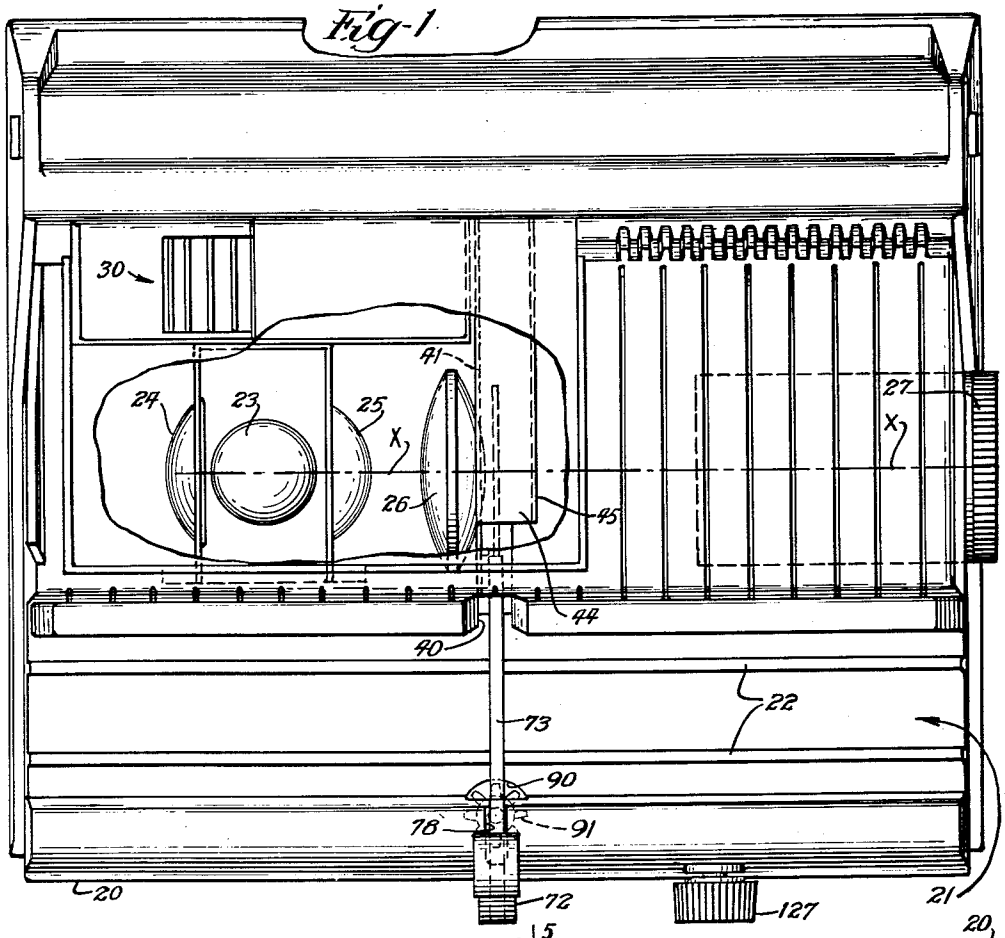
Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

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Fig-1



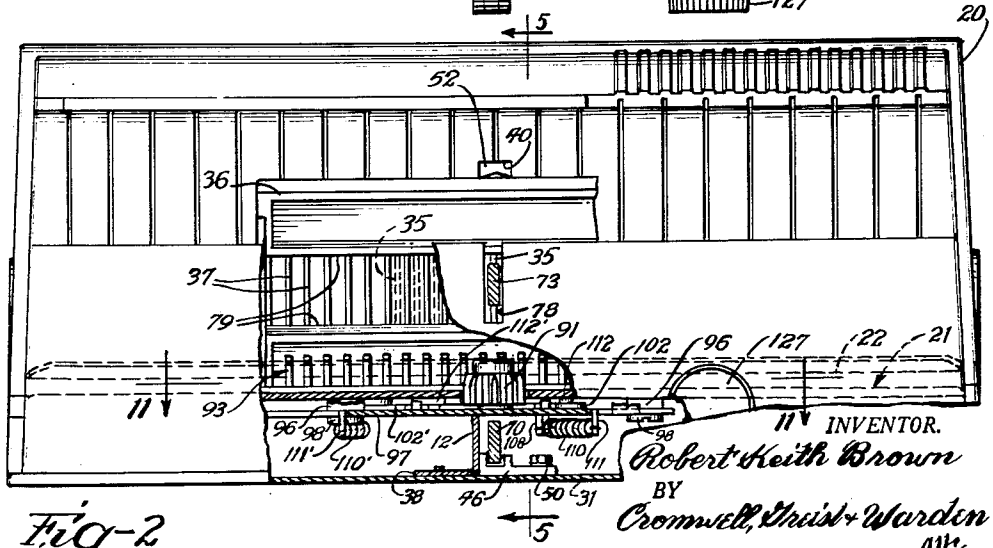


Fig-2

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Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

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Fig-3

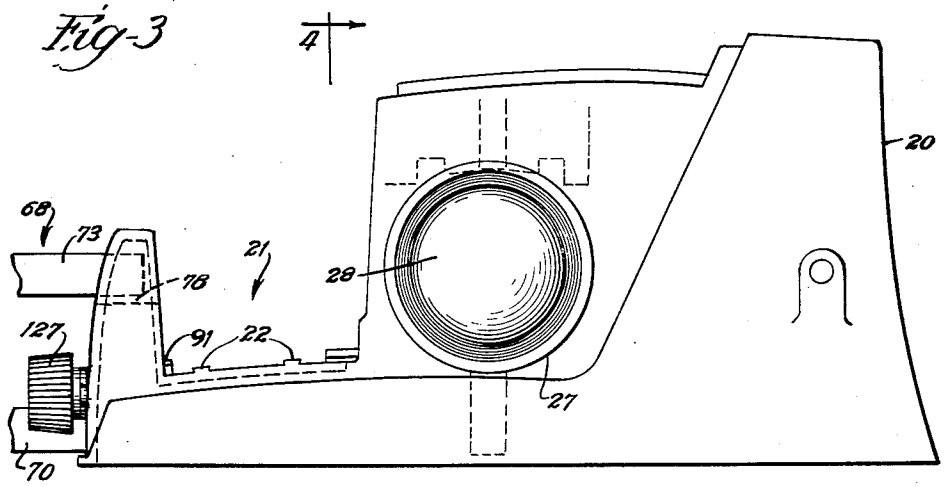
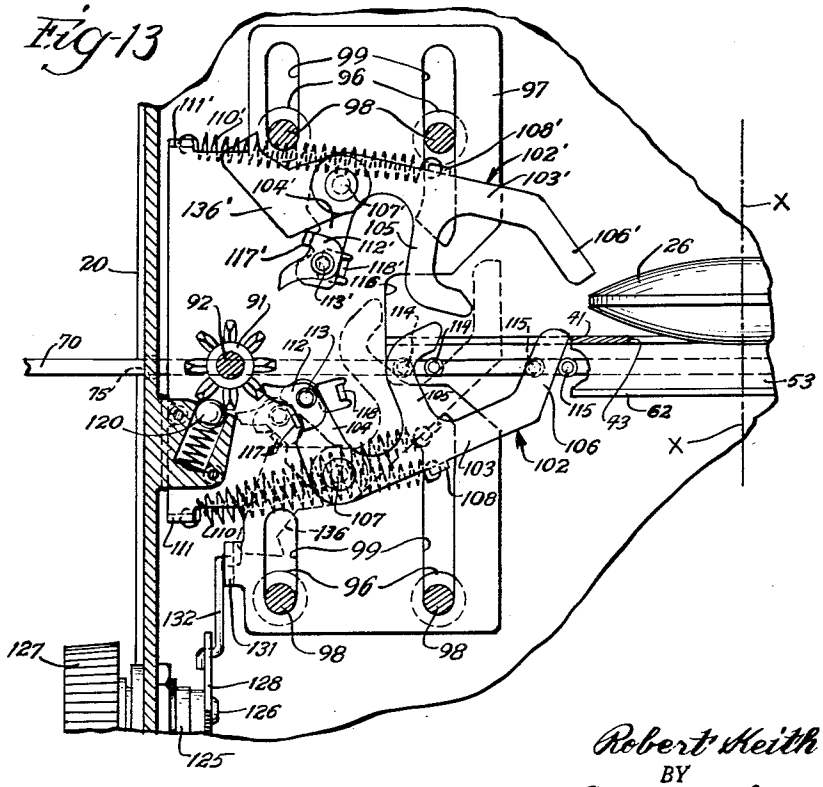


Fig-13



INVENTOR.

Robert Keith Brown

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Attys.

Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

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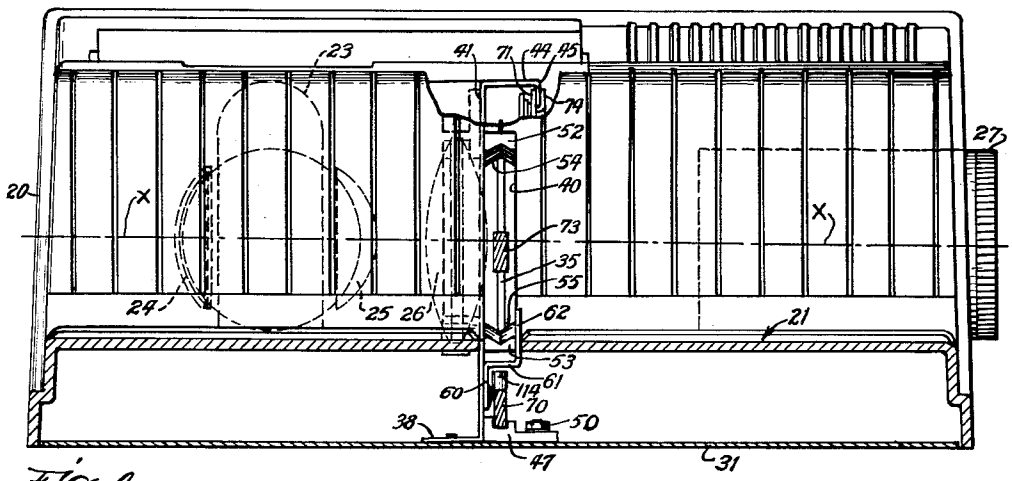


