United States Patent [19]

Frank et al.

[11] **3,907,416**

[45] **Sept. 23, 1975**

[54] **MICROFORM POSITIONING APPARATUS**

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[73] Assignee: **NCR Corporation**, Dayton, Ohio

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[52] **U.S. Cl.** **353/27**

[51] **Int. Cl.**[2] **G03B 23/08**

[58] **Field of Search** 353/25-27, 353/22, 23, 24

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Attorney, Agent, or Firm—J. T. Cavender; Wilbert Hawk, Jr.; George J. Muckenthaler

[57] **ABSTRACT**

Control mechanism for positioning and for retaining position of a microform carrier in a microform reader. The microform carrier has a plurality or series of projections on one side thereof which cooperate with a pair of rails seatable between the projections, the rails being operable independently of each other to retain the carrier in a desired position. The microform carrier is placed on a reader table which includes slots therein to allow for protrusion of the rails therethrough upon actuation thereof by the operator. One or the other rail may be normally biased to an unactuated or home position for free movement of the microform and its attached carrier in the X or the Y direction to the desired position and, upon positioning the microform, the rails are actuated to lock the microform carrier in place to enable reading of the microform. Alternatively, one or the other rail may be normally biased to an actuated position and control means is then actuated to move one or both rails in a downward direction to permit free movement of the microform carrier to the desired position.

