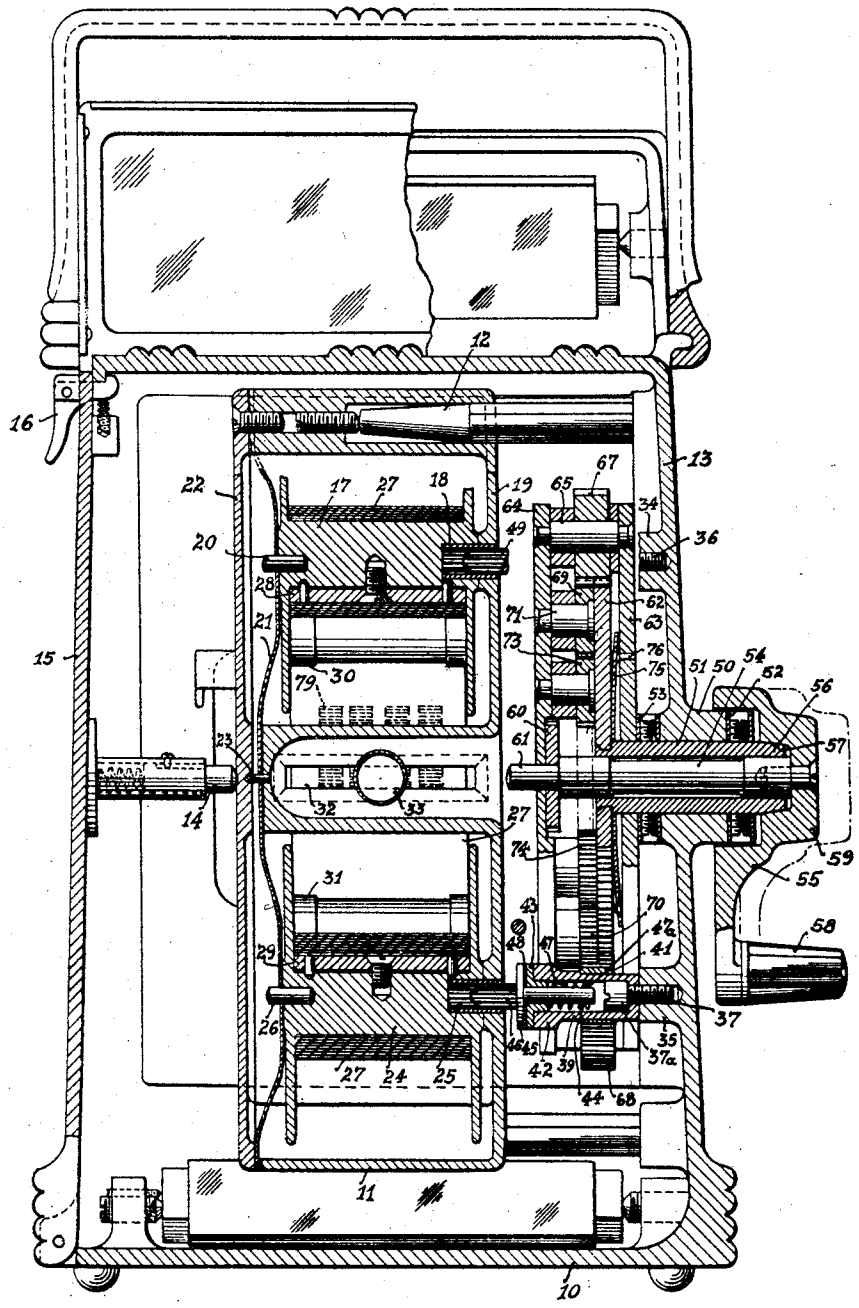
Oct. 5, 1937. V. E. PRATT 2,094,669

DRIVING DEVICE

Filed March 11, 1936 2 Sheets-Sheet 1

Fig. 1.



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DRIVING DEVICE

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FIG. 4.

