May 10, 1932. L. S. FRAPPIER ET AL 1,857,780

FRICTION DRIVE FOR MOTION PICTURE MACHINES

Filed Aug. 1, 1929 5 Sheets-Sheet 1

Fig. 1.

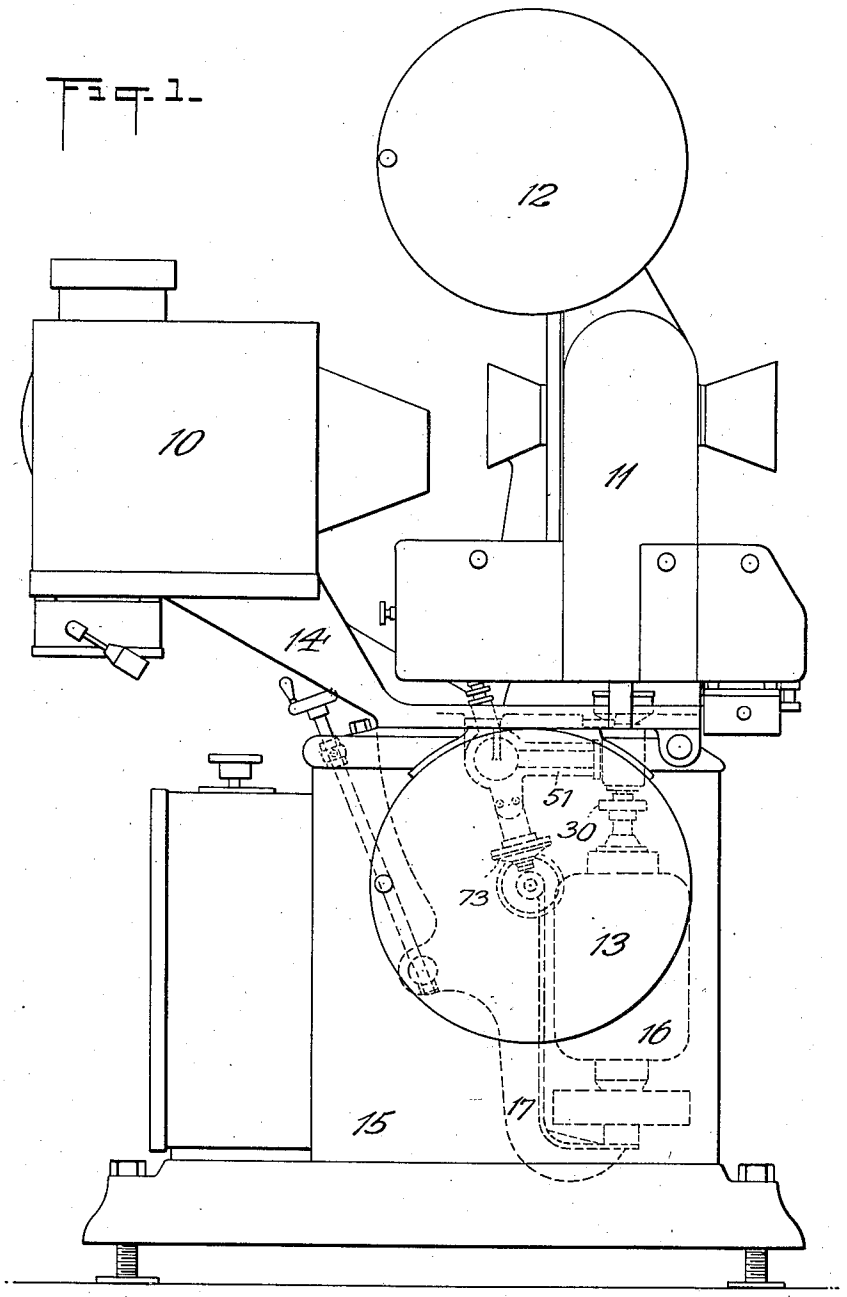

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Fig. 2.

