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DEVICE FOR RECORDING AND REPRODUCING FILMS

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Fig. 1.

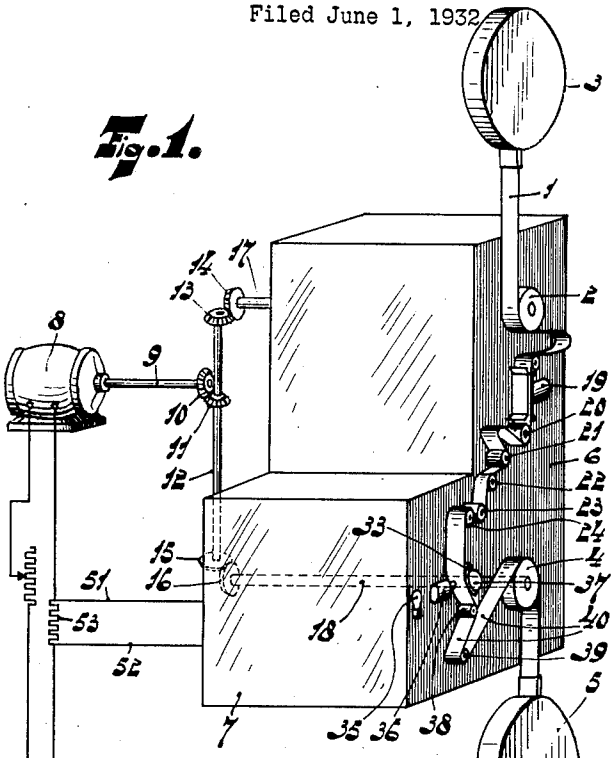
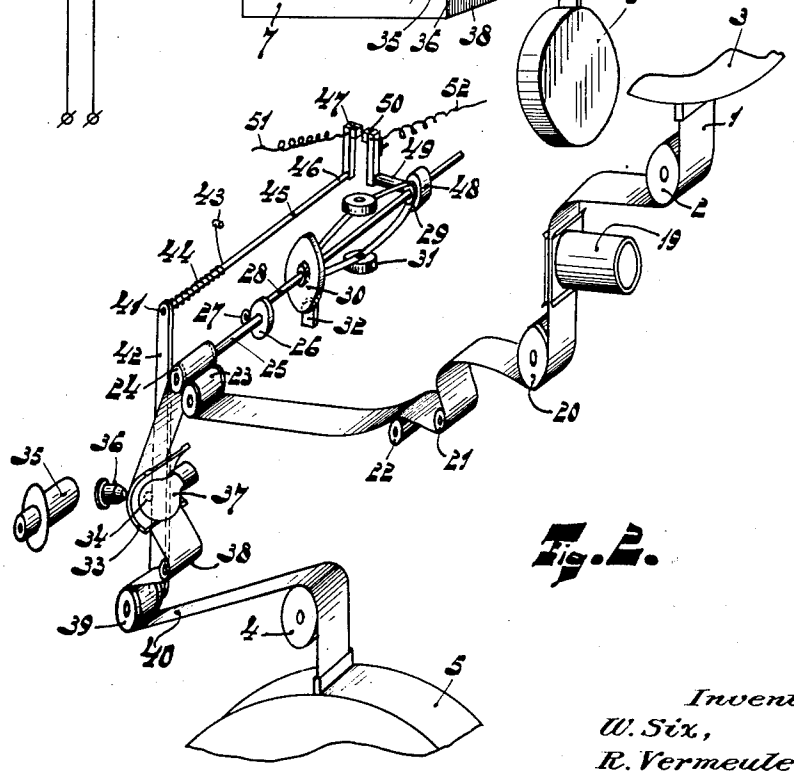


Fig. 2.



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DEVICE FOR RECORDING AND REPRODUCING FILMS

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4 Claims. (Cl. 271—2.3)

The invention relates to devices for recording or reproducing films with both optical and acoustic records. The invention more particularly relates to such a device in which the film is carried forward directly, i. e. without interposition of an elastic coupling, by a single motor through the optical portion as well as through the acoustic portion of the device. As is customary, both the optical and the acoustic portions may be built as separate units and be mounted separately or again both units may be united to form a single apparatus. The direct drive affords the advantage that the acoustic portion may be coupled in a simple manner to the driving mechanism of existing apparatus for the projection of images.

In the devices of the type referred to, the film is drawn by the motor successively past the picture gate and past the sound gate. In order to ensure that the film is always moved at a constant speed past the two gates use is made in known forms of construction of an electric motor running at a speed as constant as possible, for example a synchronous motor the number of revolutions of which is determined, as is well-known, by the frequency of the network. It has been found, however, that with such a drive the speed of the film cannot be kept constant due to the fact that the speed of the motor is influenced too much by the variations of said network magnitude. Moreover, it has been found that any irregularities in the optical apparatus due, for example, to a stiff running, to some play in the driving mechanism, etc. have a harmful effect on the sound reproduction.

