

Nov. 17, 1942.

A. S. HOWELL

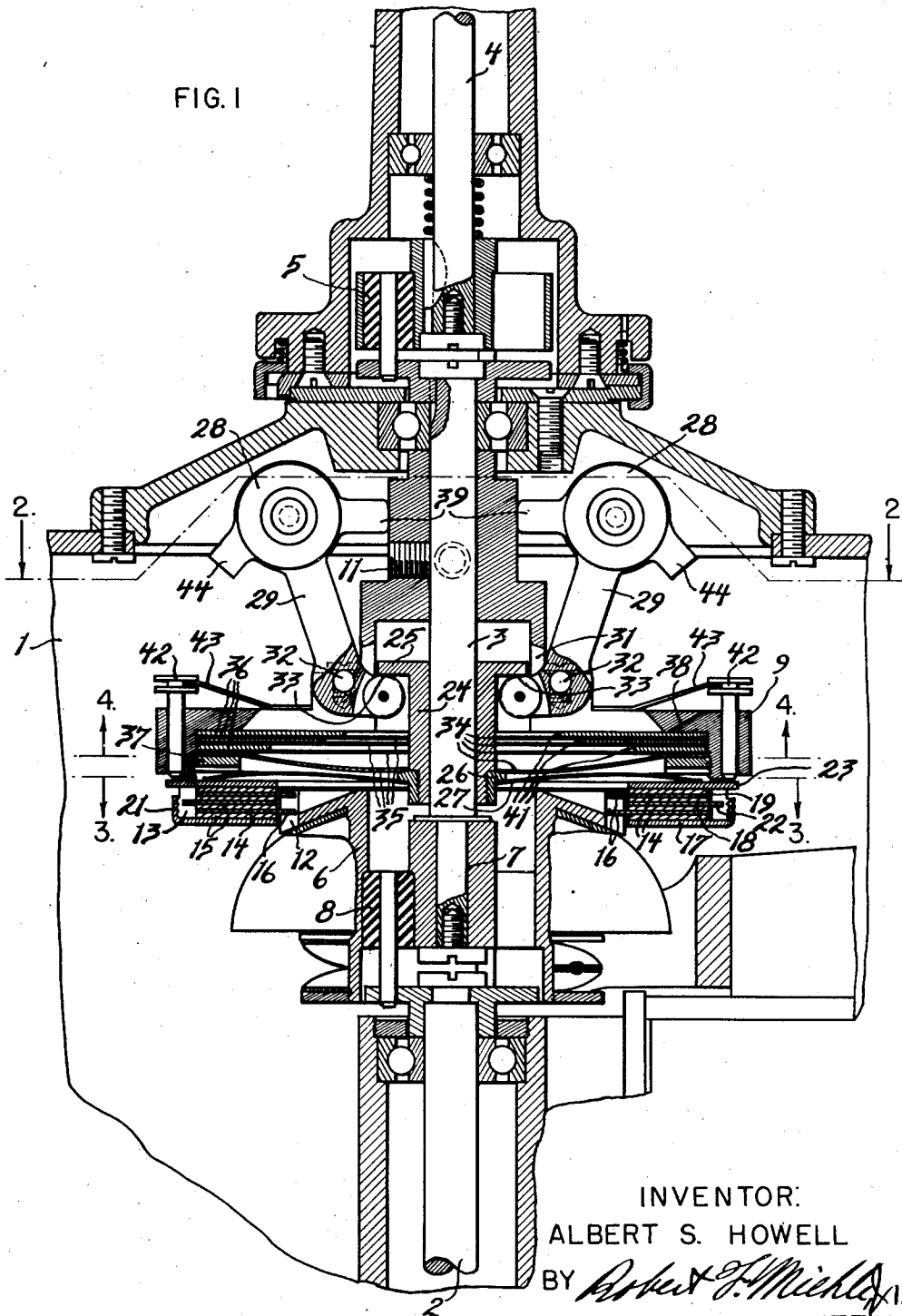
2,302,125

DRIVING MECHANISM

Filed April 19, 1939

4 Sheets-Sheet 1

FIG. 1



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FIG. 2

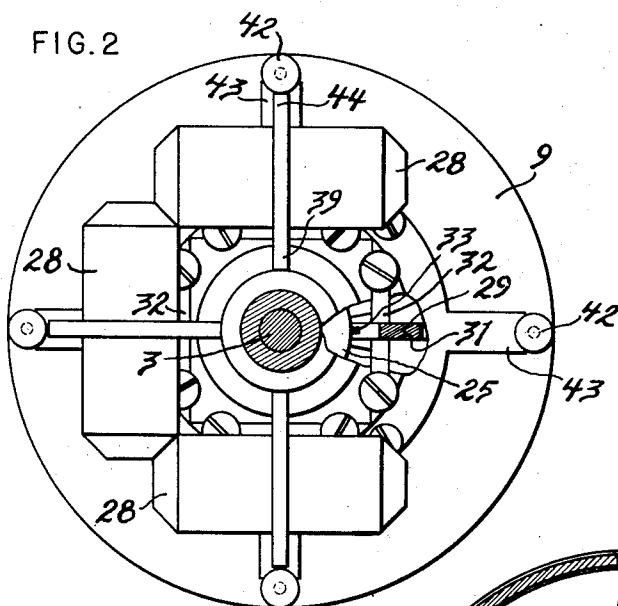


