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DRIVING MECHANISM FOR SOUND RECORDING AND REPRODUCING SYSTEMS

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FIG. 1

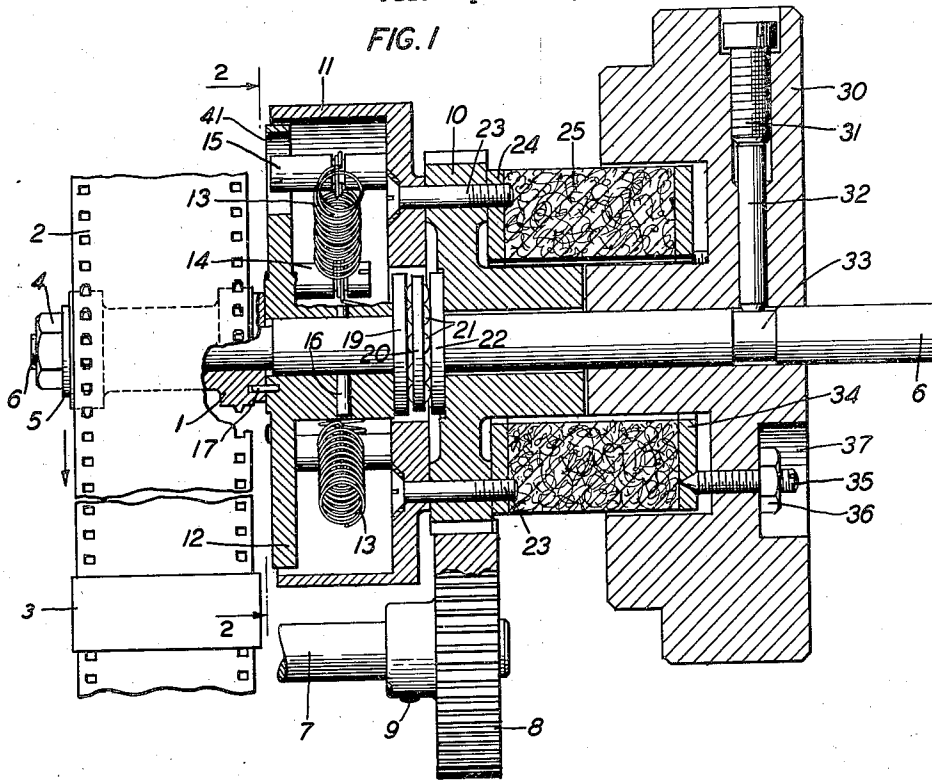
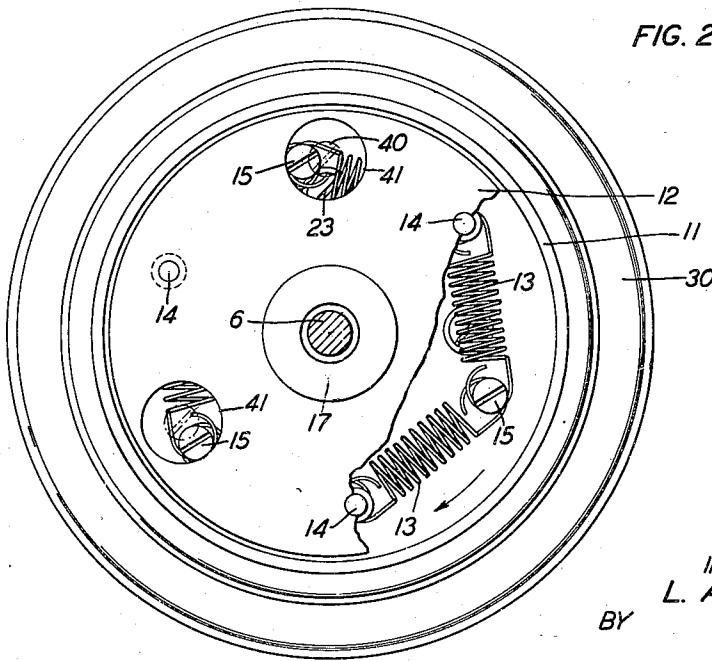


FIG. 2



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DRIVING MECHANISM FOR SOUND RECORD-
ING AND REPRODUCING SYSTEMSLloyd A. Elmer, West Orange, N. J., assignor to
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7 Claims. (Cl. 271-2.3)

This invention relates to sound picture apparatus and more particularly to a driving and a control mechanism for maintaining a film at constant velocity for sound translation.