Fig-4

Fig-11

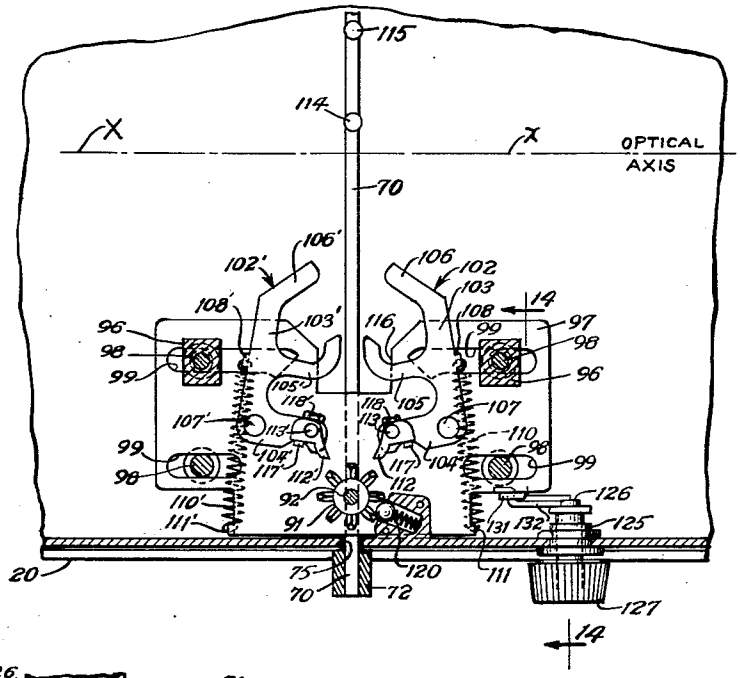
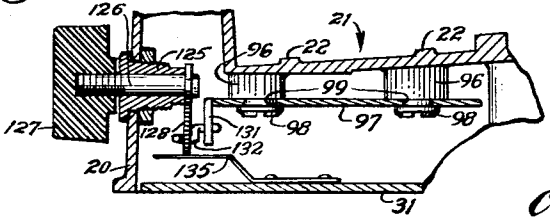


Fig-14



INVENTOR.
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Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

Filed July 3, 1959 8 Sheets-Sheet 4

Fig-5

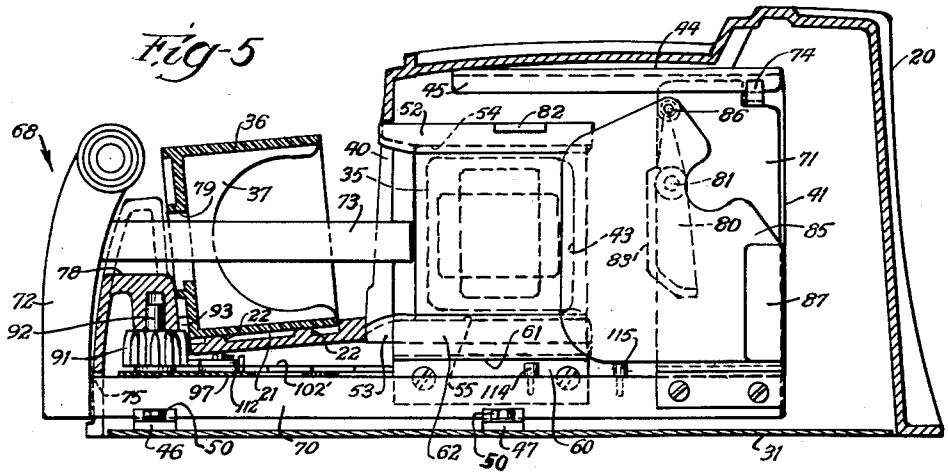


Fig-15

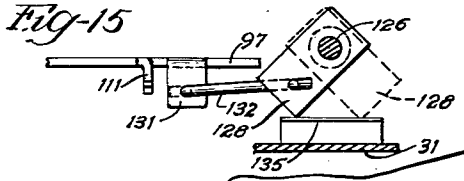
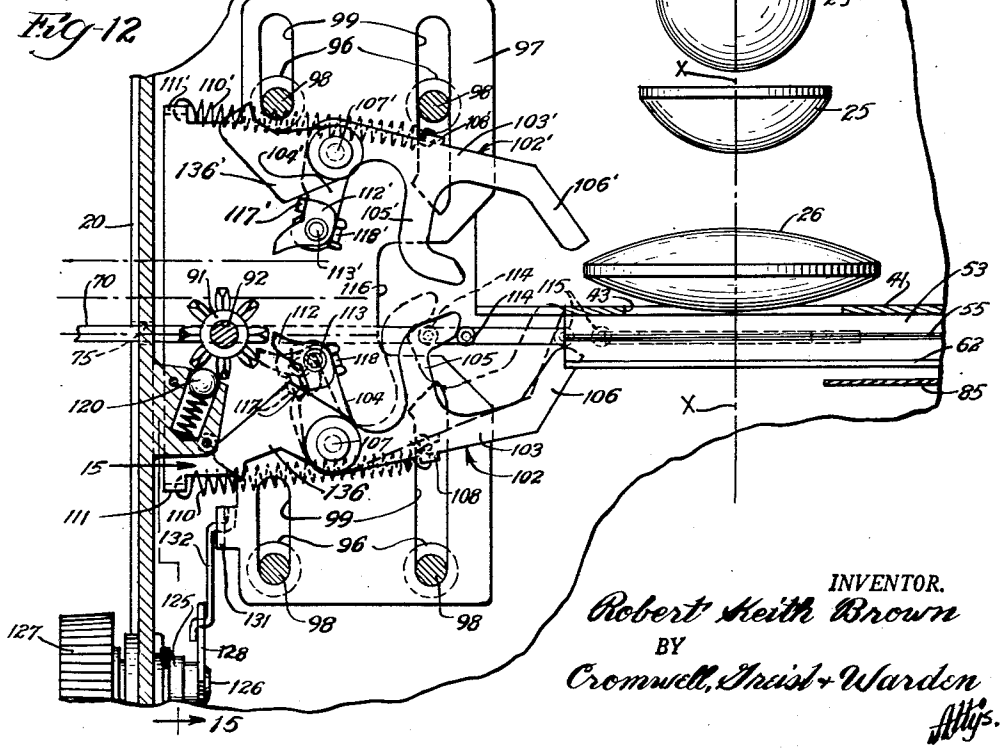


Fig-12



INVENTOR.
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Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

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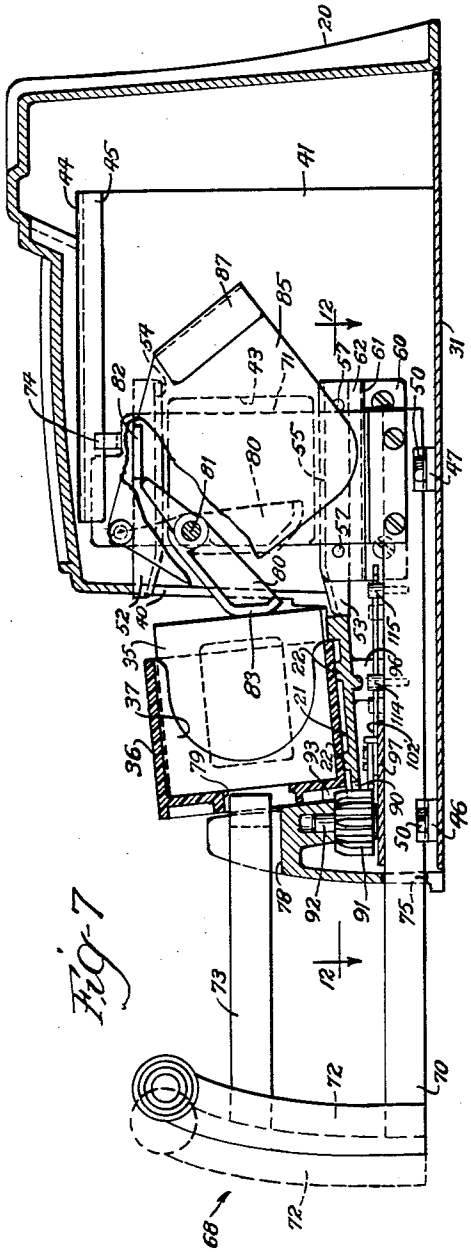


Fig-7

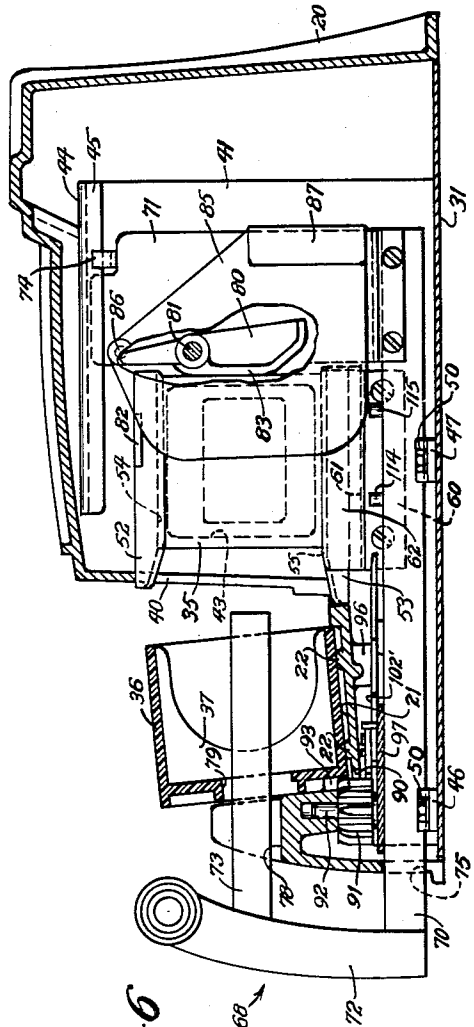


Fig-6

INVENTOR.
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Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

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Fig-8

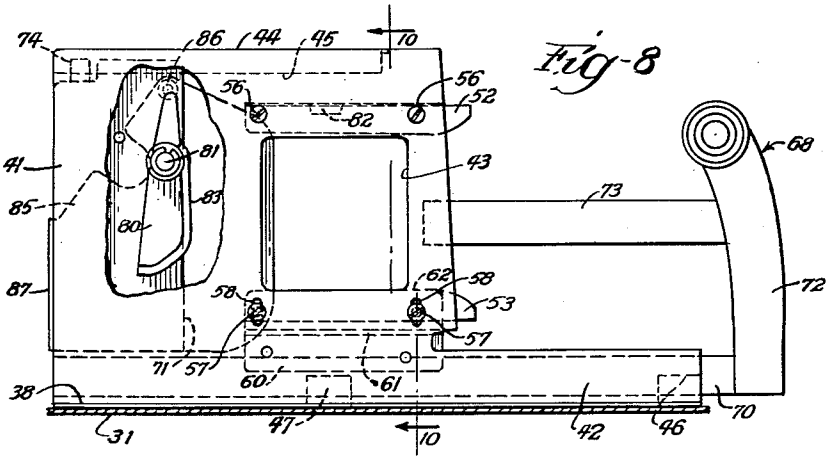


Fig-9

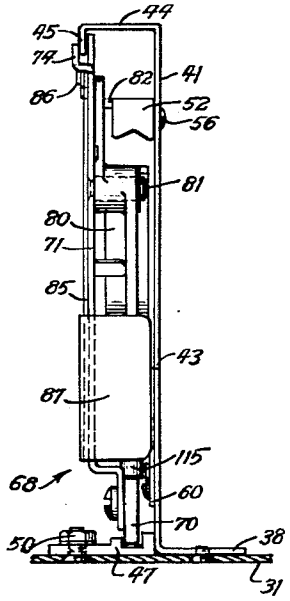
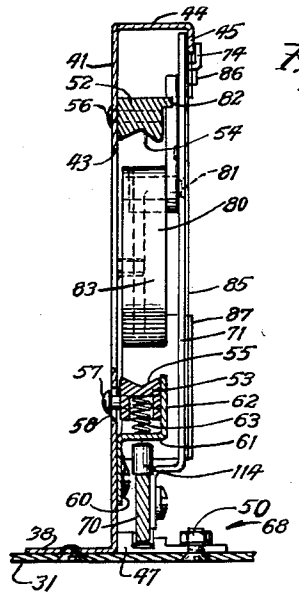


Fig-10



INVENTOR.