20 Claims, 14 Drawing Figures

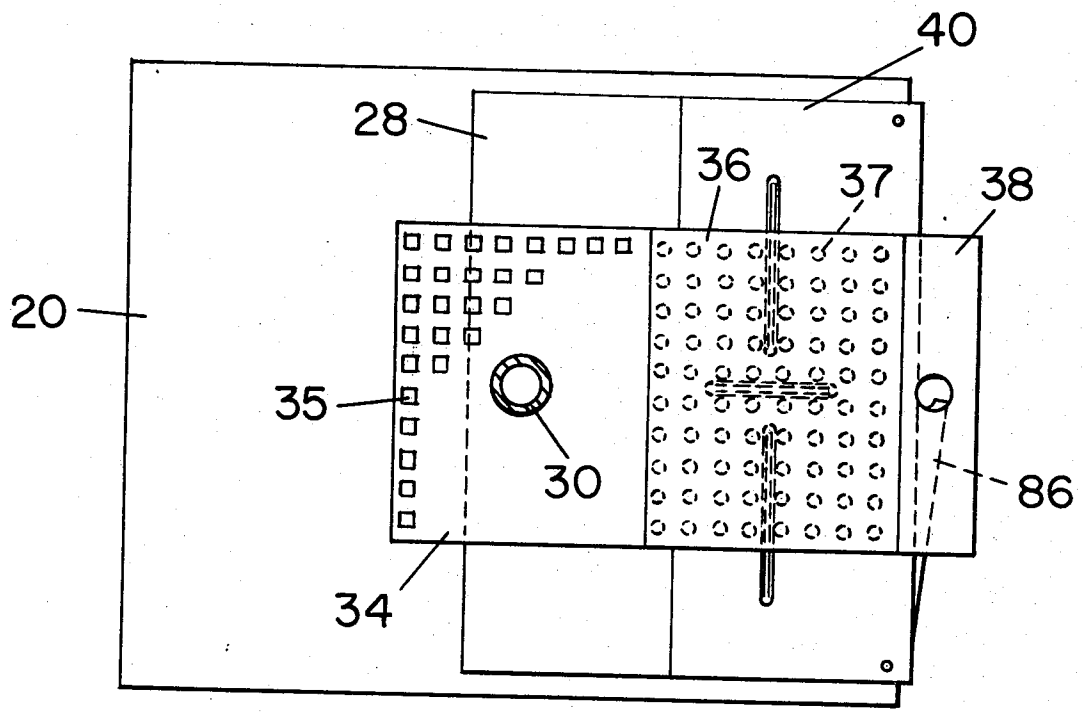

FIG. 1

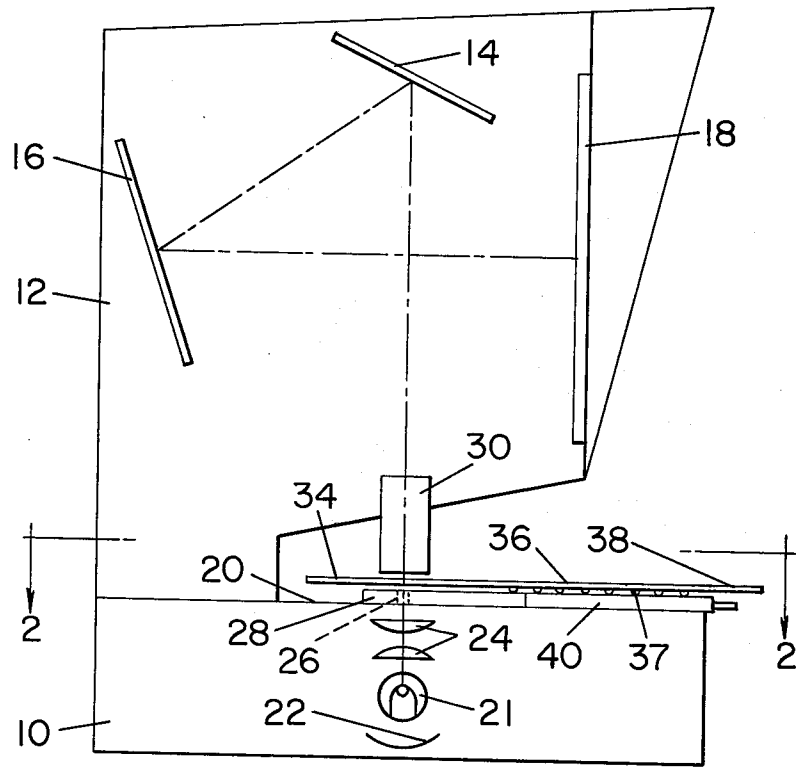
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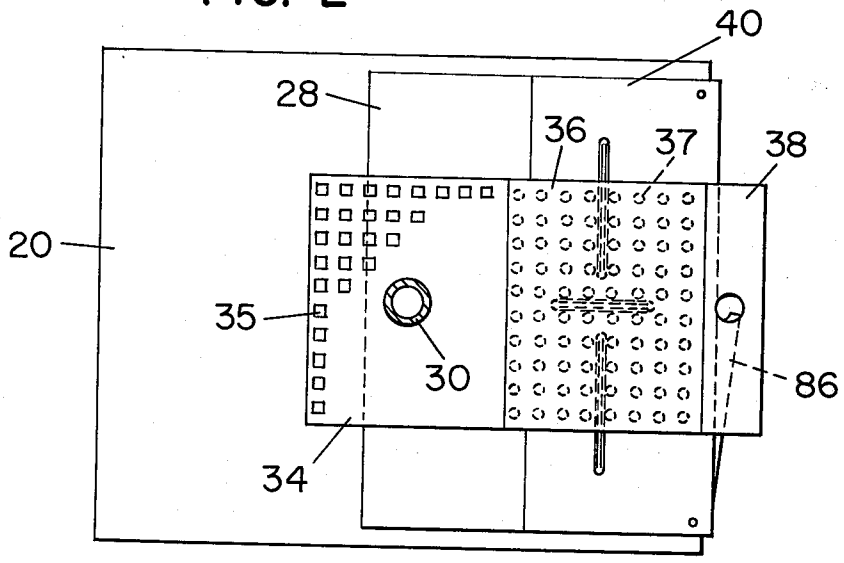
FIG. 2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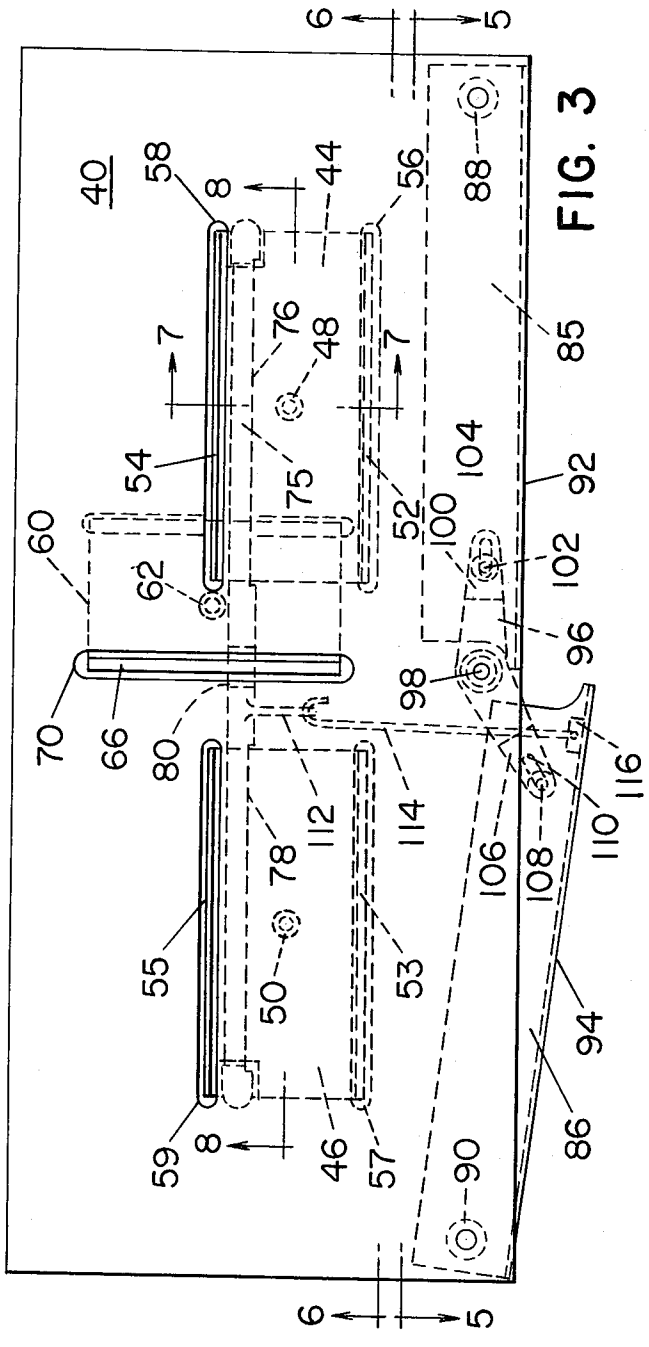

