

PATENT SPECIFICATION

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(54) SLIDE PROJECTOR

(71) We, FRANKE & HEIDECKE G.M.B.H., a German Body Corporate, trading as Rollei-Werke Franke & Heidecke, of 196 Salzdahlumerstrasse, Braunschweig, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a slide projector with means for holding a stack of slides below a projection axis and with a gripping device by which a slide from the stack is conveyed upwards to the projection axis. After being projected onto a screen the slide is returned via a chute and by gravity to the rear end of the stack of slides.

The purpose of these types of projector is to ensure uninterrupted projection of slides from a stack.

In a known apparatus of this kind a gripping device is provided which rocks up and down in the zone of the foremost slide plane and of which the stroke exactly corresponds to the height of the slide. A slide gate guide is provided with two guide bars of which the lower one is extended towards the bottom to form a guide track and terminates in the form of a curved piece on a slide stack container. The latter is positioned radially in respect of the curved piece. The front of the slide stack container, which rests in the guide curve when in the operating state, is provided with an aperture giving passage to a gripping device, so that the latter can grip the lower edge of the foremost slide and move the said slide upwards into the slide gate guide, in which process the row of slides so formed is protected from being lifted out of the guide track by means of suitable springs. The particular slides which are situated above the magazine in the guide track in each case are moved upwards by a distance corresponding to the height of the next slide, and this system, in the case of slides with round corners or of different thicknesses, may lead to incorrect operations.

After the projection of all the slides situated in the slide stack container, three so-called "test slides" will be left in the guide track, and the slide stack container can be extracted from the projector. When further slides are projected the screen will show these so-called "test slides", which cause an unnecessary delay to the commencement of the projection of the actual slides themselves. With this known type of projector, moreover, each of the slides situated in the container has to appear at least once in the path of the projection beam to ensure that the slides are deposited in the container correctly. If the projection is interrupted and the slide stack container extracted before one complete circuit of the slides, the three "test slides" remain in the container and three slides intended for actual projection remain in the guide track of the projector and thus cannot be extracted. Steps always have to be taken, therefore, to ensure that the slides complete at least one circuit. It is not possible to interrupt the projection and extract the container and insert a new stack without getting the slides completely out of order.

According to the present invention there is provided a photographic slide projector comprising means forming an optical projection axis, means for holding a stack of slides in a position beneath said axis, a gate assembly for holding a slide in a projection position aligned with said axis and in a projection plane perpendicular to said axis so that an image of such slide may be projected along said axis, a gripping device for gripping a first slide at one end of said stack and moving such first slide upwardly toward said gate assembly, and means for moving said gate assembly downwardly from said projection position to a loading position above said first slide in order to receive said first slide when it is raised by said gripping device, said gate assembly comprising a slide gate guide and a clamp movable toward each other to clamp a slide therebetween and movable away from each other to release the clamped slide, said gate

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assembly having an inlet at its lower edge shaped to receive said first slide when raised by said gripping device and to obstruct upward movement of a second slide which may tend to move upwardly with the first slide on account of frictional engagement with it.

Preferably the lower edge of the clamp is bent away from the slide gate guide to form said inlet.

In a preferred embodiment, the projector includes means for moving said gate assembly upwardly from the projection position to an ejection position over a return chute.

This pivoting of the slide gate guide in the direction of the return chute, brought about by the upward movement of the said slide gate guide beyond the projection position, offers the advantage that no additional drive mechanism is required for the return transport of the slide which has just been projected.

Advantageously, the clamp is pivotally mounted at its upper end to the slide gate guide and carries a stop lug for engagement with a fixed stop as the gate assembly is moved into the ejection position, whereby the clamp is moved away from the slide gate guide against the force of a spring. The clamp is moved away from the slide gate guide in the ejection position in order to release the slide after the projection. After the clamp has been lifted the slide can move back into the slide stack container, over the chute and by the aid of gravity.