FIG. 3

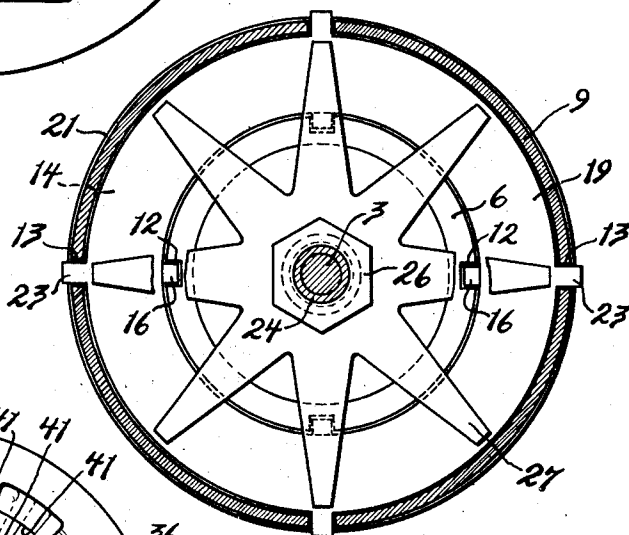
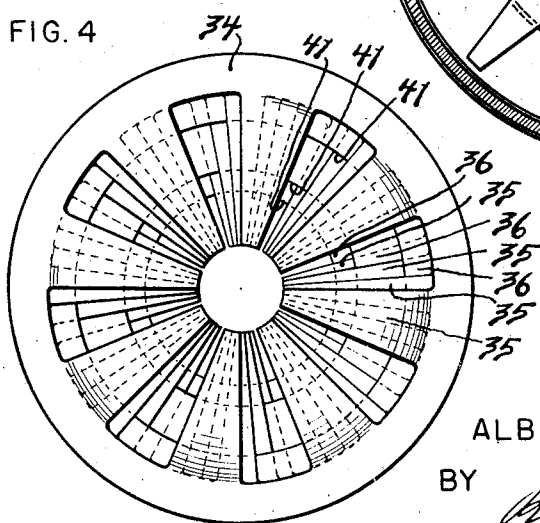


FIG. 4



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FIG. 5.

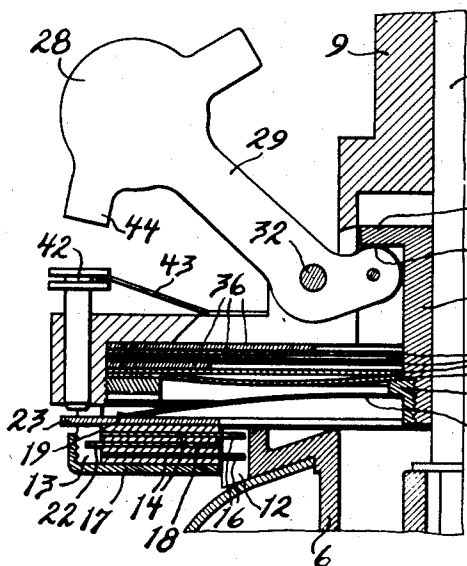


FIG. 6.