FIG. 3

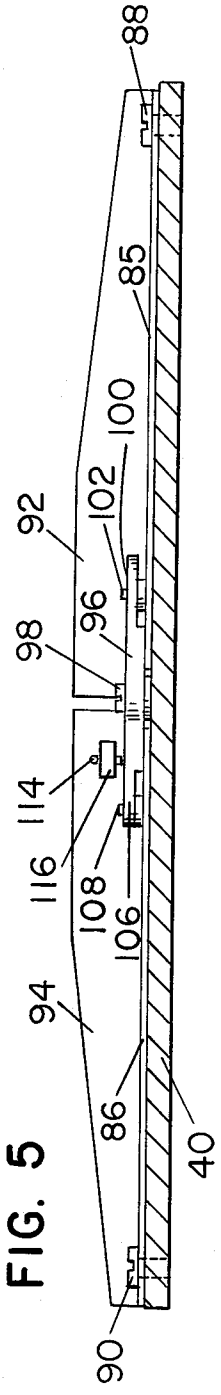

FIG. 5

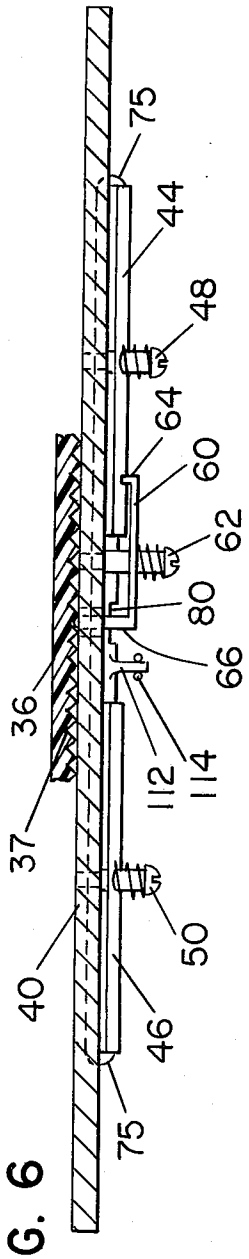

FIG. 6

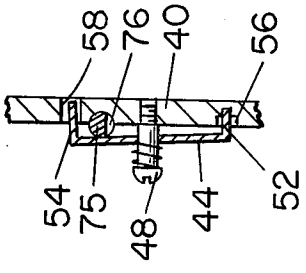

FIG. 7

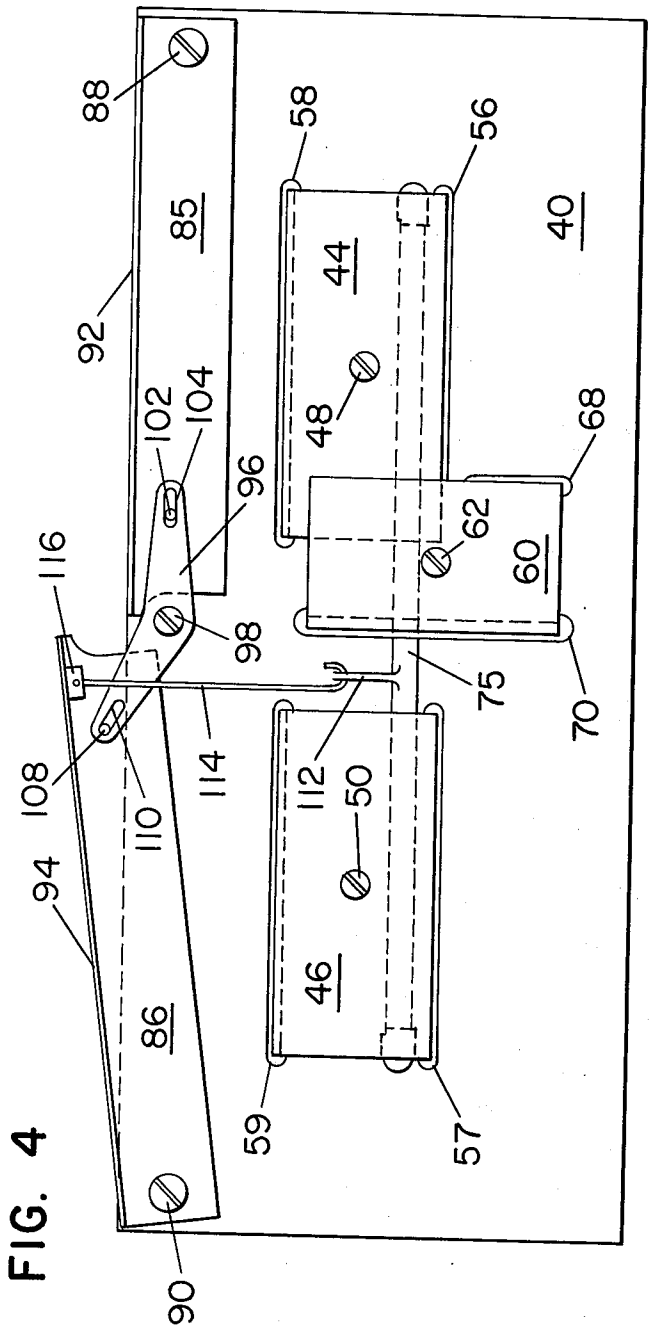
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FIG. 4

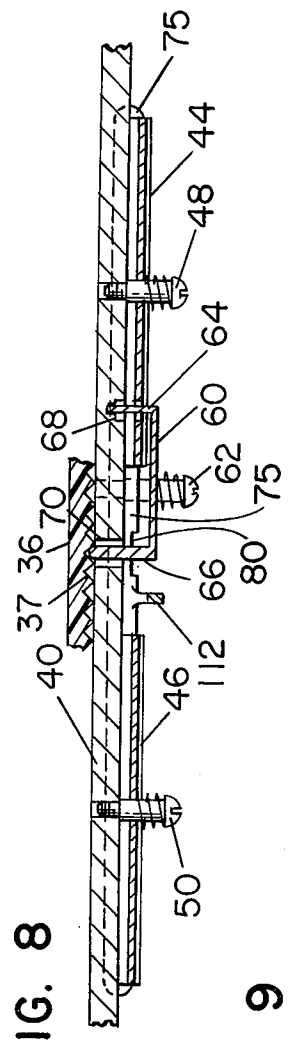
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FIG. 8

