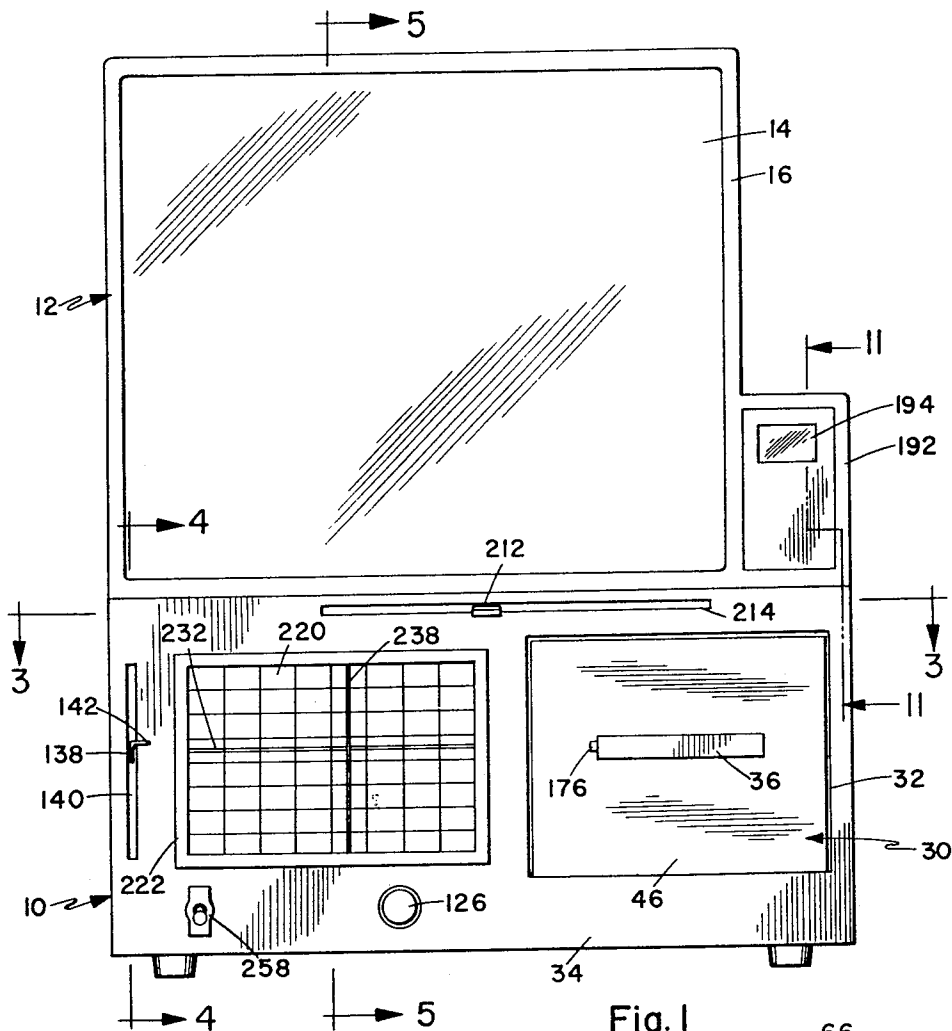


Fig. 1

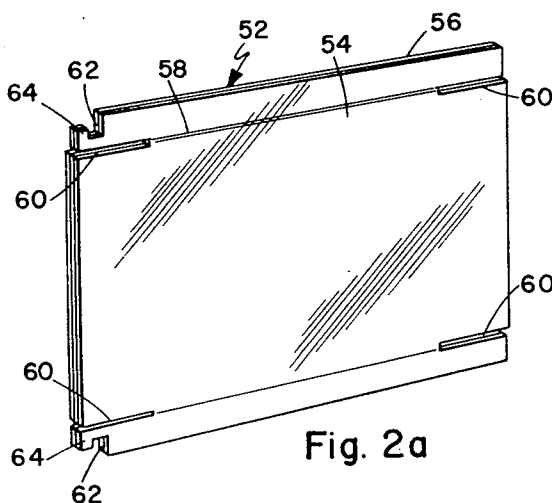


Fig. 2a

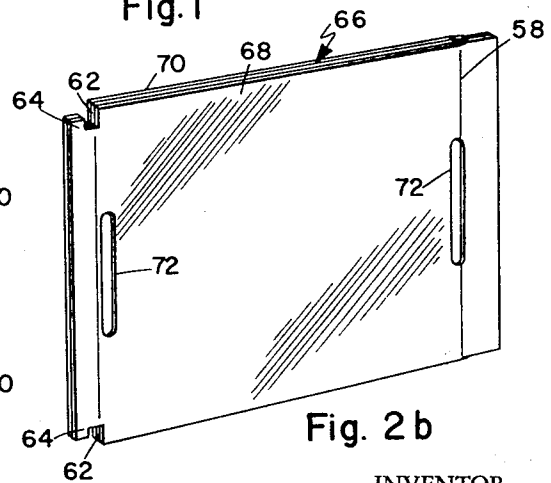