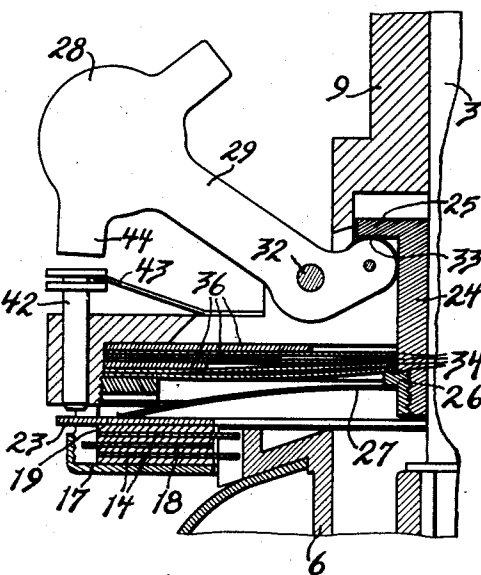


FIG. 7.

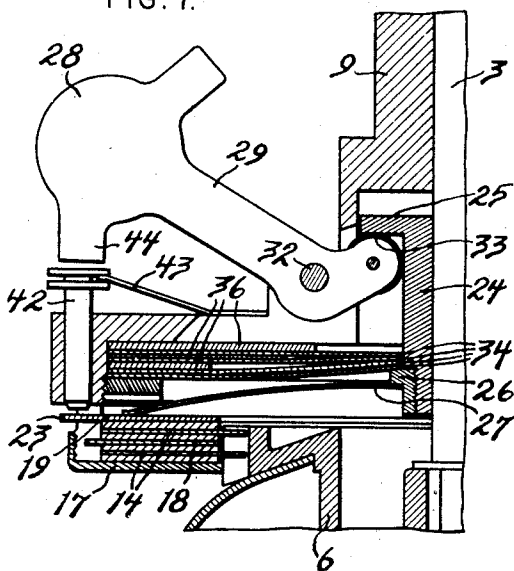
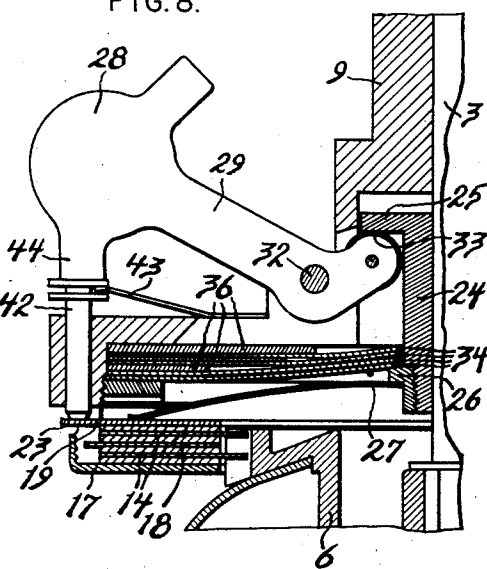


FIG. 8.



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DRIVING MECHANISM

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12 Claims. (Cl. 192-104)

My invention relates particularly to film reel driving mechanism for motion picture machines although not limited to this use alone.

In the conventional motion picture machine the film is positively driven by the mechanism of the machine and is drawn from a roll thereof on a feed reel and wound on a take up reel which is driven with the mechanism of the machine by means of a suitable yielding driving mechanism, the yielding take up reel driving mechanism accommodating for the slowing up of the take up reel as the film roll thereon increases in diameter. The conventional yielding take up reel driving mechanism provides a substantially constant power of the driven or take up reel member with the result that the take up tension on the film undesirably decreases as the diameter of the film roll on the take up reel increases.

One object of my invention resides in the provision of mechanism whereby the power of a driven or reel member is automatically varied in inverse correspondence with the speed thereof with a view toward maintaining uniform take up tension irrespective of the diameter of a roll of film on the take up reel. That is to say, the power of the driven or take up reel member is increased as the diameter of the roll of film on the take up reel increases with corresponding decrease in speed of the take up reel.

Another object resides in the provision with such mechanism of means, either manually or automatically controlled, for effecting maximum power of the driven or reel member at high speed for the instant purpose of "rewinding" the film at high speed.

