

Aug. 18, 1936.

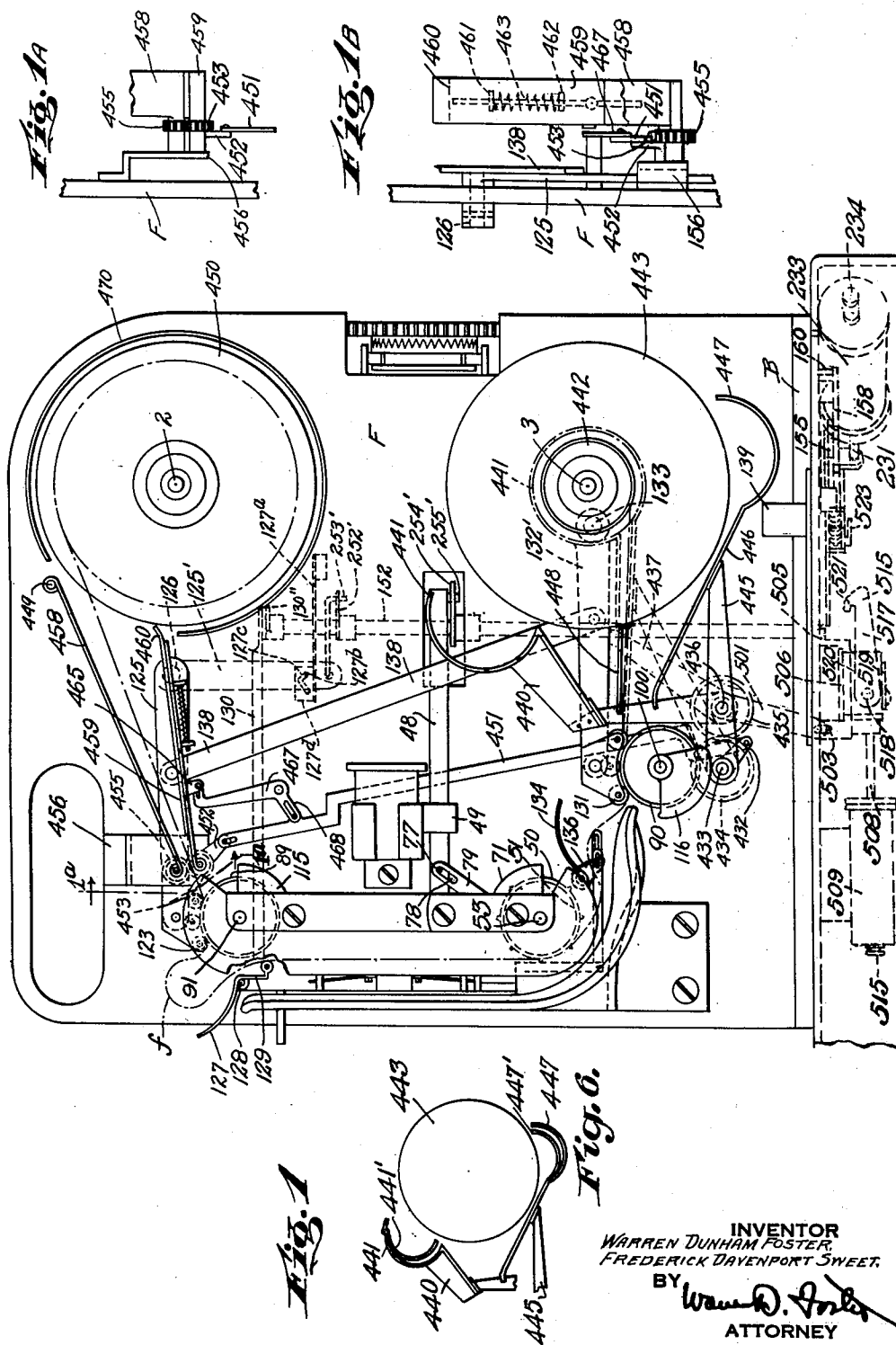
W. D. FOSTER ET AL

2,051,790

APPARATUS FOR HANDLING AND GUIDING STRIP MATERIAL

Original Filed April 4, 1929

3 Sheets-Sheet 1