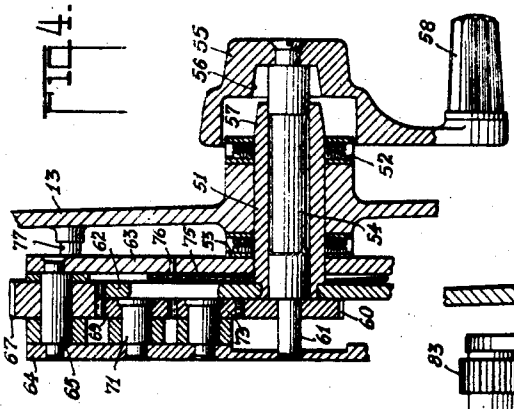


FIG. 6.

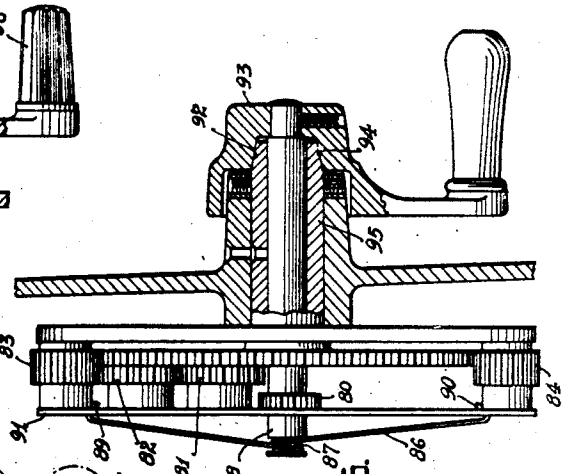


FIG. 3.

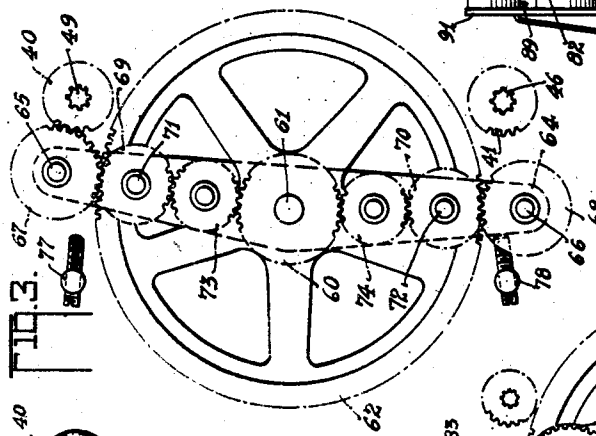


FIG. 7.

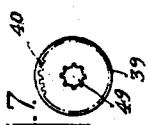


FIG. 5.

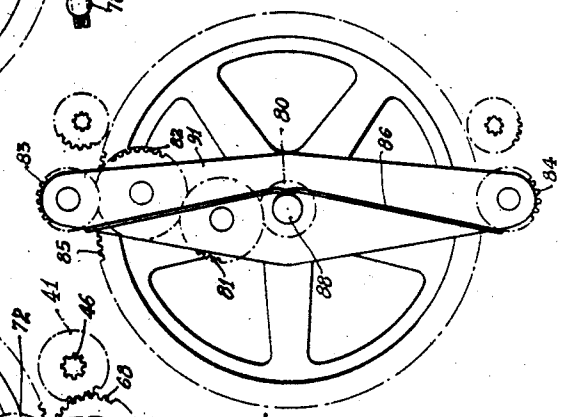
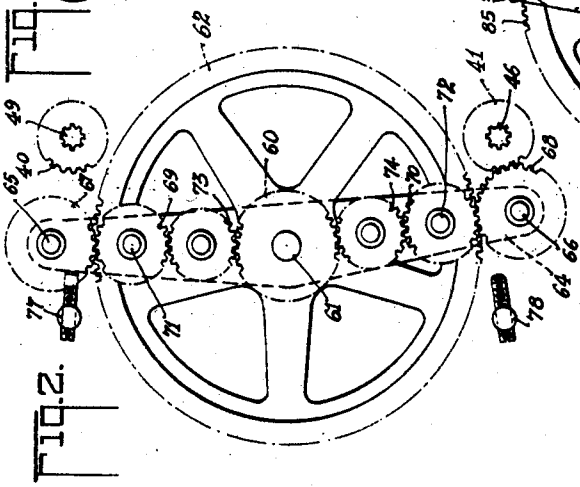


FIG. 2.