In mechanism of this general character, a variety of irregularities exist in the driving mechanism for the film. A majority of these irregularities are produced by infinitesimal imperfections in the parts of the driving mechanism and in the film. These imperfections, however, need not necessarily be great to affect sound translation. Irregularities may be grouped into high and low frequency oscillations caused by angular velocity variations. The high frequency irregularities are caused by gear teeth and consequent harmonics produced thereby. The low frequency irregularities are caused by cyclic modulations in speed due to imperfections in the driving motor, imperfect layout of gear teeth, film variations and other eccentricities.

In order to obtain constant film velocity at the point of sound translation, a flywheel or terminating resistance is ordinarily coupled with an elastic member to absorb velocity variations due to irregularities in the film and driving mechanism. Since, the manufacture of mechanism of this character cannot be accomplished in a manner to completely eliminate certain inequalities it follows that the inequalities in one assembly of mechanisms are often different than in another. In consequence of this a difference in the absorbing qualities of the elastic member may be required for each assembly of such mechanism in order that it perfectly absorb velocity variations.

The object of this invention is, therefore, to provide a resilient coupling or elasticity between the driving mechanism and the film driving cylinder which may be adjusted to obtain the correct damping for absorbing driving mechanism velocity variations and oscillations in order that continuous motion of the film may be obtained.

One embodiment of this invention resides in controlling velocity variations in a recording or reproducing device driven by an electric motor. The motor drives the mechanism of sound picture apparatus which includes the intermittent motion and a sprocket for regulating movement of the film. The aforementioned sprocket regulates the movement of the film past the point of sound translation and the rotation thereof must be maintained uniform at all times to prevent distortion of sounds. For convenience this sprocket will be hereinafter known as the sound sprocket. A flywheel is mounted on the sound

sprocket shaft to absorb and give forth energy as required. This flywheel in itself absorbs film load variations. A resilient or elastic member is placed between the driving motor and the shaft on which the sound sprocket is mounted. This resilient member is used to absorb driving mechanism velocity variations. A compound resilient member is used for this device, one unit being approximately a fixed elasticity and a second unit of adjustable elasticity. The unit of fixed elasticity comprises a plurality of springs connected between a member rotated by the motor and a hub member rigidly attached to the shaft on which the sprocket is mounted. The second member comprises a cylinder made of felt or other suitable material placed between a member rotated by the motor and the flywheel. Means are provided for adjusting the density of the felt cylinder and thus for adjusting the absorbing qualities of the elasticity as a whole. This adjustment alters the internal resistance of the felt cylinder and alters its torsibility. Ordinarily this adjustment is made to obtain critical damping. Critical damping may be defined as that which causes a mass which has been forced from its normal position to return to its normal position in a minimum time and cause said mass to stop at said normal position, that is, not to override the normal position. In some cases less or more than critical damping may be desired depending upon the kind of oscillation or vibration to be absorbed.

In the consideration of this problem the constant or uniform velocity of the sound sprocket must be taken as a zero factor. The uniform velocity may be defined as that which would be obtained if no irregularities existed to introduce velocity changes. Thus in the devices of this invention velocity changes only are of interest. These velocity changes are of various frequencies depending upon the cyclic velocity of the member producing the change. A number of driving links comprising shafts and gears are of necessity introduced between the motor and the driven end of the elastic or spring member. All of those mechanisms of the sound picture apparatus including the intermittent motion are driven through the agency of these shafts and gears. Any of these devices including the motors, gears, shafts or driven mechanisms may by slight imperfections cause velocity changes. The effect of these velocity changes is present in the elastic member in the form of angular velocity changes. However, if this elastic member is properly adjusted, the velocity changes present in the elastic

member are not transmitted to the sound sprocket in a degree which will cause sound distortions.

