

PATENT SPECIFICATION

(11) 1 532 689

- 1 532 689 (21) Application No. 24031/76 (22) Filed 10 June 1976
(31) Convention Application No. 2 542 484 (32) Filed 24 Sept. 1975 in
(33) Fed. Rep. of Germany (DE)
(44) Complete Specification published 22 Nov. 1978
(51) INT. CL.² G03B 23/04 // 23/16
(52) Index at acceptance
G2J 41H 41L2B



(54) OPTICAL PROJECTOR

- (71) We, FRANKE & HEIDECKE G.m.b.H., a German Body Corporate, trading as Rollei-Werke Franke & Heidecke, of 196 Salzdahlumer Strasse, 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 double slide optical projector, consisting of two projection devices, which are combined in one unit, and an indexing device for the alternating projection of slides, which are taken in continuous succession from a magazine common to both projection devices and which are re-arranged in the correct order after the projection, consecutive slides being temporarily simultaneously disposed in the projection gates of the two projection devices.
- 15 One of the problems arising when slides are serially projected by double slide projectors, in which slides for both projection gates are taken from a common magazine and are returned to the magazine in the correct sequence after the projection, is that the magazine has to be moved in an exact pattern of forward and reverse movements, in so-called 'pilgrim steps'.
- 20 From British Patent Specification No. 1 437 468 there is known a double slide projector where the slides for two existing projection gates are taken from a magazine in one changer plane and are returned thereto as soon as they have been projected. Such a magazine has to perform two forward steps and one backward step for each slide changing cycle. To make this possible, there are provided specially designed levers, guides, springs and cam discs, which cope with the co-ordinated and interdependent control functions. The sequence of the magazine indexing steps is dependent, on the one hand, 45 on the lever-driven movements of the projec-

tion gates, which are alternately moved in the direction of the optical axes, and, on the other hand, on the claw feed systems acting perpendicularly to the optical axes.

The object of the invention is to provide a 50 double slide projector of the kind referred to at the beginning, including a reciprocal drive of the slide magazine, which drive is completely independent of both controlling axial movements of the projection devices and the 55 claw movements occurring in the direction that is vertical to the moving direction of the magazine, so that the magazine drive can be universally used, both in the described known projectors and in double slide projec- 60 tors in which an axial movement of the projection gates is not provided for.

According to the invention there is provided a double slide optical projector, consisting of two projection devices, which are 65 combined in one unit, and an indexing device for the alternating projection of slides, which are taken in continuous succession from a magazine common to both projection devices and which are re-arranged in the correct order after the projection, consecutive 70 slides being temporarily simultaneously disposed in the projection gates of the two projection devices, characterised by two indexing gear which rotate in opposite senses 75 about a common axis during each slide change and which perform a full or a partial rotation and which carry a number of trip pins, which are disposed one behind the other in the direction of rotation, the number 80 corresponding to the desired magazine steps effected in one direction of movement of the magazine and being distributed on the entire or partial circumference of the indexing gears, and by at least one magazine pinion, 85 for meshing with a tooth row arranged on the magazine and which is drivable via an indexing cross, which co-operates with the trip pins and which is rotatable about a fixed axis, the arrangement of the trip pins on the indexing 90

gears, the indexing step of the indexing cross and the magazine pinion being co-ordinated so that, during a complete or partial rotation of the indexing gears, the magazine can be moved by the one indexing gear by the desired indexing steps in one direction and subsequently by the other indexing gear by the desired indexing steps in the opposite direction.

Such a gearing arrangement has the special advantage over lever and cam operated gears of the kind mentioned at the beginning that it works almost noiselessly, since a positive and frictional movement cycle, interengaging only via toothed gears, is ensured for each individual magazine step, ranging from a motor drive to the direct drive of the magazine. The formation of the individual magazine steps themselves results from partial rotations of the indexing gears, each partial rotation being started for each indexing cycle by actuation of an electric switching contact. In this manner, the indexing forces required for the magazine steps for each slide compartment are available at the beginning of each indexing cycle (slide change) in the indexing gears rotating in opposite senses and always become active at exactly the same point in time. A special feature of the noiselessness of the gearing arrangement thus achieved consists in that the actual indexing cycles, such as the positive entry of the trip pins into the indexing cross, also represent a virtually silent, wear-resistant rolling of the functional parts on one another.