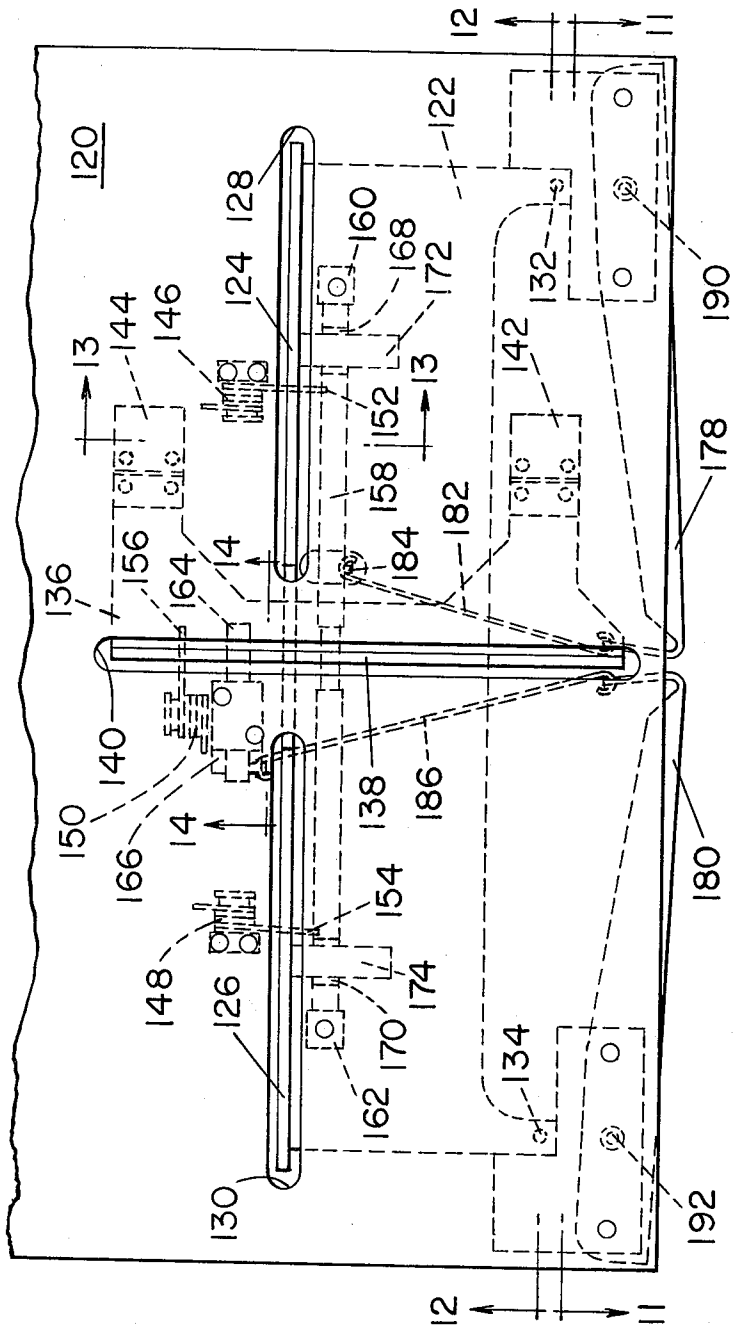
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FIG. 9

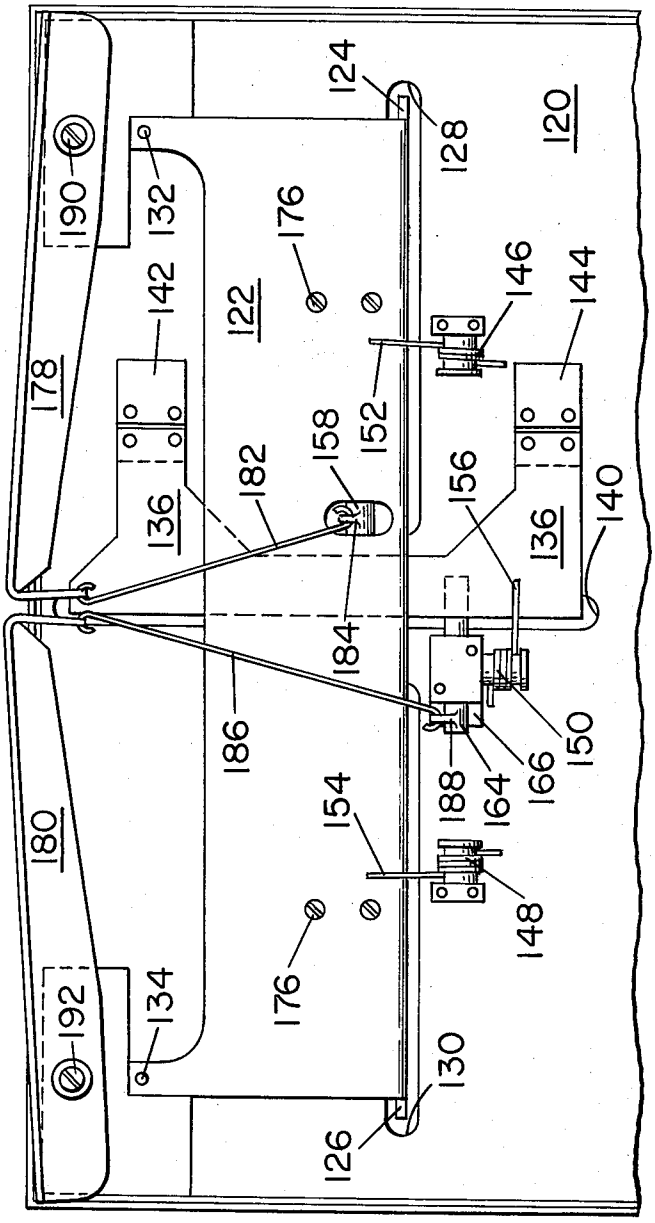
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FIG. 10

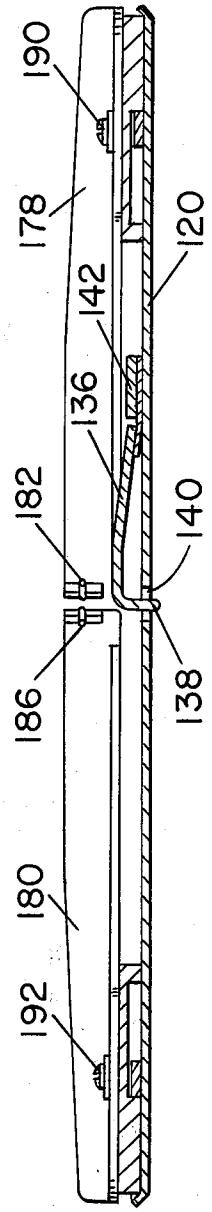
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FIG. 11

