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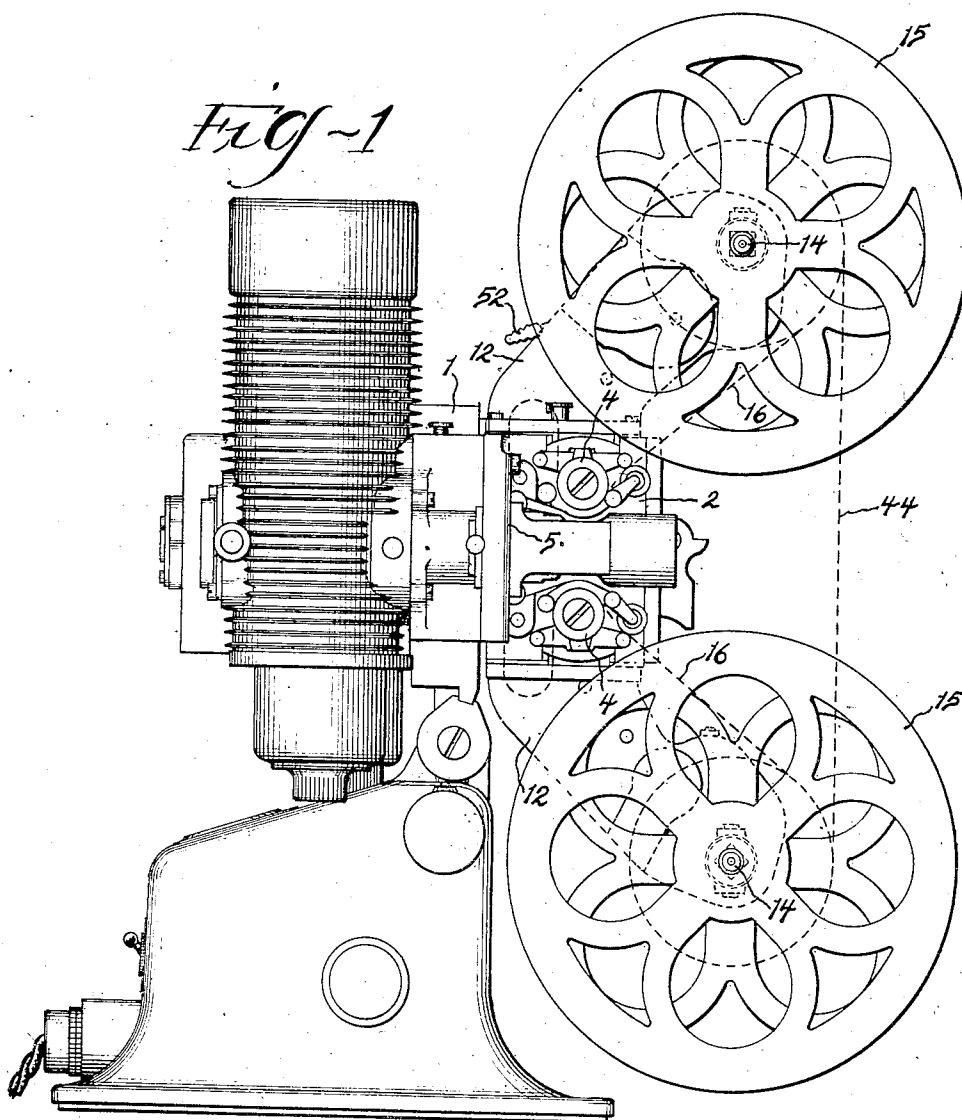
B. STECHBART

1,975,336

MOTION PICTURE PROJECTING MACHINE

Filed March 18, 1932

4 Sheets-Sheet 1



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Oct. 2, 1934.

