PATENT SPECIFICATION (11) 1 580 149

1 580 149

(21) Application No. 34725/77 (22) Filed 18 Aug. 1977

(31) Convention Application No. 2640515 (32) Filed 9 Sep. 1976 in

(33) Fed. Rep of Germany (DE)

(44) Complete Specification Published 26 Nov. 1980

(51) INT. CL.[3] G03B 23/04

(52) Index at Acceptance G2J H1L2B

(54) OPTICAL SLIDE PROJECTOR

(71) We, FRANKE & HEIDECKE GMBH, 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:-

The present invention relates to an optical slide projector with a magazine which can be fed forward in steps in a direction parallel to the optical axis and with a slide changing slider which is movable transversely with respect to the optical axis and which, for the purpose of feeding the magazine forwards and backwards, bears a shift member which is pivotally mounted on the slider and which engages indexing members of the magazine when the slider occupies its outer position, and which is provided with two mutually inclined contact surfaces which, in order to pivot the shift member out of its middle position by a distance corresponding to the forward or backward feed step of the magazine, interact with two stops which can be engaged in alternation and which are positioned on a pivotable support which is movable by an electromagnet from a first position into an extreme pivoted position, one stop being constantly situated in the path of one inclined contact surface when the support occupies its first position, while the other stop is situated in the path of the other inclined contact surface when the support has been pivoted to its extreme position.

In a known optical slide projector the fixed pivotable support is provided with a lever which, when the support is pivoted into its extreme position, engages a single-revolution drive which drives the change slider in such a way that the latter effects precisely one slide changing operation. Each excitation of the electromagnet thus sets up a slide changing operation, with the particular characteristic that when the magnet is only active for a short time the shift member causes the magazine to be fed forward by one step while the activation of the electromagnet throughout the entire change slider feed operation causes the magazine to be fed backwards by one step.

The advantage of this change mechanism, i.e. that one single control button is sufficient, feeding the magazine forward and changing the slide when pressed down for a short space of time only and changing the slide with a backward movement of the magazine when held down for a longer period, is counteracted by the drawback that the operation cannot be selected very reliably. If, for example, the operator intends to project slides in the backward sequence and does not hold the control button down long enough, the magazine will be moved in the intended forward direction and the wrong slide enter the projection beam. Conversely, the projection will take place in the reverse sequence if it is intended to take place in the forward sequence but the operator presses the button for too long a period, possibly because his attention has been distracted.

This is the reason for the increasing demand for separate operating knobs for forward and backward projection, pressure on the right knob invariably resulting in movement in the direction actually required.

Furthermore, with the driving mechanism described in the foregoing, the electromagnet had to be designed, for safety reasons, for almost 100% of its duty cycle, as the operating knob might be kept pressed down for a long time and the electromagnet thus energized continuously. An electromagnet constructed to such dimensions, which for the actual slide changing operation are not necessary, is bulky and very expensive.

Preferably the present invention modifies the slide changing drive of the optical slide projector of the type described in the beginning in such a way that without additional cost the control knobs for the forward and the backward projection can be kept separate, the electromagnet operable for the said reverse projection sequence practically only having to be actuated intermittently, so that it need only be dimensioned for a fraction of its fully duty cycle.

According to the present invention the support is provided with a detent, which is effective in the extreme pivotal position of the support, which position pivots the shift member in such a way that the magazine is fed backwards by one step, and also with a restoring device releasable after an inclined contact surface of the shift member has moved up onto the stop provided on the support and active in the said pivotal position of the support.

Thanks to these measures it is sufficient, when operating the backward projection knob, to actuate the electromagnet then taking effect and pivoting the support into its extreme position, in which it is secured by the detent. The excitation of the electromagnet can then be nullified without any change in the position of the support. The entire slide changing driving mechanism is thus adjusted in such a manner that when the driving motor for the change slider starts to run this will reliably result in the projection of a slide and in the feed of the magazine in the reverse direction. Simultaneously with the movement of the incliner contact surface onto the stop provided on the support a restoring device for the support will be activated, this device taking effect after the magazine has been fed back by one step and change slider has been moved back and returning the support from its detent position to its position of rest, so that the slide changing mechanism is now once more adjusted for a slide changing operation with forward feed of the magazine. According to whether the knob for the forward projection or for the backward projection is pressed, the support retains its position of rest, which results in a projection in forward sequence, or is transferred by means of the magnet, as described in the foregoing, to its pivotable position, which results, as already shown, in a backward movement of the magazine by one step.