Fig. 2b

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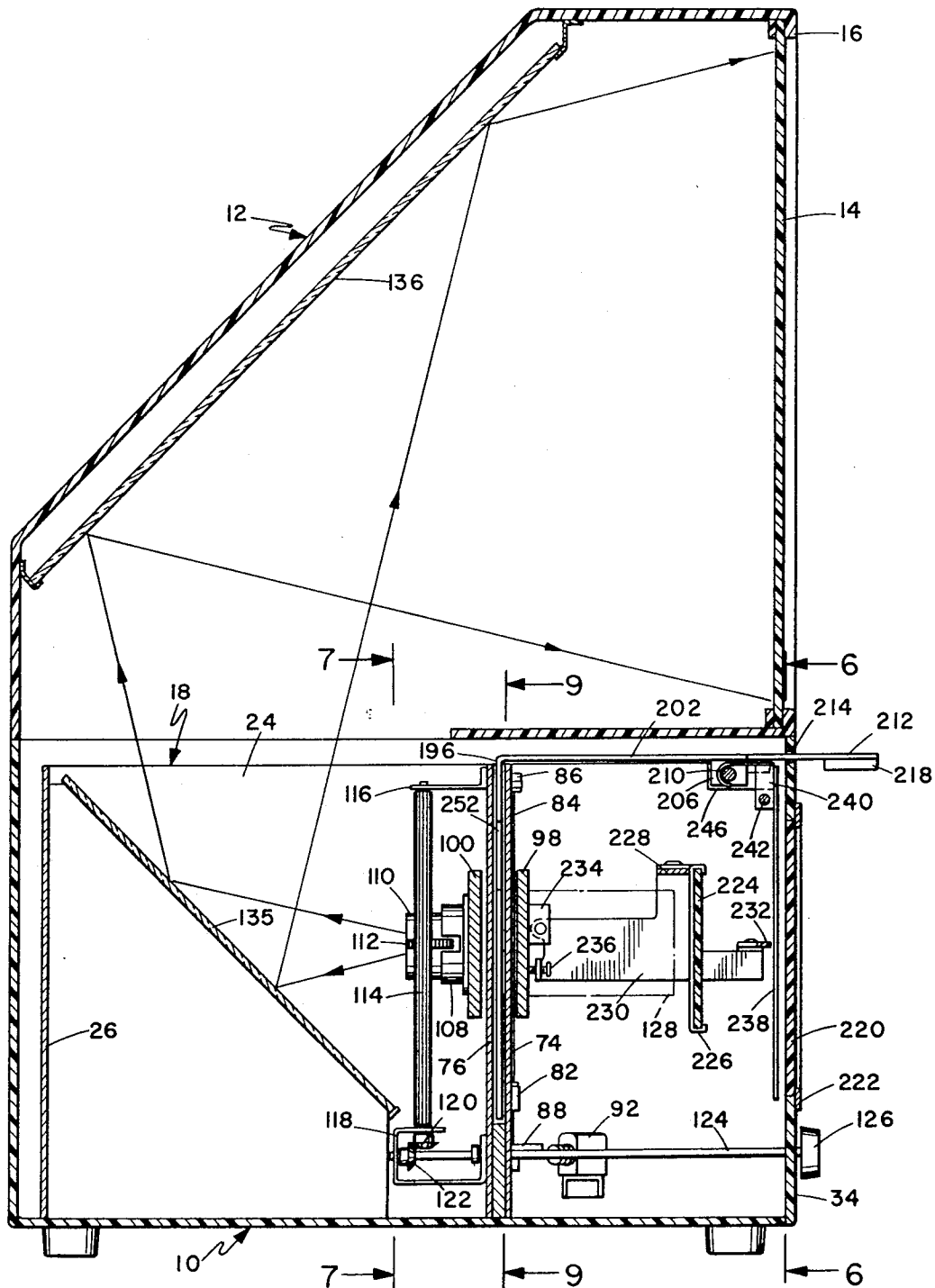


