

PATENT SPECIFICATION

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- (21) Application No. 44434/73 (22) Filed 21 Sept. 1973 (19)
 (31) Convention Application No. 2 251 757
 (32) Filed 21 Oct. 1972 in
 (33) Germany (DT)
 (44) Complete Specification published 4 Feb. 1976
 (51) INT. CL.³ G03B 3/10 3/02
 (52) Index at acceptance
 G2J 41L1 41P



(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:—

10 The present invention relates to a slide projector, preferably of the magazine type, with automatic focusing.

In a known magazine-type slide projector, automatic focusing is achieved by a measuring device by means of which a light ray is directed onto the image carrier and reflected to two photo-electric cells (a differential photo-electric cell). Any displacement in the image carrier, which may be caused, for example, by buckling of the slide, causes one photo-electric cell to be illuminated more intensely than the other. A drive is thus actuated by which the objective lens is moved in such a way that this displacement is compensated and sharp focusing is obtained. A lens element forming part of the measuring device moves together with the objective lens and restores the measuring system to equilibrium, so that it ceases to operate as soon as the sharp focusing has been effected.

In these known devices the focusing must be carried out first, by displacing the objective lens in relation to the measuring device either manually or mechanically and after focusing the objective lens and the measuring devices must be interconnected. The known automatic focusing systems could be more accurately described as systems by means of which a preselected distance between the image carrier and the objective lens is maintained. These devices only compensate for a displacement of the image carrier, but do not allow of any compensation when, for instance, the image becomes blurred as a result of a displacement of the screen. In this case the distance between objective and automatic focusing device has had to be altered by hand in order to obtain a satisfactorily defined image.

50 According to the present invention there

is provided a slide projector comprising: a slide support positioned in the projector light path; an objective lens fixed in a lens carrier movable along the light path for focusing an image of a slide onto a screen; a device releasably coupled to the lens carrier for detecting changes in a preselected slide/objective lens distance, comprising a light source for directing light onto one surface of a slide in said support and a differential photo-electric cell receiving said light reflected from said surface; means for moving said lens carrier and said device together, in response to changes in said distance detected by said device to compensate therefor; and remotely controllable means for disconnecting said lens carrier from said device to enable said lens carrier to be moved independently of said device for preselecting said distance.

Preferably, the remotely controllable means includes an electromagnetic clutch. The electromagnetic clutch may be connected in series with a motor for moving the objective lens carrier, a source of electrical power and a remotely operable switch.

In an advantageous arrangement, one component of said electromagnetic clutch is carried on a first part of a two part support member coupled to the lens carrier while the other component of said electromagnetic clutch is carried on a lever forming the other part of said support member, which lever is pivoted to said first support member part, in frictional engagement with said device, and movable out of frictional engagement with said device upon operation of said electromagnetic clutch. In this case preferably said lever is spring biased into frictional engagement with the groove of a non-rotatable grooved pulley carried on said device.

To enable the objective, comprising the lens and the lens carrier to be removed and replaced, the support member may be releasably coupled to the objective.

A constructional embodiment of the invention will now be described with reference to the accompanying drawing in which the drawing shows the schematic structure of those parts of a magazine-type slide projector

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which are essential to the invention. The item marked 1 is the image carrier supported in an image frame (not shown), positioned independently of an automatic focusing carriage 2. The said focusing carriage 2 is guided, in the direction in which the image is projected, by guide elements 3 and 4, and it is equipped at the top with two photo-electric cells 5. The photo-electric cells 5 are connected with an objective focusing motor 20 via a connecting line 6. The objective focusing motor 20 drives an objective 18 comprising an objective lens and a lens carrier via a slip clutch 7, movement of the objective being transmitted to the automatic focusing slide 2 via a sliding support member 11, until the photo-electric cells 5 no longer emit any signal, i.e. until the automatic focusing ray 8 comes to rest exactly between the photo-electric cells 5.

The upper end of the automatic focusing slide 2 also bears a non-rotatable pulley 9 in the groove of which is elastically engaged a lever 10 of the sliding support member 11, by the aid of an angle spring 12. The cross section of the lever 10 is correspondingly wedge-shaped to fit the groove of the pulley 9. The wedge-shaped lever 10 is rotatably mounted on one end of the sliding support member 11, together with the angle spring 12, and the said angle spring 12 rests by its ends against bent side bars 13 and 14 on the wedge-shaped lever 10 and on the sliding support member 11 respectively.

The sliding support member 11 is guided, in the direction in which the image is projected, in pin-and-slot connections 15, and it resiliently engages the objective 18 by means of a traction spring 16 and via a stop 17 provided on the said sliding support member 11. The engagement provides the transmission of the drive from the slip clutch 7, via the objective 18, to the member 11 and the slide 2. In addition, the sliding support member 11 is provided, in its centre, between the pin-and-slot connections 15, with an electromagnet 19 opposed to the wedge-shaped lever 10 and which is energized when the pole changing switch 21 is actuated and which thus lifts the wedge-shaped lever 10 out of the pulley 9, in opposition to the force of the angle spring 12.

