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APPARATUS COMPRISING A TIMING MECHANISM AND AN INTERMITTENT SWITCHING MECHANISM

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Fig. 1.

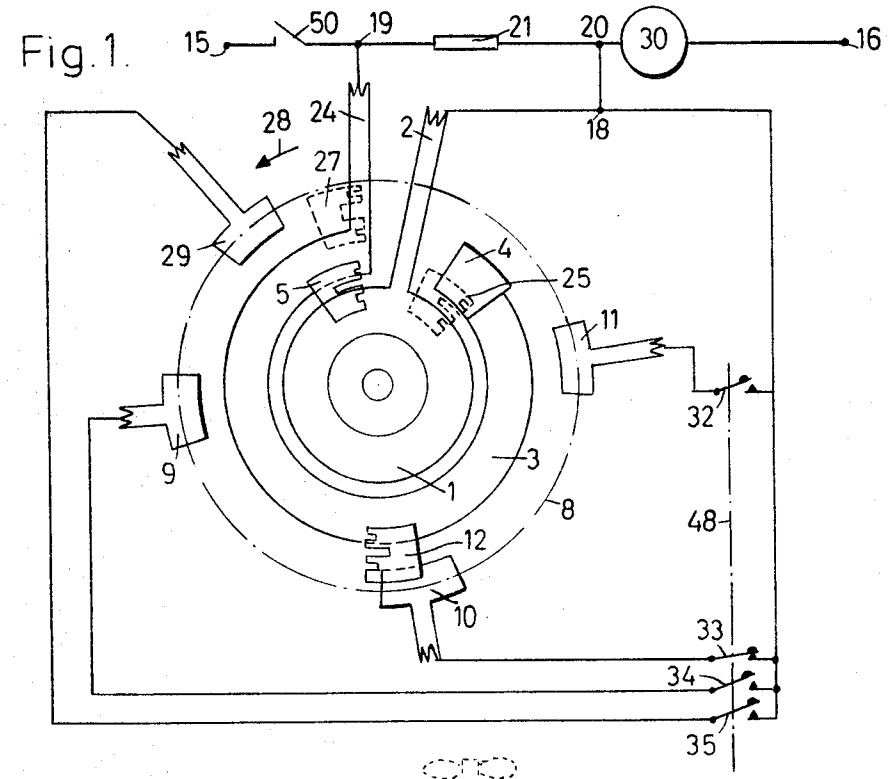



Fig. 2.

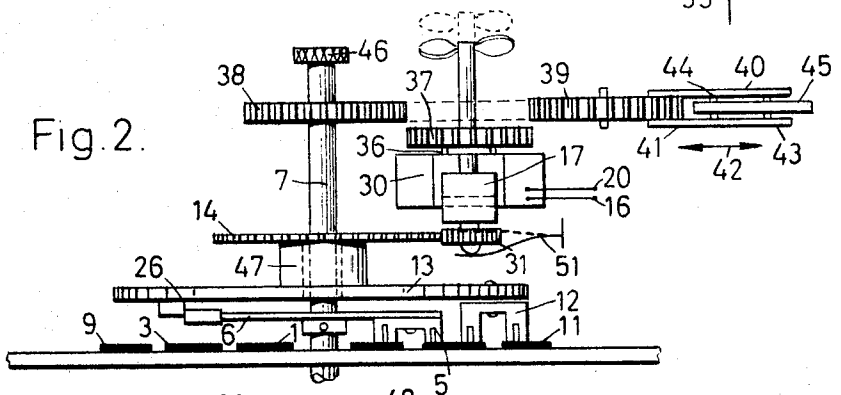
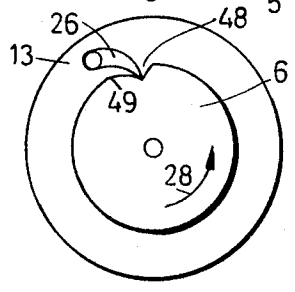



Fig. 3.




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# APPARATUS COMPRISING A TIMING MECHANISM AND AN INTERMITTENT SWITCHING MECHANISM

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This is a continuation-in-part of applicant's co-pending application Serial No. 167,715, filed January 22, 1962, now Patent No. 3,210,487, issued October 5, 1965.

The invention relates to apparatus for automatically changing transparencies in projectors.

It is an object of the invention to construct the apparatus in such a way that it is robust, shockproof, substantially unaffected by voltage fluctuations, compact and cheap to manufacture.

An apparatus comprising a timing and intermittent switching mechanism is known for progressively advancing a programme indexing disc, but which can be used for washing machines only and which is not suited for changing pictures in projectors.