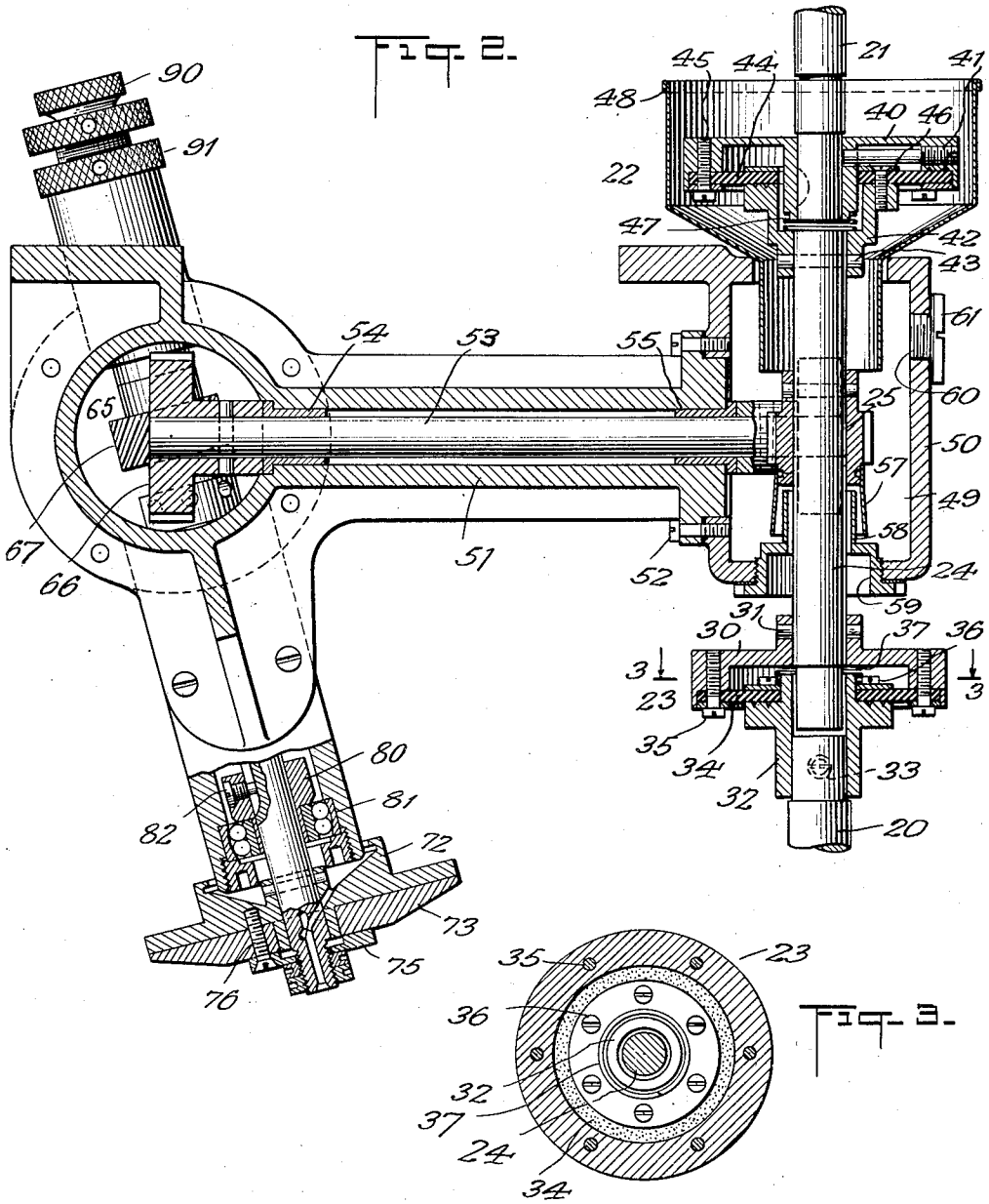

Fig. 3.