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Patented Oct. 5, 1937

2,094,669

UNITED STATES PATENT OFFICE

2,094,669

DRIVING DEVICE

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Application March 11, 1936, Serial No. 68,208

10 Claims. (Cl. 74—354)

This invention relates to improvements in driving devices.

An object of the invention is to provide means by which two shafts may be alternately or selectively driven in opposite directions from a single drive shaft.

Another object is to provide a device of the above character in which the shift from one driven shaft to the other is effected automatically upon reversal of torque applied to the drive shaft.

A further object is to provide a device of the character described in which the shift is effected quickly and substantially without lost motion.

Another object is to provide a device of the above character in which a two-speed drive is provided in either direction.

A further purpose is to provide a device particularly adapted to driving films in projectors and the like.

A still further object is to provide a device of the above character including torque-limiting means by which protection is provided against injury to films or other delicate elements being driven.

Other objects and advantages of the invention will appear during the course of the following description in connection with the accompanying drawings, in which,—

Fig. 1 is a view partially in section of the device embodied in a projecting device adapted to be driven thereby.

Fig. 2 is a front view of the device in one driving position with the front carrier plate removed.

Fig. 3 is a similar view of the device in the opposite directional driving position.

Fig. 4 is a fragmental sectional view showing the gear shifted into low speed driving position.

Fig. 5 is a front view of a modified form of the invention.

Fig. 6 is a side view of the same partly in section.

Fig. 7 is an end view of a typical driving hub.

Referring to Fig. 1, the numeral 10 indicates the casing of a reading or reference projector of the type fully described and claimed in copending application, Serial Number 68,204.

It will be understood, however, that the present invention is not limited to use with the above projector, which is described herein to illustrate a typical application of the driving device.

A film magazine 11 is mounted on locating pins 12 secured to the wall 13 of the casing and is held thereon by a spring-pressed plunger 14 carried by a hinged side plate 15 provided with a latch 16.

An upper film reel 17 has a hollow internally splined inner pivot 18 journalled in the wall 19 of the magazine 11 and an outer pivot 20 journalled in a spring plate 21 held in place by the magazine closure plate 22. A central pin 23 serves to locate the spring plate 21 vertically. A lower film reel 24 similar to reel 17 similarly has secured therein a hollow internally splined inner pivot 25 journalled in the magazine wall 19 and an outer pivot 26 journalled in the spring plate 21.

Wound on the reels 17 and 24 is a film 27 terminally secured to the reels by clamping segments 28 and 29, respectively. The film 27 in its passage from reel to reel runs over guide rollers 30 and 31, and spans a light aperture 32 in the magazine 11 in line with a projection lens 33.

Bosses 34 and 35 on the wall 13 have threaded therein screws 36 and 37 rotatably supporting retaining upper and lower driving hubs generally denoted by the numerals 38 and 39, and carrying pinions 40 and 41 as shown in Figures 1, 2 and 3. As the two driving hubs are identical in structure, the upper hub 38 is partially broken away in Figure 1 to show the structure behind it, and the following internal description of the lower hub 39 will be understood to apply also to the upper hub.

A sleeve 42, rotatably retained and guided by the cylindrical head 37a of the screw 37, has secured thereon the pinion 41 previously referred to. A flanged bushing 43 is secured in the end of the sleeve 42 and rotatably supports a pin 44 having an exterior flange 45 and a splined driving nose 46, shown in end view in Fig. 7. A compression spring 47, disposed between the bushing 43 and a cross pin 47a near the end of the pin 44, urges the flange 45 against a washer 48 between the flange 45 and the bushing 43 in frictional driving engagement.

The splined driving noses 46 and 49 of the lower and upper driving hubs 39 and 38 are adapted to respectively engage the splined interiors of the hollow pivots 25 and 18 of the lower and upper film reels. The reels 17 and 24 are thus adapted to be rotated by the hubs 38 and 39, respectively, the hollow pivots at the same time serving as pilots or bearing supports for the hubs.