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Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

Filed July 3, 1959 8 Sheets-Sheet 7

Fig-16

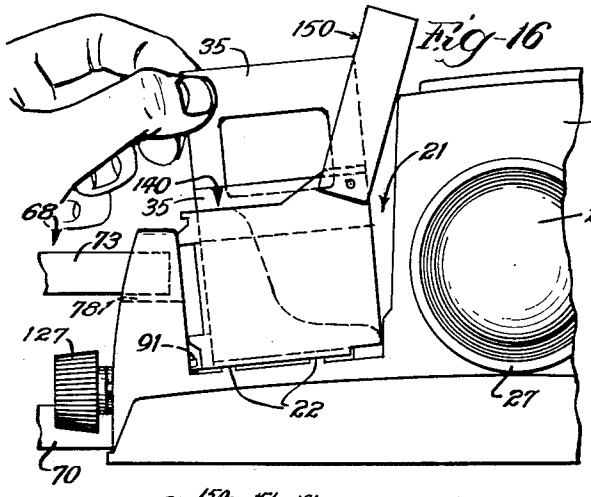


Fig-17

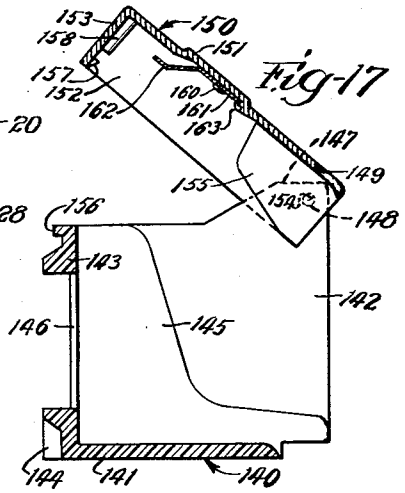


Fig-18

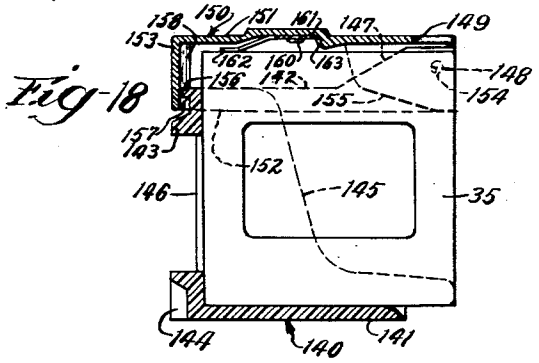


Fig-19

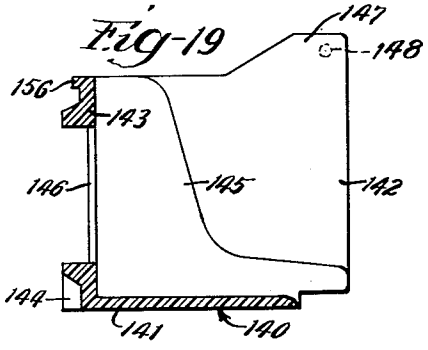
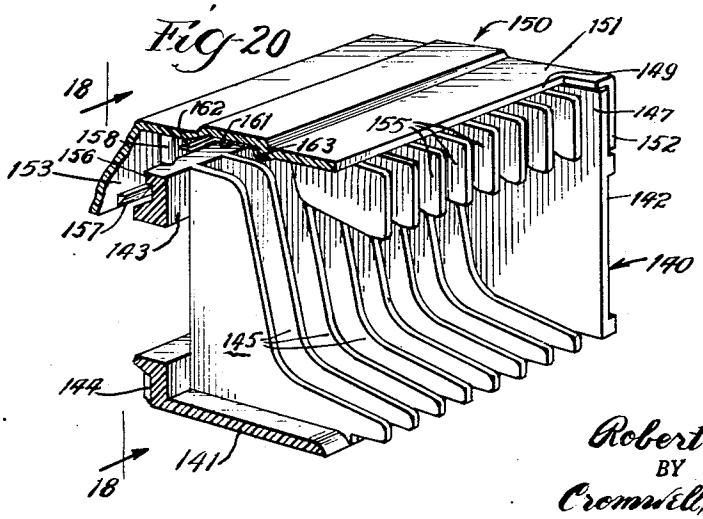


Fig-20



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Feb. 4, 1964 R. K. BROWN 3,120,150

SLIDE PROJECTOR

Filed July 3, 1959 8 Sheets-Sheet 8

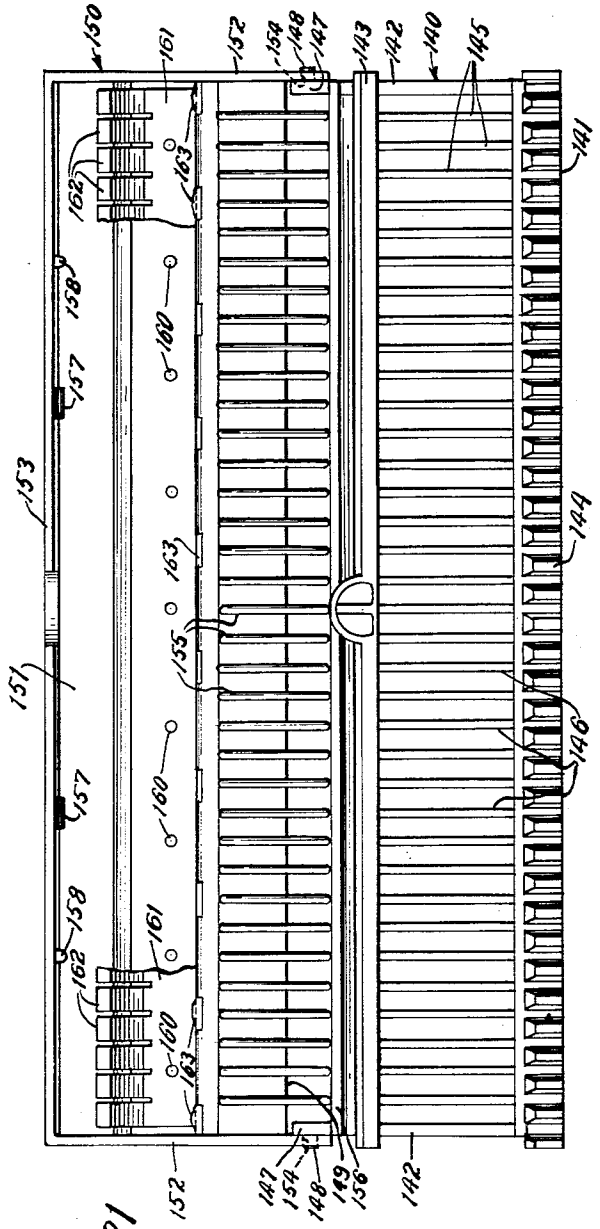


Fig-21

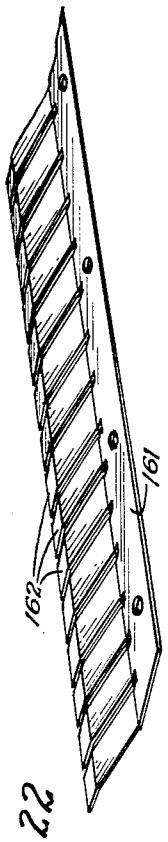


Fig-22

INVENTOR.
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United States Patent Office 3,120,150 Patented Feb. 4, 1964

3,120,150

SLIDE PROJECTOR

Robert Keith Brown, Chicago, Ill., assignor, by mesne assignments, to Sawyers, Inc., Portland, Oreg., a corporation of Oregon

Filed July 3, 1959, Ser. No. 824,877
21 Claims. (Cl. 88—28)

The present invention relates to a projector for showing mounted slides and transparencies and particularly to such a projector adapted for showing such slides and transparencies directly and sequentially from a slide tray in which they are normally stored when not being shown.

A number of projectors have been developed having means for transferring slides between a slide tray and the projector in combination with means for indexing the slide tray whereby all the slides in the tray may be shown automatically or semi-automatically in a desired sequence. In some of these projectors, the mechanism for transferring the slides between the tray and the projector includes structure which extends over the top of a channel or trough-like groove normally formed in the projector housing and in which the slide tray is movable, thus permitting placing of the slide trays in the groove only by inserting them at the ends of the groove. Obviously, projectors with this type of structure do not permit setting a slide tray down into such a slide tray receiving groove with a particular slide positioned for immediate showing. With such projectors, the tray must be indexed along until the desired slide is properly positioned for showing.

Additionally, most of the present projectors having an automatic, slide-tray-indexing feature rely upon movement of a slide carrier in returning a slide to the tray for actuating a slide-tray-indexing mechanism. Obviously, a problem arises because the slide tray cannot be indexed until the slide is fully returned to its position in the slide tray and any further outward movement of the slide carrier would tend to jam the member returning the slide to the slide tray against the already fully returned slide. A number of mechanisms have been developed to solve this problem including the use of spring connected and/or telescoping slide carriers of various types. Many of these mechanisms require a large number of parts which may become jammed, thus resulting in an unsatisfactory projector. Such projectors may also be costly to produce and difficult to assemble.

It is, therefore, the general object of the present invention to provide a new and improved slide projector which overcomes the above discussed disadvantages of present projectors of this type.

An important object of the invention is to provide a new and improved slide projector of the type having a channel or trough-like groove extending along one side thereof for receiving many well-known types of slide trays and means for transferring slides between a slide tray and a viewing aperture in the projector in combination with means for indexing the slide tray automatically after the showing of each slide.

It is another important object of the invention to provide a slide projector of the character described having a structure such that a slide tray may be lifted up out of or set down into the slide-tray-receiving groove so as to permit ready positioning of the slide tray with a particular slide in position to be moved from the tray into the projector.

Another important object of the invention is to provide a new and improved slide projector of the character described wherein a slide changing mechanism is an integral part of the projector.