Fig. 5

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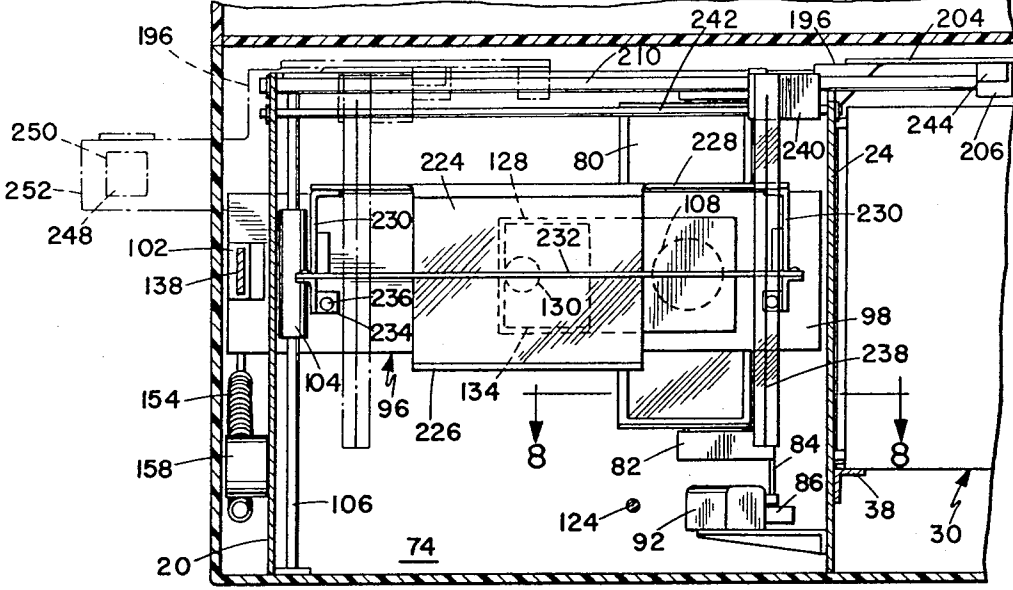