A large boss 50 on the wall 13 has journalled therein a sleeve 51. Exterior and interior collars 52 and 53 secured to the sleeve 51 retain it in place longitudinally. A shaft 54, rotatably and slidably fitted in the sleeve 51 has secured to its outer end a crank member 55, provided with an internal taper 56 adapted to engage the tapered end 57 of the sleeve 51. The member 55

carries a crank handle 58, and the hub 59 of the member 55 is shaped as a knob for making fine adjustments in a manner hereinafter described.

A small driving gear 60 is secured on a pilot 61 formed on the inner end of the shaft 54, and a second driving gear 62 of relatively large diameter is fastened on the inner end of the sleeve 51. Carrier plates 63 and 64, rotatably mounted on the sleeve 51 and pilot 61, respectively, are fastened together by upper and lower spacer pins 65 and 66, the latter shown in Figures 2 and 3. Wide faced pinions 67 and 68 are rotatably mounted on the spacer pins 65 and 66, respectively, and are permanently in mesh with the large driving gear 62.

Outer transfer pinions 69 and 70, also in mesh with the wide faced pinions 67 and 68, are rotatably mounted on headed pins 71 and 72 secured to the inner carrier plate 64. Inner transfer pinions 73 and 74, similarly rotatably mounted on the plate 64, are in mesh with the outer transfer pinions 69 and 70, respectively, and are adapted to mesh with the small driving gear 60 when the shaft 54 is drawn outward, as shown in Figure 4.

A leaf spring 75, Figure 1, is disposed between the inner carrier plate 63 and the large driving gear 62, urging the two apart and creating a light friction which tends to revolve the carrier when the gear 62 is revolved. The spring 75 is prevented from turning on the carrier plate 63 by loosely fitting pins 76.

The pinions 40 and 41 on the driving hubs 38 and 39 are disposed in the same plane as the pinions 67 and 68 and adapted to selectively mesh with them.

In operation, the carrier plates are swung counter-clockwise, as shown in Figure 2, the pinion 68 moves into mesh with the pinion 41. Similarly, if the plates are swung clockwise, as shown in Figure 3, the pinion 67 engages the pinion 40. When the crank member 55 is in engagement with the tapered end 57 of the sleeve 51, as shown in Figure 1, and the crank is revolved to turn the sleeve 51 and large gear 62 counter-clockwise as in Figure 3, the friction of the spring 75 causes the carrier plates and their entire gear assembly to swing counter-clockwise as a unit until the pinion 68 meshes with the pinion 41 on the lower driving hub 39, at which point further rotation of the carrier plates is prevented by an adjustable stop 77. Further rotation of the crank thereupon causes the larger gear 62 to revolve between the carrier plates, thereby driving the wide faced pinion 68 and through it the pinion 41 with which pinion 68 is held in mesh. By this means the driving hub 39 is driven and in turn drives the lower film reel 24 to wind the film 37 thereon while drawing the latter from the upper reel 7, which is revolved by the film.

Revolving the crank in the reverse direction swings the carrier clockwise as shown in Fig. 3, until it is restrained by a second adjustable stop 78, the wide faced pinion 68 having released the pinion 41, while the pinion 67 has engaged the pinion 40 on the upper drive hub 38, after which continued rotation of the crank causes the device to drive the upper film reel 17 in the manner already described, but in the reverse direction. By this means the film is rewound on the upper reel from the lower reel which is in turn revolved by the film.

From the foregoing description it is evident that a rotation of the handle in one direction drives the lower reel to wind the film thereon, while reverse rotation of the crank automatically shifts the drive to the other reel and draws the film in the reverse direction. The large radial spacing of the pinions 67 and 68 and the small circumferential movement of the carrier necessary to effect a change of driving mesh reduces the lost motion during reversal to a minimum, which is substantially unnoticeable to the operator at the short radius of the crank handle 58.

The large diameter of the driving gear 62 with respect to the pinions 40 and 41 results in a rapid drive of the film reels relative to the speed of the crank. When the crank member 55 is pulled out, as shown in Fig. 4, thereby releasing the taper 56 from the tapered end 57 of the sleeve 51, the small driving gear 60 is drawn into mesh with the inner transfer pinions 73 and 74. Rotation of the crank member 55 now causes meshing of the wide-faced and hub pinions and driving of the reels in the same manner as described except that the drive takes place through the transfer pinion trains, and due to the small diameter of the driving gear 60, the rotative speed imparted to the hub pinions and film reels is low relative to that of the crank member.