It is a further important object of the invention to provide a new and improved slide projector of the character described wherein the slide carrier for transferring slides between a slide tray and the projector is provided with means operable, during a portion of the outward movement of the slide carrier, to return the slide to the slide tray at a rate of movement greater than the corresponding outward movement of the slide carrier after which the slide return means disengages the slide and permits additional outward movement of the slide carrier without requiring an increase in outward force therefor.

It is still another important object of the invention to provide a new and improved slide projector of the character described having a slide-tray-indexing mechanism adapted to be actuated by the slide carrier during such additional outward movement thereof and having means for selectively causing the slide carrier to either not index the slide tray or to index the slide tray either forwardly or rearwardly of the projector.

Another important object of the invention is to provide a new and improved slide projector of the character described wherein the slide-tray-indexing mechanism includes an indexing gear, a portion of which extends into the slide-tray-receiving groove and is engageable with a rack formed on the slide tray, and a member adapted to rotate the gear in response to movement of the slide carrier in such a manner that a lesser mechanical advantage is utilized in positioning the member for the indexing operation and a greater mechanical advantage is utilized for the actual work of indexing the slide tray.

A further object of the invention is to provide a new and improved slide projector of the character described which when a hinged-top type of slide tray is used therewith permits editing, that is changing or rearranging, the slides in the tray without removing the tray from the slide-tray-receiving groove.

It is another important object of the invention to provide a new and improved slide tray for a slide projector of the character described herein, which tray is provided with a hinged cover to permit editing of the slides while the tray is positioned in the slide-tray-receiving groove of the projector, the hinged cover of the tray being provided with finger-like springs which are engageable with edge portions of the mounted slides to aid in retaining the slides within the tray.

Another object of the invention is to provide a new and improved slide projector of the character described which is economical and relatively simple to manufacture, which is highly effective for its intended purpose, which may readily be provided with suitable attachments for remotely controlling the slide changing and slide-tray-indexing mechanisms and the focusing of the projector, and which is sturdy and requires little or no maintenance.

Certain other objects of the invention will, in part, be obvious, and will in part appear hereinafter.

For a more complete understanding of the nature and scope of the invention reference may now be had to the accompanying drawings wherein:

FIG. 1 is a top plan view of a preferred embodiment of the invention, partially broken away to clarify the disclosure;

FIG. 2 is a side elevational view of the projector shown in FIG. 1 looking toward the slide-tray-receiving groove side of the projector and partially broken away to better show some of the structural detail thereof;

FIG. 3 is a front end elevational view of the projector shown in FIGS. 1 and 2 with the slide carrier partially shown as in its outermost position;

FIG. 4 is a vertical section taken generally on the line **4—4** of FIG. 3 and partially broken away to better show the invention, the slide carrier being shown in its innermost position;

FIG. 5 is a vertical section taken generally on the line **5—5** of FIG. 2 and showing the slide carrier in its innermost position after having advanced a slide from a conventional type slide tray to a position in register with the viewing aperture in the projector;

FIG. 6 is a vertical section similar to FIG. 5 but showing the slide carrier after the first portion of its outward movement, the plate and shutter members being broken away to better show the slide eject flipper member;

FIG. 7 is a vertical section similar to FIGS. 5 and 6 showing the slide carrier after the third portion of its outward movement in full line and showing the slide carrier handle and pusher arm in their outermost positions in broken line, the broken line position of the flipper member illustrates it immediately after it is disengaged from the returned slide, as at the beginning of the final portion of the outward movement of the slide carrier;

FIG. 8 is an elevational view of the slide carrier and the portion of the projector upon which it is slidably supported looking from the rear when the slide carrier is in its innermost position, the supporting structure being partially broken away to better show the slide eject flipper member;

FIG. 9 is an enlarged left-end elevational view of the structure shown in FIG. 8;

FIG. 10 is an enlarged vertical section taken generally on the line **10—10** of FIG. 8;

FIG. 11 is a horizontal section taken generally on the line **11—11** of FIG. 2 and showing the indexing mechanism in its neutral position;

FIG. 12 is an enlarged horizontal section taken generally on the line **12—12** of FIG. 7 and showing one of the indexing members before and after the first portion of its indexing movement in solid and broken lines, respectively;

FIG. 13 is a horizontal section similar to FIG. 12 but showing the indexing member before the second and after the third portions of its indexing movement in solid and broken lines, respectively;

FIG. 14 is an enlarged vertical section taken generally on the line **14—14** of FIG. 11;

FIG. 15 is a vertical section taken generally on the line **15—15** of FIG. 12;

FIG. 16 is a front end elevational view similar to FIG. 3 but partly broken away and showing a specially designed slide-editing tray having a hinged cover positioned in the slide-tray-receiving groove of the projector with the cover fully opened and showing a mounted slide being positioned in (or removed from) the tray;

FIG. 17 is an enlarged vertical transverse section through the slide tray shown in FIG. 16 with the cover in a partially open position;

FIG. 18 is a vertical section similar to FIG. 17 and taken generally along the plane indicated by the line **18—18** of FIG. 20 showing the cover in its closed position and one of the spring-like fingers carried thereon in engagement with one of the mounted slides;

FIG. 19 is a vertical section similar to FIGS. 17 and 18 but with the hinged cover detached;

FIG. 20 is a perspective view, partly broken away, of the slide tray as shown in FIG. 18 with the cover in its closed position and looking toward the open side of the slide tray;

FIG. 21 is a side elevational view of the slide tray looking toward the opposite side thereof with the cover opened to a generally vertical position; and

FIG. 22 is a perspective view, partly broken away, of the spring retainer which is mounted in the cover of the slide tray.

As shown in FIGS. 1 to 3 inclusive, a preferred embodiment of the invention includes a housing or casing **20** which is preferably formed of metal and in one piece, as by a casting operation. The casing **20** is provided with a slide-tray-receiving channel or trough-like groove **21** which extends along one side thereof and is open at its top and at the forward and rear ends of the casing **20**. Suitable slide rails **22** are provided on the bottom surface of the groove **21**.

The optical axis of the projector is indicated by a broken line *x—x* in FIGS. 1, 4, 11, 12 and 13 and, as is well known in the art, a lamp **23**, a reflector **24**, lenses **25** and **26**, and an adjustable focusing-lens-housing **27** including a focusing lens **28** (FIG. 3) are disposed in the projector casing **20** in alignment with the optical axis *x—x* thereof. If desired, means may readily be provided by one skilled in the art for automatically or remotely varying the position of the focusing-lens-housing **27** for adjustment of the focus of the projector. A blower, indicated generally at **30**, is provided for inducing a flow of air past the bulb **23** to substantially reduce the temperature within the projector casing **20** and thus prevent damage to the slides or transparencies being shown therein. A suitable motor (not shown) is provided for the blower **30** and is adapted to actuate the same whenever the bulb **23** is energized. Suitable supporting structure for the lamp, reflector, lenses and blower is provided but is not described herein as it comprises no part of the invention.

The bottom surface of the slide-tray-receiving groove **21** is spaced a substantial distance above the bottom edge of the casing **20** for reasons which will be fully explained hereinafter. In the embodiment of the invention shown in the drawings, this distance is equal to approximately one-fourth the total height of the projector casing **20**. As is best shown in FIGS. 4 through 7, the open bottom end of the casing **20** is preferably closed by a suitable plate member **31**.

Slides and transparencies of the type intended to be shown on a screen by means of the projector disclosed herein are usually mounted in 2" x 2" paperboard mounting members. One such typical slide is shown in FIGS. 5, 6 and 7 and is identified by a reference numeral **35**. Such slides are often stored for convenience in slide trays such as a slide tray **36** shown in FIGS. 5, 6 and 7. The slide tray **36**, which is of the standard or conventional type, may be formed of plastic or other suitable material and is provided with a series of spaced partitions or septums **37** extending partially therethrough. The slide tray **36** is adapted to store thirty or more slides which may be placed in the tray or removed therefrom through an open side thereof. The slide storage spaces between adjacent partitions or septums **37** may be consecutively numbered whereby a person owning the slides may be able to identfy each slide immediately through a correspondingly numbered descriptive index. As shown in FIGS. 5, 6 and 7, the slide tray **36** is adapted to be set down into the groove **21** with the open side of the slide tray **36** disposed toward the optical axis *x—x* of the projector.

In order to permit transfer of the slide **35** from the slide tray **36** to a position within the projector casing **20** aligned with the optical axis *x—x*, a vertically extending slide aperture **40** is formed in a portion of the casing **20** defining the inner wall of the groove **21** approximately midway between the front and rear ends of the projector casing **20**. A slide-changing mechanism,

which comprises an integral part of the projector, is provided for transferring slides between the slide tray 36 positioned in the groove 21 and the optical axis x—x of the projector.

A generally vertically extending plate member 41 is rigidly supported within and transversely of the casing 20 in alignment with the rearward edge of the slide aperture 40. The lower edge of the plate member 41 is provided with a horizontally extending flange 38 which is secured to the upper surface of the base plate member 31 by suitable fasteners, for example, rivets. A reduced-in-height portion 42 of the plate member 41 extends beneath the bottom surface of the slide-tray-receiving groove 21. This vertical plate member structure is most clearly shown in FIGS. 8, 9 and 10. The plate member 41 is provided with a generally square slide viewing aperture 43 approximately the same size as the mounted slide 35, the aperture 43 being aligned with the optical axis x—x of the projector. A top portion 44 of the upper end of the plate member 41 is bent forwardly of the projector and then downwardly to define a guide rail 45. A pair of guide blocks 46 and 47 formed of nylon, plastic or other suitable bearing material are secured to the base plate member 31 immediately forward of the lower edge of the plate member 41 in spaced apart relationship by suitable fasteners 50 and 51, respectively, such as rivets or bolts and nuts.

An upper track member 52 and a lower track member 53 are mounted on the forward surface of the plate member 41 adjacent the upper and lower edges respectively of the aperture 43 formed therein. The track members 52 and 53 are adapted to support a mounted slide 35, when positioned adjacent the slide viewing aperture 43, in alignment with the optical axis x—x of the projector. For this reason, the track member 52 is provided with a downwardly opening V-shaped groove 54 and the track member 53 is provided with an upwardly opening V-shaped groove 55. The ends of the track members 52 and 53 adjacent the slide-tray-receiving groove 21 project slightly through the vertical aperture 40 at the upper and lower ends thereof, respectively, with the upper V-shaped groove 54 diverging slightly upwardly and the lower V-shaped groove 55 diverging slightly downwardly so as to facilitate slidably positioning the mounted slide 35 in alignment with the viewing aperture 43.

As is best shown in FIG. 10, the upper track member 52 is rigidly secured to the plate member 41 by fastener members, such as rivets or threaded members 56. The lower track member 53, however, is mounted for resilient movement in a vertical direction relative to the plate member 41 whereby slightly oversized mounted slides may be readily accommodated in the projector. The track member 53 is connected to the plate member 41 by means of fastener members, such as rivets or threaded members 57, which are movable within vertical slots 58 formed in the plate member 41. A guide member is provided which has a lower portion 60 secured to the plate member 41 by suitable fasteners, a forwardly extending portion 61 disposed below the track member 53, and a portion 62 extending upwardly alongside the forward surface of the track member 53. A pair of compression springs 63 which are seated between the forwardly extending portion 61 of the guide member and suitable recesses formed in the lower surface of the track member 53 are provided to normally urge the track member 53 toward its uppermost position.