The performance of the pattern of forward and reverse magazine steps (pilgrim steps) in a slide double projector is dependent on the respective arrangement of the projection gates and/or the claw feed systems for the transportation of the slides to the projection gates. In a special design of such a double slide projector, where the slide change occurs in a changer plane that is common to both projection devices and preferably by using one single claw feed system, an advantageous development of the invention consists in that the first indexing gear carries a trip pin and the second indexing gear carries two trip pins, which are located one behind the other in the direction of rotation, the magazine being movable by the first indexing gear by one magazine step in the direction that is opposed to the pre-selected magazine transport direction and by the second indexing gear, rotating in the opposite sense, by two steps in the magazine transport direction. Accordingly, the magazine pilgrim steps occur by one backward step and two forward steps during each indexing cycle of the indexing gears (slide change), thus ensuring the correct sequence of withdrawing and returning the slides.

According to a further advantageous design of the invention, the trip pins of the

indexing gears are provided in two groups and are symmetrically arranged around the circumference of the indexing gears so that an indexing cycle is completed after half a rotation of the indexing gears. This results in particularly favourable operating conditions with respect to the speed of the indexing gears as well as to the circumferential speed of the trip pins arranged on the circumference of the indexing gears:— The complete indexing operations effected with half-rotations require only half the speed that is required when a single number of pins is provided, the running noises thus being reduced. Since the driving friction and the impingement of the trip pins on the walls in the indexing cross recesses also occur with a reduced intensity when the rotational speed is halved and two groups of trip pins are provided, the trip pins are subjected to considerably less wear. Of course, it is conceivable to reduce the indexing gear speeds further with a corresponding increase of the trip pin groups to, for example, three times or even four times their number; however, the drive performance of the motor and the indexing gear diameter have a particularly favourable relationship when two trip pin groups are provided.

In order to allow the direction of projection sequence determined at the beginning of a series of projections to be reversed at any time, if required, that is to say to allow a rearward projection sequence, in order to repeat individual slides or a whole group of slides, it is provided according to a particularly advantageous design of the invention that the direction of rotation of the indexing gears is reversible, the trip pins of the one indexing gear being stopped for the duration of an indexing gear cycle associated with the slide change. Consequently, these trip pins cannot cause any magazine indexing when the projecting direction is reversed, and the required sequence of the correct return of the slides into the magazine is also correctly observed when a change-over to a reverse projection is effected in the pilgrim step sequence. When such a reversal of the direction of projection occurs, the driving gears bringing about the magazine steps also remain constantly in positive engagement with one another.

This observance of the pilgrim step sequence of the magazine upon a reversal of the direction of projection sequence can be achieved in an advantageous manner, according to a further development of the invention, in that the trip pins of the one indexing gear are arranged on a compensating ring, which is movably mounted relative to this indexing gear, and in that the compensating ring can be moved along with the indexing gear by means of a pin, which is located on the indexing gear and is guided in an

arcuate slot of the compensating ring, at one of the slot ends.

Further advantageous developments of the invention, more especially for performing an interruption in the projection and for bringing about the delivery and return of the slides at the beginning and end of a series projection, emerge from the sub-claims and the description of the examples.

Hereinafter, an exemplified embodiment of the invention will be explained in greater detail with reference to the drawings, in which:—

Fig. 1 shows a top view of the magazine drive in a diagrammatical representation;

Fig. 2 shows a lateral view of the magazine drive shown in Fig. 1, partially in section;

Fig. 3 shows a partial top view, as shown in Fig. 1, with a first backward step, indicated in broken lines, and two subsequent forward steps of the magazine at the commencement of the projection;

Fig. 4 shows a partial top view, as shown in Fig. 1, with a last double forward step, indicated in broken lines, to release the magazine at the end of the projection; and

Fig. 5 is a survey in table form of the magazine movement across some cycles, with an indication of the consecutive cycles, the magazine position, the projection gate function as well as the pilgrim step directions for a normal forward projection.

If, at the commencement of a slide projection with a double slide projector, it is intended initially to take two slides in direct succession from a common magazine, and to deliver one each to one of the two projection gates, to project them one after the other, and to return these two slides, after first one and then the other slide has been projected, successively and in the correct sequence of counting into the correct magazine slide compartment, then the magazine also has to perform in continuous order in each case two forward steps and one backward step for the third slide and the following slides. This cycle of movement is known as the so-called 'pilgrim step'.