In order to provide one single drive for the entire slide changing operation, the gripping device may be mounted on a first rocker arm, the slide gate guide is mounted on a second rocker arm, the rocker arms are pivotable about a common axis and have a spring connected therebetween, and means are provided for rocking said first rocker arm. To achieve this, a reciprocating driving element may act approximately in the centre of the first rocker arm carrying the gripping device.

According to a further advantageous development of the invention, the slide ejection process described above can be effected manually, by means of a press button adjacent to the fixed stop, above the stop lug.

In a preferred development of the invention there is provided a further return chute associated with means for holding a further stack of slides, and means whereby a clamped slide is able to be selectively ejected into one or other return chute.

This may be achieved in that the stop lug on the clamp engages a fixed stop, the position of which can be varied selectively according to which stack of slides the slide is to be returned. Thus a number of fixed

stops may be provided, each movable selectively into or out of the path of the clamp stop lug.

Thus, if a stop situated lower down has been moved out of the path, the stop lug of the clamp will eventually make impact on a stop situated higher up, i.e. the slide gate guide is pivoted in the direction of the return chute at a later stage and in a higher position.

The different slide gate guide pivoting ranges described above can be advantageously used for the purpose of providing, above the return chute, a supplementary second return chute, largely parallel to the first and serving to return the slides to a large slide stack container. The slide projector can thus accommodate as many slide stack containers of different sizes as there are return chutes. For the further automation of the slide projector accommodating different slide stack container sizes, coupling devices can be provided which, in accordance with the length of the slide stack container, appropriately control the insertable stops for the stop lug of the clamp.

In order to ensure that in the loading position the slide gate guide will not be drawn, by the elastic connection between the rocker of the slide gate guide and the rocker of the gripping device, onto the slides which are loose in the slide stack container, the second rocker arm carries a stop lug for engagement with a fixed stop in the loading position to enable relative movement between the first and second rocker arms against the force of said spring therebetween.

In a further version of the invention, over-expansion of the spring between the rocker arm of the gripping device and that of the slide gate guide i.e. the first and second rocker arms, is prevented by a stop lug provided on the rocker of the gripping device in such a way that it does not encounter the same stationary stop as that provided for the rocker of the slide gate guide until the edge of the gripping device has been pivoted into position underneath the first slide.

An embodiment of the invention will now be described, purely by way of example, with reference to the accompanying drawings which show in perspective:—

Fig. 1: A slide projector in the projection position.

Fig. 2: A slide projector with a slide gate guide in the ejection position.

Fig. 3: A slide projector with a slide gate guide in the charging position, the gripping device having been pivoted into position underneath the first slide.

Figure 1 shows the slide transport mechanism and the illumination device. A

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slide 1 is situated in the path 2 of the projection beam and is held and guided by a slide gate guide 3 and a clamp 4. A spring 5 is situated between the slide gate guide 3 and the clamp 4 and prevents the slide 1 from falling out as a result of gravity. The slide gate guide 3 is U-shaped, the side faces being at a right angle to the plane of the slide. At the other end of the guide, on the side faces is a horizontal shaft 6 firmly attached to a rocker arm 8. The horizontal shaft 6 is the fulcrum and bearing point for the slide gate guide 3 and the clamp 4. It also bears a spring 7 one end of which rests against a pin on the rocker arm 8 and the other end rests against a pin 9 mounted on the slide gate guide 3. The pin 9 limits the rotatability of the said slide gate guide 3.

One of the side bars bent at an angle and serving as a support of the clamp 4 on the horizontal shaft 6 has an extension forming a stop lug 10 which in the projection position shown in Figure 1, lies against or closely adjacent a stationary stop 11. In addition to the rocker arm 8, mounted on a fulcrum 12, a rocker arm 13 with a gripping device 14 bent at an angle is mounted on the same fulcrum. The gripping device 14 is so constructed that when the slide 1 is in the projection position it engages the bottom of the said slide 1 by the edge 15 of the gripping device. The gripping rocker 13 and the rocker 8 are resiliently interconnected by a spring 16 (Fig. 2 and 3). When the rocker arm 8 and the rocker arm 13 of the gripping device are in the projection position shown in Figure 1 a removable and replaceable slide stack container 17 is situated underneath the image gate guide 3 and the gripping device 14. The slide stack container 17 contains the loose slides 18 obliquely stacked together.