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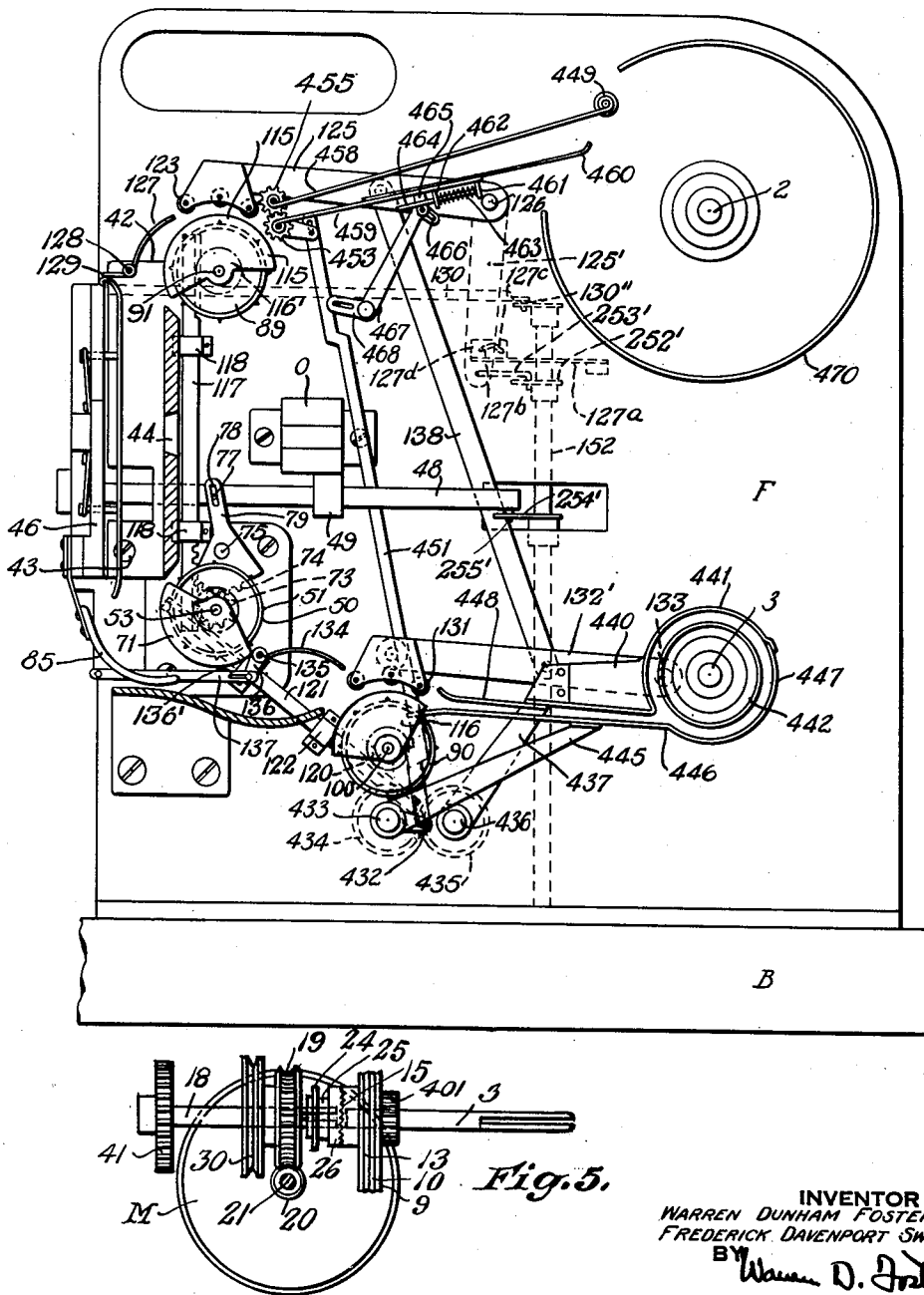
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APPARATUS FOR HANDLING AND GUIDING STRIP MATERIAL