A slide carrier, indicated generally by the reference numeral 68, is reciprocable transversely of the projector casing 20 and is adapted for transferring slides between the slide tray 36 positioned in the groove 21 and the viewing aperture 43 aligned with the optical axis x of the projector. The slide carrier 68 has three main portions, which may be integrally formed, including an elongated bar member 70 which is slidably supported by the

guide blocks 46 and 47, a handle member 72 which extends upwardly from the outer end of the bar member 70, and a pusher arm 73 which extends inwardly from the upper end of the handle member 72 toward the optical axis x—x of the projector in parallel spaced arrangement above the bar member 70. An upwardly extending plate member 71 is secured by suitable fastening means to the inner end of the bar member 70. The upper end of the plate member 71 on the end of the elongated bar member 70 is preferably provided with an outwardly and upwardly turned lug 74 which is adapted to fit over the rail portion 45 of the stationary plate member 41. The slide carrier 68, therefore, is slidably mounted for reciprocal movement in a horizontal direction transversely of the projector casing 20 by the guide blocks 46 and 47 and the lug 74.

The elongated bar member 70 is disposed wholly below the bottom surface of the slide-tray-receiving groove 21 and is slidable through a vertical slot 75 formed in the portion of the projector casing 20 defining the outer wall of the slide-tray-receiving groove 21. The pusher arm 73 is adapted to slidably extend through a vertical slot or groove 78 formed in the portion of the casing 20 defining the outer wall of the slide-tray-receiving groove 21 and between adjacent pairs of the partitions 37 in the slide tray 36, necessary openings 79 (FIG. 2) being provided in the side of the slide tray 36 opposite the open side thereof to permit movement of the pusher arm 73 therethrough into engagement with a mounted slide 35.

When the slide carrier 68 is in its outermost position, the pusher arm 73 is disposed wholly outside of the slide-tray-receiving groove 21, as in FIGS. 3 and 7. With this arrangement, when the pusher arm 73 is in its outermost position, it is a simple matter either to lift the slide tray 36 upwardly out of the groove 21 or to set the slide tray 36 down into the groove 21 with the slide tray 36 positioned with any particular one of the slides aligned with the vertical slide aperture 40 in the projector casing 20. The desired slide is thus positioned for immediate positioning in the projector and thus for immediate viewing. This convenient means of loading and unloading the slide tray 36 into and from the slide-tray-receiving groove 21 is possible because the groove 21 is provided with an open top and because the slide carrier 68 may be positioned so that no part thereof extends through or above the groove 21. This means of loading slide trays is much more convenient than having to insert them through either the forward or rear ends of the groove 21 as is necessary with projectors in which either portions of the projector casing extend across the top of the slide-tray-receiving groove or portions of the slide-changing mechanism extend above the groove 21.

When the slide carrier 68 is moved inwardly from its outermost position, as shown in broken lines in FIG. 7, the innermost end of the pusher arm 73 is adapted to engage a slide 35 stored in the slide tray 36 so as to transfer the slide 35 from the slide tray 36 through the vertical aperture 40 to a position in which the slide 35 is in register with the slide viewing aperture 43 formed in the plate 41. In this position, the slide 35 is supported between the V-shaped grooves 54 and 55 of the upper and lower track members 52 and 53, respectively, and in alignment with the optical axis x—x of the projector. The slide 35 is transferred from the slide tray 36 to its viewing position at the same rate of movement as that of the inward movement of the slide carrier 68.

The slide 35 which is positioned for viewing adjacent the viewing aperture 43 is returned to the slide tray 36 upon outward movement of the slide carrier 68 from its innermost position by means of a mechanism which will now be described. A kicker or flipper arm 80 (FIGS. 5, 6, 7, 8, 9 and 10) is pivotably mounted intermediate the ends thereof on the rear surface of the upstanding plate 71 which is secured to the inner end of the elongated

bar member 70 by means of a conventional combination bearing-and-fastener element 81. A projecting member or ear 82 projects forwardly from the upper track member 52 and is adapted to be engaged by the upper end of the flipper member 80 which normally hangs in a vertical position due to the fact that the lower portion thereof has a greater mass than the upper end portion. The edge 83 of the lower portion of the flipper member 80 which is disposed nearest to the optical axis x—x of the projector is formed with a broadened cam surface for engagement with the edge of the mounted slide 35.

With the device described herein, the slide 35 is adapted to be fully returned to its storage position in the slide tray 36 before the slide carrier 68 reaches the limit of its outward stroke. The innermost position of the slide changer 68 is shown in FIG. 5. During the first portion of the outward movement of the slide changer 68, the slide changer moves from the position shown in FIG. 5 to the position shown in FIG. 6 wherein the flipper member 80 first engages the edge of the mounted slide 35. During this portion of the outward movement of the slide changer 68, the mounted slide 35 remains stationary while the innermost end of the pusher arm 73 is moved away from the mounted slide 35.

During the next or second portion of the outward movement of the slide carrier 68, the mounted slide 35 is moved toward the slide tray 36 through its engagement with the flipper member 80 at substantially the same rate of movement as that of the slide carrier 68, the innermost end of the pusher arm remaining substantially the same distance ahead of the mounted slide 35. This second portion of the outward movement of the slide carrier 68 is relatively small and is terminated simultaneously as the upper end of the flipper arm 80 first engages the forwardly projecting ear 82 which is rigidly secured on the upper track member 52.

During the next or third portion of the outward movement of the slide carrier 68, the slide carrier is moved to the full line position shown in FIG. 7. During this third portion of the outward movement of the slide carrier 68, the upper end of the flipper member 80 is engaged by the projecting ear 82 whereby the lower portion of the flipper member 80 is pivoted relatively rapidly toward the left clockwise, as viewed in FIGS. 6 and 7. This pivoting movement of the flipper member 80 fully returns the mounted slide 35 to its storage position within the slide tray 36 and at a rate of movement which is substantially greater than the corresponding outward movement of the slide carrier 68, as can be seen from the relative distances moved by the slide 35 and the slide carrier 68 between the positions shown in FIGS. 6 and 7. This rapid return or eject movement of the slide may be described as the vectorial sum of the corresponding outward movement of the slide carrier and the linear movement imparted to the slide by the pivoting movement of the flipper member. The parts are arranged such that the innermost end of the pusher arm 73 has cleared the inner surface of the outer wall of the slide tray 36 by the time the slide 35 abuts thereagainst. Simultaneously as the slide 35 is fully returned to its position in the slide tray 36, the upper end of the flipper member 80 is disengaged from the projecting ear 82 and the flipper member 80 is thereby permitted to swing into its normal vertically disposed position, as shown in broken line in FIG. 7, in which position it is not only disengaged from the slide 35 but is also spaced a considerable distance therefrom.

The next or final portion of the outward movement of the slide carrier 68 is utilized for indexing the slide tray 36 as will be fully explained hereinafter. This final portion of the outward movement of the slide carrier 68 is clearly shown by a comparison of the full line and broken line positions of the slide carrier handle 72 and the inner end of the pusher arm 73 in FIG. 7 and is permitted because the flipper member 80 is disengaged from the fully returned slide 35 during this final portion of the outward movement of the slide carrier 68. The disengagement of the flipper member 80 from the fully returned slide 35 also permits indexing of the slide tray 36 during this final portion of the outward movement of the slide carrier 68.

A shutter member 85 is preferably associated with the slide changer 68 for preventing the passage of light through the focusing lens 28 during the transfer of slides 35 between the slide tray 36 and the viewing aperture 43. The shutter member 85 is pivotably hung from the upper portion of the upstanding plate 71, which is secured to the inner end of the elongated bar member 70, by a conventional combination bearing-and-fastener element 86 and is provided at one edge with a right angular weighted member 87 adapted to normally retain the shutter member 85 in a position in which the right angular member 87 engages the outer vertical edge of the upstanding plate 71 (FIG. 5). During outward movement of the slide carrier 68, the non-weighted edge of the shutter member 85 is adapted to engage the inner surface of the portion of the projector casing 20 immediately forward of the vertical slide aperture 40 whereupon the shutter member 85 is pivoted to the right, as viewed in FIG. 7, into a blocking position relative to the slide viewing aperture 43. Inward movement of the slide carrier 68 permits the shutter member 85 to assume the position shown in FIG. 5, in which position the viewing aperture 43 is not blocked. The movement of the shutter member 85 is not dependent in any way upon whether or not a slide is being transferred between the slide tray 36 and the viewing aperture 43. Rather, the operation of the shutter member 85 is dependent solely upon the movement of the slide carrier 68. Thus, inward movement of the slide carrier 68 without the pusher arm 73 advancing a slide into the projector, as at the end of a slide viewing session, will result in an unblocked viewing aperture 43 whereby to permit the escape of light through the focusing lens 28 and provide sufficient light in the darkened room to permit a person to find the switch for the room lighting.

As before mentioned herein, the projector is provided with a slide-tray-indexing mechanism which is adapted to be actuated during the final portion of the outward movement of the slide carrier 68. An arcuate slot or opening 90 (FIG. 1) is provided in the base of the slide-tray-receiving groove 21 adjacent the outer wall thereof and in lateral alignment with the vertical slide aperture 40 which is formed in the inner wall of the groove 21. An indexing gear 91 is rotatably mounted on a bearing shaft 92 which is suitably supported in a portion of the projector casing 20. The gear 91 is positioned so that a portion of the teeth thereof extend through the opening 90 and into the slide-tray-receiving groove 21. A rack, indicated at 93 in FIG. 2, is formed along the bottom edge of the outer side of the slide tray 36 shown in the drawings and is adapted to be engaged by the teeth of the indexing gear 91 whereby rotation of the gear 91 moves or indexes the slide tray 36 forwardly or rearwardly of the slide-tray-receiving groove 21 depending upon in which direction the gear 91 is rotated. As some slide trays may have a rack formed on the bottom side thereof, the teeth of the gear 91 are preferably formed with a special design adapted to permit engagement thereof with either a rack formed on the vertical side of a slide tray, as in the drawings, or a rack formed on the horizontal bottom side of a slide tray.

The mechanism for rotating the indexing gear 91 upon each outward movement of the slide carrier 68 whereby to index the slide tray 36 one position each time a slide 35 is returned to the slide tray 36 will now be described. The projector casing 20 is provided with downwardly extending bosses 96, as shown in FIGS. 2, 11 and 14. A plate member 97 is supported from the lower ends of the bosses 96 by suitable fastener members 98 which

extend through elongated slots 99 (FIGS. 11, 12 and 13) formed in the plate 97 whereby the plate 97 is shiftable forwardly and rearwardly of the projector for purposes and by a mechanism to be fully described herein. When the plate 97 is positioned midway between its limits of travel, as in FIG. 11, the center of the plate 97 is aligned with the vertical axis of the indexing gear 91.