According to the invention, use is made of a motor whose speed is regulated. It may thus be ensured that the speed of the film moving past the point of sound-recording or -reproducing is constant when for some reason or other the speed of the motor without control would vary. Due to this control the speed of the film at the picture gate slightly fluctuates. It has been found, however, that these fluctuations are so small as to be imperceptible to the eye. In order to obtain a device of small dimensions, the device for controlling the motor is conveniently housed in the acoustic portion although in principle this is not absolutely necessary.

In one embodiment of the invention, the speed of the motor is influenced by a regulator which is coupled with a roller driven by the film itself. This influencing may be effectuated, for example, by mounting the regulator in a device in which the film in the acoustic portion forms a loop kept taut by a roller, said loop being employed for controlling the speed of the motor.

According to one embodiment of the invention, in a reproducing device the tightening roller is located behind the sound gate and mounted on a lever which is movable under the action of a spring and which is provided with a contact member; this contact member cooperating with another movable contact member whose movement may be derived from the regulator shaft which is conveniently located before the sound gate. The expressions "before and behind the sound gate" are chosen in accordance with the direction of travel of the film. If desired, the regulator may also be arranged behind the sound gate and before the film loop. Preferably, however, it is arranged before the sound gate for in this case it may serve at the same time for keeping constant the pressure of the film against the guide at the point of reproduction and for taking up the fluctuations due to the intermittent motion of the film in the projection apparatus before the film passes the sound gate.

As the regulator ensures a substantially constant speed of the film at the sound point the loop in the film increases or decreases when the speed of the motor varies, and thus it actuates the lever on which the tightening roller is mounted, which results in that the duration of the contact between said two contact members—which may be connected in known manner into the circuit of the motor and which periodically short-circuit a resistance included in this circuit—is modified and that consequently the speed of the motor is regulated.

The movement of the one contact member may be obtained, for example, by means of an eccentric secured to the regulator shaft. While this movement need not be derived from the regulator shaft, such construction is advisable for reducing the dimensions of the whole controlling device as much as possible.

In order that the invention may be clearly understood and readily carried into effect, it will be explained more fully with reference to the accompanying drawing which represents, by way of example, one embodiment thereof. In the drawing:

Figure 1 is a detailed diagrammatic view of a device according to the invention.

Fig. 2 represents diagrammatically in detail the controlling mechanism for the motor of the device according to Figure 1.

In Figure 1, the film 1 is unwound by a driven roller 2 from a supply drum 3 and is wound up

via a driven roller 4 by a drum 5. The rollers 2 and 4 form part of a projection apparatus 6. In the film portion located between the rollers is provided a loop housed in the acoustic portion which is built so as to form a separate unit 7. The figure shows that the portion 7 is combined with the projection apparatus 6 to form a unit. It is also possible, however, to arrange both apparatus separately from each other. Thus it is possible to couple the acoustic portion to existing optical apparatus without altering the latter.

For driving the film there is provided a single electric motor 8 whose shaft 9 is coupled via bevel gear wheels 10 and 11 to a shaft 12. The shaft 12 drives, via toothed gear couplings 13, 14 and 15, 16, the shafts 17 and 18 respectively of the rollers 2 and 4. The intermittent movement of the film past the picture gate is derived in the usual manner (not shown) from the shaft 17.

Figure 2 shows the manner in which according to the invention the speed of the motor 8 may be controlled when this speed deviates from the desired value.

After having passed the roller 2, the film is drawn past the picture gate 19, for example, by a roller 20 which is driven by the known Geneva cross drive. Beyond the roller 20, the film passes over two rollers 21 and 22 which serve to smooth as much as possible the jerky movement of the film caused by the intermittent drive. This is of importance because, as is well-known, it is advisable to have a continuous advance of the film in the acoustic portion 7. The film further passes over two rollers 23 and 24. The spindle 25 of the roller 24 drives, via gears 26 and 27, the shaft 28 of a centrifugal regulator 29. This regulator is provided in the usual manner with a brake-disc 30 which in different positions of weights 31 engages a fixed brake-shoe 32 with different pressures.

After having passed the rollers 23 and 24, the film is led over a curved guide 33 which is provided at the point of the sound strip on the film with an aperture 34 through which, in the usual manner, the light of a light source 35 falls via an objective lens 36 upon a photo-electric cell 37 which allows the acoustic records provided on the film to be converted into electric currents. For the sake of clearness the light source and the photo-electric cell are not enclosed by a casing as occurs in practice.

Beyond the guide 33, the film passes a guide roller 38 and a roller 39 which is arranged in such manner that the loop 40 formed at this point in the film is constantly kept under the same tension. Finally, the film is wound up via the driven roller 4 by the drum 5.

The tightening roller 39 is mounted on one end of a lever 42 whose other end is secured at 41 to a rotatably-mounted rod 45, which, by means of a helical spring 44 having one end rigidly held at 43 and its other end secured to the lever, ensures that the loop 40 has the required tension. The rod 45 carries at its free end 46 a contact member 47. On the shaft 28 of the regulator is eccentrically mounted a cam 48 which when rotating imparts a continuous, rapid, vibratory motion to a pin 49 slidable in the direction of its longitudinal axis and having mounted on it a contact member 50. The contact members 47 and 50 are connected by means of conductors 51 and 52 to the circuit of the driving motor 8 which in the case shown is an alternating current series motor, and periodically short-circuit a resistance 53 included in this circuit. (Figure 1).