The driving motor 20 is frictionally connected via a slip clutch 7 with the objective and via the sliding support member 11 with the automatic focusing slide 2. The forward and reverse movement of the driving motor 20 is brought about either via the pole change switch 21, which can be remotely controlled, or by the automatic focusing device 25. The current is supplied to the driving motor 20 via a D.C. source 22.

The wedge-shaped lever 10 can also be lifted out of the non-rotatable pulley 9 by hand, with the use of a press button 23. For

this purpose the wedge-shaped lever 10 is provided, on its upper side, with a sliding path 24. The magazine-type slide projector operates as described below:

After the image carrier 1, with the photographic slide, has moved into the projection place, the automatic focusing device 25 controlled by the photoelectric cells 5 automatically adjusts the objective to give a picture of the maximum possible definition on a screen, not shown. This object is achieved as a result of the fact that the automatic focusing device 25 controls the driving motor 20 via the connecting line 6. The driving motor 20 moves the automatic focusing slide 2, via the slip clutch 7, the objective 18, the sliding support member 11 with the wedge-shaped lever 10 and the non-rotatable pulley 9. Only when the photo-electric cells 5 no longer emit any signal to the automatic focusing device 25 will the driving motor 20 come to a stop, and the final focusing can be effected remotely by means of the pole change switch 21.

In most cases, however, it is only with the first photographic slide that the final focusing need be carried out. This once-only final focusing operation is effected by a process in which, via the pole change switch 21, the electro-magnet 19 is energized, the wedge-shaped lever 10 thus being lifted out of the pulley 9, in opposition to the force of the angle spring 12. The connection between the automatic focusing slide 2 and the objective 18 is thus interrupted. By the aid of the slip clutch 7 the objective 18 can now be displaced forwards or backwards, as the case may be, in accordance with the desired adjusting direction, until the projected picture is finally seen to be in focus on the screen. In this process the traction spring 16, acting via the stop 17, maintains the connection between the sliding support member 11 and the objective 18. When the pole change switch 21 is opened, the driving motor 20 is no longer receiving any current, and the wedge-shaped lever 10 drops away from the electro-magnet 19 and is pressed against the non-rotatable pulley 9 by or through the force of the angle spring 12, which acts on the side bars 13 and 14. The connection between the objective 18 and the automatic focusing slide 2 is thus restored, so that the next photographic slide, by the aid of the image carrier 1, can be moved into the image frame, not shown in the drawing.

With the next photographic slide the automatic focusing slide 2, automatically moves, together with the objective 18 and by the aid of the automatic focusing device 25, into the position most favourable for the image to be projected.

If the focusing of the first photographic slide is effected by hand the press button 23 is pressed onto the sliding path 24 of the

wedge-shaped lever 10, as the result of which the said lever moves out of the non-rotatable pulley 9 of the automatic focusing slide 2. The objective 18 can now be moved by hand until the projected picture is finally focused. The angle spring 12 then once again presses the wedge-shaped lever 10 against the pulley 9, via the side bars 13 and 14, and the press button 23 moves away from the slide path 24.

WHAT WE CLAIM IS:—

1. A slide projector comprising: a slide support positioned in the projector light path; an objective lens fixed in a lens carrier movable along the light path for focusing an image of a slide onto a screen; a device releasably coupled to the lens carrier for detecting changes in a preselected slide/objective lens distance, comprising a light source for directing light onto one surface of a slide in said support and a differential photo-electric cell receiving said light reflected from said surface; means for moving said lens carrier and said device together, in response to changes in said distance detected by said device to compensate therefor; and remotely controllable means for disconnecting said lens carrier from said device to enable said lens carrier to be moved independently of said device for preselecting said distance.

2. A slide projector as claimed in claim 1, wherein said remotely controllable means includes an electromagnetic clutch.

3. A slide projector as claimed in claim 2, wherein the electromagnetic clutch is con-

nected in series with a motor for moving the lens carrier, a source of electrical power and a remotely operable switch.

4. A slide projector as claimed in claim 2 or 3, wherein one component of said electromagnetic clutch is carried on a first part of a two part support member coupled to the lens carrier while the other component of said electromagnetic clutch is carried on a lever forming the other part of the support member, which lever is pivoted to said first support member part, in frictional engagement with said device, and movable out of frictional engagement with said device upon operation of said electromagnetic clutch.

5. A slide projector as claimed in claim 4, wherein said lever is spring biased into frictional engagement with the groove of a non-rotatable grooved pulley carried on said device.

6. A slide projector as claimed in claim 4 or 5, wherein said support member first part is releasably coupled to the lens carrier to enable the latter to be removed and replaced.

7. A slide projector substantially as herein described with reference to and as illustrated in the accompanying drawings.

For the Applicants,
MATTHEWS, HADDAN & CO.,
Chartered Patent Agents,
Haddan House,
33, Elmfield Road,
Bromley, Kent, BR1 1SU.

(11)

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