When the slide 1 is in the projection position, shown in Figure 1, the path of the projection beam is guided, from a light source 19 via a reflector 20, a condenser 21, the slide 1 and a lens system 22 onto the projection surface 32. In this projection position the stop lug 10 of the clamp 4 is situated against or closely adjacent the stationary stop 11. The item marked 33 is a manually operable push button which can act by its push rod on the stop lug 10 in order to eject a slide.

Figure 2 shows the slide gate guide 3 in the ejection position. Underneath the slide gate guide 3, as viewed in the direction of the pivoting movement, a return chute 23 is provided, in such a way as to accommodate, in the manner of a funnel, the slides which fall out as a result of gravity when the slide gate guide 3 is pivoted and the clamp 4 opened, the slides then being conveyed to the end of the slide stack container 17 by

means of the converging end 24 of the said chute.

The rocker arm 13 of the gripping device is coupled to a thrust rod 25 connected with a crank 26. On the rotation of the crank 26 the gripping rocker 13 performs a reciprocal movement. The driving system of the crank 26 and the thrust rod 25 is dimensioned to ensure that the edge 15 of the gripping device 14 can extend far enough to engage the lower edge of the first slide in the slide stack container 17 (Fig. 3). A cam disc can also be used, in place of the thrust rod 25 and the crank 26, for the drive of the gripping rocker 13.

Figure 3 shows the loading position of the slide projector. The gripping rocker 13, together with the gripping device 14, has been pivoted into position underneath the first slide in the slide stack container 17. In order that the slide gate guide 3, when in the loading position, will not be drawn onto the slides loose in the slide stack container 17 by the spring 16 situated between the rocker arm 8 and the gripping rocker 13, the rocker arm 8 bears a stop lug 27 which encounters a fixed stop 28. In addition, the slide gate guide 3 and the clamp 4, by the said stop 28, are provided, on each loading operation, with an exactly defined position in relation to the particular slide situated farthest to the front in the stack of slides 18.

The method of operation of the slide projector will be described below:

In the projection position the rocker arm 8 and the gripping rocker 13 are largely parallel to each other and frictionally connected. The slide 1 is held and guided in the projection beam 2 by the gripping edge 15 of the gripping device 14, the slide gate guide 3 and, by the aid of the spring 5, by the clamp 4. The projection beam 2 passes from the lamp 19 via the reflector 20 through the condenser 21, the slide 1 and the lens system 22 onto a projection surface 32. The exact positioning of the slide gate guide 3 in the projection beam 2 is effected with the crank 26.

For the operation of changing the slides the crank 26 is moved in the direction shown by the arrow, so that the gripping rocker 13, and the rocker arm 8 together with the horizontal shaft 6 and the slide gate guide 3 mounted on it and the clamp 4, are moved upwards. In this upward movement of the rocker arm 8 and the gripping rocker 13 the stop lug 10 is forced against the fixed stop 11. The clamp 4, together with the slide gate guide 3, is thus pivoted in opposition to the force of the spring 7 (Fig. 2) to a sufficient distance to ensure that the pin 9 on the slide gate guide 3 comes to rest against a slit stop 29 situated on the rocker arm 8. In this position the slide 1, which is

now only held by the slide gate guide 3 and the clamp 4, is situated exactly above the return chute 23.