Fig. 6

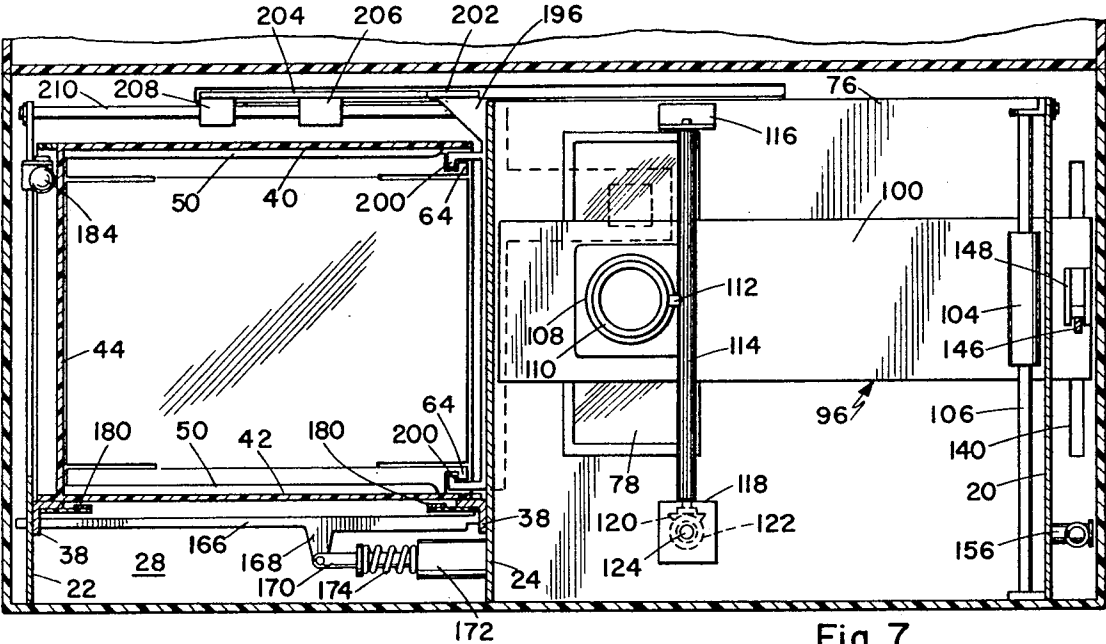


Fig. 7

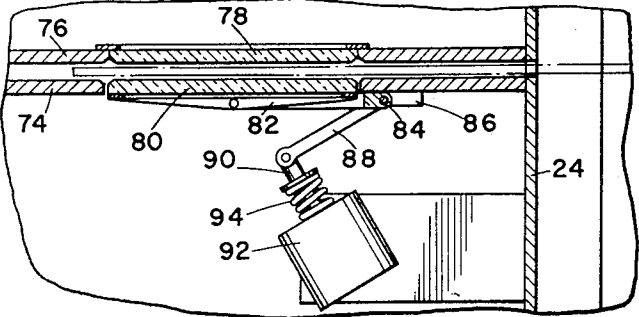


Fig. 8

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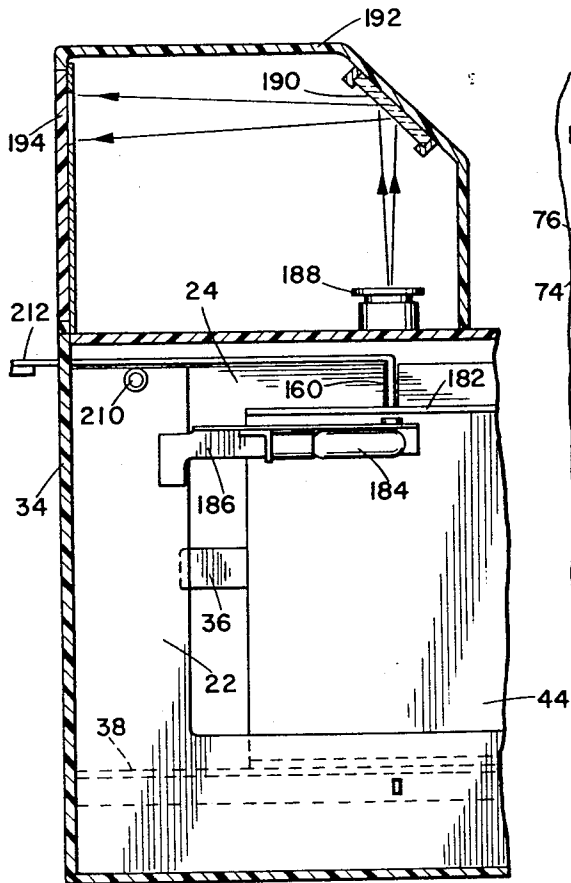
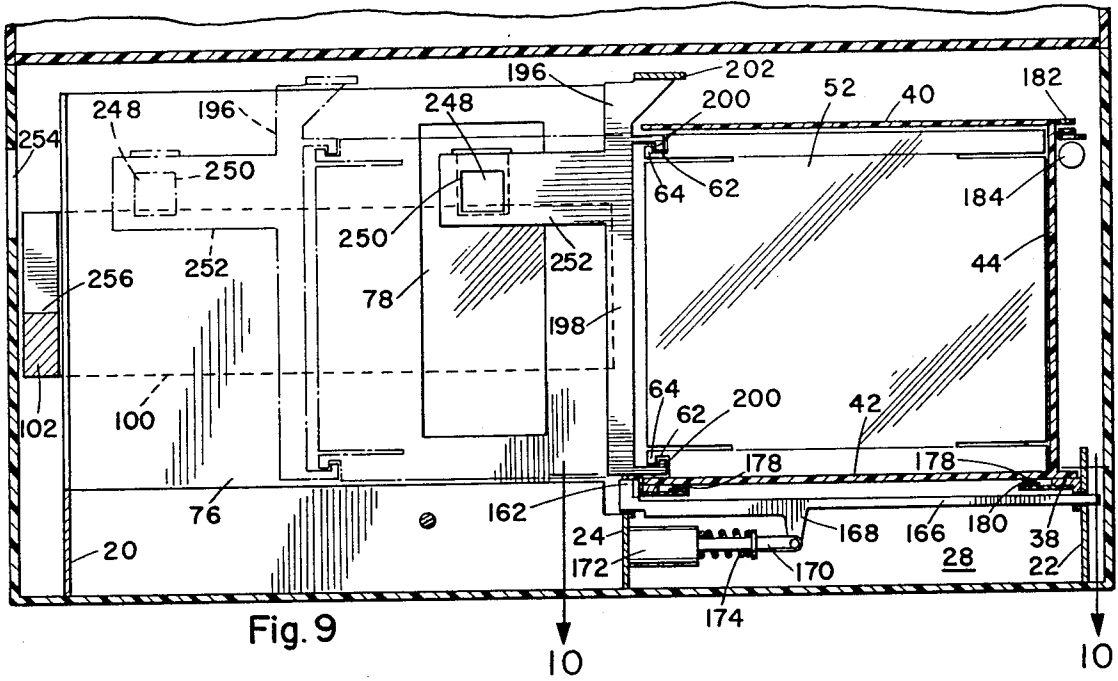