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FRICTION DRIVE FOR MOTION PICTURE MACHINES

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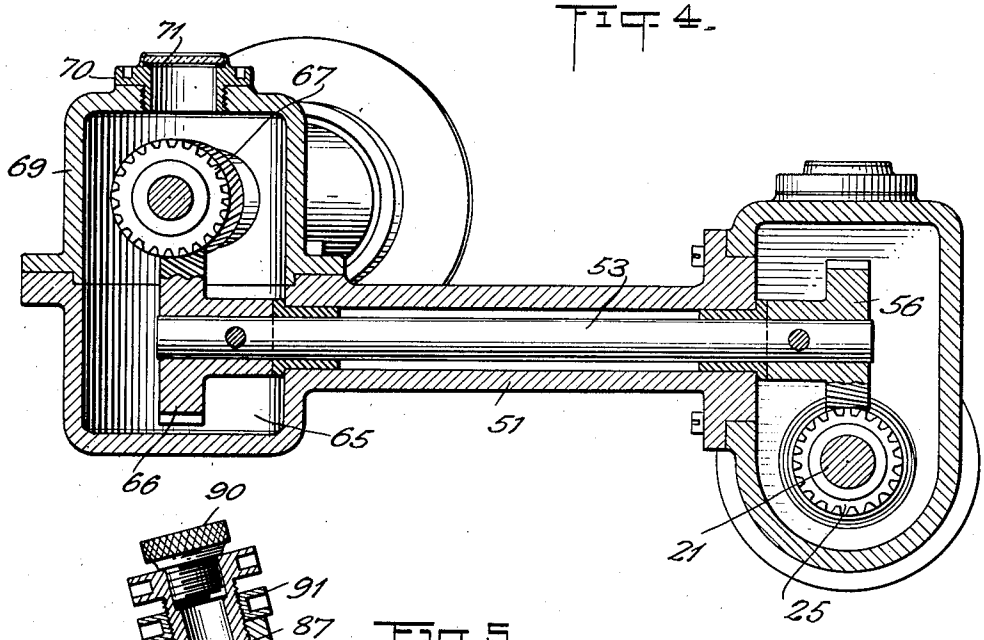
Fig. 4.



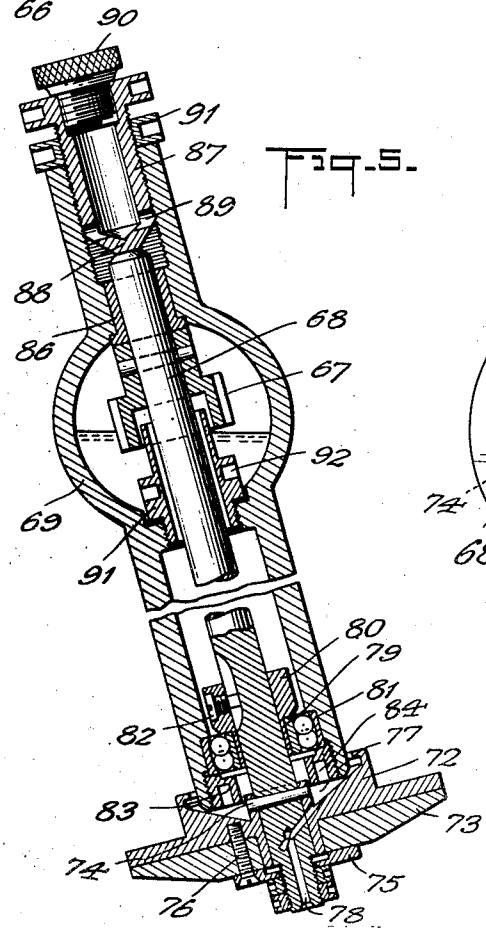


Fig. 5.

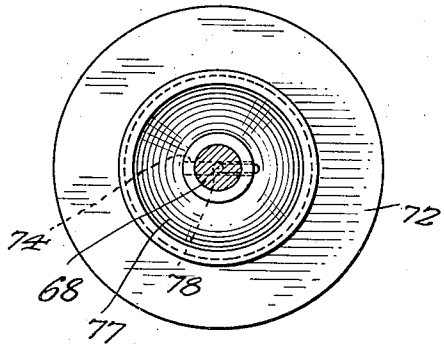


Fig. 6.