In a preferred embodiment of the invention the support restoring device consists of a resilient extension arm which is affixed to the support and which, when the support is secured in its pivotal position, is situated in the path of displacement of the change slider, while it is deflected by the slider after the slanting contact surface of the shift member has moved onto the stop on the support. This ensures that after the inclined contact surface has moved onto the stop on the support the slider will move the restoring device into its operative position and that as soon as the reverse movement of the slide separates the inclined contact surface from the said stop the support, by the action of the stretched extension arm, will be lifted out of its engaged position and transferred to its first or basic position.

In order not to have to provide the support with special devices by which it is secured in its basic position or returned thereto after release from the detent system, the support in a further embodiment of the invention bears a guide which interacts with the change slider and by which the support, situated outside its position of rest or the pivotal position in which it has been secured by the detent, is returned to its basic position. This ensures that when the slide changer is displaced the support will always be returned to its basic position if its does not already occupy this latter or the engaged position.

In a further version of the invention this object can be suitably achieved as a result of the fact that the guide is constructed as a three-sided prism which interacts with a pin occupying a fixed position on the slider and which, when the support occupies the basic or the engaged pivotal position, is situated outside the displacement path of the pin, while when the support occupies any other position at least one of those side faces of the prism which form a slanting contact surface for the pin is situated in the displacement path of the said pin. This construction for the guide not only ensures that on the forward movement of the change slider in the magazine direction the support will always occupy its basic position, with the natural exception of the pivoting of the support by the excitation of the magnet, but also that the support, when the change slider is moved back from the magazine, will return to its basic position, to which it may not have been completely returned by the restoring device.

A constructional embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, wherein:-

Figure 1 is a view, in perspective, of the slide changing mechanism;

Figure 2 is a plan view of the gearing shown in Figure 1, omitting those parts of the mechanism which are not required for the comprehension of the invention; and

Figures 2a, 2b and *2c* show different positions of the gearing shown in Figure 2.

The magazine 2 is shown in dot-and-dash lines in Figure 2 and is situated in the projector, above a carriage or rail 4 which is displaceable on the projector housing,

transversely to the optical axis. This rail 4 forms part of the change slider, which extends from the side of the projector housing, underneath the magazine, and terminates in a bracket 5 of which the free end 6 is provided with a notch 15 which serves to grip a slide 1 shown in dot-and-dash lines in the drawing. The bracket 5 may be used as a handle for the manual operation of the change slider. On pins 7 of the rail 4 a carriage 9 is guided on slits 8. The carriage 9 bears a plate 10 bent upwards and serving as an image gate closure. By means of a spring 11 this slider 9 is biased in the direction of the slide 1. A fixed stop 12 prevents the plate 10 from entering the zone of the magazine when the change slider is moved outwards (towards the left, as shown in the drawing).

The magazine-slide edge 13 of the plate 10 is provided with a vertical key-way or groove 14 which represents the counterpart to the notch or groove 15. The slide 1 is clamped in between the two grooves. The grooves 14 and 15 thus provide a resilient clamp between which the slide is secured during transport and during projection, as shown in Figure 1. The stop 12 prevents the key-way or groove 14 from moving into the zone of the magazine from that moment onwards at which the slide has reached its required position in the magazine, so that as the slider 5 continues to move outwards the gripper end 15 is likewise lifted off the slide and the magazine passage released.