A preferred embodiment of a magazine drive for the performance of pilgrim steps is shown in a top view in Fig. 1. Since essential components are arranged one beneath the other, these are shown more clearly in a lateral view in Fig. 2.

Proceeding from an electro-motor drive 43, a pinion 36 directly drives a first intermediate gear 39, which cooperates directly with the gear rim 41 of a first indexing gear 18, causing it to rotate continuously. The pinion 36 also directly drives a reversing pinion 37, and this latter drives a second intermediate gear 40 which acts, in turn, on a gear rim 42 of a second indexing gear 19 below gear 18, which is thus made to rotate, with all the teeth number ratios agreeing, at the same

speed in the opposite sense relative to the first indexing gear 18. The indexing gears 18, 19 rotating in the opposite sense form the starting point for the performance of the pilgrim steps by the magazine 1. For the performance of a complete pilgrim step, the indexing gears 18, 19 have been modified to the effect that two sets of all the parts required for an indexing cycle are provided so that a completed indexing cycle from the start of the drive to a renewed stop only necessitates a rotation of the indexing gears 18, 19 through 180°. For simplicity's sake, only the co-operating parts of these parts which are provided in symmetrical pairs will be discussed hereinafter, but the index numerals have been added in brackets for the analogously provided identical parts.

The indexing gear 18 carries at its outer circumference two trip pins 12, 13 (12', 13'), which extend perpendicularly away from the disc surface of the gear 18 and are arranged one following the other in the direction of rotation at a short spacing. During each indexing cycle (= 1/2 rotation of the indexing gears 18, 19) these pins twice enter cross recesses 7 of an maltese cross mechanism 4, which is rotatably mounted on a shaft 6. By this means, the continuous rotational movements of the indexing gear 18 are converted, for each trip pin 12, 13 (12', 13'), that passes into exactly defined, short partial rotations amounting to a quarter rotation of the maltese cross 4. The stepwise rotations of the cross 4 are now transmitted, by means of corresponding reductions, from the driving pinion 5, which is rigidly connected to the cross 4, via the toothed gears 8, 9 and the magazine pinions 10, 11, which are firmly connected to the latter and are jointly rotatably mounted on the shafts 21, 22, to the internal tooth row 2 of the magazine 1. The reduction of the cross 4 and the teeth number of the driving pinion 5, the gears 8, 9 and the magazine pinion is such that a single indexing movement of a trip pin 12, 13 (12', 13') in the cross 4 corresponds exactly to a path from centre to centre of the slide compartment in the magazine 1. The distance of the two pins 12, 13 (12', 13') relative to one another thus corresponds to a twofold indexing step, which is performed by the magazine in the same direction. Since both trip pins 12, 13 (12', 13') pass through the cross 4 during one indexing cycle of the indexing gear 18, this means that the magazine 1 is moved on consecutively by two steps.

However, in order to obtain a complete pilgrim step, there is required a provision by means of which the magazine 1 has to perform a backward step prior to performing the described two forward steps. As shown in Fig. 2, there is arranged, for this purpose, beneath the indexing gear 18 on the same journal pin 20, and also driven via the revers-

ing pinion 37 and the intermediate gear 40, an indexing gear 19, which rotates in the opposite sense to the indexing gear 18. This indexing gear 19 is designed in two parts and consists of the gear body and a compensating ring 17, which is located in a circumferentially movable manner in a recess 44. A curved slot 16 (16') is provided midway between the internal and external edges of the compensating ring 17. A guiding pin 15 (15') located on the body of the indexing gear 19 slides in the curved slot 16 (16') and moves the compensating disc 17 circumferentially in the same direction of rotation as the indexing gear 19 by abutment with a stop 28 (28'), or a stop 29 (29'). The tasks of the stops will be described in detail hereinafter. The head 45 (45') of the guide pin 15 (15') (Fig. 2), extends beyond the slot width, while the pin 15 (15') is a loose fit in the slot 16 (16').

A single trip pin 14 (15') is located near the external edges of the compensating disc 17 at a distance relative to the trip pins 12, 13 (12', 13') of the indexing gear 18 that is appropriate and required for the performance of the backward step. Its passage through the cross 4 causes a step of the magazine 1 by one slide compartment in the opposite direction.