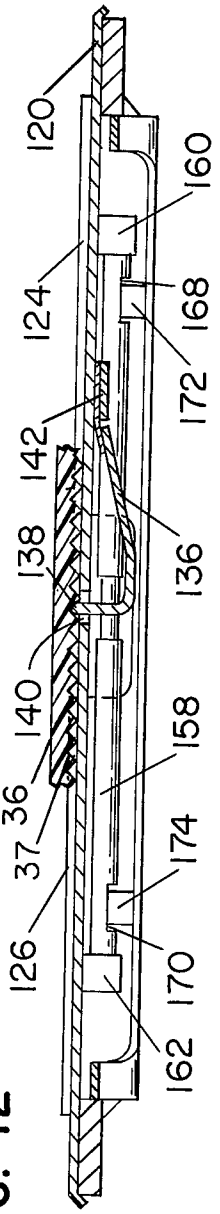

FIG. 12

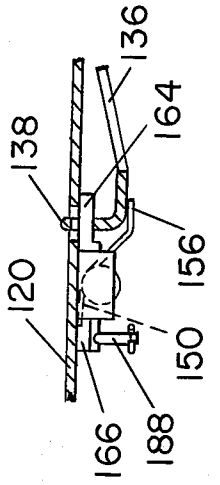

FIG. 14

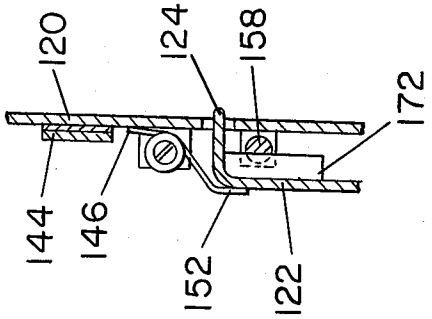

FIG. 13

MICROFORM POSITIONING APPARATUS

BACKGROUND OF THE INVENTION

In the field of microform readers, there have been various ways and means of positioning the microform for viewing thereof, the most common being the placing of the microform between a lower glass plate and an upper glass plate with the plates being supported on a carrier which is movable in the X and the Y directions to the desired position. Of course, the carrier with the plates and the microform is movable in a plane between a light source and a projection lens for projecting the enlarged image onto a screen for viewing thereof.

While the use of such glass plates, both for containing the microform therebetween and for providing a convenient means of positioning the microform in relation to the projection lens assembly, has been an extremely successful concept in the microform reader industry, it is desirable to improve the efficiency of the microform units and at the same time to provide a positioning system which assures retention of the desired microimage in a precise position.

More recently, positioning concepts have included microform carriers which eliminate the need for the glass plates and wherein the carrier comprises a flat sheet or plate having a plurality of projections on the underside thereof, and arranged in columns and rows corresponding to the columns and rows of microimages on the microform. A representative concept of such positioning device is shown and described in a co-pending application, Ser. No. 347,337, filed Apr. 2, 1973, entitled "Microform Positioning Apparatus", inventor Heinz Zeutschel, and assigned to the same assignee as the present application. Such co-pending application discloses the use of a simple plate secured to the microform and movable in X and Y directions and having projections thereon cooperating with a bar or the like on the microform table to retain the microform in position.

Additional prior art is shown and described in U.S. Pat. No. 3,680,952 to F. G. Knowles wherein apparatus for handling image bearing mediums includes a plate-like carrier slidingly supporting a microfiche, with the carrier and the microform viewer having a plurality of detent elements which cooperate upon incremental receipt and/or withdrawal of the carrier for indicating alignment of an image row of the fiche with the projection system. The fiche carrier has a plurality of spaced recesses, and an insert in the projector housing has a plurality of spring-loaded cavities with a plug member insertable in each cavity to releasably connect the plug member with one of the springs, the effect of which is to provide detent elements to indicate carrier position.

SUMMARY OF THE INVENTION

The present invention relates to microform readers and more particularly to a microform positioning system and apparatus therefor wherein a microform carrier of planar shape is secured to a microform having rows and columns of microimages thereon, such carrier including a series of projections on the underside thereof cooperating with bar or rail means on a plate or table to position and to retain the position of the microform in a desired location. The microform reader has the surface plate or table positioned between the light source and the projection lens assembly for supporting the microform and its carrier, such plate or table including an enlarged aperture near one edge thereof and over which the desired microimage is placed to be in the light path for projection thereof.

Forward of the aperture and the surrounding area of the table is a surface area which includes a pair of X-direction slots and a Y-direction slot arranged in a pattern cooperable with the microform carrier and adapted to be substantially covered thereby but having a sufficient surface area to permit movement of the carrier over a predetermined distance. A pair of X-direction bars or rails are positioned in the X-direction slots and adapted to be movable up-and-down therein and, likewise, a Y-direction bar or rail is located in the Y-direction slot for up-and-down travel therein and operating within the recesses formed by the projections of the microform carrier.

In one embodiment of the invention, such bars or rails are raised and lowered by means of flatted portions of rods or shafts which are rotatable to engage with supporting members of the bars or rails, the flatted rods or shafts being actuated by lever means readily accessible to the operator. Such lever means may take a variety of forms, however, it is desirable that when, for instance, the X-direction rail is in a raised position for engaging within recesses in the microform carrier, thereby locking against movement in the Y-direction, but permitting travel of the carrier in the X-direction, the Y-direction rail is in a lowered position to permit such X-direction travel of the microform carrier. Independent levers are provided in this embodiment for separate actuation of the rails, however the levers may be connected in a manner to insure that the X-direction rails are raised when the Y-direction rail is lowered, and vice versa, to permit movement of the microform carrier without interference in one or the other direction.

Another embodiment of the invention is similar in design but employs spring loading on the bars or rails so that both X-direction and Y-direction rails are normally biased in the raised condition to lock the microform carrier in the desired position. Upon actuation of one lever, the X-direction rail is lowered to permit free travel of the carrier in the Y-direction and, likewise, actuation of the other lever lowers the Y-direction rail to permit travel of the carrier in the X-direction. Additionally, both levers may be actuated at any one time to permit rapid travel or movement of the microform carrier across the table when desired. In this respect the spring loading on the bars or rails retains the carrier and its microform in position to permit the operator freedom for other operations when viewing a projection of the microimage.

In line with the above discussion, the principal object of the present invention is to provide microform positioning apparatus which eliminates the need for the commonly used microform containing transparent glass plates.

Another object of the present invention is to provide microform positioning apparatus for controlling travel or movement of the microform carrier in a simple operation.

An additional object of the present invention is to provide a microform positioner or carrier which permits rapid travel in one or the other direction while assuring arresting of movement in one direction.

A further object of the present invention is to provide control mechanism for a microform carrier for rapidly

positioning and retaining position of the microform in desired locations.

