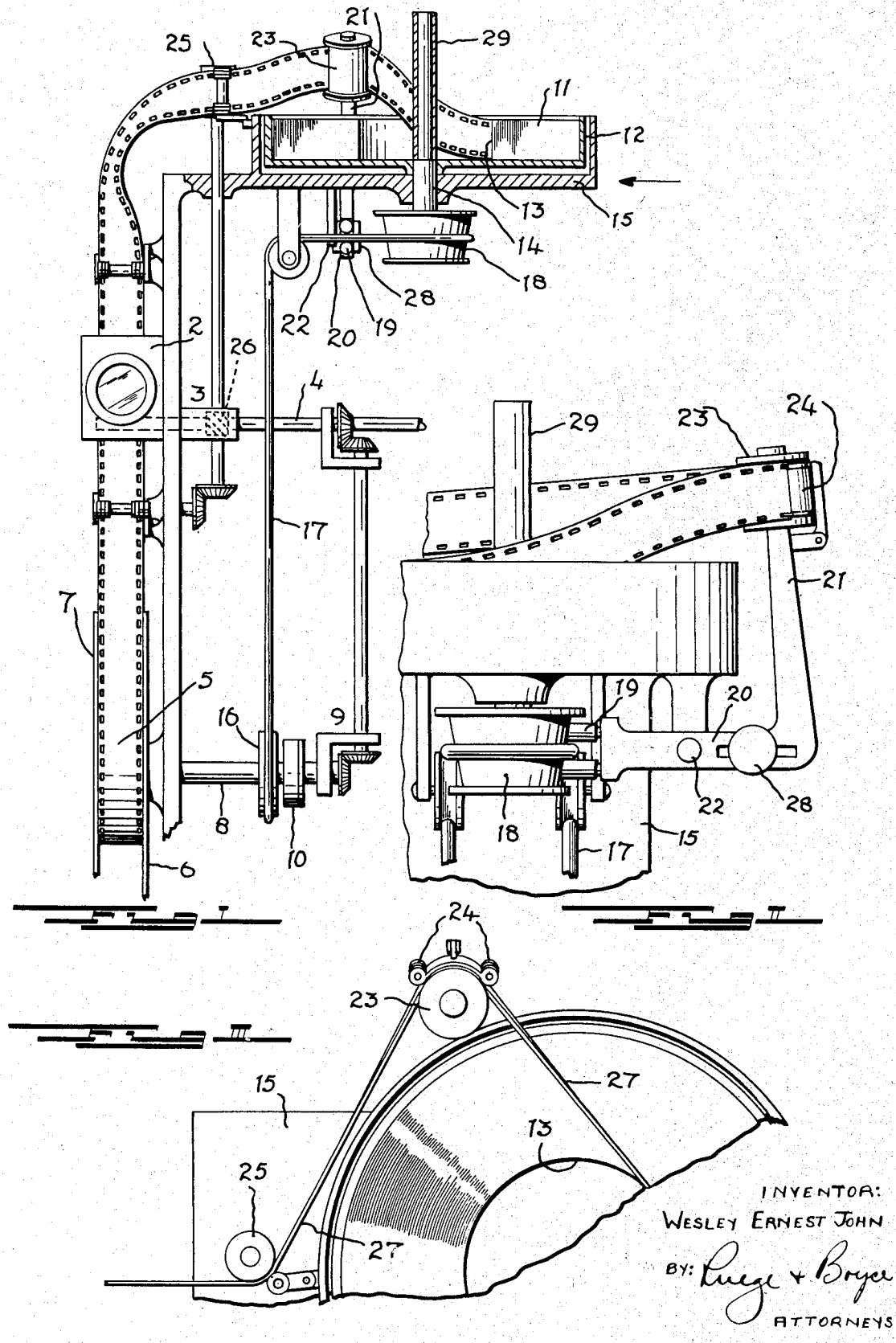
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FILM WINDING APPARATUS

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FILM WINDING APPARATUS

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5 Claims. (Cl. 88—18.7)

The present invention relates to film winding apparatus for kinematograph machines, of the kind in which the film is fed from the inner periphery of the delivery film coil, to the gate feed mechanism and is wound onto the outer periphery of the receiving film coil; so that the wound receiving coil is ready for re-use without re-winding.

The particular problem presented in apparatus of this kind is to rotate the delivery coil carrier with a high degree of precision at the continually varying angular speed necessary to ensure that film is pushed out from the inner periphery of the coil on said carrier at a linear speed which is constant relatively to the linear speed due to the gate feed mechanism.