During the indexing cycles, an arresting lever 23, which locks the magazine 1 at each slide change, has to be unlocked by its projections 25 engaging the external tooth rack 3 of the magazine 1, in order to make possible the magazine advance. To this end, a sensing wheel 24 of the arresting lever 23 runs on the outer edge of the indexing gear 18 and keeps the arresting lever 23 swung so that the projections 25 release the magazine 1 when they are in the position shown in Fig. 1, in which they are disengaged from the external tooth rack 3. As soon as an indexing cycle of the indexing gears 18, 19 is completed, the sensing wheel 24 drops into a recess 26 (26') formed on the outer edge of the indexing gear 18. At the same moment, the projections 25 engage again in the external tooth rack 3 of the magazine 1 and lock the magazine with the appropriate compartment in front of the slide claw aperture. This safety measure prevents the magazine from being inadvertently moved when it is at a standstill, which would mean that at least the correct counting sequence of the control programme would be upset.

For the purpose of interrupting the projection process at any desired point, there is provided a key 33, which is provided at one end of a lever 35. The lever 35 is pivoted about a pivot point 34 to a bracket 30 so that in its depressed state, a stop 32 carried by the lever 35 engages the tongue 31 of the lever arm 27 and holds the arresting lever 23 with the projections 25 out of engagement with the external tooth row 3 of the magazine 1.

At the same time, another lever 46, which operates with the key 33, actuates a switch 47, which is connected via a line connection 48 to an electric switching device 49, which initiates directly all the electrical switching steps connected with the projection lamp control required when the projection is interrupted. These switching steps include the control of the immediate slide return in the correct order of counting from the two apertures I and II into the magazine 1, the indexing gears 18, 19 performing two final indexing cycles. The key 33 is pressed to interrupt a projection process and is held, in the pressed state, in its depressed position by means of a holding mechanism 55 (shown diagrammatically) in the manner of a ball-pen mechanism and is not released until renewed pressure is applied, for example after the removal of the magazine.

When a slide magazine is inserted into the magazine channel as far as a stop 50 (Fig. 3) for the purpose of a series projection (the magazine not being completely shown), at first only the first teeth of the internal tooth row 2 are seized by the magazine pinion 10 (Fig. 3). In this stop position, the slide compartment No. 1 will then be disposed by one compartment width forward of the claw aperture 52 or the changer plane, which should be imagined to be on the centre line of the extending gears 18, 19 and the cross 4. Since the stop position of a magazine is always provided at the start of a slide projection and the magazine front edge 51 is not yet in the area of the arresting cams 25, the magazine pinions 10, 11 and the toothed gears 8, 9 freely run independently of one another, so that the teeth of the magazine pinion 10 and the first teeth of the internal tooth row 2 of the magazine 1 can be very easily pushed into one another. The performance of continuous pilgrim steps during the entire magazine passage through the projector necessitates for the programme control a defined stop, which is also the starting point. This stop 50, which the magazine front edge 51 abuts at the commencement of a series projection, sets the first slide compartment with the slide No. 1 one magazine step in front of the claw aperture (designated diagrammatically by 52 in Fig. 5). Since the magazine 1 already has to be in operating connection with the indexing gears 18, 19 in this position, in order to begin the pilgrim steps immediately with a backward step when the starting key is pressed, it is necessary to provide the magazine pinions 10, 11 in two units, one directly in front of the claw aperture and a second one directly behind it. The magazine pinion 10 carries out all the pilgrim step movements immediately after the start in front of the claw aperture. On the other hand, the magazine pinion 11 on the opposite side of the claw aperture ensures

that at the end of the projection those pilgrim steps are performed completely which are necessary for returning the last slide in the correct counting order from the picture apertures to the magazine before the projection process is completed altogether. At this point in time, the magazine pinion 10 is no longer in engagement with the magazine 1. If only one single magazine pinion, arranged centrally relative to the claw aperture, were provided, as in the prior art projectors, it would not be possible to cope with the pilgrim steps both at the beginning and at the end of a slide projection.