Fig. 11

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MICROFICHE READER WITH INDEXED FICHE MAGAZINE

BACKGROUND OF THE INVENTION

For convenience of storage, much microfilm data is carried on microfiche cards, on which the frames of microfilm are arranged in vertical columns and horizontal rows. In a typical reader or viewing apparatus, a fiche card is held in a frame or stage which is movable in two orthogonal directions in the focal plane of a fixed projection lens, each frame being projected by multiple reflections to a convenient viewing screen. The stage usually moves in a horizontal plane and a substantial space is necessary to accommodate motion of the fiche card to its extremities in two directions. Also, from the horizontal position of the card to the viewing screen, which is vertical or nearly so, requires at least three reflections of the image. The fiche cards are usually manually inserted in and removed from the stage and the frames must be searched, or reference made to a separate index for specific subject matter.

Mechanisms have been devised for selection of microfiche cards from a stack, but are complex and require the return of the stage or card holding frame to a precise loading position each time a change is made.

SUMMARY OF THE INVENTION

The microfiche reader described herein accommodates fiche cards stored in a magazine which can be indexed for selection of any card, the selected card identification being displayed at the operating position. A single lever is used to extract a card from the magazine, move the card horizontally relative to the frame projection position, and return the card to the magazine. A second lever moves the lens and lamp assembly vertically relative to the card for individual frame selection so that the card itself is moved along only one axis. Cursors are coupled to move with the levers to indicate, on an illuminated grid, which frame is at the projection position. Connected to the card moving lever is a holder for an index slide, which can be moved into projection position to show the complete contents of the magazine. The fiche card is held precisely in focus during projection, and the image is projected with only two reflections to a large viewing screen.

The magazine can be indexed by one hand and is readily removable and replaceable from any indexed position. All controls are fully accessible from the viewing position, and specific frames of data can be displayed on the screen with a few simple control actions.

The primary object of this invention, therefore, is to provide a new and improved microfiche reader.

Another object of this invention is to provide a new and improved microfiche reader having a magazine containing fiche cards which can be individually selected for viewing.

Another object of this invention is to provide a new and improved microfiche reader having visual means for indicating the card and frame being viewed and permitting rapid selection of data.

A further object of this invention is to provide a new and improved microfiche reader in which the fiche card is moved along one axis only, the lens assembly being movable orthogonally to the card for individual frame selection.

Other objects and many advantages of this invention will become more apparent upon a reading of the following detailed description and an examination of the drawings wherein like reference numerals designate like parts throughout and in which:

FIG. 1 is a front view of the complete microfiche reader.

FIG. 2a is a perspective view of a typical fiche card.

FIG. 2b is a perspective view of an alternative form of fiche card.

FIG. 3 is an enlarged sectional view taken on line 3—3 of FIG. 1.

FIG. 4 is an enlarged sectional view taken on line 4—4 of FIG. 1.

FIG. 5 is an enlarged sectional view taken on line 5—5 of FIG. 1.

FIG. 6 is a sectional view taken on line 6—6 of FIG. 5.

FIG. 7 is a sectional view taken on line 7—7 of FIG. 5.

FIG. 8 is an enlarged sectional view taken on line 8—8 of FIG. 6.

FIG. 9 is a sectional view taken on line 9—9 of FIG. 5.

FIG. 10 is a sectional view taken on line 10—10 of FIG. 9.

FIG. 11 is an enlarged sectional view taken on line 11—11 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The microfiche reader has a lower housing 10 containing all of the mechanism, and an upper housing 12 having a back projection type viewing screen 14 mounted in a front frame portion 16 of the housing. Upper housing 12 is made detachable in any suitable manner for access to the interior, both housings being made from plastic, metal, or other such material.

In the lower housing 10, the mechanism is carried in an inner frame 18, having end walls 20 and 22, an intermediate wall 24 and a rear wall 26. The space between walls 22 and 24 is a compartment 28 for the magazine 30, which passes through an opening 32 at the right hand side of front panel 34 of the lower housing. Magazine 30 is a rectangular drawer-like unit with a handle 36 on the front end, and slides on support rails 38 extending from front to rear of compartment 28. The magazine is enclosed by a top panel 40, bottom panel 42, right hand side wall 44, front wall 46 and back wall 48, the left hand side being open. On the inside of both the top and bottom panels are spaced parallel ribs 50, extending from left to right to hold a plurality of fiche cards 52 in upright spaced relation.