With these objects in view my invention consists in certain features of novelty in the construction, combination and arrangement of parts by which the said object and certain other objects, hereinafter appearing, are effected all as fully described with reference to the accompanying drawings and more particularly pointed out in the appended claims:

In the said drawings—

Figure 1 is an axial sectional view of a driving mechanism embodying one form of my invention;

Figure 2 is a partial sectional view substantially on the line 2-2 of Figure 1;

Figure 3 is a sectional view substantially on the line 3-3 of Figure 1;

Figure 4 is a partial assembly view substantially on the line 4-4 of Figure 1;

Figures 5, 6, 7 and 8 are partial sectional views similar to Figure 1 and showing parts in different positions;

Figure 9 is an axial sectional view of a driving mechanism embodying another form of my invention; and

Figure 10 is a view similar to Figure 9 and showing parts in different positions.

Referring to Figure 1, 1 designates a hollow frame assembly in which a drive shaft 2, an intermediate driven shaft 3 and a second driven shaft 4 are rotatably mounted in alinement. The shaft 4 is driven from the shaft 3 by means of a driving joint generally designated at 5. A centrally bored circular member 6 is journaled on the lower portion of the shaft 3, as designated at 7, and is driven from the shaft 2 by means of a driving joint 8.

A centrally bored generally bell shaped member 9 has its bore engaged on the shaft 3 and is secured therewith, as designated at 11. The member 6 is provided with axially extending slots 12 and the member 9 is provided with axially extending slots 13. See Figures 1 and 3. Annular clutch plates 14, provided with facings 15 of friction material, are provided with internal lugs 16 which are slidably engaged in the slots 12 to form a driving connection with the member 6 driven by the drive shaft 2.

Annular clutch plates 17, 18 and 19 are alternated with the clutch plates 14 for frictional engagement with the facings 15, and the lower clutch plate 17 is provided with a cylindrical flange 21, which is screwthreaded on the member 9 to maintain the clutch plates in assembly and to angularly fix this clutch plate 17 with the member 9. The intermediate clutch plate 18 is provided with external lugs 22 and the upper clutch plate 19 is provided with lugs 23 which are slidably engaged in the slots 13, the assembly permitting a variable friction drive between the member 6 and the member 9 dependent on the relative axial positioning of the clutch plates 17 and 19.

Slidably engaged on the shaft 3 within the member 9, is a bored collar member 24 provided at its upper end with a radial flange 25, and secured on the lower end of the member 24 is a collar 26. The collar member 24 is variably positioned longitudinally of the shaft 3 in a manner hereinafter described, and a centrally bored crowned star spring 27 engages with its central portion upwardly against the collar 26 and engages with its peripheral portion downwardly against the clutch plate 19 to frictionally engage the driving clutch plates 14 and the driven clutch plates 17, 18 and 19.

Thus is provided a variable friction driving

clutch for driving the shafts 3 and 4 from the drive shaft 2 whereby the power of the shafts 3 and 4 may be varied by adjustment of the collar 24 along the shaft 3. The shaft 4 may be connected to drive a usual film reel in a usual manner, not shown, so that the power of the reel may be varied for the purposes heretofore described by variance of the friction of the clutch.

Centrifugally actuated governor weights 28 are provided with arms 29 which extend through radial slots 31 through the member 9 and are pivoted on the member 9, as designated at 32, on axes transverse to the axis of the shaft 3. See Figures 1 and 2. The inner ends of the arms 29 are engaged under the flange 25 of the collar 24, as designated at 33, so that as the weights 28 are centrifugally actuated by rotation of the driven shaft 3 they actuate the collar 24 upwardly and reduce the pressure of the clutch spring 27 on the clutch plates thereby reducing the power of the driven shafts 3 and 4.

Arranged within the member 9 above the clutch spring 27 is a series of centrally bored concentric spring disks 34 provided with spring arms 35 extending inwardly from the peripheral portions thereof. See Figures 1 and 4. Annular reaction plates 36 are alternated with the upper three of the spring disks 34, the upper of these reaction plates being disposed above the upper spring disk and the remainder of these reaction plates spacing the upper three spring disks. The assembly of the spring disks 34 and the reaction plates 36 is secured within the member 9 by means of a ring 37 screwthreaded into the member 9 and clamping this assembly against a shoulder 38 of the member 9.