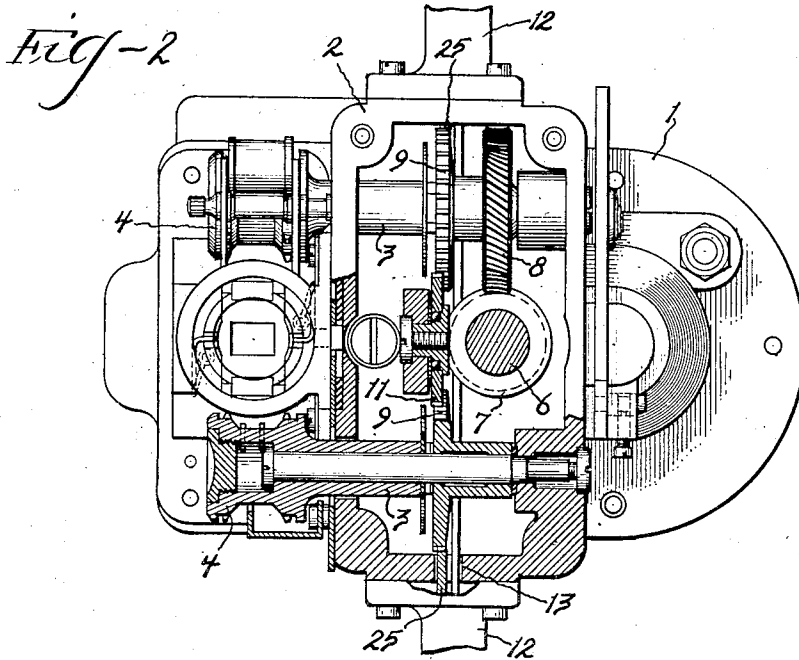
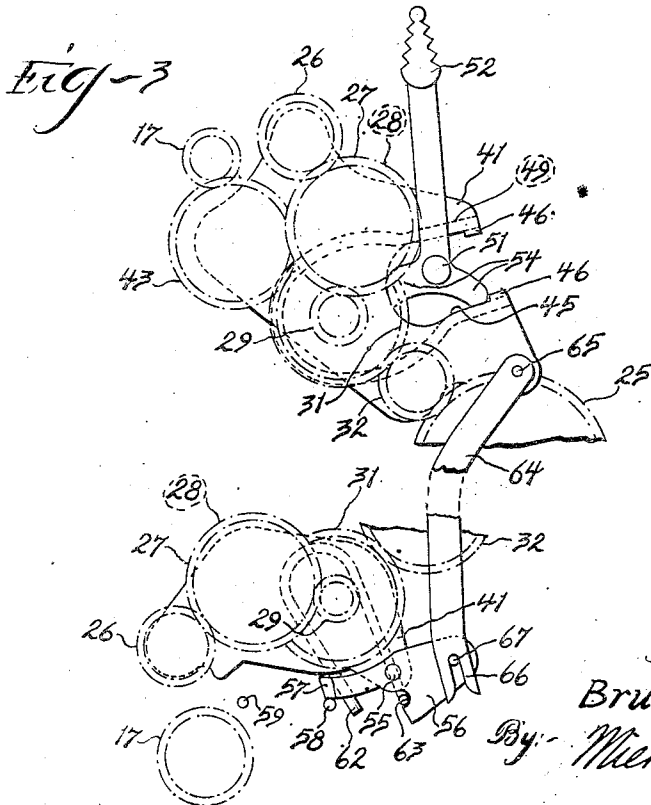
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4 Sheets-Sheet 2



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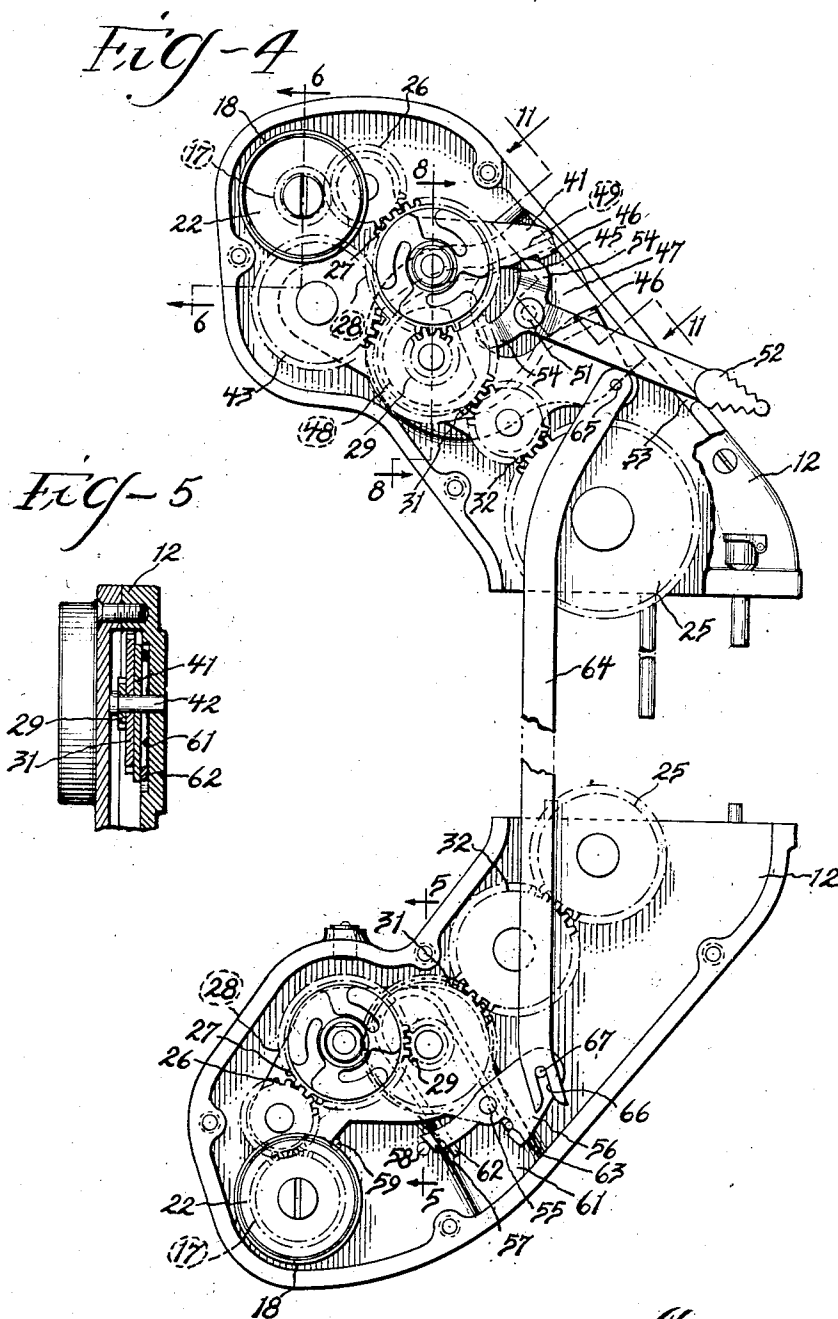
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MOTION PICTURE PROJECTING MACHINE