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FRICTION DRIVE FOR MOTION PICTURE MACHINES

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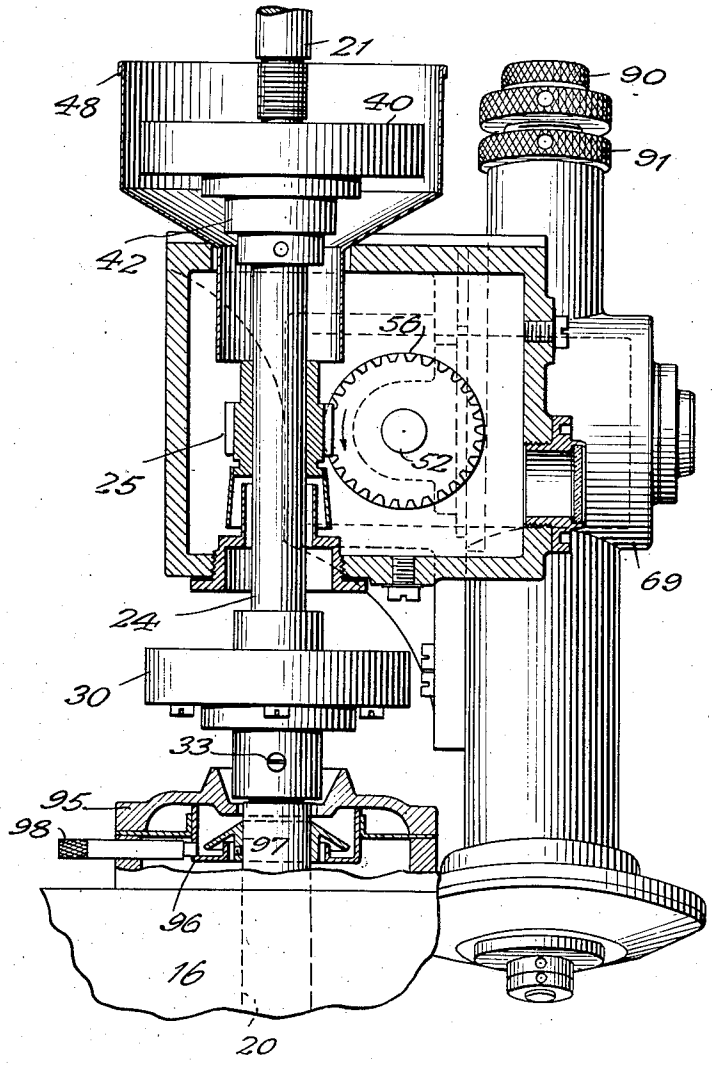

Fig. 7.

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FRICTION DRIVE FOR MOTION PICTURE MACHINES

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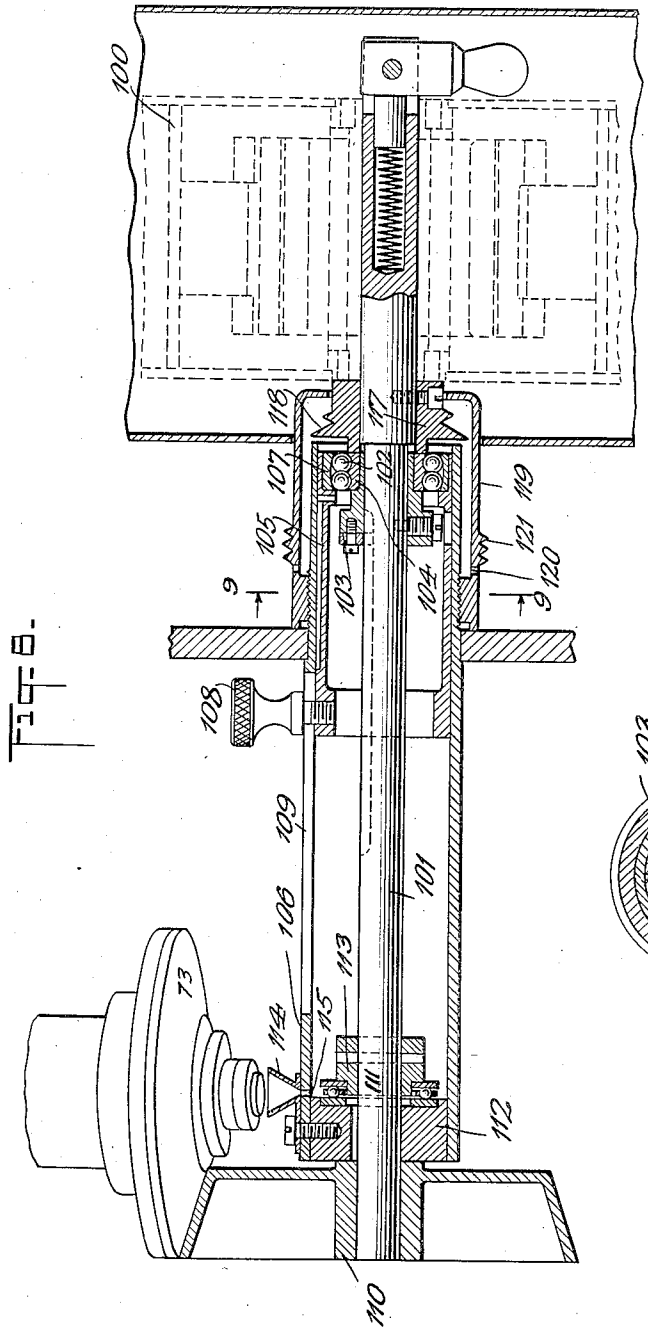