The lower spring disk 34 is crowned downwardly and inwardly so that its spring arms are normally spaced downwardly from the adjacent spring disk 34, and the spring arms of the lower spring disk engage downward on the collar 26 to oppose the clutch spring 27 and to oppose centrifugal actuation of the governor weights 28 and to tend to maintain the governor weights at their inner positions which are fixed by lugs 39 on the governor weights and engaging against the member 9 as shown in Figure 1.

As the governor weights are centrifugally actuated outwardly by rotation of the driven shafts 3 and 4 by the clutch, the collar 24 is shifted upwardly to reduce the friction of the clutch and power of the driven shafts, and the spring arms of the upper three spring disks 34 are sequentially engaged to sequentially augment the resistance of the lower spring disk 34. The resistance of the upper three spring disks is also varied by varying the internal diameters of the reaction plates, as indicated at 41, the purpose of the sequentially engaged springs and the varied resistance thereof being that of providing a desired variance of power of the driven member through the speed range thereof and facilitating fixed or factory adjustment of the governor spring means.

In operation, as the speed of the driven shafts 3 and 4, driven by the clutch, is increased, the governor weights, driven with these shafts, swing outwardly and, overcoming the resistance of the governor spring means, decrease the friction of the clutch with resulting variance of the power of the driven shafts in inverse correspondence with the speed thereof.

Figures 1, 5, 6, 7 and 8 show progressively the positions of the parts as the speed of the driven shafts increase.

Plungers 42 are slidably mounted on the member 9 and are arranged to bear downwardly on the lugs 23 of the clutch plate 19 to engage the clutch independently of the clutch engaging spring 27, the plungers 42 being normally maintained in an upper position by a spring 43. The governor weights 28 are provided with lugs 44 which in the maximum speed position thereof bear downwardly upon the plungers 42 and increase the friction of the clutch independently of the clutch engaging spring 27 with resulting increase in power of the driven shafts, the instant purpose of increasing the friction of the clutch by depression of the plungers 42 being that affording maximum power of the driven shafts at higher or maximum speed for "rewinding" a film at high speed with the film released from the feed mechanism of the machine.

Referring to Figures 9 and 10, 51 designates a hollow frame in which a drive shaft 52 and a driven shaft 53 are rotatably mounted in alignment, the drive shaft 52 being mounted on bearings 54. Secured on the upper portion of the shaft 52, is a hub member 55 provided at its lower end with a radial flange 56. An inverted cup shaped member 57 is provided with an upwardly extending bored hub 58, and is rotatably and slidably mounted on the upper end of the shaft 52, as designated at 59.

The lower end of the driven shaft 53 is slidably mounted in the bore of the hub 58, and is provided with a diametrical pin 61 which is slidably engaged in a diametrical slot 62 in the upper end of the hub 58 to form a driving connection between the shaft 53 and the member 57 which permits relative axial movement thereof. A bearing 63 is axially secured on the upper end of the shaft 53 and is slidably engaged in the bore of the frame 51, thus permitting axial movement of this shaft.

A compression spring 64, encircling the shaft 53, engages downwardly on a shoulder 65 of the bore of the frame 51 and engages upwardly against the bearing 63 to normally position the shaft 53 in an upper position. A bored cap 66 is secured on the upper end of the frame 51 in concentric relation with the shaft 53, and a flanged cup shaped member 67 has its flange disposed between the bearing 63 and the cap 66 and extends upwardly through the bore of the cap for manual depression.

The shaft 53, being urged upwardly by the spring 64, has its upper position determined by the bearing 63 engaging upwardly against the flange of the member 67 which engages upwardly against the cap 66, as shown in Figure 9, manual depression of the member 67 effecting movement of the shaft 53 to a lower position in which the pin 61 may engage the bottom of the slot 62 to urge the member 57 downwardly, as shown in Figure 10. A horizontal spindle 68, such as a film reel mount spindle, is rotatably mounted on the frame 1 and is driven from the driven shaft 53 by spiral angle gearing 69, it being noted that the gearing 69 permits of axial movement of the shaft 53.