Thus, when the starting key is pressed, the magazine 1 commences the pilgrim steps, to begin with, with a backward step, performed by the indexing gear 19. That is to say, after this first backward step, the magazine compartment No. 1 is disposed, to begin with, two steps (compartments) back from the claw aperture 52, before the actual projection series can commence. This process of the first "empty steps" is necessary in order to have just as many "empty steps" available at the end of the slide series projection, to ensure that the last slide returns to the magazine in the correct counting order. The slide claw having grasped "the empty space" once (the slide claw not being shown in the drawings), the next cycle of the indexing gear 18, with its two trip pins 12, 13 (12', 13') will move the magazine in the forward direction by two steps (compartments). Only now is the slide No. 1 in readiness in front of the claw and is taken to the projection gate I, is faded in and projected. The step of the indexing gear 19 immediately following hereafter leads back again by one step. Now there would be taken from the projection gate II a slide that has already been projected, if it were present. However, at the start of a projection series the projection gate II is still empty at this step moment in time, (the programme control automatically directed the projection lamp of the projection gate II to be dark), while the projecting time of slide No. 1 is in progress in gate I. Only the next indexing cycle of the indexing gears 18, 19, one backward and two forward steps, will then conduct slide No. 2 in front of the claw and to the projection gate II. During this last claw movement, that is to say at the end of the projection phase of slide No. 1, slide No. 2 is already disposed in the gate II in readiness for the change-over process. There follows the change-over process:— A switching device designated by 49 controls the brightness of the projection lamp down to its extinction and thus darkens slide No. 1 to zero. At the same time, slide No. 2 is faded in from zero to its full illumination. Directly after this fade-over, slide No. 1 has to be returned into the magazine 1 and slide No. 3 has to be fetched. But the slide compartment

No. 2 is still disposed in front of the claw aperture after the second double forward step that has occurred. When a new start is made, the indexing gear 19 now takes, with its programmed backward step, the slide compartment No. 1 once more to the front of the claw aperture:— Slide No. 1 can be returned in the correct counting order. The renewed forward steps, provided twice, by the indexing gear 18 by means of the trip pins 12, 13 (12', 13') take the slide compartment No. 3 to the front of the claw and slide No. 3, disposed therein, to the projection gate I, which has been emptied beforehand. After the fading-over from slide No. 2 to slide No. 3, slide No. 2 has to be returned when its projection period has expired. Thus, the magazine 1 goes backwards by one step by means of the indexing gear 19 and placed slide No. 2 back into the magazine pigeon-hole No. 2. Thereafter, slide No. 4 has to be brought in front of the claw aperture with its corresponding slide compartment. This means once more a double step in the forward direction, etc., etc., until all the slides have been projected. The process is shown in the composition in table form of Fig. 5.

According to a further development of the slide double projector, it is possible to reverse the direction of projection at any time, be it for repeating individual slides or a whole slide series in the reverse order. For this purpose, there is provided beside a start-forward key another control key for a reverse start. When the start-reverse key is pressed from a forward projection position at any time, all the control operations in the projector, such as the claw control, the lamp fade-over control of the projection gates I and II as well as, finally, the pilgrim step cycle, have to be reversed immediately. In this context, the reversal does not merely mean that what ran in the forward direction before should now run in the backward direction. A reverse projection, including the requirement to withdraw and return slides for both projection gates I and II in the correct order of counting in this direction, too, means to perform the each pilgrim step function in the reversed direction relative to those described for the forward projection. The reversal of the pilgrim step functions in the titles of the table (Fig. 5) automatically results in the new direction of the operational cycle:— Thus the statement must be (and be carried out): Instead of one backward step = one forward step in the direction from which the magazine was moved before the reversal of the direction; instead of two forward steps = two backward steps in the direction from which the magazine came before the reversal of the direction. As soon as the reversal has been effected, the slide projection will occur in the reverse direction with a correctly counted pilgrim step programme.

The programme reversal thus differs from the forward projection to the backward projection in that there has to be omitted only once a backward step of the indexing gear 19 and will thereafter again be "in step" in the rearward projection, that is to say the correct slide will be taken from the correct slide compartment or be taken back to it when a sudden change of direction occurs.