A lever 17, which is provided with a shift member 23 and with two mutually inclined contact surfaces 18 and 19 taking opposite directions, is pivotably mounted about a pin 16 on the change slider rail 4. Underneath the said lever the projector housing bears a thick pivotable support 20 carrying the stop pins 21 and 22. When this support 20 occupies its first or basic position (Figure 2*a*) the pin 22 is situated in the path of the contact surface 19 of the lever 17, so that when the slider is moved out the said contact surface 19 encounters the pin 22 and pivots the lever 17 in the direction shown by the arrow C. The shift member 23 has points which, at the moment when the end 15 of the changer bracket 6 emerges from the contour of the magazine, engages indexing recesses or teeth of the latter, moving the magazine by one division in the direction shown by the arrow C (the forward direction) as the slide changer continues to be moved. If, however, the support 20 is pivoted into the other limit position (Figure 2*b*), in the direction shown by the arrow C, which can be done by actuating an electromagnet 24 for a short space of time, the contact surface 19 of the lever 17 is able to slide past the pin 22. Now, however, the pin 21 is situated in front of the contact surface 18, so that with the same change operation the lever 17 is now pivoted (as seen in Figure 2*c*) in the direction shown by the arrow B, the magazine thus being fed in the said direction shown by the arrow B, i.e. in the reverse projection direction. In the plane of the contact surfaces 18 and 19 are bars 31 and 31′ respectively, in such a way that the lever 17 cannot be pivoted until immediately before the points of the shift member 23 engage the magazine, while the pivoting of the lever 17 is prevented during the remainder of the change operation. These bars also ensure that when the slide changer rail 4 is returned the lever 17, which occupies an oblique position after the magazine movement, will be returned to its central position.

In order to ensure that after the magnet is no longer being energized the support 20 will remain in its pivotal position, the said support bears a detent spring 32 which, together with a pin 33 occupying a fixed position on the housing, forms a detent for the said support 20. To nullify this detent and return the support 20 to its basic position shown in Figure 2*a* and in broken lines in Figure 2, the said support 20 is provided with a resilient extension arm 34 which extends beyond its pivotal point and which, when the support 20 occupies its engaged extreme position shown in full lines in Figure 2, is situated in the displacement path of a pin 35 provided on the rail 4 of the change slider. With the support 20 occupying the basic position shown in dot-and-dash lines in Figure 2, the extension arm 34 is situated outside the displacement path of the said pin. As soon as the slide is changed and the magazine is to be fed in the reverse direction, i.e. that shown by the arrow B, the contact surface 18 of the lever 17 moves up onto the stop 21 of the support, the pin 35 engages the extension arm 34 and presses the latter outwards, in opposition to the action of its spring. After the slide feed operation has been completed by one step in the reverse direction, i.e. in that shown by the arrow B, the slide changer is drawn back again, in which process, at the moment when the contact surface 18 of the lever 17 begins to separate from the stop 21 of the support 20, the extension arm 34, under the action of its spring tension, pivots the support 20 in the direction shown by the arrow B and, as the change slider gradually moves back, returns the support 20 to its basic position.

The support 20 is additionally provided with a guide which consists of a three-sided prism 36 and by which the support 20, freely oscillating about its fixed shaft 37, will invariably be moved into its basic position, when the change slider is moved forwards, i.e. in the direction of the magazine, with

the sole exception that the support 20 will always occupy the engaged pivotal position. For this purpose the prism 36 is arranged in such a way that both when the support 20 occupies its basic position and when it occupies its engaged pivotal position the said prism will be situated outside the path of displacement of the pin 35, while when the support 20 occupies any intermediate position one of the three side surfaces of the prism 36 will enter the displacement path of the pin 35 in such a way as to form, for the pin 35, a contact surface in the direction of the basic position of the slider.

The change slider is driven by a single-revolution drive 28. For this purpose the single-revolution drive 28 bears a crank pin 29 which interacts with a stepped groove 30 affixed to the change slider. By actuating the single-revolution drive 28 in intermittent impulses, by means of one of the two slide changing buttons, not shown in the drawing, for projection in forward or in backward sequence, the single-revolution drive 28 will always be caused to perform a full rotation in which a complete slide change operation is carried out, i.e. the slide 1 is moved from the projection position into the empty magazine compartment, the magazine fed forwards or backwards by one step and the slide now present in the change plane removed from the magazine and conveyed to the projection device. When the forwards projection knob is actuated, only the single-revolution drive 28 will be intermittently operated in impulses, in which process, owing to the basic position occupied by the support 20 and shown in dot-and-dash lines in Figure 2, the magazine, in the case of a slide changing operation, will invariably be fed forwards by one step, i.e. in the direction shown by the arrow C. When the projection knob for projection in the reverse direction is actuated, then in addition to the intermittent operation of the single-revolution drive 28, the electromagnet 24 will likewise receive an energization impulse and pivot the support 20 into its position shown in full lines in Figure 2. When the magnet is no longer energized the support remains in this position, as a result of the detent system formed by the detent spring 32 and the pin 33, until it as moved the slide, situated in the projection device, back into the magazine and has fed this latter forwards by one step (direction shown by arrow B). The support is then returned, by the extension arm 34 and the pin 35, to its basic position shown in dot-and-dash lines in Figure 2, so that a forward or backward projection can now be re-initiated by pressing the forward or backward projection knob as the case may be.