Additional advantages and features of the present invention will become apparent and fully understood from a reading of the following detailed description taken together with the annexed drawings, in which:

FIG. 1 is a diagrammatic view of a microform reader incorporating one embodiment of the subject matter of the present invention;

FIG. 2 is a plan view of the microform positioning apparatus taken on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged plan view of the microform positioning apparatus shown in FIG. 2;

FIG. 4 is a plan view of the reverse or under side of the microform positioning apparatus shown in FIG. 3;

FIG. 5, on the sheet with FIG. 3, is a sectional view taken on the line 5—5 of FIG. 3;

FIG. 6, on the sheet with FIG. 3, is a sectional view taken on the line 6—6 of FIG. 3;

FIG. 7, on the sheet with FIG. 3, is a sectional view taken on the line 7—7 of FIG. 3;

FIG. 8 is a sectional view taken on the line 8—8 of FIG. 3;

FIG. 9 is a plan view, similar to FIG. 3, and showing another embodiment of the microform positioning apparatus;

FIG. 10 is a plan view of the reverse or under side of the positioning apparatus shown in FIG. 9;

FIG. 11 is a sectional view taken on the line 11—11 of FIG. 9;

FIG. 12 is a sectional view taken on the line 12—12 of FIG. 9;

FIG. 13 is a sectional view taken on the line 13—13 of FIG. 9; and

FIG. 14 is a sectional view taken on the line 14—14 of FIG. 9.

Referring now to FIG. 1, which shows in diagrammatic form a side elevation of a microform reader incorporating the microform positioning and retaining apparatus of the present invention, a base 10 supports an enclosure 12 containing mirrors 14 and 16 for projecting an image onto a screen 18. The base 10 has a top or table 20 under which is disposed a light source 21, a concave reflector 22, and a condensing lens system 24 for directing the light beam through an opening or aperture 26 in a plate or platform member 28 carried on the table 20. The light beam is directed through a projection lens assembly 30 suitably supported from the enclosure 12 and which lens assembly generally rides on the surface of the plate 28, or slightly above the surface when a microform is placed in the reader, it being sufficient to say that the projection lens is spring-loaded so as to provide a slight downward force on the microform and thereby maintain the lens in proper focus. As is well known, the light beam picks up the microimage and the projection of the image is directed to the mirrors 14 and 16 for deflection of such image onto the screen 18 for viewing or reading by the operator.

The microform positioner of the present invention includes several portions, one of which is a carrier for the microimages, and in the preferred case, is in the form of a card or fiche inserted in an envelope (to be more fully explained) attached to a positioning portion, in turn, secured to a handle portion. In FIG. 2 is shown a plan view of the positioning apparatus with the microfiche 34 containing microimages 35 thereon and arranged in columns and rows in a well-known manner. Adjacent the microfiche 34 is the positioning portion in the form of a carrier member 36 having adhered thereto on one side thereof a formation of papillary-like embossed projections 37, such projections being arranged in columns and rows corresponding to the columns and rows of the microimages 35. A handle portion 38 of the positioning apparatus is secured to the carrier member 36 to enable moving of the positioning portion and of the microfiche to various desired locations. The particular construction of the microfiche positioning apparatus is more fully shown and described in the heretofore mentioned co-pending application Ser. No. 347,337, filed Apr. 2, 1973.

The plate or platform member 28 is secured in position on the base 10 of the reader so that the aperture 26 in the plate 28 allows the path of light from lamp 21 to project through the lens assembly 30 and to be deflected from the mirrors 14 and 16 to the screen 18. An operating portion 40 of the microfiche positioning apparatus is shown in the enlarged plan view in FIG. 3, such portion being attached to or a part of the plate 28 and extending on a plane therewith toward the reader operator, who is stationed normally at the right of FIG. 2. The positioning portion of plate member 40 carries mechanism for engaging with the projections 37 of member 36 for purposes of positioning and maintaining position of the member 36 and the microform carrier 34 in the desired locations. While the member 40 is shown and described as a portion separate from the plate 28, these parts could be fabricated as one to provide a planar surface for the microform 34 and its carrier 36. Such mechanism includes a pair of U-shaped or channel-shaped members 44 and 46, FIGS. 3, 4, 6, and 7, connected to the member 40 by means of spring-loaded screws 48 and 50, each of the members 44, 46 having a flat portion being disposed in tandem in the X direction and the members 44, 46 including upright legs 52, 53, 54, and 55, the legs 52 and 53 being seated in recesses 56 and 57 in the member 40 and the legs 54 and 55 extending into elongated slots 58 and 59 in the member 40. A third U-shaped or channel-shaped member 60 is connected to the member 40 by means of a spring-loaded screw 62, FIG. 6, the member 60 having a flat portion disposed in the Y direction and including upright legs 64 and 66, the leg 64 being seated in a recess 68 in member 40, as best seen in FIG. 4, and the leg 66 extending into an elongated slot 70 in the member 40. It should be here repeated that FIG. 4 is a view of the under side of the portion 40 to better show the mechanism as being described. It is thus seen that in the case of each of the members 44, 46, and 60, the seating of the legs 52 and 53 in their respective recesses 56 and 57, the seating of the leg 64 in recess 68, and the biasing of the screws 48, 50, and 62 provides, in effect, a pivotal action for the members 44, 46, and 60 to thereby permit up-and-down movement of the legs 54 and 55 through the slots 58 and 59, and such movement of the leg 66 through slot 70.