Filed March 18, 1932 4 Sheets-Sheet 3



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4 Sheets-Sheet 4

*Fig-6*

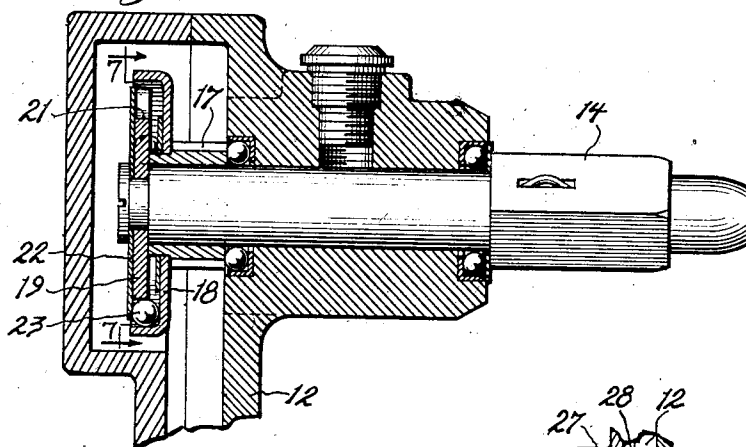


*Fig-7*

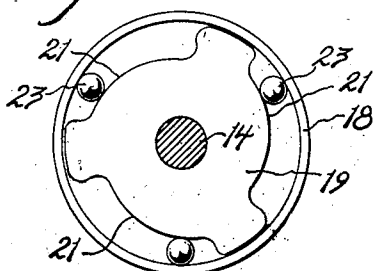


*Fig-8*

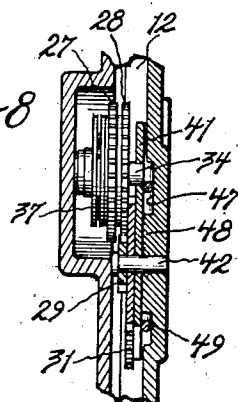


*Fig-9*

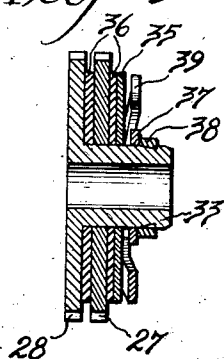


*Fig. 11*

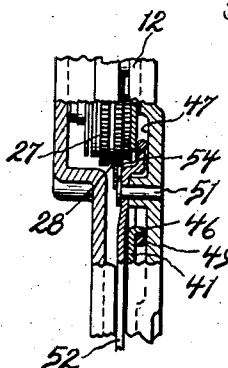
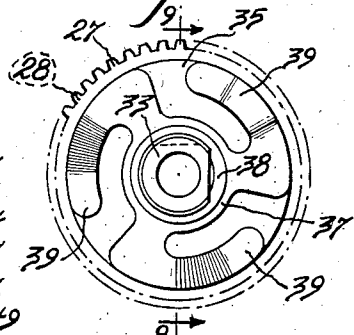