- 10 The omission of one indexing step upon a reversal of direction is effected in that the wheel body of the indexing gear 19 immediately reverses its direction of rotation via the gear rim 42. Also, the guide pin 15 (15'), which has previously taken along the compensating ring 17 on the stop 28 (28'), without the compensating ring 17 moving itself, moves to the stop 29 (29') at the other end of the curved slot 16 (16'). The result is that the trip pin 14 (14') has stood still with the compensating ring 17 for the duration of a single step, while the trip pins 12, 13 (12', 13') of the indexing gear 18 have at once become active in the opposite direction upon the reversal of the direction of rotation. During the time of the omitted indexing step by the indexing gear 19, resulting in the magazine 1 being stopped, the slide claw can immediately return the slide it had just fetched, since the magazine pigeon-hole is still at the same point before entering the reversed pilgrim step cycle.

Thus a continuous reverse projection has been initiated after a previous forward projection and will now proceed in the same manner until the last slide is returned into the magazine.

WHAT WE CLAIM IS:—

1. A double slide optical projector, consisting of two projection devices, which are combined in one unit, and an indexing device for the alternating projection of slides, which are taken in continuous succession from a magazine common to both projection devices and which are re-arranged in the correct order after the projection, consecutive slides being temporarily simultaneously disposed in the projection gates of the two projection devices, characterised by two indexing gears which rotate in opposite senses about a common axis during each slide change and which perform a full or a partial rotation and which carry a number of trip pins, which are disposed one behind the other in the direction of rotation, the number corresponding to the desired magazine steps effected in one direction of movement of the magazine and being distributed on the entire or partial circumference of the indexing gears, and by at least one magazine pinion, for meshing with a tooth row arranged on the magazine and which is drivable via an indexing cross, which co-operates with the trip pins and which is rotatable about a fixed axis, the arrangement of the trip pins on the indexing

gears, the indexing step of the indexing cross and the magazine pinion being co-ordinated so that, during a complete or partial rotation of the indexing gears, the magazine can be moved by the one indexing gear by the desired indexing steps in one direction and subsequently by the other indexing gear by the desired indexing steps in the opposite direction.

2. A double slide optical projector as claimed in Claim 1, having a changer plane that is common to both projection devices, characterised in that the first indexing gear carries one trip pin and the second indexing gear carries two trip pins, which are disposed one behind the other in the direction of rotation, the magazine being movable by the first indexing gear by one magazine step in the direction that is opposed to the preselected transport direction of the magazine and by the contrarotating second indexing gear by two steps in the transport direction of the magazine.

3. A double slide optical projector as claimed in Claim 2, characterised in that the trip pins of the indexing gears are provided in two groups and are arranged symmetrically around the circumference of the indexing gears so that an indexing cycle is always completed after half a rotation of the indexing gears.

4. A double slide optical projector as claimed in one of the preceding Claims, characterised in that the direction of rotation of the indexing gears is reversible, the possibility being provided to stop the trip pin of the one indexing gear for the duration of an indexing gear indexing cycle required for the slide change.

5. A double slide optical projector as claimed in Claim 4, characterised in that the trip pins of the one indexing gear are arranged on a compensating ring, which is mounted so as to be movable relative to this indexing gear, and in that the compensating ring can be moved by the indexing gear by means of a pin, which is located on the indexing gear and which is guided in an arcuate slot of the compensating ring, at one of the slot ends.

6. A double slide optical projector as claimed in one of the preceding Claims, characterised in that there are arranged near the changer plane two magazine pinions, which are driven in the same sense by the indexing cross and of which one is disposed forward of the changer plane and one behind the changer plane in the direction of movement of the magazine.

7. A double slide optical projector as claimed in one of the preceding Claims, characterised in that there is provided a multi-arm arresting lever, which is mounted so as to be pivotable about a pivot point and whose one limb arm carries arresting cams

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The programme reversal thus differs from the forward projection to the backward projection in that there has to be omitted only once a backward step of the indexing gear 19 and will thereafter again be "in step" in the rearward projection, that is to say the correct slide will be taken from the correct slide compartment or be taken back to it when a sudden change of direction occurs.

10 The omission of one indexing step upon a reversal of direction is effected in that the wheel body of the indexing gear 19 immediately reverses its direction of rotation via the gear rim 42. Also, the guide pin 15 (15'), which has previously taken along the compensating ring 17 on the stop 28 (28'), without the compensating ring 17 moving itself, moves to the stop 29 (29') at the other end of the curved slot 16 (16'). The result is that the trip pin 14 (14') has stood still with the compensating ring 17 for the duration of a single step, while the trip pins 12, 13 (12', 13') of the indexing gear 18 have at once become active in the opposite direction upon the reversal of the direction of rotation. During the time of the omitted indexing step by the indexing gear 19, resulting in the magazine 1 being stopped, the slide claw can immediately return the slide it had just fetched, since the magazine pigeon-hole is still at the same point before entering the reversed pilgrim step cycle.