A known automatic control system for projectors and stereoscopes comprises a spring-actuated mechanism for a wheel and locking device, wherein an electric magnet and armature are provided for the locking action. Neither a motor controlling the timing mechanism nor another motor for the step-by-step system are present. The timing must be very exact, so it will operate in synchronism with the clockwork over the whole range. This necessitates a re-selection of different time intervals. It also calls for timing of a lighting current circuit, wherein the second-hand touches a contact.

Another known device for controlling electric circuits is in the form of a punched card timing system, but in which there is no possibility of intermittent operation of a switch to change pictures, wherein the timing mechanism as well as the intermittent switching mechanism always start at the initial position.

For allocation of a series of still pictures to the text of a record, there has been proposed a device comprising a punched tape and contacts penetrating through the perforations for timing. With such a system the time sequence is initially convertibly fixed. This is also true of other, already known devices for projection of educational and/or entertaining programmes, having a recording tape with metal foils for switching.

There are also projectors for automatically showing a series of transparencies. The projection times however cannot be adjusted but are dependent upon the uniform rotation time of a drum, carrying the transparencies. Special switches for showing the picture any length of time have to be actuated, and preselection of desired and variable time intervals during projection is not possible.

The use of a known circuit-opening and -closing switch, which is actuated during a certain setting-time on the still-picture projector does not make it possible to cause the picture sequence in a preselected time interval relation, and to keep the mechanism so simple as to attain the different time intervals starting from an initial position.

The aim of the invention is therefore to avoid these disadvantages and to provide a simple device with which it is possible to change the pictures in projectors by means of a timing mechanism and an intermittent switching mechanism.

This object is attained by providing a device for changing pictures in a still-picture projector having adjustable time intervals, comprising a timing- and intermittent switching mechanism, each of which has a slide connected to a disc and which is coaxially driven by means of a hollow shaft, the slide engaging at least two of three contact tracks on a printed circuit, one of which is in the form of segments, wherein the quick rotating slide of the intermittent switching mechanism is being moved after actuation of one of several selector contacts and the timing mechanism slide which either stands still or rotates slowly is taken over, from the initial position, by means of an overrunning clutch and carried back to the initial position, whereby according to the invention the timing mechanism and intermittent switching mechanism could be driven by the same motor, having a sliding rotor, which drives by means of several gears in one position, i.e. at a low energizing current the slide of the timing mechanism and in another position, i.e. high energizing current the slide of the intermittent switching mechanism.



This arrangement is cheap to manufacture and easy to adjust, while having great accuracy. Since the timing mechanism slide, as well as the intermittent switching mechanism slide start at their initial positions during the change of pictures, no errors are added up by stepwise operation. It is therefore sufficient, for very precise operation, to arrange the switching segments at certain distances from one another, i.e. in form of conducting tracks on a printed circuit.

The driving motor could be a synchronous motor for practical purposes. The time elapsing, until the timing mechanism slide, starting from its initial position, engages the segment connected with the activated selector contact, is equal to the time interval during which the subsequent transportation of the pictures is performed.

When the timing mechanism slide engages this selector contact, the rotor will be transported to the other engaging position, whereby the intermittent switching mechanism slide will be moved. The latter is faster than the timing mechanism slide and carries it along, until the intermittent switching mechanism slide reaches its initial position. At this point the timing mechanism slide is able to overtake the slide of the intermittent switching mechanism, until it reaches its initial position. The cycle can then start again.

The arrangement and general application of the drive motor are described in my Patent 3,041,480 (filed March 22, 1960, Ser. No. 16,789) and 3,164,729 (filed March 16, 1960, Ser. No. 15,389).

The selector contacts enable the projectionist to set the time during which each individual picture is screened, by operating one or the other of the selector keys. The various selector keys correspond to various time intervals in the picture changing. It is desirable to provide the selector contacts in form of pushbutton keys, having an operating position, and upon further depression a rest position.

When the operating position is used, the picture changes are performed during the time associated with the particular selector key. When the rest position is used, a multiple of the time associated with this key is obtained.

In order to permit fully automatic screening, one possibility for the selector key consists in scanning a punched card, rotated by the intermittent switching mechanism. The card has recesses made by hand, in accordance with the desired programme and allocates therefore a predetermined time interval for screening of each picture. The operating sequence is then fully automatic. The pictures can be shown in conjunction with, for example, a tape recorder so that the pictures may be explained.

Construction is further simplified, if the drive motor carries the ventilator wings as well as the projection lamp, thereby simultaneously cooling the projecting lamp, setting the time interval and effecting the intermittent switching.

If a printed circuit is used, the whole apparatus can be small and cheap to manufacture and the resulting accuracy and variety of possible combinations are such as are otherwise found only in much more expensive apparatus.