A pair of identical, generally E-shaped, three-armed members 102 and 102' are mounted on the plate 97. Each member 102 and 102' includes, respectively, an elongated base portion 103 and 103', a first arm 104 and 104', a middle arm 105 and 105' the end of which is bent so as to extend away from the first arm 104 and 104', and a third arm 106 and 106' which extends generally diagonally away from the elongated base portion 103 and 103'. The two three-armed members 102 and 102' are disposed on the plate 97 in forwardly and rearwardly spaced apart relationship and with their arms extending generally toward each other. Each member 102 and 102' is provided, respectively, with a pivotal connection to the plate 97 at the intersection of the elongated base portion 103 and 103' and the first arm 104 and 104', as indicated at 107 and 107' in FIGS. 11, 12 and 13. The pivotal connections 107 and 107' are spaced equidistantly from the center of the plate 97 and, respectively, forwardly and rearwardly thereof. The base portions 103 and 103' of the three-armed members 102 and 102' each extends across one of the slots 99 formed in the plate 97 and each is provided with a downwardly bent ear 108 and 108', respectively, which extends downwardly through the associated slot 99. A spring member 110 and a spring member 110' are each interconnected, respectively, between the downwardly bent ears 108 and 108' and downwardly bent ears 111 and 111' formed at the outermost edge of the plate 97 whereby to normally bias the three-armed members 102 and 102' to their positions shown in FIG. 11. The two slots 99 through which the ears 108 and 108' depend are further elongated and designed to permit free movement of the ears 108 and 108' therein during pivoting movement of the three-armed members 102 and 102'.

The end of each of the first arms 104 and 104' is provided with a pivotably mounted gear-engaging pawl 112 and 112', respectively. With the three-armed members 102 and 102' in their normal positions (FIG. 11) the pawls 112 and 112' are disengaged from the gear 91 no matter which position the plate 97 is in. Each pawl 112 and 112' (FIGS. 12 and 13) is pivotable about a pin 113 and 113' on the arms 104 and 104' respectively, between a first position in which it is engageable between adjacent teeth of the gear 91 to cause rotation thereof upon pivoting movement of its associated three-armed member and a second position in which it may be moved relative to the gear 91 without causing rotation thereof. The pawl 112, in its first position, has a portion engageable with a stop member 117 which extends upwardly from one edge of the arm 104 to insure positive rotation of the gear 91 when the three-armed member 102 is rotated from its normal position. The side of the pawl 112 opposite the portion engageable with the stop member 117 is provided with a cam surface which is engageable with a lug 118 which is struck up from the plate 97 for a reason to be described hereinafter. Likewise, the arm 104' is provided with a stop member 117' and the pawl 112' is provided with a cam surface engageable with a lug 118' which is struck up from the plate 97.

When the plate 97 is disposed in its central position and the three-armed members 102 and 102' are in their normal positions (FIG. 11), the bent ends of the middle arms 105 and 105' are disposed substantially equal distances from a vertical transverse plane extending through the axis of the indexing gear 91. Further, the bent end portions of the middle arms 105 and 105' are the portions of their respective members 102 and 102' positioned most closely adjacent to each other when the three-armed members 102 and 102' are in their normal positions.

The elongated bar member 70 of the slide carrier 68 is reciprocal immediately beneath the plate 97 and in the vertical transverse plane extending through the axis of the indexing gear 91. Provision is made for actuating either one of the three-armed members 102 and 102' during the final portion of the outward movement of the slide carrier 68 whereby to rotate the gear 91 and index the slide tray 36 either forwardly or rearwardly of the slide-tray-receiving groove 21. A pair of upstanding pins 114 and 115 are mounted in spaced-apart relationship on the inner end of the elongated bar member 70. The pins 114 and 115 are adapted to selectively engage the arms of either the member 102 or the member 102' to index the slide tray 36, as will be fully described herein. However, in the central or neutral position of the plate 97, the pins 114 and 115 move between the arms of the members 102 and 102' without engagement therewith whereby the indexing gear 91 will not be rotated upon full outward movement of the slide carrier 68. This feature is desirable when individual slides are being shown or when it is preferred not to show the slides in a particular tray 36 in their normal sequence. A relatively wide slot 116 is formed in the inner edge of the plate 97 to permit unrestricted movement of the pins 114 and 115 with the slide carrier 68.

When the plate 97 is in its rearwardmost position, the pins 114 and 115 actuate the three-armed member 102 whereupon the slide tray 36 is indexed forwardly one position each time the slide carrier 68 is moved outwardly. With the plate 97 in its forwardmost position, the pins 114 and 115 are adapted to actuate the three-armed member 102' whereby to index the slide tray 36 rearwardly one position upon each outward movement of the slide carrier 68. For convenience, actuation of the three-armed member 102 only is illustrated and described herein inasmuch as the three-armed member 102' is actuated in exactly the same manner when it is desired to index the slide tray 36 rearwardly.

In FIGS. 12 and 13, the plate 97 is shown in its rearwardmost position for indexing the slide tray 36 forwardly of the projector. In this position of the plate 97, the bent end of the middle arm 105 of the member 102 is positioned immediately above the elongated bar member 70 of the slide carrier 68 when the member 102 is in its normal position, with the end of the third arm 106 being positioned slightly away from the bar member 70. During the final portion of the outward movement of the slide carrier 68, that is, after the slide 35 has been fully returned to its position in the slide tray 36, the slide tray is indexed one position to advance the next slide into alignment for movement into the projector. This indexing movement of the slide carrier 68 may be broken down into three successive portions. During the first portion of this indexing movement the pin 114 engages the bent end of the middle arm 105 of the member 102 and pivots the member 102 from its normal solid line position toward the broken line position shown in FIG. 12. This first portion of the pivoting movement of the member 102 positions the pawl 112 on the first arm 104, which is in its first or gear-rotating position, between a pair of adjacent teeth of the gear 91 and simultaneously positions the end of the third arm 106 for engagement by the pin 115. During the second portion of the indexing movement of the slide carrier 68, the pin 115 engages the end of the third arm 106 and further pivots the member 102 whereby to cause the pawl 112 to rotate the gear 91 one position in a clockwise direction, as viewed in FIGS. 12 and 13, and acts to index the slide tray 36 in a forward direction whereby to position the next slide in the tray in alignment with the vertical slide aperture 40 in the projector casing 20. After the second portion of the indexing movement, the pin 114 again engages a portion of the arm 105 for the third and final portion of the indexing movement and pivots the member 102 to the broken line position shown in FIG. 13 wherein the pawl 112 is clear of the

gear 91. The three-armed members 102 and 102' are so designed that there is no interference therebetween when they are pivoted during the indexing operation. A conventional spring-urged ball detent device, indicated at 120, is preferably associated with the gear 91 to insure that the gear 91 is rotated one position only upon each outward movement of the slide carrier 68. As shown in FIGS. 11, 12 and 13, a ball is mounted in a bore formed in a portion of the casing 20 and is resiliently urged toward the gear 91 by a spring disposed in the bore.

Upon inward movement of the slide carrier 68, the three-armed member 102 is returned to its normal position through engagement of the pin 114 with the inner surface of the third arm 106 and as a result of the action of the spring 110. During the return movement of the three-armed member 102, the pawl 112 is rotated, through engagement with the gear 91, to its second position away from the stop member 117 whereby there will be no reverse indexing of the gear 91. As the three-armed member 102 returns to its normal position, the cam surface on the pawl 112 is engaged by the lug 118 whereby the pawl 112 is automatically returned to its first or gear-rotating position against the stop member 117 and is thus properly positioned for the next indexing operation.

When the plate 97 is in its forwardmost position, the arms of the member 102' are positioned for engagement by the pins 114 and 115 during outward movement of the slide carrier 68 in the same manner described herein for the member 102 whereby to rotate the gear 91 in a counterclockwise direction, as viewed in FIGS. 12 and 13, to index the slide tray 36 rearwardly of the projector 20.

With the structural arrangement disclosed herein, a maximum mechanical advantage is utilized for the actual work of indexing the slide tray 36 and a lesser mechanical advantage is utilized for positioning the member 102 or 102' for the actual indexing operation and for clearing the pawl 112 or 112' away from the gear 91 at the end of the actual indexing operation. The pin 114 engages the relatively short lever arm 105 or 105' to position the pawl 112 or 112' between a pair of adjacent teeth of the gear 91 and simultaneously to position the third arm 106 or 106' for engagement by the pin 115. The pin 115 then engages the longer lever arm 106 or 106', which results in a substantially greater mechanical advantage, during the actual work of rotating the gear 91 and indexing the tray 36.

Provision is made for conveniently positioning the plate 97 in either its neutral, forward indexing, or rearward indexing positions. This mechanism is best shown in FIGS. 12, 14 and 15 and includes a bearing sleeve 125 rigidly mounted in a well-known manner in an opening formed in the portion of the casing 20 defining the outer wall of the slide-tray-receiving groove 21, a rotatable or rockable shaft 126 extending through the bearing sleeve 125, and a manually operable knob 127 secured on the outer end of the shaft 126. A flat plate member 128, which is preferably rectangular, is secured near its upper end to the inner end of the shaft 126. A motion-transmitting member 132 is connected between the bottom end of the plate member 128 and a downwardly turned ear 131 formed on the forward end of the plate 97. In the form of the invention show in the drawings, the motion-transmitting member 132 comprises a rigidly formed wire element. A flat spring device, indicated at 135, is preferably provided and is engageable with the bottom edge of the plate 128 for indexing the plate 97 between its three positions, that is, neutral, forward index, and rearward index positions. In FIG. 15, the forward index position of the plate 97 is indicated by the full line position of the plate member 128 with the rearward index position being indicated by the broken line position of the plate 128. The neutral position of the plate 97 corresponds to the plate member 128 being positioned between the two positions shown in FIG. 15, that is, with its flat bottom edge flush against the flat spring device 135.

Preferably, the plate positioning knob 127 should be turned between its different positions for reversing the index movement of the slide tray when the slide carrier 68 is in its innermost position whereby the three-armed members 102 and 102' will be in their normal positions as shown in FIG. 11. When the slide carrier 68 is in its outermost position, one of the three-armed members 102 and 102' will be in the position indicated by the broken line showing of member 102 in FIG. 13. Inward movement of the slide carrier 68 after the knob 127 has been turned from its forward indexing to its rearward indexing positions, for example, might tend to cause interference or jamming between the pin 114 and the members 102 and 102'. Therefore, as a safety or precautionary measure, provision may be made for returning the members 102 and 102' to their normal positions when the knob 127 is turned with the slide carrier 68 in its outermost position whereby to insure against any jamming of the slide carrier 68 when it is thereafter moved inwardly.