Fig. 8.

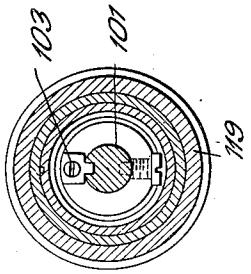

Fig. 9.

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UNITED STATES PATENT OFFICE

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FRICTION DRIVE FOR MOTION PICTURE MACHINES

Application filed August 1, 1929. Serial No. 382,637.

This invention relates to projection machines, and more particularly to a take-up device for variably driving a film reel and maintaining a substantially constant tension on the film.

An object of the invention is to provide mechanism for controlling the power applied to the reel in accordance with the weight of the film thereon.

A further object is to provide a simplified driving mechanism which is substantially automatic in operation.

A still further object is to provide for interconnecting the drive shaft for the reel with the main driving shaft in such manner that the normal operation of the shaft is unimpeded.

Another object is to provide means for controlling the oil distribution in the drive for the take-up device.

Still another object is to provide mechanism for preventing oil from entering the motor.

Another object is to provide mechanism for adjusting the ratio of the driving force to the weight of the film on the reel.

Still another object is to provide a simplified oiling system whereby the various gears may be automatically oiled from a single source.

The above objects and others which will be apparent as the nature of the invention is disclosed are accomplished, in a machine having a main vertical drive shaft, by driving the take-up mechanism from a floating gear which is connected into the main drive shaft between a pair of universals. The take-up device is so arranged that the weight of the film causes the shaft to pivot about its bearing thereby bringing the frictional driving members into variable engagement. The frictional force is accordingly controlled by the amount of the film on the reel and is always maintained such that a constant film tension is obtained. Means are also provided for shifting the bearing for the shaft longitudinally thereof so that the ratio of the weight of the reel to the frictional force may be varied as desired.

The simplified oiling mechanism includes a casing surrounding the various shafts and the driving gears interconnecting the take-up device with the main driving shaft. The casing is so arranged that oil may be applied at a single point and is automatically transmitted to the various gears. An oil shield is secured to the motor shaft to prevent the oil from following the drive shaft down into the motor.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which

Fig. 1 is a side elevation of a projection machine showing the location of the driving motor and take-up mechanism;

Fig. 2 is an enlarged detail of the driving mechanism;

Fig. 3 is a section taken on the line 3—3 of Fig. 2 showing the construction of the universal;

Fig. 4 is a plan view partly in section of the driving mechanism;

Fig. 5 is a sectional view of the friction disc and driving shaft therefor;

Fig. 6 is a bottom plan view of the friction disc;

Fig. 7 is a side elevation of the driving mechanism showing the oil shield on the motor shaft;

Fig. 8 is a detail view of the driving shaft for the reel showing the take-up mechanism; and

Fig. 9 is a section taken along the line 9—9 of Fig. 8.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended

to be as generic in their application to similar parts as the art will permit.

Referring to the drawings more in detail the invention is shown as applied to a projection machine including a lamphouse 10, projection head 11, upper film magazine 12 and lower film magazine 13 supported on lever 14 which is pivotally secured to pedestal 15.

The mechanism in projection head 11 is driven by motor 16 through a vertical drive shaft as will be described. Motor 16 is supported by web 17 forming a part of lever 14.