During the low speed drive operation as described, the large gear 62 is revolved by the wide-faced pinions 67 and 68, so that the leaf spring 75 is still effective to hold the device in driving mesh. The radial spacing of the driving hubs 38 and 39 from the center of the shaft 54 may be made slightly larger than that of the pinions 67 and 68, by which arrangement the direction of the driving torque tends to assist the action of the spring in maintaining the device in mesh.

In the foregoing description it has been shown that movement of the film in either direction is accomplished by driving the reel on which the film is being wound, the other reel being revolved by the unwinding of the film from it. The plate spring 21, Fig. 1, bears against the ends of the reels and maintains thereon a friction which prevents the unwinding reel from over-running when the winding reel is stopped. The film is thus kept taut at all times. The drive at all times takes place through the friction of the spring-pressed flanges 45 and bushings 42 against the member 48 in the driving hubs. If during operation of the device the crank is turned until the film is entirely unwound from either reel, the stoppage of the film causes the washer 48 to slip between the flange and bushing, thereby preventing the film from being torn loose from the reel or otherwise damaged.

To sum up, the device as described and illustrated provides selectively a drive in opposite direction to two shafts by means of normal rotation of a single crank, comprises means of driving at a high or low speed ratio, and provides a protective release to prevent injury to a device or element being driven as illustrated in the case of the film 27. The high and low speed drive is particularly useful in the employment of films carrying microscopic reproductions of reference data, as indicated at 79 on the film 27, in which the high speed drive is used to rapidly bring the image of a page to registry with the aperture 22, after which the low speed drive may be used as a micrometric adjustment to bring a single line of the page or column into accurate registry for projection.

In the modified form of the device shown in

Figures 5 and 6, the low speed drive from the small driving gear 80 takes place through a single gear train comprising inner and outer transfer pinions 81 and 82. The outer transfer pinion drives the upper wide-faced pinion 83 directly. The lower wide-faced pinion 84 is driven by the upper pinion 83 through the medium of the large driving gear 85, which is in mesh with both wide-faced pinions, as previously described.

In the modified form the friction to cause the device to rock as a unit to throw either wide-faced pinion into mesh is supplied by a torsion spring 86 wound in a groove 87 in the inner end of the shaft 88. The ends 89 and 90 of the spring 86 are hooked or otherwise secured around the outer carrier plate 91.

In addition to supplying the friction noted, the spring 86 exerts a mild pressure urging the shaft 88 outward to the right, Figure 6. This pressure is not sufficient normally to disengage the taper 92 in the crank member 93 from the tapered end 94 of the sleeve 95, but once the taper has been disengaged in order to shift the small gear 80 into driving position, the spring pressure throws the gear into mesh with the pinion 81, and holds it meshed during operation of the low speed drive. In other words, the device is held in high speed drive position by the taper, and in low speed drive position by the spring 86, which latter prevents the gears from remaining in neutral or in partial mesh and thereby insures positive operation.

Where adjustability is not required to hold a very accurate alignment of the pitch lines of the wide-faced pinions and driving hub pinions, the stops 77 and 78 may be omitted, the driving hub pinions themselves serving to stop the unitary rotation of the gearing assembly.

While the device has been described in preferred form, it is not limited to the precise structures shown, as various modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. In a driving device, in combination, a support, a sleeve rotatable therein, a shaft rotatable in said sleeve, a carrier rockable around said sleeve and shaft, a driving gear secured on said sleeve, two pinions rotatably mounted in said carrier and in mesh with said driving gear, an outer transfer gear in mesh with one of said pinions, an inner transfer gear in mesh with said outer transfer gear, a second driving gear secured to said shaft and adapted to mesh with said inner transfer gear, means to couple said shaft to said sleeve, means to rotate said shaft, said shaft being slidable in said sleeve to release said coupling means and to bring said second driving gear into mesh with said inner transfer gear, a pair of hubs rotatively secured to said support, pinions on said hubs adapted to be circumferentially meshed with said first two pinions respectively, and means positioned between said carrier and driving gear whereby the motion of said gear is transmitted to said carrier to rock said carrier to bring one of said first two pinions into mesh with one of said hub pinions when said shaft is rotated in one direction and to bring the other of said first two pinions into mesh with said other hub pinion when said shaft is rotated in the other direction whereby said hubs may be selectively driven in opposite directions.