On a further rotation of the crank 26 and thus an upward movement of the rocker arm 8 and the gripping rocker 13, the clamp 4 is moved away from the slide 1, in opposition to the force of the spring 5, by means of the fixed stop 11 and stop lug 10. The slide gate guide 3 cannot rotate any further, since it is prevented from doing so by the pin 9 and the slit stop 29. The slide 1 moves out of the slide gate guide 3 into the return chute 23, under the force of gravity, and drops into the slide stack container 17.

After the crank 26 has passed its upper dead centre the rocker arms move downwards, together with the horizontal shaft 6, in the direction shown by the arrow B. This process is accompanied by the reverse of the operation taking place in the aforementioned upward movement in the direction shown by the arrow A. The clamp 4 is drawn against the slide gate guide 3, by the force of the spring 5, the stop lug 10 of the clamp 4 then moving along the fixed stop 11.

On a further downward movement in the direction shown by the arrow B the slide gate guide 3 likewise will be pivoted about the horizontal shaft 6, by the aid of the force of the soft spring 7, until its pin 9 encounters the other end of the slit stop 29 of the rocker arm 8. The slide changing mechanism is now in the projection position. Since, however, no slide is present in the slide gate guide 3, the crank 26 moves through this position without being held up, until the stop lug 27 of the rocker arm 8 makes impact against the stop 28. This stop 28 is provided in order to ensure that the slide gate guide, when in the loading position, will not be drawn onto the slides 18 loose in the slide stack container 17, by the spring between the rocker arm 8 and the gripping rocker 13. The U-shaped branches of the slide gate guide 3 and the lower edge of the clamp 4 bent at an angle, will be situated, in the said position, exactly above the first slide in the container 17. On a further rotation of the crank 26 in the direction shown by the arrow C the gripping rocker 13 and the gripping device will be moved downwards past the first slide, in the direction shown by the arrow B and in opposition to the force of the spring 16. In this process the edge 15 of the gripping device (Fig. 1) moves over the face of the first slide and slightly raises the slides 18 in the container 17, in opposition to the force of gravity. After the edge 15 of the gripping device has moved into position underneath the lower edge of the first slide, the slides 18 return to the position determined by the

slide stack container 17.

After the crank 26 has passed through the lower dead centre the gripping rocker 13 and the gripping device move in the direction shown by the arrow A, and the said gripping device, by its edge 15, grips the particular slide which is situated farthest down in the slide stack container 17.

During this process the rocker arm 8 and its stop lug 27 continue to be pressed against the stop 28 by the force of the spring 16, i.e. the slide gate guide 3 and the clamp 4 remain in the position previously described, even while the first slide is being inserted by the gripping device 14. The first slide forces itself between the clamp 4 and the slide gate guide 3. A bent-up lower edge of the clamp 4 prevents the second slide, situated behind the first, from moving up together with the latter as a result of the friction between them. The force of the spring 5 and the considerable angle given to the inlet of the clamp 4 are co-ordinated with each other in such a way that the adhesive friction between the first and the second slide can never become great enough for the torque occurring about the horizontal shaft 6, and consisting of the normal force of the second slide, pressing on the bent end of the clamp 4, to become greater than the torque which takes the opposite direction and which consists of the force of the spring 5. The angle of the inlet of the clamp 4 ensures, according to the particular type of slide used, that the second slide will not move together with the first into the slide gate guide 3 underneath the clamp 4.

The gripping device 14 pushes the first slide into the slide gate guide 3 to a sufficient distance to ensure that the gripping rocker 13 will make impact on the securing and stop pin 30 of the rocker arm 8. The slide thus occupies the correct position in the gate guide.

In a further upward movement of the gripping rocker 13 in the direction shown by the arrow A the rocker arm 8 is pivoted upwards with it, being frictionally connected therewith via the holding and stop pin 30, the spring 16 still being stressed. While the gripping device 14 is being pivoted upwards together with the slide gate guide 3 and the clamp 4 the slides 18 present in the slide stack container 17 move downwards, as a result of gravity. The pivoting movement is continued until the stop lug 10 has reached or nearly reached the fixed stop 11, the slide which has just been extracted from the slide stack container 17 thus having been moved into the projection position (Fig. 1).