*Fig-10*



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## UNITED STATES PATENT OFFICE

1,975,336

## MOTION PICTURE PROJECTING MACHINE

Bruno Stechbart, Chicago, Ill., assignor to The  
Bell & Howell Company, Chicago, Ill., a corpo-  
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Application March 18, 1932, Serial No. 599,612

19 Claims. (Cl. 242—55)

My invention has for its general object the provision of a novel and effective means for driving the film reels of a motion picture projecting machine, particularly with reference to the provision of means for conveniently rewinding the film after projection, all with a view toward ease and convenience of control and enclosure of operating parts.

With this object 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 a side elevation of a motion picture projecting machine embodying my invention;

Figure 2 is a front elevation of a portion of the same with parts removed, broken away and shown in section;

Figure 3 is a vertically condensed diagrammatic view in side elevation of the film reel driving mechanism of the machine;

Figure 4 is a side elevation of the film reel arm and driving mechanism of the machine with parts broken away and removed;

Figure 5 is a partial section on the line 5—5 of Figure 4;

Figure 6 is an enlarged partial section on the line 6—6 of Figure 4;

Figure 7 is a partial sectional view on the line 7—7 of Figure 6;

Figure 8 is a partial sectional view on the line 8—8 of Figure 4;

Figure 9 is an enlarged partial section on the line 9—9 of Figure 10;

Figure 10 is a side elevation of the structure shown in Figure 9; and

Figure 11 is a partial section substantially on the line 11—11 of Figure 4.

Referring to the drawings, 1 designates the body of the machine which is inclusive of a hollow forwardly disposed mechanism frame 2 disposed in a vertical rearwardly and forwardly extending plane. See Figures 1 and 2.

The mechanism of the machine includes a pair of vertically spaced transverse revoluble sprocket shafts 3 extending within the mechanism frame and provided exteriorly thereof with constant feed film sprockets 4 by means of which a film, not shown, is fed to and from an exposure aperture guide, generally designated at 5, of an intermittent film feed mechanism not shown.

The mechanism of the machine is also inclusive of a forwardly and rearwardly extending drive shaft 6 within the frame 2 and provided with a spiral gear 7 fast therewith and meshing with a second spiral gear 8 secured with the upper sprocket shaft 3 for driving this sprocket shaft, both of these gears being disposed within the frame 2. The lower sprocket shaft is driven from the upper sprocket shaft by means of spur gears 9 secured with the sprocket shafts and an idler spur gear 11 meshing with the gears 9, the gears 9 and 11 being disposed within the frame 2.

Mounted on the top and bottom of the frame 2 are two hollow film reel arms 12 which extend vertically therefrom in substantially opposite directions and which are of substantially flat form and disposed in a common forwardly and rearwardly disposed vertical plane with the enclosures thereof aligned with the gears 9 and communicating with the enclosure of the frame 2 by means of openings 13 through the walls of the frame 2.

Carried outwardly on the reel arms are film reel spindles 14 which are disposed transversely thereto in parallelism with the sprocket shafts 3 and which are adapted to have film reels 15 detachably mounted on the projecting ends thereof for the feeding of film to and the taking up of film from the sprockets 3 as indicated at 16 in Figure 1.

Rotatably mounted on each spindle within the enclosure of the corresponding reel arm, is a spur gear 17, on which is secured a concentric cup shaped member 18. See Figures 6 and 7. Secured on the inner end of each spindle is a clutch cam disc 19 disposed within the plane of the flange of the member 18 and provided with peripheral identical cam formations 21, a retaining washer 22 secured on the spindle forming an enclosure with the member 18. Balls 23 are disposed within this enclosure and, functioning with the cam formations 21 and the interior surface of the member 18, provide an automatic one way drive connection between each pinion 17 and its spindle 14.

These drive connections are arranged for the alternate driving of the reel spindles with operation of the machine in opposite directions to take up film on one reel and to permit it being drawn off the other reel, as is usual.

Spur gear trains, extending within and carried by the reel arms 12 with their planes corresponding with the plane thereof, are provided for driving the gears 17 and the spindles 14 from

the corresponding gears 9, and will now be described.

Each gear train is inclusive of an inner gear 25 projecting into the enclosure of the frame 2 through the corresponding opening 13 of the frame and meshing with the adjacent gear 9 of the corresponding sprocket shaft 3. See Figures 2 and 4.