Referring to Fig. 2, the shaft 20 of motor 16 is connected to main drive shaft 21 through a pair of universals 22 and 23. Shaft 24, interconnecting said universals, carries gear 25 (Figs. 2 and 4) from which the take-up device is driven in a manner to be pointed out.

Universal 23 comprises a housing 30 which is pinned to shaft 24 by aluminum pin 31. Sleeve 32 is keyed or otherwise secured, to shaft 20 to which it is locked by set screws 33 (Figs. 2 and 7). Flexible driving member 34 interconnects housing 30 and sleeve 32 and is secured thereto by means of screws 35 and 36 respectively. Spring 37 is seated between sleeve 32 and housing 30 for applying sufficient pressure to the shafts in a longitudinal direction to prevent irregular operation.

Universal 22 comprises a housing 40 which is secured to shaft 21 by set screw 41 and a sleeve 42 which is pinned to shaft 24 by aluminum pin 43. Washer 44, of flexible material, is secured to housing 40 and sleeve 42 by screws 45 and 46 respectively and provides a flexible driving connection. Spring 47 is located between shafts 21 and 24 and operates in a manner similar to spring 37. Oil shield 48 surrounds universal 22 and directs any oil which may pass the universal into the gear chamber 49. Aluminum pins 31 and 43 are of less strength than the remainder of the apparatus and will shear if any of the apparatus should become jammed thereby preventing injury to the driving mechanism.

Gear chamber 29 is formed of a housing 50 which is secured to a housing 51 by suitable means such as screws 52. Shaft 53 is journalled by bearings 54 and 55 in housing 51 and carries gear 56 which meshes with gear 25 (Fig. 4). Oil shield 57 is mounted on gear 25 and telescopes with shield 58 which loosely surrounds shaft 24, and forms a part of cap 59 which is secured in housing 50.

Oil guard 57 and shield 58 prevent direct passage of oil around shaft 24 and permit a certain oil level to be maintained in chamber 49. Oil may be applied to said chamber through an opening 60 which is normally closed by cap 61.

Housing 51 also forms a gear chamber 65 in which are located gear 66 which is pinned to shaft 53 and gear 67 which is pinned to shaft 68 (Figs. 4 and 5). Housing 69 surrounds shaft 68 and cooperates with housing 51 to form gear chamber 65. A cap 70 carrying a glass 71 may be secured in housing 69 to provide an oil level indicator. Oil from chamber 49 flows past bearings 54 and 55 and is applied to chamber 65 for oiling gears 66 and 67.

Member 72 carrying friction disc 73 is pinned to shaft 68 by pin 74. Friction disc 73 may be secured by washer 75 and screw 76. Member 72 is provided with an oil recess 77 communicating with a bore 78 in shaft 68 by which oil may be discharged.

Shaft 68 carries a ball race 79 secured in collar 80 which, in connection with ball race 81 secured in housing 69, forms a thrust bearing. Collar 80 may be secured to shaft 68 by means of set screw 82. Ring 83, threaded into housing 69, secures ball race 81 in its desired position. Said ring is provided with a pair of recesses 84 for receiving a spanner wrench.

The upper end of shaft 68 is journalled in housing 69 by means of bearing 86. Hollow plunger 87 is threaded in said housing and is provided with a pointed end 88 which bears against shaft 68 for holding said shaft firmly against its thrust bearing. Said plunger 87 may be adjusted to compensate for wear of the various parts. Plunger 87 is provided with a pair of holes 89 through which grease may be applied to bearing 86. Said plunger is closed by a grease cap 90, and is secured in its desired position by means of lock washer 91. Oil shield 92 is secured in housing 69 and loosely surrounds shaft 68 below gear 67 whereby the desired oil level may be maintained in chamber 65. Shield 91 is provided with a pair of recesses 92 which are adapted to receive a spanner wrench for purposes of adjustment.

Referring to Fig. 7, motor 16 is shown as provided with a stationary casing 95 having an oil cup 96 secured thereto and surrounding shaft 20. Shield 97 is secured to shaft 20 and directs any oil which may flow down said shaft into oil cup 96. Discharge pipe 98 connects with oil cup 96 for directing the oil outside of motor 16 and thereby preventing oil from the projection head from entering the motor and damaging the same.