The hub member 55 is provided with axially extending slots 71, and the member 57 is provided with axially extending slots 72. Annular clutch plates 73, provided with facings 74 of friction material, are provided with internal lugs 75 which are slidably engaged in the slots 71 to form a driving connection with the member 55 driven by the drive shaft 52.

Annular clutch plates 76 are alternated with

the clutch plates 73 for frictional engagement with the facings 74, and the clutch plates 76 are provided with external lugs 77 which are slidably engaged in the slots 72 to form a driving engagement with the member 57. The clutch plates 73 and 76 are confined between the flange 56 of the member 55, secured with the drive shaft 52, and the radial portion of the member 57.

A bored cylindrical member 79, provided at its upper end with an internal radial flange 79 slidably and rotatably engaged on the shaft 53, has its bore slidably and rotatably engaged on the hub 58 of the member 57. A collar member 81 is secured on the driven shaft 53 above the member 78. Normally straight governor springs 82 extend longitudinally of the shaft 53 and are arranged angularly about the axis thereof and have their opposite ends secured, as designated at 83, with the member 78 and the member 81.

Governor weights 84 are secured on the intermediate portions of the springs to the end that, as the speed of rotation of the driven shaft 53 is increased, the springs 82 are correspondingly flexed outwardly by centrifugal actuation of the weights 84 to correspondingly actuate the member 78 upwardly, and vice versa. A compression spring 85 within the member 78 and encircling the shaft engages upwardly against the flange 79 of the member 78 and downwardly against the hub 58 of the member 57 to frictionally engage the clutch plates 73 and 76.

Thus is provided a variable friction driving clutch for driving the driven shaft 53 and the reel spindle 68 from the drive shaft 52 whereby the power of the shaft 53 and reel spindle 68 may be varied by adjustment of the member 78 along the shaft 53.

In operation, as the speed of the driven shaft 53 and the spindle 68, driven by the clutch, is increased the governor weights 84, driven with these shafts, are centrifugally actuated outwardly in opposition to the resistance of the governor springs 82, thus moving the member 78 upwardly and decreasing the pressure of the clutch spring 85 on the clutch plates 73 and 76 with resulting variance of the power of the driven shaft 53 and the spindle 68 in inverse correspondence with the speed thereof.

The spring 64 normally maintains the drive shaft 53 in its upper position, as shown in Figure 9. When the member 67 is manually depressed, as shown in Figure 10, the shaft 53 is moved to a lower position and, acting either through the governor springs 82 or by the engagement of the pin 61 with the bottom of the slot 62, increases the friction of the clutch with resulting increase in power of the driven shaft 53 and spindle 68, the instant purpose of increasing the friction of the clutch by manual depression of the member 67 being that of affording maximum power of the driven shaft 53 and spindle 68 at high or maximum speed for "re-winding" a film strip at high speed with the film released from the feed mechanism of the machine.

While I have thus described my invention, I do not wish to be limited to the precise details described as changes may be readily made without departing from the spirit of my invention, but having thus described my invention I claim as new and desire to secure by Letters Patent the following:

1. In a device of the character described, the combination with a rotatable driven member, of variable power driving means therefor, a speed

responsive device driven with said driven member and operative on said driving means to vary the power of said driven member in inverse correspondence with the speed thereof, and means under the control of said speed responsive device for effecting maximum power of said driven member at high speed.

2. In a device of the character described, the combination with a rotatable driven member, of a variable friction driving clutch therefor, a speed responsive device driven with said driven member and operative on said clutch to vary the power of said driven member in inverse correspondence with the speed thereof, and means under the control of said speed responsive device and operative on said clutch for effecting maximum power of said driven member at high speed.

3. In a device of the character described, the combination with a rotatable driven member, of variable power driving means therefor, a speed responsive device driven with said driven member and operative on said driving means to vary the power of said driven member in inverse correspondence with the speed thereof, said speed responsive device comprising centrifugally actuated weight means and spring means opposing centrifugal actuation of said weight means, and means actuated by said weight means at the maximum speed position thereof for effecting maximum power of said driven member.

4. In a device of the character described, the combination with a rotatable driven member, of a variable friction driving clutch therefor including a clutch engaging spring, a speed responsive device driven with said driven member and operative on said clutch spring to vary the power of said driven member in inverse correspondence with the speed thereof, and means actuated by said speed responsive device at the maximum speed position thereof and operative independently of said engaging spring to engage said clutch.