Each gear train is also inclusive of a final idler gear 26 adapted to mesh with the corresponding reel spindle gear 17, a pair of coaxial gears 27 and 28 having a frictional driving connection therebetween, hereinafter described, and of which the gear 27 meshes with the gear 26, an intermediate double gear comprising a small gear 29 meshing with the gear 28, see Figure 8, and a large gear 31 meshing with another gear 32 which in turn meshes with the corresponding inner gear 25.

The frictional driving connection between the gears 27 and 28 consists as follows. See Figures 8, 9 and 10. The gear 28 is provided with a bored hub 33 by means of which it is rotatably mounted on a stud 34, mounted as hereinafter described, and the gear 27 is rotatably mounted on this hub. A pressure washer 35 is engaged on the hub 33 above the gear 27 and friction washers 36 are also engaged on the hub and are disposed between the gears 27 and 28 and the gear 27 and the pressure washer 35. A bored spring member 37 is engaged on the hub 33 above the pressure washer 35 and is secured against upward movement on the hub, as designated at 38, and has angularly extending arms 39 thereof pressing downwardly on the pressure washer to maintain the gears 27 and 28 and the washers 35 and 36 in frictional engagement.

This frictional driving engagement functions to permit slippage so that either film reel acting as a take up reel winds the film thereon as it is fed thereto from the corresponding sprocket 4 irrespective of the diameter of the film roll on the reel.

The gear trains are disconnectible with reference to driving the reel spindles in the following manner.

Plates 41 are disposed within the reel arms 12 with their planes corresponding with the plane thereof and are disposed between the plane of the gear trains and the back wall of the reel arms. These plates are pivoted for movement in their planes on studs 42 secured on the back walls of the reel arms and on which the double gears, comprising the gears 29 and 31, are rotatably mounted. See Figures 3, 4, 5 and 8.

The upper plate 41 carries the gears 26, 27, 28 and 32 of the upper gear train and the lower plate 41 carries the gears 26, 27 and 28 of the lower gear train, so that pivotal movement of each plate 41 in opposite directions effects engagement and disengagement of the gear 26 carried thereby with the corresponding reel spindle drive gear 17. Figure 4 shows the gears 26 engaged with the gears 17 which is the position for operating the projector in either direction, and Figure 3 shows the gears 26 disengaged from the gears 17.

In the normal operation of the machine film is fed from the upper reel 15 and taken up on the lower reel 15, though the machine may be operated in the reverse direction. In either case the corresponding gear train drives the reel which is taking up the film, the automatic one way clutches above described serving to release the reel from which the film is fed.

In order to drive the upper reel to rewind the

film from the lower reel, which takes up the film in the normal operation of the machine, without reversing the machine, the following is provided.

Carried on the upper plate 41 is a revoluble spur gear 43 which meshes with the gear 31, and the gear 43 is so positioned that it and the upper gear 26 alternate in their engagement with the upper spindle drive gear 17 with opposite positioning of the upper plate 41.

This gear 43 drives the upper reel spindle drive gear 17 in the direction opposite from that in which the gear 17 is driven by the gear 26 and at a higher speed to rewind the film on the upper reel, so that rewinding is effected quickly and without reversing the machine. During the rewinding operation the lower gear 26 is disconnected from the lower spindle drive gear 17 to permit free rotation of the lower reel, and the film is unlaced from the sprockets 3 and feed guide 5 and extends directly between the reels, as indicated at 44 in Figure 1.

Accordingly, Figure 4 shows the position of the mechanism for projection in either direction and Figure 3 shows the position of the mechanism for rewinding the film, and it will be observed that the gears 27 and 28 and the frictional drive connection therebetween are disposed in the gear train between the point of drive of the additional or rewinding gear 43 and the upper spindle drive gear 17, so that the rewind drive is positive.

When the machine is only operated in the normal direction in which the upper reel is the feed reel and the lower reel is the take up reel, the upper gears 26, 27 and 28 do not function and are superfluous, and the functioning upper gear train consists of the gears 43, 31, 29, 32, 25 and 9, the lower gear train consisting as before described. Thus, two alternately functioning gear trains are provided, one for driving the take up reel during projection and the other for driving the feed reel for rewinding the film after projection.

The engagement and disengagement of the gears for projection and rewind is controlled in the following manner.

The upper plate 41 is provided with a rearwardly extending radial opening 45 at the outer ends of which are formed backwardly projecting lugs 46 which lie in a recess 47 in the inner surface of the back wall of the upper reel arm. See Figures 4, 8 and 11.