A typical fiche card 52, illustrated in FIG. 2a, comprises a pair of generally rectangular transparent sheets 54 and 56, bonded together at the corners to form an envelope, into which a fiche film 58 can be inserted from either side. The end edges of the envelope are inwardly slotted, as at 60, to provide resiliency for insertion of fiche film material of various thicknesses.

At the left hand side, the upper and lower corners have inwardly opposed notches 62, with outwardly opposed ears 64 at the end edge, for gripping the fiche card as hereinafter described.

An alternative fiche card 66, illustrated in FIG. 2b, comprises transparent sheets 68 and 70 bonded together at their end edges, leaving the top and bottom

open for insertion of the fiche film 58. Slots 72 in the transparent sheets along the edges of the bonded areas provide freedom for insertion of the film. The upper and lower corners of the left hand edge have notches 62 and ears 64, as on fiche card 52, the two types being interchangeable.

Fixed between walls 24 and 20 and spaced from front panel 34, are two vertical guide plates comprising a front guide plate 74 and a back guide plate 76, spaced in close parallel relation for a fiche card to slide therebetween. Back plate 76 has a fixed, vertically elongated window 78 and front plate 74 has a similar window 80 movably inset therein, as in FIGS. 6 and 8. Window 80 is pivotally mounted on a vertical axis in a frame 82, which itself is pivotally attached at one side to front plate 74 on a shaft 84 mounted in bearings 86. An arm 88 is connected to frame 82 through the shaft 84, the arm being attached to the armature 90 of a solenoid 92. A pressure spring 94 on armature 90 normally urges window 80 rearwardly to clamp a fiche card against fixed window 78 in proper focal position. Operation of the solenoid retracts the window 80 very slightly to allow the fiche card to move, the operation being described hereinafter.

The projection assembly is mounted on a carriage 96, having a front plate 98 and a back plate 100, joined at the left hand end by a connecting block 102. Carriage 96 moves vertically on bearings 104 riding on fixed posts 106 adjacent the connecting block, the plates 98 and 100 straddling and moving in spaced parallel relation to guide plates 74 and 76, respectively. Bearings 104 are preferably of the linear recirculating ball type for free motion with a minimum of play. Projection lens 108 is mounted on the back plate 100 and moves vertically over the fixed window 78. The lens has an adjustable barrel 110 on which is a toothed rack 112, the rack being engaged at any vertical position by a splined rod 114 rotatably mounted in bearings 116 and 118 on the back guide plate 76. On the lower end of splined rod 114 is a bevel gear 120, engaged by another bevel gear 122 on a focusing rod 124, which extends through front panel 34 and is fitted with a knob 126. The lens can thus be focused at any position of the carriage.

On the front plate 98 is a lamp housing 128, containing a lamp 130, condenser 132 and a mirror 133 to reflect the light through windows 78 and 80 and the lens 108. The front portion of the lamp housing adjacent the lamp has an opening 134 for forward illumination. An image is projected through lens 108 to an inclined first mirror 135 immediately behind the lens assembly, and upwardly to an inclined second mirror 136 in the upper housing 12, which reflects the image forwardly to screen 14.

Carriage 96 is moved vertically by a lever 138 fixed to connecting block 102 and extending through a slot 140 in front panel 34, the projecting end of the lever having a hand grip portion 142. The weight of the carriage is balanced by a spring loaded bell crank 144 pivotally mounted on end wall 20, one arm 146 of the bell crank fitting into a fork 148 fixed on connecting block 102, beneath a support pin 150 in the fork. The other arm 152 of bell crank 144 is connected by a spring 154 to a fixed retaining pin 156 near the forward edge of end wall 20. Spring 154 is long and passes under a roller 158 mounted on the end wall, to minimize variation in spring tension as the carriage moves. Depending on the materials used and the rigidity of the carriage, guide

means such as simple channel members may be used to retain the free ends of the carriage plates adjacent wall 24.

In the wall 24 is a vertical slot 160 coincident with the gap between guide plates 74 and 76, so that a fiche card can be extracted from the magazine and moved between the guide plates. To ensure accurate alignment the magazine 30 is indexed by a pawl 162, which engages substantially V-shaped notches 164 spaced along the left hand edge of bottom panel 42 in conformance with the spacing of the fiche cards in the magazine. Pawl 162 is integral with an indexing bar 166 which extends below the magazine and is slidably supported in walls 24 and 22, as in FIG. 9. The indexing bar 166 has a lug 168 which is connected to the armature 170 of a solenoid 172, a spring 174 on the armature biasing the pawl into engagement with indexing notches 164. The magazine can be moved by applying sufficient pressure to slide the pawl from one notch to the next against the pressure of spring 174, or can be moved freely, as when inserting or removing the magazine, by actuating solenoid 172 to retract the pawl.