Referring to FIGS. 12 and 13, angled cam arms 136 and 136' each have one end pivotably mounted, respectively, on the pivot pin connections 107 and 107' of the three-armed members 102 and 102' to the plate 97. When the members 102 and 102' are in their normal positions (see member 102' in FIGS. 12 and 13 and the solid line position of member 102 in FIG. 12), the cam arms 136 and 136' extend generally toward the outer wall of the casing 20 with the inner edges thereof disposed against the stop members 117 and 117' formed, respectively, on the arms 104 and 104' of the members 102 and 102'. When the slide carrier 68 is moved to its outermost position with the plate 97 in its rearmost or forward indexing position for actuation of the member 102, as illustrated in FIGS. 12 and 13, the member 102 is pivoted from its solid line position in FIG. 12 to its broken line position in FIG. 13, as previously described herein, and the cam arm 136 is pivoted, as a result of its engagement with the stop member 117, to its broken line position shown in FIG. 13. In this latter position of the cam arm 136, the non-connected or free end thereof is disposed closely adjacent to one of the plate-supporting bosses 96 which are rigid with the casing 20. Upon turning the knob 127 to shift the plate 97 to its forwardmost or rearward indexing position, the cam arm 136 is pivoted clockwise, as viewed in FIG. 13, as a result of its engagement with the boss 96 and the movement of its pivot connection 107 toward the boss 96. This pivoting movement of the cam arm 136 is transmitted to the member 102 through the engagement of the inner edge of the cam arm 136 with the stop member 117 on the member 102. This pivoting movement of the arm 102, which is also aided by the spring 110, causes partial inward movement of the slide carrier 68, first as a result of engagement by the middle arm 105 of the member 102 with the pin 114 and then as a result of engagement by the third arm 106 with the pin 115. This inward movement of the slide carrier 68 insures that the pin 114 will not be jammed behind the middle arm 105' of the member 102' when the plate 97 is fully shifted to its forwardmost or rearward indexing position.

Although the slide-changing and slide-tray-indexing mechanisms have been illustrated and described herein as being manually operable through manipulation of the handle 72, one skilled in the art could readily provide suitable automatic and remote control systems for actuating the slide-changing and slide-tray-indexing mechanisms disclosed herein. Inasmuch as such control systems comprise no part of the present invention, no attempt has been made to illustrate and describe them herein.

From the standpoint of the operator, the operation of the projector disclosed herein is extremely simple. After the projector has been plugged into a suitable wall socket to energize the lamp 23 and the blower 30, the knob 127 is turned to either its neutral, forward indexing or rearward indexing positions. The slide carrier 68 is then moved to its outermost position, after which the slide

tray 36 is set down into the slide-tray-receiving groove 21 with any particular slide aligned with the vertical slide aperture 40 and with the rack 93 on the tray 36 engaged with the indexing gear 91. Reciprocal movement of the slide carrier 68, either manually or automatically, will then result in sequential showing of all of the slides 35 stored in the slide tray 36, the slide tray 36 being indexed in the proper direction after the showing of each slide.

The invention is additionally concerned with a specially designed slide-editing tray 140 (FIGS. 16–21, inclusive) which is particularly well adapted for use with the slide projector disclosed herein because of the open-topped slide-tray-receiving groove feature thereof. The slide tray 140 is provided with a hinged cover 150 which because of the last-mentioned feature of the projector permits editing of the slides 35 stored therein without removing the slide tray 140 from the slide-tray-receiving groove 21 of the projector. The hinged cover 150 is merely pivoted to its open position (FIGS. 16 and 21), whereby to permit replacing any one of the slides in the tray 140 with another slide or re-arranging the slides in the tray 140. As is clearly illustrated in FIG. 16, the cover 150 may be fully opened when the tray 140 is positioned in the slide-tray-receiving groove 21 of the projector so that mounted slides 35 may be positioned in the tray 140 or removed therefrom through the open top thereof to replace or re-arrange the slides 35 as desired. This slide-editing feature is particularly convenient inasmuch as the slides being edited may readily be transferred into the projector by the slide carrier 68 for proper identification thereof inasmuch as the slide tray 140 may at all times remain in the groove 21. Use of the slide-editing tray 140 for the purpose intended is not possible with projectors in which portions of either the casing or the slide-change mechanism thereof extend across or project into a slide-tray-receiving groove thereof.

As best shown in FIGS. 17–21, the slide-editing tray 140 which may be molded of plastic, is characterized by a bottom wall 141, as viewed in the drawings, a pair of end walls 142, and a side wall 143 which is provided with a centrally arranged, longitudinally extending slot for a purpose which will be evident hereinafter. The lower edge of the side wall 143 is provided with a multi-toothed rack 144 which is adapted to be engaged by the indexing gear 91 for forward and rearward indexing of the tray 140 as previously described herein. The side of the tray 140 opposite the longitudinally slotted wall 143 is open to permit slides 35 stored in the tray 140 to be advanced into the projector and returned to the tray 140.

The tray 140 is provided with a plurality of longitudinally spaced partitions of septums 145 which define separate storage areas for each of the slides 35. The septums 145 are generally L-shaped and extend along the bottom wall 141 and the side wall 143 of the tray 140 whereby they are adapted for confining engagement with three of the four corners of the slides 35 disposed therebetween. The portions of the septums 145 which extend along the side wall 143 form with the longitudinal slot therein a plurality of vertically elongated openings 146 through each of which the inner end of the pusher arm 73 may be advanced to transfer a slide 35 from the tray 140 into the projector for viewing. The inner upper corners of the end walls 142, as viewed when the tray 140 is positioned in the slide-tray-receiving groove 121 of the projector, are each provided with a raised portion 147 having an outwardly projecting pivot pin 148 formed on the outer surface thereof for hingedly or pivotably mounting the cover 150 on the tray 140 as will be described.

The cover 150, as best shown in FIGS. 17, 18, 20 and 21 is characterized by a top wall 151 which, when in its closed position on the tray 140, terminates inwardly of the pivot pins 148 at an edge 149, a pair of depending end walls 152 each of which is provided with an opening 154 adapted to receive one of the pivot pins 148, and a depending side wall 153 adapted to extend over the upper portion of the side wall 143 of the tray 140. The cover 150 may be snapped onto the pivot pins 148 by flexing the portions 147 of the end walls 142 of the tray 140 inwardly. A plurality of longitudinally spaced ribs 155 depend from the top wall 151 of the cover 150 and project somewhat beyond the terminating edge 149 thereof. Each of the ribs 155 is aligned with one of the septums 145 whereby the ribs 155 act to confine the fourth corner of each of the slides 35 stored in the tray 140. The depending and projecting ribs 155 on the cover 150 permit the transfer of slides 35 between the tray 140 and the projector when the cover 150 is either in its open or closed positions.

The upper portion of the side wall 143 of the tray 140 is provided with a longitudinally extending latching lip 156, and the inner surface of the side wall 153 of the cover 150 is provided with a plurality of friction lugs 157. Thus, when the cover 150 is pivoted into its closed position (FIGS. 18 and 20), the lugs 157 snap over the latching lip 156 and the cover 150 is retained in its closed position. The inner surface of the side wall 153 of the cover 150 is also provided with a plurality of integral posts 158 which are engageable with the upper edge of the side wall 143 of the tray 140.

It is noted that the hinged connection of the cover 150 is at the projector side of the tray 140 whereby it is most convenient for a person sitting alongside of the projector to have access to the slides 35 for editing purposes. As is evident from a comparison of FIGS. 5 and 16, the slide-editing tray 140, which almost fills the slide-tray-receiving groove 21, is somewhat wider than the standard or conventional slide tray 36 and thus provides greater guiding control over the slides 35 when they are being transferred between the tray 140 and the projector.

The slides 35 when stored in standard or conventional type trays, such as the tray 36, are somewhat loose and tend to fall out of the tray when it is flipped on its side for positioning in the slide-tray-receiving groove of a projector. The slide-editing tray 140 is provided with a spring retainer which is adapted to prevent the slides 35 from falling out of it. The undersurface of the top wall 151 of the cover 150 is provided with a plurality of centrally arranged, longitudinally spaced mounting pins 160. The spring retainer is formed of an elongated strip 161, or series of strips arranged in end-to-end relationship, of spring metal which is mounted on the pins 160 in any suitable manner. The strip 161 is provided along one edge with a plurality of integral, downwardly biased spring fingers 162 each of which is engageable with the upper edge of one of the mounted slides 35, as shown in FIG. 18, whereby to retain the slides 35 in the tray 140. The undersurface of the top wall 151 of the cover 150 may be provided with a series of projections 163 which are engageable with the other edge of the strip 161 to retain it flush against the top wall 151. When the cover 150 is in its open position, the spring pressure is of course no longer effective and the slides 35 may be readily removed from the tray 140 for editing purposes. The spaces or slots separating the spring fingers 162 are substantially narrower than the thickness of the mounted slides 35 whereby to prevent the slides 35 from becoming jammed therebetween.

The operation of the projector when the slide-editing tray 140 is being used is identical to the operation as described with regard to the standard or conventional tray 36. The spring pressure acting to retain the slides 35 in the tray 140, when the cover 150 is latched in its closed position, is not sufficient to prevent movement of the slides from the tray 140 by the pusher arm 73. However, if desired, the cover 150 may be unlatched or even pivoted to its open position during operation of the projector to permit completely unrestricted transfer movement of the slides 35 between the tray 140 and the projector.

It will be understood that certain changes may be made in the construction or arrangement of the slide projector and the slide-editing tray therefor which are disclosed herein without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A slide projector comprising, a housing having a slide-tray-receiving groove extending along one side thereof, a viewing aperture aligned with the optical axis of the projector, a slide carrier having a pusher arm for pushing a slide from a slide tray disposed in said groove to a position in register with said viewing aperture upon inward movement thereof and a flipper arm engageable with a slide for returning same to the slide tray upon outward movement thereof, and an abutment member associated with said viewing aperture and adapted to be engaged by one end of said flipper member during a portion of the outward movement of the slide carrier whereby the other end of the flipper member is pivoted toward the slide tray to return a slide to the slide tray at a rate of movement greater than the corresponding outward rate of movement of said slide carrier.

2. A slide projector as recited in claim 1 having a slide-tray-indexing mechanism adapted to be actuated by elements carried on said slide carrier during a portion of its outward movement and immediately after a slide has been fully returned to the slide tray.