According to the present invention the carrier for the receiving coil is driven with the gate feed mechanism in the usual manner through a slipping clutch whereby the linear speed of the film winding on to it is equal to the linear speed of the film through the gate and its angular speed is constantly varied according to the increasing diameter of the receiving coil. The delivery coil carrier is driven from the receiving coil carrier; by which means its angular speed may be made equal to that of the receiving coil carrier and the rate of film delivery from its coil approximated to the rate of film winding on the receiving coil. It is necessary however that the angular speed of the two carriers should differ by a slight and non-constant amount, due, among other things to there being always a length of film unwound from the delivery coil and not wound onto the receiving coil. This difference of angular speed is provided for by including in the driving connection between the two carriers, a variable speed mechanism. There is further provided a movable roller structure adapted to engage both faces of the film and a fixed roller co-operating with said roller structure to form the film issuing from the inner periphery of the delivery film coil into a substantially V-shaped loop with the roller structure at its apex. Said roller structure is arranged for movement to follow variation in the length of the loop, and by such movement so to vary the velocity ratio of the variable speed mechanism as to oppose change in the length of the loop.

A preferred form of the invention is shown in the accompanying drawing in which:

Figure I is an elevation of part of a kinematograph projector.

Figure II is an elevation at right angles to Figure I.

Figure III is a part plan; Figures II and III being on a larger scale than Figure I.

2 indicates a film gate with feed mechanism 3 driven by a shaft 4. 5 is the receiving film coil wound onto its carrier 6. The latter is a spool one side 7 of which is displaceable to permit the wound coil 5 to be removed from it. Said spool 6 is removably secured on a shaft 8 driven from the shaft 4 through mechanism 9 and a slipping clutch 10.

11 is the delivery film coil carried in a horizontal carrier 12 which allows film to be passed out from the inner periphery 13 of the coil 11. Said carrier is secured on a vertical shaft 14 mounted in the frame member 15.

16 is a grooved pulley fast on the shaft 8 and connected by a belt 17 to a cone pulley 18 fast on the shaft 14. The diameter of pulley 18 approximates to that of pulley 16. The belt 17 can be shifted up and down the cone pulley 18, to vary the angular speed of the latter and its attached carrier 12, by means of the movable belt fork 19, provided on one arm 20 of a bell crank 20, 21. The latter is pivoted to the frame at 22 to oscillate in a vertical plane.

The other arm 21 of the lever extends approximately vertically so that its upper end oscillates approximately horizontally. At its upper end it carries the freely rotatable roller 23 and the two freely rotatable rollers 24, 24 spaced sufficiently from the roller 23 to permit film to be inserted between them.

25 is a sprocket driven positively with the gate feed mechanism 3 by a connection 26. It is mounted on the frame in such a position that film issuing from the periphery 13 of the coil 11 and fed first around the roller 23 and then around roller 25, forms an approximately V-shaped loop consisting of the two legs 27 and having the roller 23 at its apex. The path of displacement of the roller 23 permitted by the bell crank 20, 21 coincides with the direction in which the apex of the loop tends to move when the loop is lengthened or shortened. By such means as a shiftable weight 28, the bell crank is nicely balanced about its pivot 22 and can thus be moved by the small forces exerted through the legs 27 of the film loop when the latter lengthens or contracts owing to the angular speed of its carrier being too high or too low relatively to the linear speed of the film through the gate. Shortening of the loop causes it to press on the roller 23, whilst lengthening of the loop causes it to press on the rollers 24. By such movement of the bell crank the belt 17 is shifted up or down the cone pulley to

correct the angular speed. It is preferable so to bias the bell crank 20, 21 by means of the weight 28 that the tendency is always to overfeed slightly, such tendency being corrected by the pressure of the film on the rollers 24.

Such means as an extension of shaft 14, having a freely rotatable sleeve 29 forming a central pillar, is provided to prevent coils of film from being pulled out of the carrier 12 if it should happen that, for any reason, the film is drawn too rapidly from said carrier 12.