One means for actuating the solenoid comprises a press switch 176 in handle 36, a circuit to the solenoid being made through contacts 178 on the underside of bottom panel 42, which ride on contact strips 180 mounted parallel to the support rails 38. The electrical wiring has been omitted from the drawings for clarity, since all operations are by simple on-off switching action.

To identify the fiche card in alignment with slot 160 and facilitate selection, the right hand edge of top panel 40 has an index scale in the form of a transparent flange 182 with spaced numerals thereon corresponding to the fiche cards. Below the flange 182 is a lamp 184 mounted on a bracket 186 on wall 22, which is cut away as in FIG. 11. The lamp 184 projects the image of a numeral upwardly through a lens 188 to an inclined mirror 190 mounted in a housing extension 192 at the side of upper housing 12. Mirror 190 reflects the image forward to a small index viewing screen 194 mounted in the front of housing extension 192, alongside the main screen 14, so that the number of the selected fiche card is clearly displayed.

The selected fiche card is extracted by a carrier 196, comprising a vertical bar element 198 with upper and lower claws 200 to fit into notches 62 and engage the ears 64 of the card. From the top of bar element 198, an arm 202 extends forwardly to a support bar 204, which is attached to a pair of slide blocks 206 and 208 that guide the support bar along a guide rod 210 fixed between walls 20 and 22. A lever 212 extends forwardly from support bar 204 and projects through a horizontal slot 214 in front panel 34, for manual operation of the carrier 196. A stop 216 on guide rod 210 limits movement of the carrier to the right so that the claws 200 are accurately aligned in notches 62. In this position the FIG. 30 can be inserted, positioned and removed, with the claws in position for extraction of any card, as in FIG. 9.

A selected fiche card is extracted from the magazine, moved to any required position for projection and returned to the magazine, all by moving lever 212 along slot 214. An intermediate position is indicated in broken line in FIG. 9. To release the pressure on movable window 80 while the fiche card is moving, a switch 218 is mounted on lever 212, to cause operation of solenoid

92 when the lever is gripped. The switch 218, and switch 176, may be of simple press or squeeze type, or could be of capacitive type to respond to presence of the operator's hand.

Selection of an individual frame of a microfiche card is made on a grid 220, inset in a frame 222 in front panel 34, each rectangle in the grid corresponding to a single fiche frame. The grid 220 is translucent and is backlighted by a projection lamp 130 through the opening 134. A diffuser screen 224 is mounted between the lamp and grid to provide even lighting at a suitable level of illumination. The diffuser screen 224 is carried in a frame 226 suspended from a cross bar 228, which is supported on a pair of arms 230 extending forwardly from opposite ends of the front plate 98. Fixed between the forward ends of arms 230 is a horizontal cursor 232, horizontally aligned with the axis of lens 108, the shadow of the cursor appearing on the grid and indicating the position of the lens relative to the fiche card. Arms 230 are pivotally attached to front plate 98 by hinge brackets 234, each arm having an adjustment screw 236 by which the cursor 232 is aligned with the lens axis. The hinged mounting of the arms also allows the diffuser screen to be swung upwardly for access to the lamp housing.

The position of the fiche card relative to the lens as the fiche card is moved horizontally is indicated by a vertical cursor 238, illustrated as a line printed on a transparent strip. Cursor 238 is suspended immediately behind grid 220 from a support block 240, which is slidable along a support rod 242 secured between walls 20 and 24 and spaced forward of guide rod 210. As the carrier 196 is moved to the left, as seen in FIGS. 3 and 6, support block 240 is engaged and held by a magnet 244, shown as mounted on slide block 206. Cursor 238 is maintained in vertical parallel alignment with the grid by a stabilizing hook 246, which is fixed to support block 240 and fits slidably over guide rod 210, as in FIG. 5. The cursor 238 is thus moved in synchronization with the fiche card and is visible on grid 220. The frame of the fiche card appearing in projection position will be at the intersection of cursors 232 and 238, as indicated in FIG. 1. When carrier 196 is moved to the right to return the fiche card to the magazine, support block 240 is stopped against wall 24 and magnet 244 breaks the connection as the fiche card is fully seated in the magazine. In this position, shown in FIGS. 3 and 6, the cursor 238 is kept clear of the magazine compartment.

