

May 1, 1956

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2,743,922

FILM DRIVE MECHANISM

Filed March 9, 1953

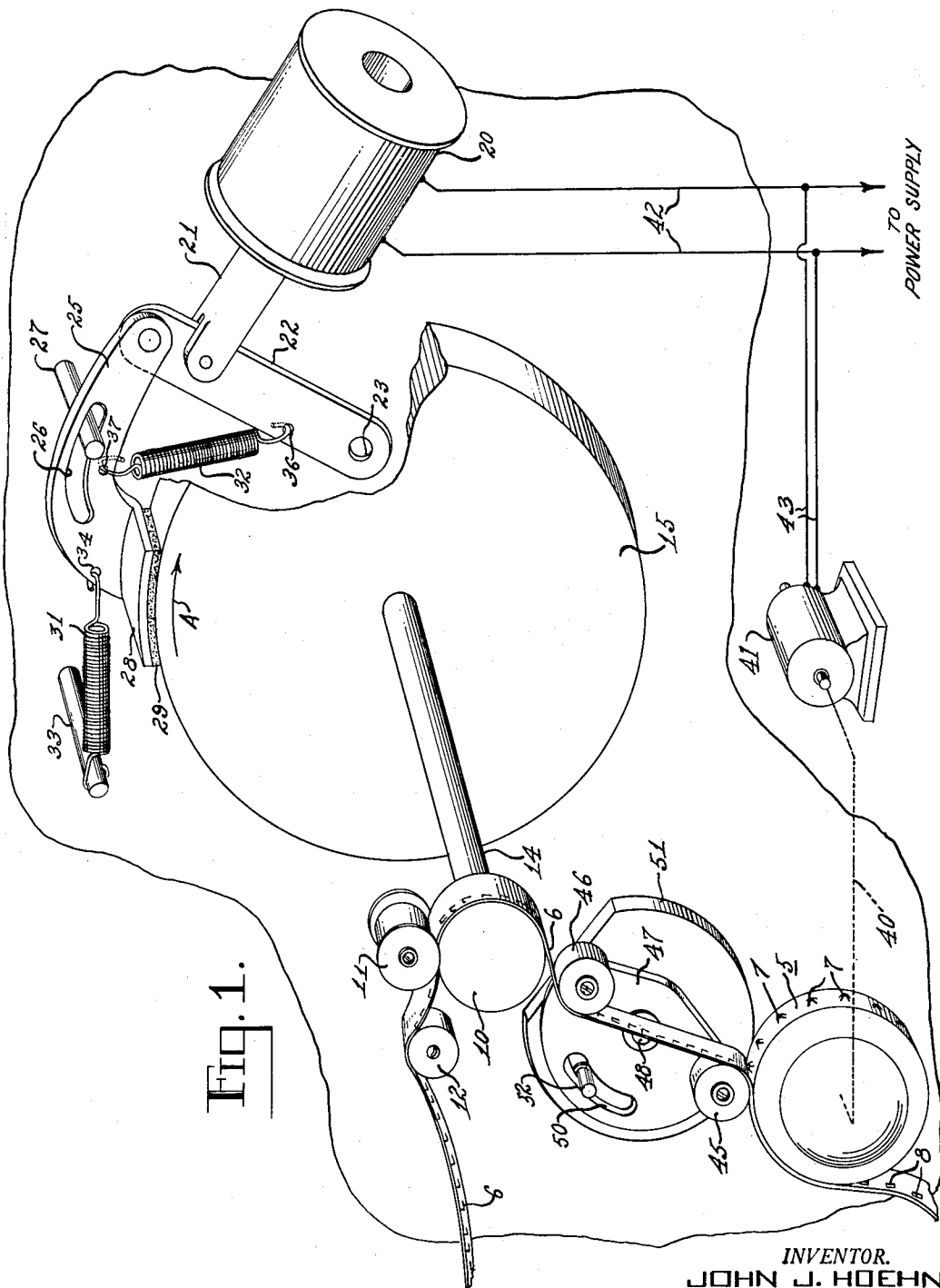


Fig. 1.

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FILM DRIVE MECHANISM

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Application March 9, 1953, Serial No. 341,222

7 Claims. (Cl. 271—2.3)

This invention relates to film drive mechanisms, and particularly to a starting booster for a film-pulled drum and flywheel combination for controlling sound film.