WHAT WE CLAIM IS:-

1. An optical slide projector with a magazine which can be fed forward in steps in a direction parallel to the optical axis and with a slide changing slider which is movable transversely with respect to the optical axis and which for the purpose of feeding the magazine forwards and backwards bears a shift member which is pivotably mounted on the slider and which engages indexing members of the magazine when the slider occupies its outer position and which is provided with two mutually inclined contact surfaces which in order to pivot the shift member out of its middle position by a distance corresponding to the forward or backward feed step of the magazine interact with two stops which can be engaged in alternation and which are positioned on a pivotable support which is movable by an electromagnet from a first position into an extreme pivoted position, one stop being constantly situated in the path of one inclined contact surface when the support occupies its first position while the other stop is situated in the path of the other inclined contact surface when the support has been pivoted to its extreme position, having a detent system provided for the support and operative when the said support occupies its extreme pivotable position and a restoring device, provided for the support and releasable after the inclined contact surface of the shift member has moved up onto the stop of the support.

2. An optical slide projector as claimed in Claim 1, wherein the support restoring device comprises a resilient extension arm which is affixed to the support and which, when the support is secured in its pivotal position, is situated in the path of displacement of the change slider, while it is deflected by the slider after the inclined contact surface of the shift member has moved onto the stop on the support.

3. An optical slide projector as claimed in Claim 1 or 2, having a guide which interacts with the change slider and by which the support, situated outside its position of rest or the pivotal position in which it has been secured by the detent, is returned to its basic position.

4. An optical slide projector as claimed in Claim 3, wherein the guide is constructed as a three-sided prism which interacts with a pin occupying a fixed position on the slider and which, when the support occupies the basic or the engaged pivotal position, is situated outside the displacement path of the pin, while when the support occupies any other position at least one of those side faces of the prism which form an inclined contact surface for the pin is situated in the displacement path of the said pin.

5. An optical slide projector, substantially as described herein with reference to and as illustrated by the accompanying drawings.

6. An optical slide projector as claimed

in Claim 1, substantially as hereinbefore described.

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Printed for Her Majesty's Stationery Office,
by Croydon Printing Company Limited, Croydon, Surrey, 1980.
Published by The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.

1580149 COMPLETE SPECIFICATION
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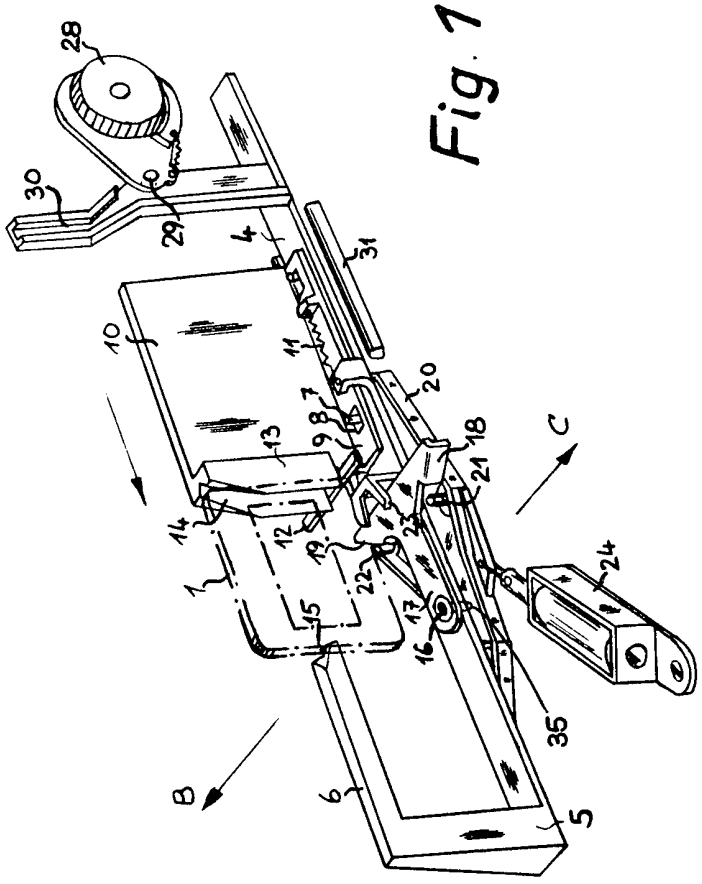