The recess 47 extends about a hub formation 48 concentric with the pivotal axis of the upper plate 41, and disposed in this recess and extending about the hub formation 48 is a U-shaped spring 49, the legs of which are engaged in tension on the lugs 46 in directions toward each other.

Pivotaly mounted, as designated at 51, on the back wall of the upper reel arm intermediate the opening 45 of the upper plate 41 for movement corresponding with the plane thereof, is a lever 52 which projects outwardly through a slot 53 through the edge wall of the upper reel arm for the manual actuation thereof.

The main portion of the lever 52 is disposed on the side of the upper plate 41 on which the gears in the upper reel arm are disposed, and this lever is provided with radial arms 54 which are offset into the plane of the spring 49 for alternate engagement with corresponding legs of the spring to oppositely actuate the upper plate 41 with opposite manual actuation of the lever 52 to alternately engage the upper gear 26 and the gear 43 with the upper gear 17, the arrangement affording

a desirable spring action in both directions to engage the gears and the arms 54 having a substantially overcenter relation with the spring at the ends of the movement thereof to maintain the upper plate 41 in either gear engaged position.

Pivotaly mounted intermediately thereof on the lower plate 41 on an axis parallel to the pivotal axis of this plate, as designated at 55, is an arm 56 one end of which is offset into the plane of the lower plate, as designated at 57, to provide a positive engagement therewith to operate this plate into gear disengaged position, as shown in Figure 3. This end of the arm 56 extends correspondingly with the movement of the arm with the lower plate 41, and a pin 58, mounted on the back wall of the lower reel arm, is slidably engaged therewith for controlling pivotal movement of the arm to effect gear engaging movement of the plate.

Gear engaged position of the lower plate 41 is determined by a stationary pin 59 mounted on the back wall of the lower reel arm, and in this position of the plate, the said end of the arm 56 engages in back of the pin 58 to lock the plate in gear engaged position.

The back wall of the lower reel arm is provided with a recess 61 extending radially of the pivotal axis of the lower plate 41, and disposed in this recess is a U-shaped spring 62 one leg of which is engaged against the corresponding side of the recess and the other of which is turned to engage in a notch in the arm 56, as designated at 63, to actuate the arm in the direction to actuate the lower plate 41 into gear engaged position and to pivot the aforementioned end of this arm in back of the pin 58 to lock the plate in gear engaged position.

A connecting bar 64 has its upper end pivotally connected with the upper plate 41, as designated at 65, and extends within the reel arms and frame 2 and has its lower end forked, as designated at 66 and engaged with a pin 67 on the other end of the arm 56.

Thus, movement of the upper plate 41 to engage the upper gear 26 with the upper gear 17, causes upward movement of the connecting bar 64 to permit the spring 62 to actuate the arm 56 and with it the lower plate 41 into gear engaged position, it being observed that the arm 56 is free of the connecting bar 64 in its gear engaging movement, so that the spring 62 is unhindered in its yielding actuation of the lower gear 26 into engagement with the lower gear 17. See Figure 4.

Movement of the upper plate 41 to engage the gear 43 with the upper gear 17 causes downward movement of the connecting bar 64 to actuate the arm 56 and with it the lower plate 41 into gear disengaged position.

While I have described and shown the preferred embodiment of my invention, I do not wish to be limited to the precise details of construction as changes may readily be 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 motion picture projecting machine the combination with a film reel driving train, a movable member for connecting and disconnecting said driving train, a U-shaped spring having its legs oppositely engaged with said movable member in directions toward one another for actuating said movable member in opposite directions, and a pivoted actuating member be-

tween said legs and alternately engageable therewith with opposite movement of the actuating member to effect opposite movement of said movable member.

2. In a motion picture projecting machine the combination with two film reel driving trains, of two movable members for connecting and disconnecting said gear trains respectively, manually actuated means for actuating one of said movable members, spring means for actuating the other of said movable members into connecting position, and a one way operative connection between said movable members for actuating said second mentioned movable member into disconnecting position with movement of said first mentioned movable member in one direction.

3. In a motion picture projecting machine the combination with two film reel drive elements, of two spur gear trains for driving said drive elements respectively, of additional spur gear means for driving one of said drive elements oppositely, a movable element for alternately connecting said spur gear means and the corresponding gear train, a second movable member for connecting and disconnecting the other gear train, spring means operatively connected with said first mentioned movable member for actuating the same in both directions, a manually actuated pivoted member operative upon said spring means in both directions and having an overcenter relation with said spring means at the ends of its movement, and an operative connection between said movable members.