In order to permit alteration of the programme sequence, it is imporant for the motor driving the switching mechanism to drive the latter by means of a slip clutch, so that the shaft of the intermittent switching mechanism can be turned manually.

For fully automatic projection a recording tape containing the accompanying text with metal foils constituting the selector contacts or actuating same may be used so that the change of pictures necessarily coincides with the sequence of the accompanying text instead of the punched card.

An example of the invention is illustrated in the drawing wherein:

FIGURE 1 shows the electric circuit of an apparatus according to the invention.

FIGURE 2 shows a portion of the operating mechanism.

FIGURE 3 shows a schematic view on a reduced scale of the over-riding clutch shown in FIGURE 2.

According to FIGURES 1 and 2 the timing- and intermittent switching mechanism comprise three tracks on a printed circuit. The first of these tracks is closed, the second is interrupted and the third is made up of switch segments. The spacings of these switch segments correspond to the selected time intervals between picture changes. An outer slide is moved by the timing mechanism and establishes the electric connection between the third and second contact tracks. An inner slide is moved by the intermittent switching mechanism and establishes the electric connection between the first and second contact tracks. An overriding clutch between the two slides enables the slide that is moved more slowly by the timing mechanism to be carried along by the faster slide, which is moved by the intermittent switching mechanism. It is carried along, until the slide moved by the switching mechanism, reaches an interruption in the second contact track and remains stationary, until it is carried along next, while the slide moved by the timing mechanism runs on continuously.

FIGURE 1 shows the first contact track **1**, having a connecting lug **2**. The second contact track **3** has an interruption **4** in the form of a depression, as to avoid burning at the beginning and the end of this track. The first and second tracks **1** and **3** are bridged by a slide **5** mounted on a disc **6** (FIGURE 2). Any type of rotating arm can be used instead of a disc. The disc **6** is rigidly connected with the spindle **7**.

The third contact track **8** is made up of the segments **29, 9, 10, 11**, which are connected in that sequence to the second contact track **3** by a slide **12**. The slide **12** is mounted on a disc **13** which is driven by the gearwheel **14** through a hollow shaft **47** surrounding the spindle **7**. The main terminals **15, 16**, and the drive motor **30** are also shown, as well as the selector contacts **32, 33, 34, 35** which may be actuated manually or by the intermittent switching mechanism.

The drive motor **30** receives according to the illustrated example, after actuation of switch **50** current through resistor **21**. With a low exciting current, the rotor **17** remains in the lower position, so that the gear **31** meshes with gear **14** to drive the timing mechanism by the slide **12**.

When the drive motor **30** receives the full amount of current across the main terminals **16** and **19**, the stator will be highly excited and the rotor **17** will be drawn into the stator field, assisted by the spring **51**. The gear **36** then meshes with gear **39**, causing actuation of the picture changing mechanism, and also with gear **38**, which is rigidly connected to the spindle **7** and will rapidly move slide **5**.



The actual picture changing mechanism is only indicated schematically. It comprises a gear wheel **39**, crank and thrust rods **40, 41**.

These are reciprocated in the direction of the arrow **42** depending upon the ratio of the gearing **39**. They are provided with supports **43, 44** on which the pictures or transparencies **45** rest. Each picture drops in a known manner vertically to the plane of the drawing when the thrust rods **40, 41** with their supports are moved appropriately, and the next picture **45** may follow from above. This apparatus may be constructed in any other usual way.

The presence of the slip coupling **36** permits the spindle **7** to be turned by hand, by using the diagrammatically illustrated handwheel **46**. According to the drawing the drive motor **30** also drives the fan above it for the projecting lamp (not shown).

It is to be mentioned that actuation of the selector contacts **32–35** is also possible by the gearing **39**, if the sildes are to be fully automatic. The possibility of shaping the selector contacts **32–35** as scanning contacts of a magnetic tape onto which the contact-making foils are stuck, is not illustrated.

It is important for the continuously rotating drive motor **30**, after actuation of switch **50** to use as little current as possible in its normal position, i.e. while driving the timing mechanism, with minimal loss of heat. High output is only required during the short time while driving the intermittent switching and picture changing mechanisms. A slip clutch **36** assists the fast, and smooth meshing of gear **36** with gears **38** and **39**, whereby full output of the drive motor will be permitted without danger of great wear.