Referring now to Fig. 8, the film reel 100 is shown as supported on a driving shaft 101 which is rotatably journalled in bearing 102. Said bearing comprises a collar 103 which is slidably keyed to shaft 101 and carries ball race 104. Sleeve 105 is slidably carried in housing 106 and carries ball race 107 which cooperates with race 104 to form bearing 102. Handle 108 is threaded into sleeve 105 and extends through slot 109 in housing 106 for

providing a hand grip to permit longitudinal adjustment of bearing 102.

Shaft 101 carries friction wheel 110 which is in frictional engagement with disc 73. Thrust bearing 111 is formed by collar 112, which is secured in housing 106, and member 113 which is pinned to shaft 101, and prevents longitudinal movement of said shaft. Collar 112 is provided with an elongated opening for shaft 101 to permit limited pivotal movement of said shaft about bearing 102. An oil cup 114 may be secured to housing 106 in alignment with bore 78 of shaft 68 and in communication with an aperture 115 in said housing. Said oil cup receives oil which drains from chamber 65 and applies the same to thrust bearing 111. The oil then follows shaft 101 and is applied to bearing 102. Collar 117 carrying oil threads 118 is secured to shaft 101 between bearing 102 and film reel 100 for preventing oil from following said shaft into the film magazine. Oil shield 119 is secured to housing 106 and catches the oil from bearing 102 and discharges the same through aperture 120. Oil threads 121 may be formed on shield 119 adjacent said aperture for preventing oil from following the outer surface of the shield into the film magazine.

In the above described apparatus the lower film reel is driven by friction members 73 and 110 from a main driving shaft 21 of the projection head. The friction members which form the take-up mechanism are driven from a floating gear 25 which is mounted between universals 22 and 23. This prevents variation in the take-up device from affecting the alignment of shaft 21 and interfering with the operation of the projection head. The aluminum pins by means of which the universals are secured also prevent injury to the driving mechanism when any particular portion becomes jammed. The various gears and bearings are oiled from a single source, namely, chamber 49. The oil passes along shaft 53 to chamber 75, thence follows shaft 68 past the thrust bearing whence it is discharged through bore 78. The oil thus discharged passes through oil hole 115 and is applied to bearings 111 and 102, thence it is caught by oil shield 119 and discharged through hole 120.

Shaft 101 is free to pivot about bearing 102 to a limited extent, hence the weight of reel 100 causes said shaft to operate as a lever fulcrumed on bearing 102 thereby bringing friction member 110 into engagement with friction disc 73. The force applied to the friction drive is thus dependent upon the weight of the film on reel 100. The ratio of the force applied to the friction mechanism to the weight of the film on reel 100 may be adjusted by varying the longitudinal position of bearing 102 on shaft 101. This is accomplished by means of handle 108.

When the desired adjustment is obtained for a particular type of film it is normally maintained while that type of film is being used. The adjustable bearing, however, permits the machine to be adjusted so as to operate under various operating conditions.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. A drive for a utility comprising a driving motor, a main driving shaft formed in three sections and driven from said motor, universals interconnecting said sections, a gear carried by the intermediate section, and means driven by said gear for operating the utility.

2. A drive for a take-up mechanism comprising a driving motor, a main driving shaft formed in three sections, universals interconnecting said sections, a gear carried by the intermediate section, and means for driving said take-up mechanism from said gear.

3. A reeling device comprising a substantially horizontal shaft adapted to support a reel, a bearing for pivotally mounting said shaft, a friction device carried by said shaft, said device being spaced from said bearing and movable vertically in response to pivotal movement of said shaft, said bearing being located between the reel support and friction device, a second friction device in engagement with said first-mentioned friction device, means for driving said second friction device, said elements being so arranged that the weight of the film being reeled causes pivotal movement of said shaft about said bearing for holding said friction devices in engagement.

4. A reeling device comprising a substantially horizontal shaft, a bearing supporting said shaft intermediate its ends for pivotal movement, one end of said shaft being adapted to carry a reel, a friction member carried by the other end of said shaft, said member being spaced from said bearing and movable vertically in response to pivotal movement of said shaft, a friction device cooperating with said friction member and means for driving said friction device.