A rod or round bar 75 (FIGS. 3, 6, 7 and 8) is disposed adjacent the legs 54 and 55 of the members 44 and 46 and parallel therewith, such bar being journaled at the ends thereof for limited rotation by means to be described. The bar is positioned with respect to the members 44 and 46 so as to be engageable with the flat portion of such members, as best seen in FIG. 7, however, the bar 75 also includes flatted surfaces 76 and 78

(FIG. 3) for a distance therealong for operation to permit the flat portion of the members **44** and **46** to pivot slightly and to permit the legs **54** and **55** to move upwardly through the slots **58** and **59.** Near the center of the bar **75** is a flatted surface **80** of limited dimension which engages with a portion of the leg **66** of member **60,** the leg having a cutout therein for seating by such flatted surface **80.** It is seen that the surface **80** is rotated at a right angle from the surfaces **76** and **78** to provide actuation of either the X direction members **44** and **46** or the Y direction member **60** at different times upon rotation of the bar **75.**

The member **40** also carries means for rotating the bar **75** to enable the maintaining of position of the microfiche carrier in either the X or the Y direction at any one time. A pair of actuating members in the nature of rectangular plates **85** and **86** (FIGS. **3** and **4**) are pivotally connected by means of screws **88** and **90** to the forward corners of the member **40,** the plates having downwardly turned portions **92** and **94** (FIG. **5**) which act as handles for the operator to use in operating the positioning mechanism. A link **96** pivoted on a pin **98** connects the plates **85** and **86** in a lost-motion arrangement wherein an ear **100** of the link **96** is connected by a pin **102** riding in a slot **104** in the ear **100,** and an ear **106** of the link **96** is connected by a pin **108** riding in a slot **110** in the ear **106.** It is thus seen that the link **96** and the lost-motion arrangement permit an alternating fore-and-aft movement of the two actuating members **92, 94** so that when one member **94** is in the forward position, as seen in FIG. **3,** the other member **92** is in the retracted position.

An arm **112** (FIGS. **3** and **4**) extends from the rod **75** near the center thereof and a wire **114** is connected to the arm **112** and to an attachment block **116** secured to portion **94** of the plate **86.** When the handles **92** and **94** are operated in a fore-and-aft direction, the rod **75** is rotated to bear against the respective parts of the members **44, 46,** and **60.** For example, with the left handle **94** placed in the position as shown in FIG. **3,** the wire **114** has moved the arm **112** and the rod **75** to a position wherein the diametral surface of the rod is engaged against the members **44, 46** thereby moving the legs **54, 55** downwardly below the top surface of the plate **40** and biasing the spring on screw **48,** as best seen in FIG. **7.** At the same time, an edge of the slot in the leg **66** is engaged with the flatted surface **80** of the rod **75** to permit the leg **66** to protrude above the surface of the member **40,** as seen in FIG. **6.** In this respect, the X direction legs **54** and **55** are below the surface of the member **40** and the Y direction leg **66** is above such surface, the leg **66** being in position between two columns of the projections **37,** as seen in FIG. **2,** and permitting sliding movement of the microfiche and its carrier in the Y or fore-and-aft direction.

When the left handle **94,** along with plate **86,** are moved forward or to the left in FIG. **2,** the right handle **92** and plate **85** are moved outward or to the right by reason of the link **96** connecting the two members, such movement causing rotation of the rod **75** to cause the diametral surface of the rod, rather than the flatted surface thereof, to be engaged with an edge of the slot in the leg **66** and to lower such leg below the surface of the member **40,** while simultaneously permitting the legs **54** and **55** to move upwardly in the slots **58** and **59** and protrude above the surface of member **40.** In this respect, the Y direction leg **66** is below such surface and the X direction legs **54, 55** are above this surface and positioned between two rows of projections **37,** as seen in FIG. **2,** thereby permitting sliding movement of the microfiche and its carrier in the X or side-to-side direction.

It is thus seen that the microfiche and its carrier are positioned and maintained in position along either the X or the Y direction by means of the mechanism as just described. With the microfiche and its carrier in position on the surface of the plates **28** and **40,** the engagement of the legs **54** and **55** with the projections **37** permits manual movement of the microfiche and carrier in the X direction while maintaining these parts in the Y direction, and engagement of the leg **66** with the projections **37** permits manual movement of the microfiche and carrier in the Y direction while maintaining the parts in the X direction. The alternating motion of the members **92** and **94** provides for simultaneously changing the protrusion of the legs **54, 55,** (or leg **66,** as the case may be) to permit movement of the carrier **36** in one direction while maintaining its position in the other direction.

Referring now to FIGS. **9** and **10** of the drawings, a modification of the structure of the present invention includes a flat member **120** in the form of a table or plate for supporting the microfiche **34** and its carrying or positioning plate **36,** FIG. **9** showing a plan view of the structure and FIG. **10** showing the under or reverse side of the member **120** and the associated parts. The mechanism has a flat rectangular member **122** having an upturned edge **124** and an upturned edge **126** oriented in the X direction and projecting through elongated slots **128** and **130,** respectively, in the member **120** (FIG. **12**), the member **122** being attached to the member **120** by means of ears at points **132** and **134,** but allowing such member **122** to be pivotally operated a slight amount at such points. A second flat member **136** is disposed in the Y direction and has an upturned edge **138** projecting through an elongated slot **140** in the member **120** (see also FIG. **11**), the member **136** being attached to the member **120** by ears **142** and **144** at pivot points to permit slight pivoting of the member **136.** Means for biasing the members **122** and **136** in the upward direction so as to expose the upturned edges **124, 126** and **138** above the top surface of the member **120** is provided by coiled springs **146, 148,** and **150** (FIGS. **9** and **10**) having end portions **152, 154,** and **156** engaging with the lower side of the members **122** and **136,** shown in FIGS. **13** and **14,** thereby continually maintaining the edges in position for engaging the projections **37** of the microfiche carrier **36.**

One or both of the members **122, 136** with the upturned edges **124, 126** and **138** may be moved by pivotal action thereof to a position where the edges are below the top surface of the plate **120,** the movement being actuated by mechanism including a round bar or rod **158** for the X direction member **122,** journaled at **160** and **162** (FIGS. **9** and **12**), and a shorter round bar or rod **164** for the Y direction member **136,** and journaled at **166,** (FIG. **14**). The rod **158** includes flatted portions **168** and **170** engageable with blocks **172** and **174** (FIG. **12**) secured to the member **122** on the underside thereof by means of screws **176** (FIG. **10**).