The speed of the motor in influenced by the regulator in the following manner: owing to the action of the regulator the film tends to pass the roller 24 at a substantially constant speed. If for some reason or other the speed of the motor varies, the length of the film loop behind the guide 33 has, due to the constant drive by the regulator, the opportunity of increasing or decreasing. Owing to this the lever 42 and the contact member 47 connected thereto are displaced, which means that the duration of the contact between the two contact members 47 and 50 is altered. The period of short-circuiting of the resistance 53 varies accordingly and the speed of the motor is restored to the original value. One of the great advantages of the device according to the invention is that for carrying forward the film at a constant speed past the point of recording or reproducing in the acoustic portion no use is made of a fly wheel. As is well-known, the disadvantage of using a fly-wheel in such a device is due to the fact, that during starting there is great danger of the film breaking as the film has to set into motion the whole mass of the fly wheel. By utilizing the regulator in the manner set forth according to the invention, this drawback is avoided because the regulator does not exert its influence until a certain speed has been attained. It has been found, therefore, that the control according to the invention is much more flexible.

Another advantage of the device described is that a variable speed alternating current series motor can be used for the drive, and thus a single-phase or three-phase synchronous motor, the cost of which is much higher than that of the series motor just referred to may be dispensed with.

Furthermore the dimensions of the control device according to the invention are so small that together with the acoustic portion of the device which also includes an amplifier, if any, it can easily be mounted as an auxiliary apparatus to existing optical film apparatus if the latter are to be made suitable for recording or reproducing sound films.

Certain features disclosed in this application are claimed in the copending application of W. Six and R. Vermeulen, Ser. No. 595,646, filed February 27, 1932, and Ser. No. 614,786, filed June 1, 1932.

What we claim is:

1. In a sound film apparatus having a picture gate and a sound gate, means to move said film past said picture gate and said sound gate, said means comprising conveying rollers, and a single driving motor rigidly connected with said rollers, a centrifugal speed governor driven by a portion of the film disposed between the picture gate and the sound gate to keep the speed of said film constant at the sound gate, and a contact controlled by said speed governor, a regulator to maintain the film tension constant in the rear of the sound gate and a contact controlled by said regulator, a circuit for said motor and a resistance inserted in said circuit, said contacts short-circuiting said resistance for varying time intervals to accelerate and decelerate the speed of the driving motor and thereby maintain its average speed at a substantially constant value.

2. In a sound-picture film apparatus having a picture gate, a sound gate, and means to move said film past said picture gate and said sound gate, said means comprising conveying rollers, and a single driving motor rigidly connected with said rollers, a speed governor driven by a portion

of the film disposed between the picture gate and the sound gate to keep the speed of said film constant at the sound gate, and a vibrating contact controlled by one of the shafts of the apparatus, a regulator to maintain the film tension constant in the rear of the sound gate, a contact whose position relative to that of the vibrating contact is controlled by said regulator, a circuit for said motor and a resistance inserted in said circuit, said contacts shortcircuiting said resistance for varying time intervals to accelerate and decelerate the speed of the driving motor and to thereby maintain its average speed at a substantially constant value.

3. In a sound-picture film apparatus having a picture gate, a fixed guide for the film, a sound gate in said guide, and means to move the film past said picture gate and said sound gate, said means comprising conveying rollers, and a single driving motor rigidly connected with said rollers, a roller disposed directly before the sound gate and driven by the film, a centrifugal speed governor coupled with said latter roller to keep the speed of the film substantially constant at the sound gate, said film having a loop in the rear of the sound gate, a spring-actuated lever carrying a stretching roller to tension said loop, a vibrating contact controlled by the speed of the governor shaft, a contact carried by said lever, the position of said last-named contact relative to that of the vibrating contact being controlled in accordance with the lack of synchronism between the speed of the film before the sound gate and behind the sound gate, and a circuit for said motor having a resistance inserted therein, said contacts shortcircuiting said resistance for varying time intervals to accelerate and decelerate the speed of the driving motor and to thereby maintain its average speed at a substantially constant value.

4. In a sound film apparatus having a picture gate, a sound gate, and means to move said film past said picture gate and sound gate, said means comprising conveying rollers, a single driving motor rigidly connected to said conveying rollers, an electric circuit for said motor, a roller disposed before the sound gate and driven by the film, and a centrifugal governor coupled with said latter roller to maintain the speed of said roller constant, said film having a loop in the rear of the sound gate, a stretching roller for said loop, a spring-actuated lever carrying said stretching roller to tension said loop, a contact actuated by said lever, and a vibrating contact controlled by said governor, said contacts cooperating to control said circuit in accordance with the lack of synchronism between the speeds of the film before and behind the sound gate, to thereby maintain the speed of the driving motor matched to the governor speed.

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