Fig. 1

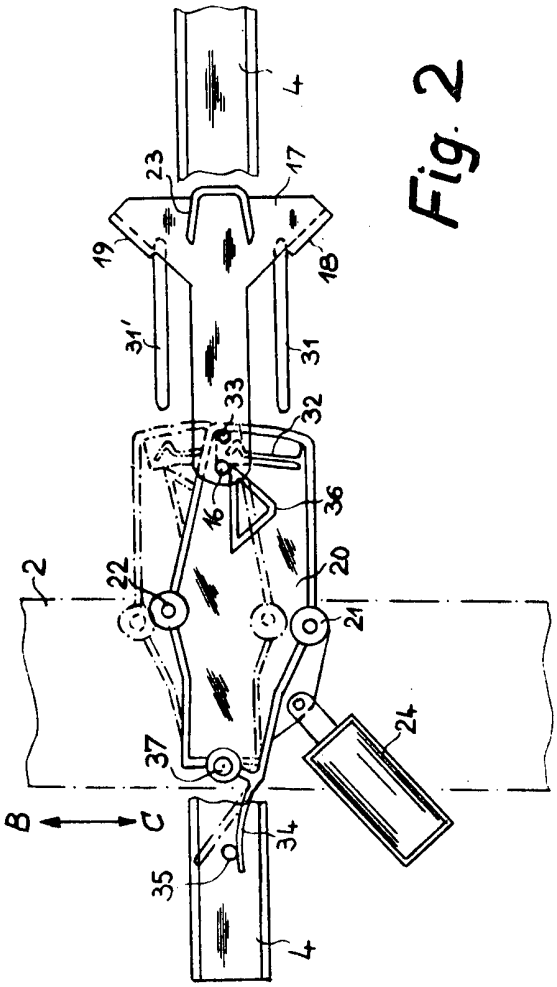

Fig. 2

1580149 COMPLETE SPECIFICATION

5 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

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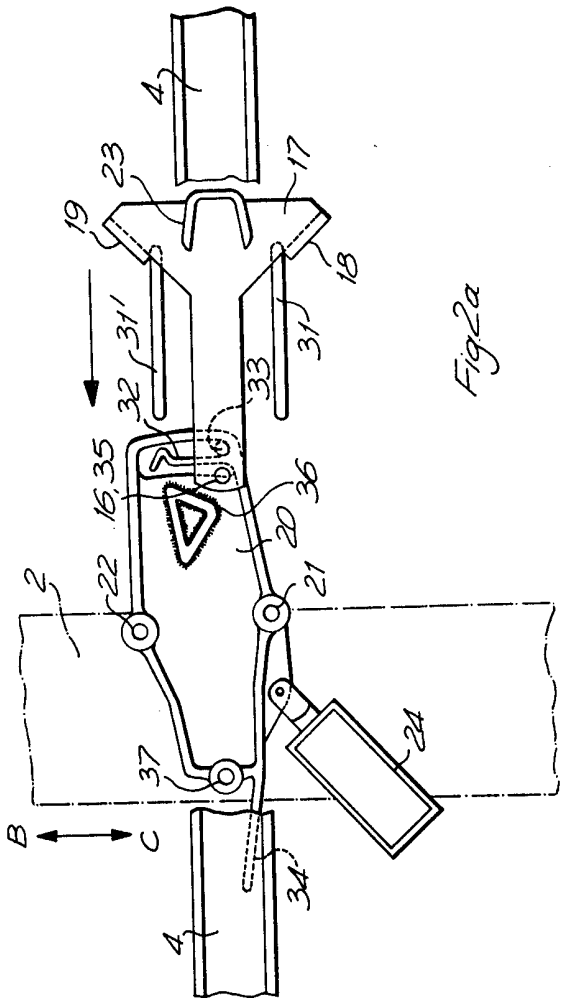