Fig. 1 is a view partly in cross section of the driving and driven mechanisms and the elastic member; and

Fig. 2 is an elevation showing the arrangement of the springs for the elastic member.

The driving motor, shaft, intermittent motion, etc., of the sound picture apparatus is of conventional design and therefore has not been disclosed. The shafting extending from the motor is connected to gear 8 for driving the film past the point of sound translation. A portion of shaft 7 has been shown on which the gear 8 is fastened by pin 9. An electric motor is ordinarily run at 20 revolutions per second, and is ordinarily connected through a gear set to the various shafting for regulating the speed of different gears which drive individual units of the sound picture apparatus. Gear 8, for example, is ordinarily driven six revolutions per second. Gear 8 is meshed with gear 10 and thus any irregularities in gear structure of either of these gears tend to introduce velocity variations at a frequency of six cycles per second. Gear 10 is journaled on the sound sprocket shaft 6 and is connected by screws 23 to the spring housing 11. The spring housing 11 is connected through springs 13 to the flanged hub member 12. Flanged hub member 12 is rigidly connected to shaft 6 by pin 16.

The manner of connecting the springs between housing 11 to the flanged hub 12 may be best understood by observing Fig. 2 in conjunction with the disclosure of Fig. 1. Three studs 15 are screwed into the spring housing 11 for supporting one end of each spring. Stud 14 are screwed into the flange of flanged hub 12 for supporting the alternate end of each spring. It will be noted that studs 15 extend through holes 41 drilled at three points in the flange of flanged hub 12. When the sound picture mechanism is at rest the studs 15 rest approximately as shown near the metal surrounding the hole 41. When the mechanism of the motion picture apparatus has been brought up to speed the stud 15 is brought to the center of the hole as shown by the dotted stud 40. The shaft 6 is thus driven through springs 13 by gears 8 and 10. This comprises one unit of the elastic member.

The sprocket 1 is rigidly connected to shaft 6 by nut 4 having a lock washer 5 for holding nut 4 rigidly in position. The sprocket 1 is also keyed to the hub flange 12 by key 17. The flywheel 30 is rigidly connected to shaft 6 by screw 31, and locking stud 32. A recess 33 is formed in shaft 6 to receive the locking stud 32.

It will be noted that screw 23 extends through spring housing 11, gear 10 and circular plate 24, rigidly fastening the three together. Between the plate 24 and the flywheel a cylinder of felt is used as the second unit of the elastic member. This cylinder of felt extends between circular plate 24 and circular plate 34. The circular plate 34 is held in position by screw 35 which is arranged with a conical shaped end. Only one of the screws 35 has been shown in the drawing. There are, however, a plurality of such screws used. Normally three are all that is required. The felt cylinder is of such density that relative motion between the flywheel 30 and gear 10 causes twisting of the cylinder and thus tends to dissipate the energy of oscillations. To obtain the degree of damping required in the felt cylinder screws 35 are thrust into the circular plate 34 until the felt cylinder is compressed to the proper degree

of density. The internal resistance and torsibility of the felt cylinder are altered by this adjustment. The lock nuts 36 are then fastened in place to retain the felt cylinder compressed to the proper degree for the correct damping of the particular mechanism of the machine in which the resilient coupling is used.

The compression of the felt cylinder by screws 35 as described has a tendency to thrust gear 10 toward the flanged hub 12. To relieve friction between the gear and hub, a ball bearing comprising balls and races 19, 20, 21 and 22 has been used. This is of particular value in preventing the transmission of gear oscillations to the sound sprocket shaft 6.

From the foregoing it is apparent that the sound sprocket is driven through the composite elastic member comprising the springs 13 and the felt cylinder 25 and that these two elastic members are interlocked with each other. From this it is apparent that any adjustment of the density of the felt cylinder controls the elasticity of the complete elastic member to an extent that a particular quantity of damping may be obtained. The manner of judging the amount of damping required is ordinarily obtained through the use of instruments for measuring vibrations and oscillations present in a given mechanism. By the use of a compound elastic member as herein described the film 2 may be driven at constant velocity past the point of sound translation which in this case is schematically shown by the rectangle 3. The apparatus for sound translation may be of any well known character.