4. In a motion picture projecting machine the combination with two film reel drive elements, of two spur gear trains for driving said drive elements respectively, of additional spur gear means for driving one reel drive element oppositely, a movable element for alternately connecting said spur gear means and the corresponding gear train, a second movable member for connecting and disconnecting the other gear train, spring means operatively connected with said first mentioned movable member for actuating the same in both directions, a manually actuated pivoted member operative upon said spring means in both directions and having an over-center relation with said spring means at the ends of its movement, a second spring means operative upon said second movable member to move the same into connected position, and a one way operative connection between said movable members for operating said second movable member into disconnected position.

5. In a motion picture projecting machine the combination with a film reel driving spur gear train, a movable member carrying a gear of said train for gear engaging and disengaging movement, an actuating member pivoted on said gear carrying member on an axis transverse to the movement thereof and having a positive engagement therewith for actuating the same into gear disengaged position, a spring operative upon said actuating member at a point spaced from the pivotal axis thereof and yieldably urging the same in the direction of gear engaging movement of said gear carrying member, and means controlling pivotal movement of said actuating member for effecting gear engaging movement of said gear carrying member by said spring.

6. In a motion picture projecting machine the combination with a film reel driving spur gear train, a pivoted member carrying a gear of said train for gear engaging and disengaging move-

ment, an actuating member pivoted on said gear carrying member in parallelism with the pivotal axis thereof and having a positive engagement therewith for actuating the same into gear dis-  
 5 engaged position, a spring operative upon said actuating member at a point spaced from the pivotal axis thereof and yieldably urging the same in the direction of gear engaging movement of said gear carrying member, and a stationary  
 10 formation slidably engaged by said actuating member for controlling pivotal movement of the actuating member to effect gear engaging movement of said gear carrying member under the  
 15 influence of said spring and behind which said actuating member engages under the influence of the spring at the end of its gear engaging movement to lock the same.

7. In a motion picture projecting machine the combination of a substantially flat hollow arm, a  
 20 revoluble reel spindle carried outwardly on said arm and disposed transverse thereto, a spur gear train carried within said arm with the planes of the gears thereof disposed correspondingly with the plane of said arm for driving said reel spindle  
 25 from the mechanism of the machine, and a member carried within said arm for movement corresponding with the plane of the arm and carrying a gear of said train for gear engaging and disengaging movement.

8. In a motion picture projecting machine the combination of a substantially flat hollow arm, a revoluble reel spindle carried outwardly on said  
 30 arm and disposed transverse thereto, a driving train carried within said arm for driving said spindle from the mechanism of the machine comprising a spur gear train having the planes of its gears disposed correspondingly with the plane  
 35 of the arm, and a flat member within said arm and disposed correspondingly with the plane thereof and pivoted on the axis of one gear and carrying another gear of said gear train for gear  
 40 engaging and disengaging movement.

9. In a motion picture projecting machine the combination of a substantially flat hollow arm,  
 45 a revoluble reel spindle carried on said arm and disposed transverse thereto, a spur gear train within said arm and disposed correspondingly with the plane thereof, a plate within said arm and disposed correspondingly with the plane  
 50 thereof and pivoted for movement in its plane and carrying at least one gear of said train for engaging and disengaging movement with a second gear of said train, additional spur gear  
 55 means driven from said gear train and carried on said plate for engaging and disengaging movement with said second gear in alternation with said first mentioned gear for driving said second gear oppositely.

10. In a motion picture projecting machine the combination of a substantially flat hollow arm, a revoluble reel spindle carried on said arm and  
 60 disposed transverse thereto, a spur gear train within said arm and disposed correspondingly with the plane thereof, a plate within said arm and disposed correspondingly with the plane  
 65 thereof and pivoted coaxially with a gear of said train and carrying gears of said train for engaging and disengaging movement of one thereof with another gear of said train, said gears carried by said plate including coaxial gears and a  
 70 friction slip driving connection therebetween, and additional spur gear means driven from said first mentioned gear and carried on said plate for engaging and disengaging movement  
 75 with said third mentioned gear in alternation

with said second mentioned gear for driving said third mentioned gear oppositely.

11. In a motion picture projecting machine the combination with a hollow mechanism frame, of a pair of transversely disposed parallel film  
 80 sprocket shafts extending within said frame, a drive shaft within said frame and disposed normal to the plane of said sprocket shafts, a gear driving connection within said frame for driving  
 85 one of said sprocket shafts from said drive shaft, and a spur gear driving connection within said frame for driving the other sprocket shaft from said last mentioned sprocket shaft.