For convenience of the operator, the entire contents of the magazine can be projected on screen 14 in index form. The index is carried on an index transparency frame 248, which is removably held in the opening 250 of an index arm 252, projecting from the left side of carrier bar element 198. When the carrier 196 is fully to the right, with the fiche card still in the magazine, and the carriage 96 is at the full up position, the index frame 248 is in projection position. The fiche card containing the desired subject matter can then be identified in the index and selected by moving the magazine to the indicated card number, visible on screen 194. Index frame 248 can be left in place during use of the particular magazine, since it is moved out of projection position as soon as a fiche card is extracted from the magazine.

To insert the index frame 248 in arm 252, the carrier 196 is moved fully to the left, as in the broken line posi-

tion in FIG. 6, in which position the arm 252 projects outside the housing 10 through a slot 254. The connecting block 102 of carriage 96 has a slot 256 for clearance of the index arm in the upper position of the carriage. Thus no special positioning of controls, other than lever 212, is necessary for insertion or removal of the index frame.

Since the lens assembly is moved vertically relative to the fiche card, it would appear that the image center would move correspondingly on screen 14. However, lens 108 is a very wide angle type and projects an image much larger than necessary to fill the screen. Thus the lever 138 is adjusted until the image of the selected subject matter is centered on the screen. At the uppermost limits of travel of carriage 96, the fiche frame being projected on the screen will actually be off axis to the lens, but due to the wide angle characteristics of the lens, no objectionable distortion has been noticed. In other words, the frame being viewed on the screen is a portion of the total image being projected at any time, there being no size limiting frame opening in windows 78 and 80.

By moving the fiche card along only one axis of reference, the card is always maintained in alignment with the magazine, less space is needed to accommodate the motion of the card, and handling means is simplified. The latter is especially true in view of the multi-purpose action of lever 212, which is used for all handling of the fiche cards. Movement of the lens assembly is by means of a simple lever, the front panel controls comprising only the levers 138 and 212, focus knob 126 and a convenient ON/OFF switch 258. The number of the fiche card in use is clearly visible on screen 194 and the selected frame is visible at all times on grid 220. Numbered, or otherwise coded ordinate means could be used on grid 220 if desired, for frame location at corresponding ordinates on the fiche card.

Having described my invention, I now claim:

1. A microfiche reader comprising,
 - a lower housing having a front panel,
 - an upper housing secured on said lower housing and having an image viewing screen therein above said front panel,
 - a frame in said lower housing with a magazine receiving compartment in one side thereof, said front panel having an access opening for said compartment,
 - a magazine adapted for selective positioning in said compartment and having means for holding a plurality of fiche cards therein,
 - spaced parallel guide plates fixed in said frame, with windows therein at a projection position.
- positioning means including a carrier mounted on said frame for horizontal sliding motion parallel to said guide plates, said carrier having engaging means for engaging and extracting a fiche card from said magazine and moving the card past the projection position,
- a carriage mounted on said frame for vertical sliding motion parallel and adjacent to said guide plates,
- a light source on said carriage on one side of said guide plates, directed through said windows,
- a projection lens on said carriage on the other side of said guide plates in alignment with said light source,

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cooperating mirror means in said upper and lower housings for reflecting an image from said lens to said image viewing screen,

an index arm extending from said carrier on the side opposite said compartment and between said guide plates, said index arm having means for holding a transparent frame of index data,

and stop means in said frame for limiting motion of said carrier toward said compartment, said index arm holding the transparent frame in projection position at the stopped position of the carrier.

2. A microfiche reader according to claim 1, wherein said lower housing has a slot through which said index arm protrudes externally, when said carrier is at the limit of travel away from said compartment.

3. A microfiche reader according to claim 1, wherein said front panel has a translucent grid therein, with divisions corresponding to the image frames on a fiche card,

a first cursor coupled to said carrier,
a second cursor coupled to said carriage,
said cursors being supported adjacent the rear of said

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grid and aligned to intersect at the grid location corresponding to the fiche frame in projection position,

said light source having a lamp housing with an open portion directed to backlight said grid,
and a diffuser pivotally mounted on said carriage between said lamp housing and said grid.

4. A microfiche reader according to claim 1, wherein said magazine has spacing means therein for holding fiche cards in spaced parallel relation,

said compartment having indexing means for holding said magazine with a selected fiche card aligned between said guide plates,

said magazine having a transparent index scale with markings corresponding to the fiche cards therein,
said upper housing having an index viewing screen adjacent said image viewing screen,

and means in said lower housing for projecting to said index viewing screen an image of said scale at the position of the fiche card aligned for engagement by said carrier.

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