The cylinder 25 has been described and is normally made of felt. It is not, however, the intention of the inventor to limit himself to a given material for this cylinder since it may be manufactured of many resilient materials capable of undergoing torsion and capable of being compressed to change its internal resistance and torsibility.

In some mechanisms a very small and light flywheel is used. In this case the springs 13 are made extremely flexible to absorb oscillations and a particular off-center adjustment of the spring studs must be made. This biasing or off-center adjustment is made by rotating the flywheel against spring tension before locking the flywheel in position on shaft 6.

What is claimed is:

1. A drive for a continuous motion film having a sound record thereon comprising a driving and a driven member, a resilient coupling mounted between said driving and driven member, said coupling having a member of material having internal resistance capable of undergoing torsion and capable of being compressed to change its internal resistance and torsibility and an adjusting means for compressing said material for altering the internal resistance and torsibility of said member to vary the damping quality of said resilient coupling.

2. A drive for a continuous motion film having a sound record thereon comprising a driving and a driven member, a resilient coupling mounted between said driving and driven member, said coupling having a cylinder of material having internal resistance capable of undergoing torsion and capable of being compressed to change its torsibility and an adjusting means for compressing said material for altering the torsibility of said cylinder to vary the damping quality of said resilient coupling.

3. A drive for a continuous motion film having

a sound record thereon comprising a driving and driven gear, a driven member for moving said film, a resilient coupling mounted between said driven gear and driven member, said coupling comprising a set of springs and a cylinder of material capable of undergoing torsion and capable of being compressed to change its torsibility and an adjusting means for compressing said material for altering the torsibility of said cylinder to vary the damping quality of said resilient coupling.

4. A drive for a continuous motion film having a sound record thereon comprising a driving and driven gear, a shaft, a driven rotatable member for moving said film and a flywheel mounted rigidly on said shaft, a compound resilient coupling mounted between said driven gear and said driven member and flywheel, one unit of said coupling comprising linear elasticity in the form of springs connected between said driven gear and said shaft, a second unit of said coupling comprising a cylinder connected between said driven gear and flywheel of material capable of undergoing torsion and capable of being compressed to change its torsibility and an adjusting means for compressing said material for altering the torsibility of said cylinder to vary the damping quality of said resilient coupling.

5. A drive for a continuous motion film having a sound record thereon comprising a cylinder for moving said film past a point of sound translation mounted rigidly on a drive shaft, a flywheel mounted rigidly on said shaft, a driving gear in mesh with a driven gear, said driven gear being journaled on said shaft, a resilient coupling mounted between said driven gear and said flywheel, shaft and cylinder comprising a set of spring connecting said driven gear and said shaft

and a felt cylinder connecting said gear and flywheel and an adjusting member for regulating the overall density of said felt cylinder to vary the damping quality of said resilient coupling.

6. A drive for a continuous motion film having a sound record thereon comprising a driving and a driven member, a compound resilient coupling in the form of two resilient members in multiple between said driving and driven member, one member being of fixed elasticity and the second member being of material having internal resistance capable of undergoing torsion and capable of being compressed to change its internal resistance and torsibility and an adjusting means for altering the overall density of said second member thus altering the internal resistance and torsibility of said member to vary the damping of said resilient coupling.

7. A drive for a continuous motion film having a sound record thereon comprising a driving and driven gear, a shaft, a driven rotatable member for moving said film and a flywheel mounted rigidly on said shaft, a compound resilient coupling in the form of two resilient members in multiple between said driven gear and said rotatable member, one member of said coupling comprising linear elasticity in the form of springs connecting said driven gear and said shaft, a second member of said coupling comprising a cylinder, connecting said driven gear and flywheel, of material capable of undergoing torsion and capable of being compressed to change its torsibility and an adjusting means for altering the overall density of said cylinder for altering its torsibility and varying the damping of said resilient coupling.

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