Fig2a

1580149 COMPLETE SPECIFICATION

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Sheet 4

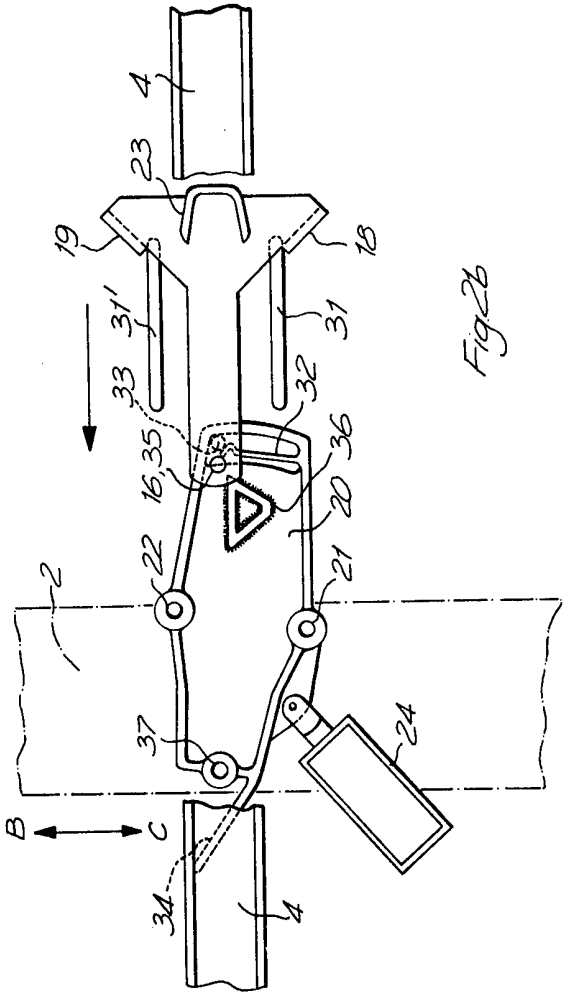

Fig2b

1580149 COMPLETE SPECIFICATION

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Sheet 5

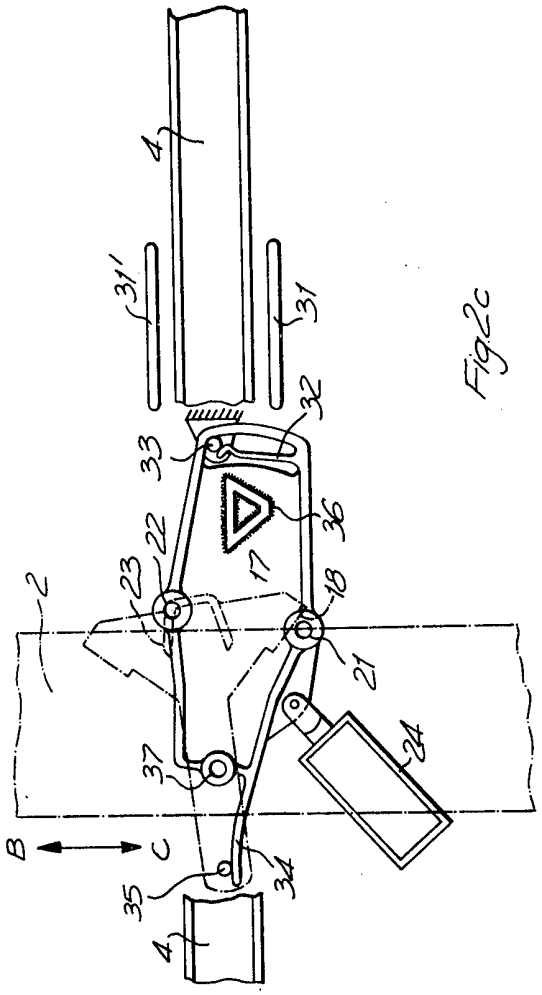

Fig2c