5. A reeling device comprising a substantially horizontal shaft, a bearing carrying said shaft intermediate its ends for pivotal movement, one end of said shaft being adapted to carry a reel, a friction member carried by the other end of said shaft, said member being spaced from said bearing and movable vertically in response to pivotal movement of said shaft, a friction device cooperating with said member, means for

driving said device and means for causing longitudinal movement of said bearing whereby the ratio of the weight of the reel to the force applied to the friction device may be varied.

6. A drive for a take-up device comprising a main driving shaft, a gear carried by said main shaft and floating between two universals and means interconnecting said gear with said take-up device.

7. In a projection apparatus, a driving motor, a main vertical drive shaft extending upwardly therefrom and carrying a gear, a second shaft in driving connection with said gear, a third shaft carrying a friction disc and in driving connection with said second shaft, a fourth shaft driven by said friction disc, a housing surrounding each of said shafts and each of said driving connections and supporting bearings for said shafts, means for applying lubricant to the gear on said first shaft, and means whereby said lubricant is automatically applied to the bearings of said second shaft, to the driving connection of said third shaft, to the bearings of said third shaft and thence to the bearings of said fourth shaft.

8. In a projection apparatus, a driving motor, a main vertical drive shaft extending upwardly therefrom and carrying a gear, a second shaft in driving connection with said gear, a third shaft carrying a friction disc and in driving connection with said second shaft, a fourth shaft driven by said friction disc, a housing surrounding each of said shafts and each of said driving connections and supporting bearings for said shafts, means for applying lubricant to the gear on said first shaft, and means whereby said lubricant is automatically applied to the bearings of said second shaft, to the driving connection of said third shaft, to the bearings of said third shaft and thence to the bearings of said fourth shaft, said motor having an oil cup associated therewith and a cooperating oil shield on said main driving shaft to prevent lubricant from following said shaft to said motor.

9. In a projection apparatus, a driving motor, a main vertical drive shaft extending upwardly therefrom; a gear carried by said shaft between two universals, a second shaft in driving connection with said gear, a third shaft carrying a friction disc and in driving connection with said second shaft, a fourth shaft driven by said friction disc, a housing surrounding each of said shafts and each of said driving connections and supporting bearings for said shafts, means for applying lubricant to the gear on said first shaft, and means whereby said lubricant is applied to the bearings of said second shaft, to the driving connection of said third shaft, to the bearings of said third shaft and thence to the bearings of said fourth shaft.

10. In a projection apparatus, a driving motor having a main vertical drive shaft extending upwardly therefrom and connected to a gear by means of a universal, a second shaft in driving connection with said gear, a third shaft carrying a friction element and in driving connection with said second shaft, a fourth shaft driven by said friction element, a housing surrounding each of said shafts and each of said driving connections and supporting bearings for said shafts, means for applying lubricant to the gear on said first shaft, said housing being so arranged that said lubricant is applied to the bearings of said second shaft, to the driving connection of said third shaft, to the bearings of said third shaft and thence to the bearings of said fourth shaft, said motor having an oil cup associated therewith and a cooperating oil shield on said main driving shaft to prevent lubricant from following said shaft to said motor.

11. A take-up device comprising a substantially horizontal shaft having a portion adapted to carry a reel, a bearing supporting said shaft for rotational and pivotal movement, a friction device mounted on said shaft at a point spaced from said bearing whereby pivotal movement of said shaft causes vertical movement of said device, said bearing being located between said friction device and said reel, said device having a substantially horizontal friction surface, a second friction device in driving engagement therewith, the arrangement being such that the weight of material supported on said shaft produces a force for maintainng said friction surfaces in engagement whereby the driving force transmitted by said surface is proportional to the weight of said material.

12. A take-up device comprising a substantially horizontal shaft having a portion adapted to support a reel, a bearing supporting said shaft for rotational and pivotal movement whereby said shaft may be pivoted about a horizontal axis in response to the weight of material supported thereon and a friction drive for said shaft comprising a friction surface carried by said shaft and cooperating with a complementary surface, said surfaces being located at a distance from said bearing and transmitting the frictional driving force in a direction substantially normal to the axis of said shaft said surfaces and said reel being located on opposite sides of said bearing.

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