Thus a continuous reverse projection has been initiated after a previous forward projection and will now proceed in the same manner until the last slide is returned into the magazine.

WHAT WE CLAIM IS:—

1. A double slide optical projector, consisting of two projection devices, which are combined in one unit, and an indexing device for the alternating projection of slides, which are taken in continuous succession from a magazine common to both projection devices and which are re-arranged in the correct order after the projection, consecutive slides being temporarily simultaneously disposed in the projection gates of the two projection devices, characterised by two indexing gears which rotate in opposite senses about a common axis during each slide change and which perform a full or a partial rotation and which carry a number of trip pins, which are disposed one behind the other in the direction of rotation, the number corresponding to the desired magazine steps effected in one direction of movement of the magazine and being distributed on the entire or partial circumference of the indexing gears, and by at least one magazine pinion, for meshing with a tooth row arranged on the magazine and which is drivable via an indexing cross, which co-operates with the trip pins and which is rotatable about a fixed axis, the arrangement of the trip pins on the indexing

gears, the indexing step of the indexing cross and the magazine pinion being co-ordinated so that, during a complete or partial rotation of the indexing gears, the magazine can be moved by the one indexing gear by the desired indexing steps in one direction and subsequently by the other indexing gear by the desired indexing steps in the opposite direction.

2. A double slide optical projector as claimed in Claim 1, having a changer plane that is common to both projection devices, characterised in that the first indexing gear carries one trip pin and the second indexing gear carries two trip pins, which are disposed one behind the other in the direction of rotation, the magazine being movable by the first indexing gear by one magazine step in the direction that is opposed to the preselected transport direction of the magazine and by the contrarotating second indexing gear by two steps in the transport direction of the magazine.

3. A double slide optical projector as claimed in Claim 2, characterised in that the trip pins of the indexing gears are provided in two groups and are arranged symmetrically around the circumference of the indexing gears so that an indexing cycle is always completed after half a rotation of the indexing gears.

4. A double slide optical projector as claimed in one of the preceding Claims, characterised in that the direction of rotation of the indexing gears is reversible, the possibility being provided to stop the trip pin of the one indexing gear for the duration of an indexing gear indexing cycle required for the slide change.

5. A double slide optical projector as claimed in Claim 4, characterised in that the trip pins of the one indexing gear are arranged on a compensating ring, which is mounted so as to be movable relative to this indexing gear, and in that the compensating ring can be moved by the indexing gear by means of a pin, which is located on the indexing gear and which is guided in an arcuate slot of the compensating ring, at one of the slot ends.

6. A double slide optical projector as claimed in one of the preceding Claims, characterised in that there are arranged near the changer plane two magazine pinions, which are driven in the same sense by the indexing cross and of which one is disposed forward of the changer plane and one behind the changer plane in the direction of movement of the magazine.

7. A double slide optical projector as claimed in one of the preceding Claims, characterised in that there is provided a multi-arm arresting lever, which is mounted so as to be pivotable about a pivot point and whose one limb arm carries arresting cams



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for locking the magazine during the slide change.

8. A double slide optical projector as claimed in Claim 7, characterised in that a limb arm of the arresting lever carries a feeler, which slides on the circumference of one of the indexing gears and which drops into a recess on the circumference of the indexing gears for the duration of the slide change.

9. A double slide optical projector as claimed in Claim 7 or 8, characterised by a device, serving for interrupting the projection, for unlocking the magazine.

10. A double slide optical projector as claimed in Claim 9, characterised in that the unlocking device comprises an actuating head, which is in engagement with the arresting lever via a lever arm.

11. A double slide optical projector as claimed in Claims 9 and 10, characterised in that there is provided an electrical control system, which co-operates with the unlocking device and which effects, when the projection is interrupted, a final twofold indexing cycle of the indexing gears.

12. An optical projector, substantially as described herein with reference to and as illustrated by the accompanying drawing.

13. An optical projector as claimed in Claim 1, substantially as hereinbefore described.

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