The described apparatus functions as follows:

In the position shown, the slide **5** connects the first contact track **1** to the second contact track **3**. The drive motor **30** thereby receives after actuating switch **50**, full current, namely from the main terminal **15** through connecting strip **19**, the second contact track **3**, the slide **5**, the first contacting track **1**, the connecting lug **2**, as well as the connecting strip **18** on one hand and through the main terminal **16** on the other hand. The drive motor **30** simultaneously drives the slide **6** as well as the picture changing mechanism. The slide **5**, respectively the disc **6** move thereby in the direction of arrow **28** and overtake disc **13**, while recess **48** on the disc **6** carries along with it the lever **26** on the disc **13** and thus also the slide **12**. The functioning of this overrunning clutch is to be seen in FIGURE 3. It is a slip clutch, because if disc **13** moves in the direction of the arrow **28** relative to disc **6**, then the rounded-off edge **49** of disc **6** prevents it from being carried along by disc **13**.

When the slide **5** reaches the position **25**, shown in dotted lines, then the drive motor **30** is almost de-energized, since the slide **12** has also broken the bridging of resistance **21**. The rotor **17** again drives the timing mechanism and the spindle **7** stops rotating. The thrust rods actuated by the intermittent switching mechanism also stop in a corresponding position. In this position the picture is supported in the projector and screened until the slide **12** connects the next actuated selector contact across the corresponding contact segment through the main terminal **15**. In relation to the time interval between picture changing, the position **27** shown in dotted lines is designated as the starting position of slide **12**. This position is only temporary as can be seen from the preceding.

Depending on which of the selector contacts **32** to **35** is closed, the terminal **15** is connected to the correspond-

ing segment **9**, **10**, **11**, **29** of the third contact track **8**. The time taken by the slide **12**, to pass from the dotted-line position **27** to the appropriate live contact segment designates the time interval bettween picture changes. In FIGURE 1 the selector contact **33** is closed, for example by hand. When the slide **12** reaches the position shown in full lines (FIG. 1), the drive motor **30** receives full current from the main terminal **15** through the second contact track **3**, the slide **12**, the contact segment **10**, the contact **33** and the connecting strips **18** and **20** on one hand, as well as the main terminal **16** on the other hand. Thus the rotor **17** meshes with the gears **38** and **39**. Now the picture changing mechanism is actuated and simultaneously the slide **5** which is mechanically connected to disc **6**, will be moved in the direction of the arrow **28**. The dotted-line position **25** of the slide **5** in FIG. 1 indicates this position. As soon as slide **5** reaches contact track **3**, shown in full lines, after leaving gap **4**, the fast moving slide **5** carries inert slide **12** with it. The slide **5** is left in the gap **4**, as it has switched itself off after leaving contact track **3**. The rotor **17** again drives the timing mechanism. The slide **12** now overtakes slide **5** and the entire process repeats itself.

If none of the selector contacts **32–35** are closed, slide **12** rotates continuously, without the rotor **17** being changed to drive the intermittent switching mechanism.

The time taken by the slide **12** to reach one of the energised segments of the contact track **8**, from the dotted-line position **27** represents the time intervals at which the pictures are changed. The selector contact **32** for instance, gives a longer time interval for changing pictures than the selector contact **34**.

Instead of the four segments **9–11** and **29** shown, any desired number of additional segments and associated selector contacts may be provided. The drive reductions from drive motor **30** to spindle **7** and gear **14** respectively, may be chosen at will. The overriding clutch may also be differently constructed.

The possibility to provide the stator of the drive motor with two or more windings or a tap winding resulting in different drive positions of the rotor, by means of different magnetisation is also of importance. In this case the priming resistance **21** and thus any direct connection between connecting strips **19** and **20** are eliminated. The connecting lug **2** is properly connected to the winding or part of the winding respectively, which effects the strongest magnetization, while the contact segments are to be connected across the appropriate selector contacts to the less magnetizing winding or windings.



I claim:

**1.** Drive mechanism for a picture-changing slide projector with adjustable time intervals comprising a timing mechanism having a slide slowly driven by gearing and carried by a rotating part, while contacting with an interrupted contact track on a printed circuit and with another contact track comprising conductive contact-segments on the same printed circuit, an intermittent switching mechanism having a rapidly rotating driving connection to a coaxially mounted, rotating part carrying a slide which slides on said interrupted contact track and on a circular track, both of which are conductive, a one-way slip clutch for mechanically connecting the rotating parts with each other during rotation and for electrically connecting them with the segments and with switches, a picture-changing mechanism having a crank and thrust rods, and a motor the rotor of which in one position drives through a gear the rotating part of the intermittent switching mechanism and also the picture-changing mechanism and in another position through gears the rotating part of the timing mechanism.

**2.** The apparatus according to claim **1**, wherein the motor drives the timing mechanism at a low magnetization of its stator.

**3.** The apparatus according to claim **1**, wherein the rotor is connected to a gear through the slip clutch.

**4.** The apparatus of claim **2**, wherein the rotor is connected to a gear through the slip clutch.

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