3. A slide projector comprising, a housing having a slide-tray-receiving groove extending along one side thereof, a slide viewing aperture disposed in the projector in alignment with the optical axis thereof, a slide carrier reciprocal in said housing to transfer slides between a slide tray disposed in said groove and said viewing aperture, a pusher arm carried on said slide carrier and adapted upon inward movement thereof to push a slide from the tray to a viewing position in register with said aperture, a cam-like projection associated with the upper edge of said viewing aperture, and a kicker member pivotally mounted intermediate its ends on the inner end of said slide carrier and normally disposed in a vertical position, said kicker member being adapted to engage a slide disposed in register with said viewing aperture to return the slide to the slide tray upon outward movement of said slide carrier, the upper end of said kicker member being adapted during a portion of the outward movement of said slide carrier to be engaged by said cam-like projection with the lower end thereof being pivoted toward the slide tray whereby to return said slide to the slide tray at a rate of movement substantially greater than the corresponding rate of outward movement of said slide carrier.

4. A slide projector as recited in claim 3 wherein said kicker member is adapted to be disengaged from said cam-like projection simultaneously with the slide being fully returned to the slide tray whereby said kicker member is permitted to return to its vertical position, thus disengaging itself from the returned slide.

5. A slide projector as recited in claim 3 wherein said slide-tray-receiving groove is open at the top and wherein said pusher arm in the outermost position of said slide carrier is positioned wholly outside of said groove whereby a slide tray may be set down into or lifted out of said groove.

6. A slide projector as recited in claim 3 having a shutter pivotably suspended from said inner end of said slide carrier, said shutter being adapted upon outward movement of said slide carrier to abut against a portion of said housing whereby said shutter is pivoted into a blocking position in front of said viewing aperture to prevent the escape of light during the changing of slides.

7. A slide projector comprising, a housing having a slide-tray-receiving groove extending along one side thereof, a vertical, transversely extending, stationary plate disposed in said housing and having a portion extending beneath the bottom surface of said groove, said plate having a slide viewing aperture formed therein in alignment with the optical axis of the projector, guide members mounted on said plate, and a slide carrier slidably reciprocal within said guide members for transferring slides between a slide tray positioned in the groove and a position adjacent said viewing aperture, said slide carrier comprising, a bar member disposed below the bottom surface of said groove, a pusher arm disposed above said bar member and extending inwardly from the outer end of said slide carrier, said pusher arm being adapted to be advanced through said groove and a slide tray positioned therein whereby to position a slide adjacent said viewing aperture, an upstanding plate member carried on the inner end of said bar member, an elongated flipper member pivotably mounted intermediate its ends on said upstanding plate member and normally disposed in a vertical position, the lower end of said flipper member being adapted to engage a slide positioned adjacent said viewing aperture, and a projecting member disposed above said viewing aperture and adapted to be engaged by the upper end of said flipper member, the arrangement of parts being such that a slide positioned adjacent said viewing aperture remains motionless during the first portion of the outward movement of said slide carrier and until the lower end of said flipper member engages the slide after which the slide is moved toward the slide tray at approximately the same rate of movement as said slide carrier until the upper end of said flipper member engages said projecting member whereupon the lower slide-engaging end of said flipper member is pivoted toward the slide tray to substantially increase the rate of return movement of the slide relative to the rate of corresponding outward movement of said slide carrier so that simultaneously the end of the pusher arm reaches the outer edge of the slide tray, the slide abuts against the outer edge of the slide tray, and the upper end of the flipper member is disengaged from said projecting member and is permitted to disengage the slide and return to its vertical position, thus permitting additional, unrestricted outward movement of said slide carrier.

8. A slide projector as recited in claim 7 having a slide tray indexing mechanism, and means carried on said bar member of said slide carrier adapted to actuate said indexing mechanism during said additional outward movement of said slide carrier.

9. A slide projector comprising, a housing having a slide-tray-receiving groove extending along one side thereof, a viewing aperture in said housing, a slide carrier reciprocal transversely of said groove for transferring slides between a slide tray disposed in said groove and said viewing aperture, said carrier having an elongated bar member disposed below the bottom surface of said groove, an indexing gear having a portion extending into said groove for engagement with a rack formed on a slide tray disposed in said groove, a generally E-shaped, three-armed member pivotably mounted at one corner thereof in horizontal alignment with a portion of said indexing gear, the one arm of said member nearest said gear having means on the end thereof adapted to engage between any two adjacent teeth of said gear, and a pair of spaced pins mounted on said bar member of said slide carrier and adapted to engage the ends of the middle arm and the other arm during the final portion of the outward movement of said slide carrier to successively position said means on the end of said one arm between a pair of adjacent teeth of said gear and then to index the gear one position whereby to index a slide tray disposed in said groove.

10. A slide projector as recited in claim 9 wherein the pin on said bar member which is disposed nearest said gear is adapted to first engage the end of said middle arm whereby to pivot said three-armed member so as to position the end of said other arm which is furthest from said pivotal mounting of said three-armed member for engagement by the other pin and simultaneously to posi-

tion the means on the end of said one arm between a pair of teeth of said gear, and wherein continued outward movement of said slide carrier causes said other pin to engage the end of said other arm and continue pivoting movement of said three-armed member whereby to index said gear one position, said arrangement of parts providing the greater mechanical advantage for the actual work of indexing said gear and the lesser mechanical advantage for positioning the three-armed member for the actual indexing operation.

11. A slide projector as recited in claim 9 wherein said slide carrier is provided with a pusher arm for pushing a slide from the slide tray to a position in register with said viewing aperture and a vertically disposed flipper member pivotably mounted intermediate its ends for returning the slide to the slide tray, one end of said flipper member being engageable with the slide for returning it to the slide tray, and wherein means are provided for pivoting said flipper member, during a portion of the slide return movement of said slide carrier, in a direction such that said one end of the flipper member is pivoted toward the tray whereby the slide is returned to the slide tray at a faster rate of movement than the corresponding rate of return movement of said slide carrier.

12. A slide projector as recited in claim 9 wherein said indexing gear is adapted to be engageable with either a horizontal rack formed on the bottom of a slide tray or a vertical rack formed on the side of a slide tray.

13. A slide projector as recited in claim 9 wherein said three-armed member is pivotably mounted on a plate member which is longitudinally slidable relative to said housing between an indexing position and a neutral position whereby in said indexing position outward movement of said slide carrier actuates said three-armed member to index said gear and whereby in said neutral position outward movement of said slide carrier results in non-engagement of said nearest pin on said elongated bar with the end of said middle arm of said three-armed member and thus non-indexing of said gear, and wherein control means are provided for selectively sliding said plate member between said two positions.

14. A slide projector as recited in claim 13 wherein a second generally E-shaped, three-armed member identical to said first-mentioned three-armed member is pivotably mounted on said plate member with its arms extending toward the arms of said first-mentioned member, wherein said plate member is selectively slidable by said control means to a third position wherein outward movement of said slide carrier results in engagement of said spaced pins on said elongated bar with the arms of said second three-armed member whereby to index said gear in the opposite direction.

15. A slide projector comprising, a housing having a slide-tray-receiving groove extending along one side thereof, a slide-tray-indexing mechanism in said housing, a slide viewing aperture in said housing, a slide carrier reciprocal transversely of said groove for transferring slides between a slide tray positioned in said groove and said viewing aperture, first means carried on said slide carrier and operable after an initial outward movement thereof for engaging and returning a slide positioned adjacent said viewing aperture to a slide tray disposed in said groove at at rate of movement greater than the corresponding rate of outward movement of said slide carrier, said first means being adapted to be disengaged from the slide simultaneously with the slide reaching its storage position in the slide tray whereby to permit additional, unrestricted outward movement of said slide carrier, and second means carried on said slide carrier and adapted to actuate said slide-tray-indexing mechanism during said additional outward movement of said slide carrier.

16. In a slide projector having a slide-tray-receiving groove along one side thereof, a viewing aperture in the projector, and a reciprocal slide carrier for transferring slides between a tray positioned in the groove and the viewing aperture, apparatus adapted to be actuated by elements mounted on the slide carrier for indexing the slide tray either forwardly or rearwardly of the projector, said apparatus comprising, an indexing gear carried on the projector and extending into the groove for engagement with a rack formed on a slide tray positioned in the groove, a plate member slidably mounted for movement between front and rear positions relative to said gear, means for shifting said plate member between said front and rear positions, a pair of multi-armed members pivotably mounted on said plate member and each being adapted for engagement with said gear for indexing the same, said multi-armed members being selectively engageable by said elements mounted on the slide carrier during a portion of its outward movement depending upon the position of said plate member whereby pivoting movement of one of the multi-armed members rotates said gear in one direction to index the tray forwardly and pivoting movement of the other member rotates said gear in the opposite direction to index the tray rearwardly, inward movement of the slide carrier being effective to return the selected multi-armed member to its initial position, and a cam arm associated with each of said multi-armed members and being operable to return said selected member to its initial position upon operation of said plate shifting means prior to inward movement of the slide carrier to insure non-jamming of the slide carrier with said multi-armed members upon inward movement thereof, said cam arms being inoperative when said plate shifting means is operated after the slide carrier has been moved inwardly.

17. A slide projector comprising, a casing having an open-top groove extending alongside thereof and adapted to receive a slide tray, a vertically extending slide aperture formed in the inner wall of said groove intermediate the forward and rear ends thereof, a viewing aperture aligned with said slide aperture and the optical axis of the projector, a slide carrier having a portion thereof reciprocal in said slide aperture for moving a slide from a slide tray positioned in the groove to a position adjacent said viewing aperture and for returning the slide to the tray, said carrier comprising an elongated bar member disposed below the bottom surface of said groove, a pusher arm disposed above one end of said bar member and movable through said groove for transfering a slide from the slide tray to said viewing aperture, and a flipper arm carried by upstanding means on said bar member at the end thereof opposite said pusher arm and engageable with a slide for returning same to the slide tray, and means operable during a portion of the return movement of said slide carrier for pivoting said flipper arm in a direction to return the slide to the tray whereby the slide is returned at a faster rate of movement than the corresponding return rate of movement of said slide carrier, said pusher arm being disposed wholly outside of said groove when said carrier is in its outermost position whereby a slide tray may readily be lifted out of or set down into said groove with any particular slide aligned with said vertical slide aperture.

18. A slide projector as recited in claim 17 having a shutter movably mounted on the inner end of said slide carrier, said shutter being automatically positioned to block light from a viewing screen during the movement of slides between the tray and said viewing aperture in the projector.

19. A slide projector as recited in claim 17 having a slide-tray indexing mechanism comprising an indexing gear extending into said groove and adapted for engagement with either a horizontal rack formed on the bottom of a slide tray or a vertical rack formed on the side of a slide tray.

20. A slide projector as recited in claim 17 having a slide-tray indexing mechanism comprising a slide-tray indexing gear, a pair of pivotably mounted members for indexing said gear, and a pair of members secured on

said bar member of said slide carrier for actuating one of said pivotably mounted members during a portion of the slide return movement of said slide carrier.

21. A slide projector as recited in claim 20 having means for selectively positioning each one of said pair of pivotably mounted members for actuation by said pair of members on said bar member upon a slide return movement of said slide carrier whereby actuation of one of said pivotably mounted members results in forward indexing of the slide tray and actuation of the other one results in rearward indexing of the slide tray.

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