2. In a driving device, in combination, a pair of rotatable hubs, pinions on said hubs, a drive shaft, a carrier rockable around said shaft, a second pair of pinions rotatably carried by said carrier and adapted to be circumferentially meshed with said hub pinions, means operative between said shaft and said second pinions to drive said second pinions, and means to rock said carrier to individually bring said second pinions respectively into mesh with said hub pinions whereby the rocking of said carrier may be stopped and whereby said hubs may be individually driven in opposite directions.

3. In a device, in combination, a pair of rotatable hubs, pinions on said hubs, a drive shaft, a carrier rockable around said shaft, a second pair of pinions rotatably carried by said carrier and adapted to be circumferentially meshed with said hub pinions, means including two-speed gearing operative between said shaft and said second pinions to drive said second pinions, and means to rock said carrier to selectively bring said second pinions into mesh with said hub pinions whereby the rocking of said carrier may be stopped and whereby said hubs may be selectively driven in opposite directions.

4. In a driving device in combination, a pair of rotary hubs carrying members adapted to positively engage rotary elements to be driven by said device, pinions on said hubs, a driving shaft, gear means connected to said shaft including a pinion adapted to mesh with and drive one of said hub pinions only when said shaft is rotated in one direction and said gear means including a second pinion adapted to mesh with and drive the other of said hub pinions only when said shaft is revolved in the opposite direction, and torque-limiting means included in said hubs.

5. A device as claimed in claim 4 wherein said gear means includes a two-ratio selective driving mechanism.

6. A device as claimed in claim 4 wherein said gear means includes a two-ratio selective driving mechanism and means to hold said mechanism in either driving ratio.

7. In combination, two-rotary members, two members to be driven thereby, means to couple said rotary members to said second members, a driving member, gear means operable by said driving member to engage and drive one of said rotary members when said driving member is rotated in one direction and to engage and drive said other rotary member when said driving member is rotated in the opposite direction, said engagements being effected solely by initial movements of said driving member in said respective directions.

8. The invention according to claim 7 wherein said coupling means includes means to limit the torque which may be transmitted thereby to said members to be driven.

9. In combination, a support, a sleeve rotatable in said support and having a tapered portion, a shaft rotatable in said sleeve, a driving gear on said sleeve, driven gears operable by said gear, a gear train engaging said driven gears, a second driving gear on said shaft, said shaft being slidable in said sleeve, a driving member on said shaft and comprising a tapered portion adapted to engage said first tapered portion whereby said sleeve and shaft may be coupled together, and resilient means to slide said shaft to bring said second driving gear into engagement with said gear train when said tapered portions are disengaged.

10. In a driving device, in combination, a support, a sleeve rotatable therein, a shaft rotatable in said sleeve, a carrier rockable around said sleeve

and shaft, a driving gear secured on said sleeve, two pinions rotatably mounted in said carrier and in mesh with said driving gear, an outer transfer gear in mesh with one of said pinions, an inner transfer gear in mesh with said outer transfer gear, a second driving gear secured to said shaft and adapted to mesh with said inner transfer gear, means to couple said shaft to said sleeve, means to rotate said shaft, said shaft being slidable in said sleeve to release said coupling means and to bring said second driving gear into mesh with said inner transfer gear, a pair of hubs rotatively secured to said support, pinions on said hubs adapted to be circumferentially meshed with said first two pinions respectively, and resilient means engaging said shaft and tending to urge said carrier to rock and bring one of said first pinions into mesh with one of said hub pinions when said shaft is rotated in one direction and to bring the other of said first two pinions into mesh with said other hub pinion when said shaft is rotated in the other direction, whereby said hubs may be selectively driven in opposite directions.

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