Means for rotating the rod **158** and the rod **166** is accomplished by operator-actuated levers **178** and **180,** respectively, (FIGS. **9, 10** and **11**) there being a wire **182** connecting the lever **178** and a stem **184** secured

to the rod **158**, and a wire **186** connecting the lever **180** and a stem **188** secured to the rod **164**. The lever **178** is pivotally connected at screw **190** to the plate **120**, and the lever **180** is pivotally connected at screw **192** to the plate **120** so that actuation of the levers **178**, **180** by the operator moves the end portion thereof rearward to rotate the rods **158** and **164** and thereby depress the upstanding edges **124**, **126**, **138** of the members **122** and **136** below the surface of the plate **120** to permit movement of the microfiche thereacross.

As mentioned above, the springs **146**, **148**, and **150** maintain the edges **124**, **126** and **138** in a position above the surface of the plate **120** so that in the normal position of the levers **178** and **180**, as shown in FIGS. **9** and **10**, the microfiche **34** and the carrier or holder **36** are retained by the engagement of the edge portions **124**, **126**, **138** between the projections **37** of the carrier **36**. When it is desired to move the microfiche in the X direction, the lever **180** is depressed inwardly to rotate the rod **164** and urge the edge **138** downwardly by reason of rotation of the rod **164** from engagement with the slot in upturned edge portion **138** from the flatted to the round portion of the rod, thereby removing any obstruction in the path of the projections **37**. Likewise, when it is desired to move the microfiche in the Y direction, the lever **178** is depressed inwardly to rotate the rod **158** and urge the edges **124** and **126** downwardly by reason of rotation of the rod **158** from engagement with the blocks **172**, **174** from the flatted to the round portion of the rod, thereby removing any obstruction in the path of the projections **37**. Additionally, the edge portions **124**, **126**, **138** may be lowered by depressing both levers **178** and **180** at the same time so that the microfiche can be freely moved in any direction across the plate **120**.

It is thus seen that herein shown and described is a positioning apparatus for use with a microfiche carrier or holder that is normally movable about the surface of the plate and manually operable to release the retaining edge portions of the apparatus to permit free movement of the microfiche in either the X or the Y direction or in both directions upon actuation of both levers of the apparatus. Such apparatus enables the accomplishment of the objects and advantages mentioned above, and while two embodiments of the invention have been disclosed herein, certain other variations may occur to those skilled in the art. It is contemplated that all such variations, not departing from the spirit and scope of the invention hereof, are to be construed in accordance with the following claims.

What is claimed is:

1. Apparatus for positioning a microform in a microform reader, comprising a platform member, a carrier secured to the microform and having a plurality of projections in matrix arrangement thereon, and means including elongated members disposed in normal relationship and operably associated with said platform member for selectively engaging with the projections of said carrier in X and Y direction and retaining said carrier thereat upon movement of said microform to a desired position.

2. The apparatus of claim **1** including manipulative means for selective engagement of said engaging means with said carrier projections.

3. The apparatus of claim **1** wherein said engaging means includes a pair of elongated members operably movable into and out of engagement with said carrier projections.

4. The apparatus of claim **1** wherein said engaging means includes a pair of plate members having edge portions operably movable into and out of engagement with said carrier projections.

5. The apparatus of claim **3** wherein at least one of said elongated members is normally positioned for engaging with said carrier projections, and manipulative means is provided for selectively moving said one elongated member to a disengaged position with respect to said carrier projections.

6. The apparatus of claim **3** wherein at least one of said elongated members is normally positioned in a carrier projection non-engaging position, and manipulative means is provided for selectively removing said one member from said non-engaging position to an engaging position with respect to said carrier projections.

7. The apparatus of claim **3** wherein one of said elongated members is normally positioned for engaging with said carrier projections and the other of said elongated members is positioned for non-engagement therewith, and manipulative means is provided for selectively reversing the position of each of said elongated members.

8. The apparatus of claim **3** including means rotatable for moving said elongated members into and out of engagement with said projections, and manipulative means is provided for controlling rotation of said moving means.

9. The apparatus of claim **8** wherein said moving means includes a rotatable rod member having a diametral portion for causing engagement of said engaging means with said projections and includes flatted portions for permitting disengagement therefrom during rotation thereof.

10. The apparatus of claim **3** wherein one of said elongated members is disposed in the X direction and the other is disposed in the Y direction, one of said elongated members is normally positioned in a carrier projection non-engaging position, and manipulative means is provided for selectively removing said one member from said non-engaging position to an engaging position with respect to said carrier projections.

11. The apparatus of claim **4** wherein one of said edge portions is normally positioned for engaging with said carrier projections and the other edge portion is normally positioned for non-engagement therewith, and manipulative means is provided for selectively reversing the position of each of said edge portions.

12. The apparatus of claim **3** wherein one of said elongated members is normally positioned for engaging with said carrier projections and the other elongated member is normally positioned for non-engagement therewith, said apparatus including means rotatable for reversing said elongated members with respect to said projections, and manipulative means is provided for controlling rotation of said reversing means.

13. In a microform reader, means for positioning a microform in a desired position and retaining same thereat, said means comprising a

carrier secured to said microform and having a plurality of projections on one side thereof, a

plate member for supporting said carrier and defining an elongated slot therein, a

pivot member operably associated with said plate member and compatible with said slot for operat-

ing therethrough, and means for actuating said pivot member thereby causing movement thereof through said slot and engagement of said pivot member with said projections.

14. In the reader of claim **13** wherein said pivot member comprises a plate having an edge portion for movement through said slot and engageable with said projections.

15. In the reader of claim **13** including means rotatable for causing engagement of said pivot member with said projections.

16. In the reader of claim **13** including a pair of slots in said plate member and a pair of elongated members perpendicularly disposed to one another and operably movable through said slots for engagement with said projections.

17. In the reader of claim **15** including operator-controlled members for actuating said rotatable means.

18. In the reader of claim **15** wherein said rotatable means includes a rod member having diametral portions thereon for causing engagement of said pivot member with said projections and includes flatted portions thereon for permitting disengagement therefrom.

19. In the reader of claim **17** wherein said operator-controlled members include a connection therebetween for permitting alternate operation of said rotatable means.

20. In the reader of claim **17** wherein said operator-controlled members include a connection therebetween for permitting simultaneous operation of said rotatable means.

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