The drive of the crank 26 and the stop 11 are interconnected by electrical or mechanical coupling devices in such a way that the slide changing mechanism remains

in this position until the signal has been given for the slide changing operation. Furthermore, by a further electrical or mechanical switch, a signal can be given to stop the drive of the crank 26 after the upper dead centre of the crank has been passed, i.e. after a slide has been ejected into the return chute 23. This makes it possible to terminate the projection process after any slide desired and to extract the slide stack container 17 from the apparatus immediately, without any further manual operations.

In an advantageous further development of the invention, supplementary return chutes are provided above the return chute described in the foregoing, with which they are largely parallel, serving to return the slides to slide stack containers of different sizes. This makes it possible to use containers of different sizes, i.e. to deal with different numbers of slides in the slide projector. For this purpose, the slide gate guide 3 must be able to be pivoted to a higher position, according to the particular slide stack container used, i.e. over a further return chute situated higher up (for a large slide stack container) or a return chute situated lower down (for a small container), the stop 11 being engageable in a position according to the position of the appropriate return chute. It is also advisable, for the further automation of this development of the invention, to provide mechanical or electrical coupling devices which, according to the length of the particular containers used, appropriately control the insertion of a stop into the path of the stop lug 10 of the clamp 4. This ensures that on the insertion of the slide stack containers of different sizes the correct stop in each case will be moved into the path of the stop lug 10.

A particular advantage of the invention resides in the fact that the slide stack container 17 can be removed after the projection of any desired slide, without any additional sorting operations and with the slides situated in the correct order.

WHAT WE CLAIM IS:—

1. A photographic slide projector comprising means forming an optical projection axis, means for holding a stack of slides in a position beneath said axis, a gate assembly for holding a slide in a projection position aligned with said axis and in a projection plane perpendicular to said axis so that an image of such slide may be projected along said axis, a gripping device for gripping a first slide at one end of said stack and moving such first slide upwardly toward said gate assembly, and means for moving said gate assembly downwardly from said projection position to a loading

position above said first slide in order to receive said first slide when it is raised by said gripping device, said gate assembly comprising a slide gate guide and a clamp movable toward each other to clamp a slide therebetween and movable away from each other to release the clamped slide, said gate assembly having an inlet at its lower edge shaped to receive said first slide when raised by said gripping device and to obstruct upward movement of a second slide which may tend to move upwardly with the first slide on account of frictional engagement with it.

2. A photographic slide projector as claimed in claim 1 wherein the lower edge of the clamp is bent away from the slide gate guide to form said inlet.

3. A photographic slide projector as claimed in claim 1 or 2 including means for moving said gate assembly upwardly from the projection position to an ejection position over a return chute.

4. A photographic slide projector as claimed in claim 3 wherein the clamp is pivotally mounted at its upper end to the slide gate guide and carries a stop lug for engagement with a fixed stop as the gate assembly is moved into the ejection position, whereby the clamp is moved away from the slide gate guide against the force of a spring.

5. A photographic slide projector as claimed in claim 4 including a manually operable push button acting on said stop lug for moving the clamp away from the slide gate guide in the ejection position.

6. A photographic slide projector as claimed in any one of claims 3 to 5 wherein there is provided a further return chute associated with means for holding a further stack of slides, and means whereby a clamped slide is able to be selectively ejected into one or other return chute.

7. A photographic slide projector as claimed in any preceding claim, wherein the gripping device is mounted on a first rocker arm, the slide gate guide is mounted on a second rocker arm, the rocker arms are pivotable about a common axis and have a spring connected therebetween, and means are provided for rocking said first rocker arm.

8. A photographic slide projector as claimed in claim 7 wherein the second rocker arm carries a stop lug for engagement with a fixed stop in the loading position to enable relative movement between the first and second rocker arms against the force of said spring therebetween.