12. In a motion picture projecting machine the combination with a hollow mechanism frame, of a pair of transversely disposed parallel film  
 90 sprocket shafts extending within said frame, a drive shaft within said frame and disposed normal to the plane of said sprocket shafts on an axis disposed between the axes of said sprocket shafts, a pair of meshed spiral gears one of which is fixed on said drive shaft and the other of which is fixed on one of said sprocket shafts for driving this sprocket shaft from said drive shaft, spur gears fast on said sprocket shafts  
 100 within said frame, and an idler spur gear within said frame and meshing with said spur gears.

13. In a motion picture projecting machine the combination with a hollow mechanism frame, of two substantially flat hollow arms on said  
 105 frame and communicating with the enclosure thereof and extending therefrom in substantially opposite directions, revoluble reel spindles carried outwardly on said arms and disposed transverse thereto, and spur gear trains extending  
 110 within said arms and having their planes disposed correspondingly therewith for driving said spindles from mechanism of the machine within said frame.

14. In a motion picture projecting machine the combination with a hollow mechanism frame, of a pair of vertically spaced transverse film  
 115 sprocket shafts extending within said frame, two substantially flat hollow arms on said frame and communicating with the enclosure thereof and extending vertically in substantially opposite directions therefrom and having their planes normal to said shafts, revoluble reel spindles carried outwardly on said arms and disposed transverse thereto, spur gear driving trains between said sprocket shafts and corresponding  
 120 reel spindles and enclosed within said frame and arms and including spur gears on said sprocket shafts, and an additional spur gear meshing with said spur gears to form a driving connection between said sprocket shafts.

15. In a motion picture projecting machine the combination with a hollow mechanism frame, two substantially flat hollow arms on said frame and communicating with the enclosure thereof  
 135 and extending in substantially opposite directions therefrom, revoluble reel spindles carried outwardly on said arms and disposed transverse thereto, spur gear trains extending within said arms and having their planes disposed correspondingly therewith for driving said spindles from mechanism of the machine within said frame, spur gear means within one of said arms and having its plane disposed correspondingly  
 140 therewith and driven from the corresponding gear train for driving the corresponding spindle oppositely, and means for alternately disengaging gears of said gear means and said gear trains with reference to driving said spindles.

16. In a motion picture projecting machine 150

the combination with a hollow mechanism frame, two substantially flat hollow arms on said frame and communicating with the enclosure thereof and extending in substantially opposite directions therefrom, revoluble reel spindles carried outwardly on said arms and disposed transverse thereto, spur gear trains extending within said arms and having their planes disposed correspondingly therewith for driving said spindles from mechanism of the machine within said frame, spur gear means within one of said arms and having its plane disposed correspondingly therewith and driven from the corresponding gear train for driving the corresponding spindle oppositely, and means for alternately disengaging gears of said gear means and said gear trains with reference to driving said spindles including an operative connection extending within both of said arms.

17. In a motion picture projecting machine the combination with two film reel drive elements, of means for alternately driving automatically said reel drive elements from the mechanism of the machine with operation of the mechanism of the machine in opposite directions, additional means for driving one of said reel drive elements, in the direction opposite that in which it is driven by said first mentioned means, from the mechanism of the machine while the mechanism is operated in the direction in which the other reel drive element is driven by said first mentioned drive means, and means for alternately disconnecting said first mentioned and additional drive means with reference to driving said reel drive elements.

18. In a motion picture projecting machine the combination with two film reel drive elements, of means including an over running clutch for driving one of said reel drive elements from the mechanism of the machine while operated in one direction, a second means including an over running clutch for driving the other reel drive element from the mechanism of the machine while operated in the other direction, additional means for driving said first mentioned reel drive element, in the direction opposite that in which it is driven by said first mentioned drive means, from the mechanism of the machine while operated in the second mentioned direction, and means alternately disconnecting said additional drive means and the other two drive means with reference to driving said reel drive elements.

19. In a motion picture projecting machine the combination with two film reel drive elements, of a spur gear train including an over running clutch and a friction slip driving connection for driving one of said reel drive elements from the mechanism of the machine while operated in one direction, a second spur gear train including an over running clutch and a friction slip driving connection for driving the other reel drive element from the mechanism of the machine while operated in the other direction, additional spur gear means for driving said first mentioned reel element, in the direction opposite that in which it is driven by said first mentioned gear train, from the mechanism of the machine while operated in the second mentioned direction, and means for alternately disconnecting said additional spur gear means and said gear trains with reference to driving said reel drive elements.

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