In Black U. S. Patents No. 2,098,215 and No. 2,106,338 of November 9, 1937 and January 25, 1938, respectively, automatic clutch mechanisms for connecting a flywheel to a motor driven shaft are disclosed and claimed. In co-pending U. S. application, Ser. No. 139,180, filed January 18, 1950, now Patent No. 2,702,705 of February 22, 1955 an attachment for a film-pulled drum and flywheel film advancing mechanism is also disclosed and claimed. The present invention is a mechanism which, when energized, rapidly accelerates a film-pulled drum stabilizing flywheel, and which, when de-energized, brakes the motion of the flywheel and drum. The present unit is rugged, stable, and economical, and functions separately from, and is not connected to, the normal film advancing elements, although cooperating therewith to provide a short starting sound reproduction period.

The principal object of the invention, therefore, is to facilitate the rapid starting of a film-pulled drum and flywheel combination.

Another object of the invention is to provide an improved flywheel starting device connectable to a film-pulled drum.

A further object of the invention is to provide a combination speed accelerator for a flywheel and a brake therefor which permits the film to reach its required speed in a minimum time period.

The novel features which are believed to be characteristic of this invention, both as to its organization and the mode of its operation, as well as additional objects and advantages thereof, will be better understood from the following description, when read in conjunction with the accompanying drawings, forming a part hereof, in which:

Fig. 1 is a diagrammatic, perspective view of a mechanism embodying the invention.

Referring now to the drawing, a film sprocket 5 which is driven by a motor 41, as shown diagrammatically by the broken line 40, advances a film 6 as its teeth 7 enter the film perforations 8. To stabilize the film speed, the film rotates a drum 10, on which the film is held by a pressure roller 11 and guided thereto by a guide roller 12.

The drum 10 is mounted on a rotatable shaft 14, on which is mounted a flywheel 15 to provide the proper damping and stabilization of the motion of the film 6 as it passes over the drum 10. This type of film drive is well-known in the art, it being understood that in order to bring the drum 10 and flywheel 15 up to the speed of the film passing thereover, not only is considerable stress placed in the film 6, but considerable time is required to bring the large flywheel mass up to speed. To quickly accelerate the flywheel, therefore, the mechanism now to be described has been provided.

The flywheel accelerator consists of a solenoid 20 having an armature 21, which is pulled into the solenoid upon energization of the latter. The armature 21 is connected

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to an arm 22 pivoted on a fixed pin passing through opening 23. The other end of the arm 22 has pivoted thereon a curved arm 25 having an arcuate slot 26 therein. A fixed pin 27 extends into the slot 26. At right angles to the outer end of the arm 25, is a shoe plate 28, to which is attached a friction pad 29 adapted to contact the peripheral surface of the flywheel 15.

When the solenoid 20 is de-energized, a spring 31 holds the arm 25 to the left, while a spring 32 holds the friction pad 29 against the flywheel 15. The spring 31 is anchored on a fixed pin 33, and to the friction pad end of arm 25 at 34. The spring 32 is anchored adjacent the fixed, pivoted end of arm 22 at 36 and near the center of arm 25 at 37.

The solenoid 20 is energized in parallel with the motor 41 over the conductors 42 and 43, so that both the motor and solenoid are simultaneously energized. Upon energization, the motor 41 brings the sprocket 5 up to speed in a time period determined by the size of the motor 41. Upon energization of the solenoid 20, the friction pad 29 is rapidly moved in the direction shown by the arrow A on the flywheel. The friction between the pad 29 and the flywheel 15 is sufficient to immediately accelerate the flywheel to substantially the rate of speed of the film as it is pulled over the drum 10. Near the end of the stroke of the arm 25, the pin 27 raises the pad 29 off the flywheel where it remains during the operation of the film drive.

When the motor driving the sprocket 5 is de-energized, the equipment comes to rest in a comparatively short period, which is much shorter than would normally take the drum and flywheel combination to come to rest. This would advance the film over the drum 10 so that a misplacement of the film loops would occur. Thus, to bring the drum and flywheel combination to rest in substantially the same time as the sprocket 5, the pad 29 is replaced on the flywheel 15 by the action of springs 31 and 32 upon the de-energization of the solenoid, which occurs simultaneously with the de-energization of the motor driving the sprocket 5. Thus, the mechanism shown at 20—37 not only accelerates the flywheel to rotate the drum 10 along with the sprocket 5, but also, brakes the flywheel so that the drum 10 decelerates along with the sprocket 5.