5. In a device of the character described, the combination with a rotatable driven member, of variable power driving means therefor, and a speed responsive device driven with said driven member and operative on said driving means to vary the power of said driven member in inverse correspondence with the speed thereof said speed responsive device comprising centrifugally actuated weight means and a series of sequentially engaged axially spaced concentric spring disks provided with radially extending spring arms opposing centrifugal actuation of said weight means.

6. In a device of the character described, the combination with a rotatable driven member, of variable power driving means therefor, and a speed responsive device driven with said driven member and operative on said driving means to vary the power of said driven member in inverse correspondence with the speed thereof, said speed responsive device comprising centrifugally actuated pivoted weight means, a series of sequentially engaged axially spaced concentric spring disks provided with radially extending spring arms opposing centrifugal actuation of said weight means and annular reaction formations of different diameters concentric and alternating with said spring disks for reaction thereagainst by said spring arms.

7. In a device of the character described, the combination with a rotatable driven member, of a variable friction driving clutch therefor, a

speed responsive device driven with said driven member and operative on said clutch to vary the power of said driven member in inverse correspondence with the speed thereof, said speed responsive device comprising centrifugally actuated weight means and a series of sequentially engaged springs opposing centrifugal actuation of said weight means, and means actuated by said weight means at the maximum speed position thereof for engaging said clutch.

8. In a device of the character described, the combination with a rotatable driven member, of a variable friction driving clutch therefor, a speed responsive device driven with said driven member and operative on said clutch to vary the power of said driven member in inverse correspondence with the speed thereof, said speed responsive device comprising centrifugally actuated pivoted weight means, a series of sequentially engaged axially spaced concentric spring disks provided with radially extending spring arms opposing centrifugal actuation of said weight means and annular reaction formations of different diameters concentric and alternating with said spring disks for reaction thereagainst by said spring arms, and means actuated by said weight means at the maximum speed position thereof for engaging said clutch.

9. In a device of the character described, the combination with a rotatable driven member, of a variable friction driving clutch therefor, a speed responsive device controlling said clutch comprising centrifugally actuated weight means driven with said driven member, resilient means yieldably urging said weight means in opposition to centrifugal actuation thereof, and a second resilient means operative between said weight means and said clutch to exert engaging pressure on said clutch and to react on said weight means in opposition to said first mentioned resilient means, and releasable means operative on said clutch independently of said second resilient means to engage said clutch for effecting maximum power of said driven member at high speed.

10. In a device of the character described, the combination with a rotatable driven member, of a variable friction driving clutch therefor, a speed responsive device controlling said clutch comprising centrifugally actuated weight means driven with said driven member and yieldably

urged in opposition to centrifugal actuation thereof and resilient means operative between said weight means and said clutch to exert engaging pressure on said clutch and to react on said weight means in opposition to said yieldable urge on said weight means, and manually controlled means operative on said clutch independently of said resilient means and actuable into and out of position to engage said clutch for effecting maximum power of said driven member.

11. In a device of the character described, the combination with rotatable driving and driven members, one of which is axially shiftable, of a variable friction driving clutch therefor, a speed responsive device controlling said clutch comprising centrifugally actuated weight means driven with said driven member and yieldably urged in opposition to centrifugal actuation thereof and resilient means operative between said weight means and said clutch to exert engaging pressure on said clutch and to react on said weight means in opposition to said yieldable urge on said weight means, a connection between said clutch and said axially shiftable member operative on said clutch to effect maximum power of said driven member with axial positioning of said shiftable member, and means controlling axial positioning of said shiftable member.

12. In a device of the character described, the combination with a rotatable axially shiftable driven member, of a variable friction driving clutch therefor, a speed responsive device controlling said clutch comprising centrifugally actuated weight means driven with said driven member and yieldably urged in opposition to centrifugal actuation thereof and resilient means operative between said weight means and said clutch to exert engaging pressure on said clutch and to react on said weight means in opposition to said yieldable urge on said weight means, a connection between said clutch and said driven member operative on said clutch to effect maximum power of said driven member with axial positioning of said driven member, and additional resilient means for positioning said driven member axially out of clutch engaging position and permitting positioning of said driven member in clutch engaging position.

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