I claim:

1. Film winding apparatus for kinematograph machines comprising a rotatable delivery film coil carrier, a gate feed mechanism, a rotatable receiving film coil carrier, a frame on which the said parts are mounted, means for withdrawing film from the inner periphery of a coil of film in the delivery carrier through the gate feed mechanism and feeding it to the outer periphery of a coil of film in the receiving carrier, a driving device for driving the gate feed mechanism, means including a slipping clutch for driving the receiving carrier from said driving device, a driving connection from the receiving carrier to the delivery carrier including a variable speed mechanism, a bell crank lever pivotally mounted on the frame with one arm upright, rollers at the end of said arm engaging both faces of a loop of film on its way to the gate mechanism to cause said lever to rotate in response to variations in the length of said loop, the other end of said lever co-operating with said variable speed mechanism for controlling the speed of rotation of the delivery carrier in accordance with the length of said loop.

2. Film winding apparatus for kinematograph machines comprising a rotatable delivery film coil carrier, a gate feed mechanism, a rotatable receiving film coil carrier, a frame on which the said parts are mounted, means for withdrawing film from the inner periphery of a coil of film in the delivery carrier through the gate feed mechanism and feeding it to the outer periphery of a coil of film in the receiving carrier, a driving device for driving the gate feed mechanism, means including a slipping clutch for driving the receiving carrier from said driving device, a driving connection from the receiving carrier to the delivery carrier including a variable speed mechanism, a bell crank lever pivotally mounted on the frame with one arm upright, rollers at the end of said arm engaging both faces of a loop of film on its way to the gate mechanism to cause said lever to rock in response to the variations in the length of said loop, the other end of said lever co-operating with said variable speed mechanism for controlling the speed of rotation of the delivery carrier in accordance with the length of said loop, and a shiftable weight on said bell crank lever for balancing said lever about its pivot when the film is in position.

3. Film winding apparatus for kinematograph machines comprising a rotatable delivery film coil carrier, a gate feed mechanism, a rotatable receiving film coil carrier, a frame on which said parts are mounted, means for withdrawing film from the inner periphery of a coil of film in the delivery carrier through the gate feed mechanism and feeding it to the outer periphery of a coil of film in the receiving carrier, a driving device for driving the gate feed mechanism, means including a slipping clutch for driving the receiving carrier from said driving device, a belt pulley rigid with the receiving carrier, a cone pulley rigid with the delivery carrier, a driving belt connecting said pulleys, a bell crank lever pivotally mounted on the frame with one arm upright, rollers at the end of said arm engaging both faces of a loop of film on its way to the gate mechanism to cause said lever to rotate in response to variations in the length of said loop, the other end of said lever co-operating with said belt for shifting it along the cone pulley to vary the speed of the delivery carrier in accordance with the length of film between the delivery carrier and the gate mechanism.

4. Film winding apparatus for kinematograph machines comprising a rotatable delivery film coil carrier, a gate feed mechanism, a rotatable receiving film coil carrier, a frame on which the said parts are mounted, means for withdrawing film from the inner periphery of a coil of film in the delivery carrier through the gate feed mechanism and feeding it to the outer periphery of a coil of film in the receiving carrier, a driving device for driving the gate feed mechanism, means including a slipping clutch for driving the receiving carrier from said driving device, a driving connection from the receiving carrier to the delivery carrier including a variable speed mechanism, a movable roller structure adapted to engage both faces of the film, a fixed roller co-operating with said roller structure to form the film issuing from the inner periphery of the delivery film coil into a substantially V-shaped loop with the movable roller structure at its apex, said roller structure being arranged for movement to follow variation in the length of the loop, and by such movement so varying the velocity ratio of the variable speed mechanism as to oppose change in the length of the loop.

5. Film winding apparatus for kinematograph machines comprising a rotatable delivery film coil carrier, a gate feed mechanism, a rotatable receiving film coil carrier, a frame on which the said parts are mounted, means for withdrawing film from the inner periphery of a coil of film in the delivery carrier through the gate feed mechanism and feeding it to the outer periphery of a coil of film in the receiving carrier, a driving device for driving the gate feed mechanism, means including a slipping clutch for driving the receiving carrier from said driving device, a belt pulley rigid with the receiving carrier, a cone pulley rigid with the delivery carrier, a driving belt connecting said pulleys, a movable roller structure adapted to engage both faces of the film, a fixed roller co-operating with said roller structure to form the film issuing from the inner periphery of the delivery film coil into a substantially V-shaped loop with the movable roller structure at its apex, and means controlled by said roller structure for shifting the belt along the cone pulley so as to vary the velocity of the delivery film coil carrier in such a way as to oppose change in the length of the loop.

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