9. A photographic slide projector as claimed in claim 1 substantially as herein described with reference to and as shown in the accompanying drawings.

in this position until the signal has been given for the slide changing operation. Furthermore, by a further electrical or mechanical switch, a signal can be given to stop the drive of the crank 26 after the upper dead centre of the crank has been passed, i.e. after a slide has been ejected into the return chute 23. This makes it possible to terminate the projection process after any slide desired and to extract the slide stack container 17 from the apparatus immediately, without any further manual operations.

In an advantageous further development of the invention, supplementary return chutes are provided above the return chute described in the foregoing, with which they are largely parallel, serving to return the slides to slide stack containers of different sizes. This makes it possible to use containers of different sizes, i.e. to deal with different numbers of slides in the slide projector. For this purpose, the slide gate guide 3 must be able to be pivoted to a higher position, according to the particular slide stack container used, i.e. over a further return chute situated higher up (for a large slide stack container) or a return chute situated lower down (for a small container), the stop 11 being engageable in a position according to the position of the appropriate return chute. It is also advisable, for the further automation of this development of the invention, to provide mechanical or electrical coupling devices which, according to the length of the particular containers used, appropriately control the insertion of a stop into the path of the stop lug 10 of the clamp 4. This ensures that on the insertion of the slide stack containers of different sizes the correct stop in each case will be moved into the path of the stop lug 10.

A particular advantage of the invention resides in the fact that the slide stack container 17 can be removed after the projection of any desired slide, without any additional sorting operations and with the slides situated in the correct order.

WHAT WE CLAIM IS:—

1. A photographic slide projector comprising means forming an optical projection axis, means for holding a stack of slides in a position beneath said axis, a gate assembly for holding a slide in a projection position aligned with said axis and in a projection plane perpendicular to said axis so that an image of such slide may be projected along said axis, a gripping device for gripping a first slide at one end of said stack and moving such first slide upwardly toward said gate assembly, and means for moving said gate assembly downwardly from said projection position to a loading

position above said first slide in order to receive said first slide when it is raised by said gripping device, said gate assembly comprising a slide gate guide and a clamp movable toward each other to clamp a slide therebetween and movable away from each other to release the clamped slide, said gate assembly having an inlet at its lower edge shaped to receive said first slide when raised by said gripping device and to obstruct upward movement of a second slide which may tend to move upwardly with the first slide on account of frictional engagement with it.

2. A photographic slide projector as claimed in claim 1 wherein the lower edge of the clamp is bent away from the slide gate guide to form said inlet.

3. A photographic slide projector as claimed in claim 1 or 2 including means for moving said gate assembly upwardly from the projection position to an ejection position over a return chute.

4. A photographic slide projector as claimed in claim 3 wherein the clamp is pivotally mounted at its upper end to the slide gate guide and carries a stop lug for engagement with a fixed stop as the gate assembly is moved into the ejection position, whereby the clamp is moved away from the slide gate guide against the force of a spring.

5. A photographic slide projector as claimed in claim 4 including a manually operable push button acting on said stop lug for moving the clamp away from the slide gate guide in the ejection position.

6. A photographic slide projector as claimed in any one of claims 3 to 5 wherein there is provided a further return chute associated with means for holding a further stack of slides, and means whereby a clamped slide is able to be selectively ejected into one or other return chute.

7. A photographic slide projector as claimed in any preceding claim, wherein the gripping device is mounted on a first rocker arm, the slide gate guide is mounted on a second rocker arm, the rocker arms are pivotable about a common axis and have a spring connected therebetween, and means are provided for rocking said first rocker arm.

8. A photographic slide projector as claimed in claim 7 wherein the second rocker arm carries a stop lug for engagement with a fixed stop in the loading position to enable relative movement between the first and second rocker arms against the force of said spring therebetween.

9. A photographic slide projector as claimed in claim 1 substantially as herein described with reference to and as shown in the accompanying drawings.



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