To provide a uniform rapid film acceleration which permits the sound on film 6 to be perfectly reproduced in a minimum time period and which cooperates with the flywheel starting mechanism, spring biased and damped idler rollers 45 and 46 have been provided. The idlers are mounted on a semi-circular disc 47 pivoted at 48 and having an arcuate slot 50 therein. The shaft of the pivot is mounted on a plate 51, to which a pin 52 in slot 50 is attached. The pin and slot combination limits the rotation of disc 47. The details of the biasing spring and damper of this unit is disclosed and claimed in Bartelson U. S. Patent No. 2,685,417 of August 3, 1954. Another feature of the drive is the silicone oil-damped pressure roller 11, which not only holds the film 6 on the drum 10, but provides a hold-back action. This roller unit is disclosed and claimed in Isom U. S. application, Ser. No. 356,940, filed May 25, 1953.

To explain the action of the filter unit and pressure roller, the film is threaded as shown with a tight loop between sprocket, film, and drum 10 and a loose loop beyond drum 10. Now, when the motor 41 and solenoid 20 are energized, the rollers 45 and 46 move against their spring bias as the sprocket 5 and drum 10 are accelerated, the roller 11 keeping the film taut. The rollers 45 and 46 then return to their normal filtering position at normal speed of the film. When the motor and solenoid are de-energized, the roller 11 holds the film back as the flywheel is braked by pad 29 and when the film

comes to rest it is still taut between sprocket 5 and drum 10. This action permits the film to get up to its proper reproduction speed very quickly without any injury thereto due to the rapid acceleration of sprocket 5.

I claim:

1. A flywheel accelerator comprising a solenoid, an armature for said solenoid, an arm connected to said armature and adapted to be moved therewith in a direction tangential to said flywheel when said solenoid is energized, a friction pad on said arm, said pad being adapted to contact the rim of said flywheel, means for moving said arm and pad in the reverse direction to the movement of said arm and pad caused by the energization of said solenoid, means for holding said friction pad at a substantially fixed position with respect to said flywheel during a predetermined movement of said arm and pad responsive to the energization of said solenoid, and means in contact with said arm for releasing said pad from said flywheel at the end of said predetermined movement of said arm by said solenoid, said first and second mentioned means returning said pad to said flywheel contacting position when said solenoid is de-energized.

2. A flywheel accelerator in accordance with claim 1 in which said means for holding said friction pad on said flywheel is a spring, and said means for moving said arm and pad in the reverse direction to the movement of said arm and pad caused by the energization of said solenoid is a second spring at approximately right angles to said first spring.

3. In a film drive system having a toothed sprocket for advancing perforated film over a film-pulled drum having a flywheel connected thereto, a solenoid, a motor for driving said sprocket, means for simultaneously energizing said motor and solenoid, a friction pad normally in contact with said flywheel when said solenoid is de-energized, an arm interconnecting said solenoid with said pad, said pad remaining in contact with said flywheel during a predetermined movement of said arm, said arm and pad being moved in a direction tangential to said flywheel upon energization of said solenoid, and means for removing said pad from said flywheel after said predetermined movement of said arm and pad.

4. A film drive system in accordance with claim 3 in which means are provided for returning said friction pad

to said flywheel upon the de-energization of said solenoid.

5. A mechanism for accelerating the rotation of a flywheel comprising a solenoid, an armature for said solenoid, a pair of arms having one end of each pivoted together, a fixed pivot for the other end of one of said arms, said one arm being connected to said armature, a friction pad on the other end of said other arm adapted to contact said flywheel, means for holding said friction pad at a substantially fixed position with respect to said flywheel, means for energizing said solenoid for moving said other arm and pad in a direction tangential to said flywheel while said pad is held on said flywheel, means for moving said arm and pad in a reverse direction to the movement of said arm and pad caused by the energization of said solenoid, and means for removing said pad from said flywheel after a predetermined movement of said pad responsive to the energization of said solenoid.

6. A mechanism in accordance with claim 5 in which said friction pad arm has an arcuate slot therein, said last-mentioned means including a fixed pin positioned in said slot, said pin removing said pad from said flywheel after said predetermined movement of said pad responsive to the energization of said solenoid.

7. A mechanism in accordance with claim 6 in which said means for holding said friction pad at a substantially fixed position with respect to said flywheel is a spring and said means for moving said arm and pad in a reverse direction to the movement of said arm and pad caused by the energization of said solenoid is a second spring.

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