3 Sheets--Sheet 2

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Fig. 2



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Fig. 3

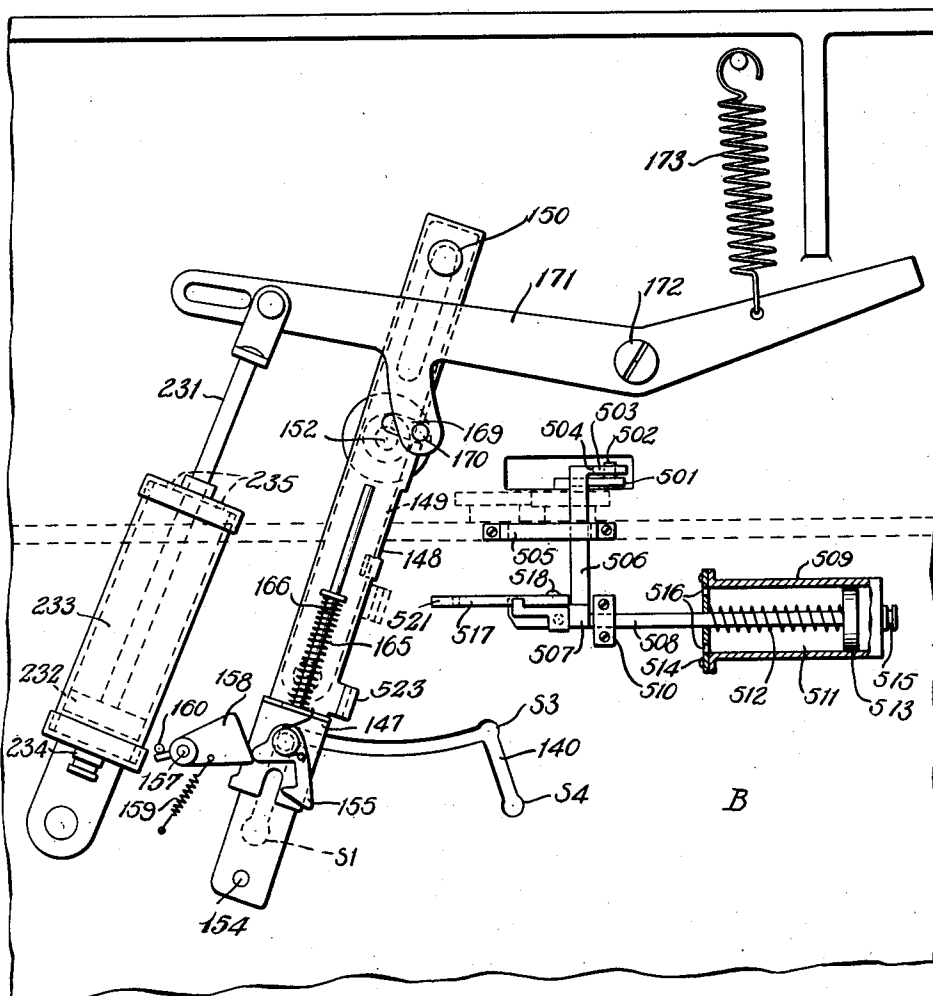
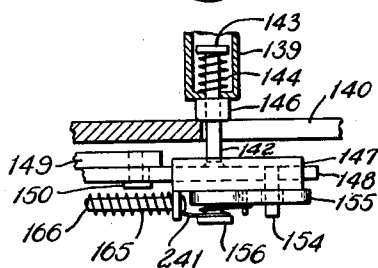


Fig. 4



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UNITED STATES PATENT OFFICE

2,051,790

APPARATUS FOR HANDLING AND GUIDING
STRIP MATERIAL

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and mesne assignments, to Kinatome Patents
Corporation, Ridgewood, N. J., a corporation of
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Original application April 4, 1929, Serial No.
352,525, now Patent No. 1,993,735. Divided and
this application March 11, 1935, Serial No.
10,560

23 Claims. (Cl. 242—55)

The present invention is illustrated as applied to the art of photography and more particularly to improvements in apparatus adapted for the handling and guiding of films, whether for the projection or taking of successive pictures or for reproduction or recordation upon films of images representing sound as in a film playing phonograph or for the reproduction or recordation of such images in conjunction with images of things. It will be readily understood, however, that the present invention is directly applicable to many other types of apparatus which handle material in strip form.

The present invention is a division of our co-pending application, Serial Number 352,525, filed April 4, 1929, which upon March 12, 1935, became Patent Number 1,993,735. This application specifically describes and claims improved mechanism for operating the members which guide a film in relation to a core placed upon a spindle. This mechanism gradually removes the guiding means from guiding relation to the film as the mass of the film builds up upon a take-up spindle. It includes means for timing the actuation of the control mechanism which starts the operation of the mechanism which moves the guiding members and also timing means for controlling this mechanism once it has been started. Both of these timing means can be so adjusted at will that any desired timing is secured. Such timing is preferably carried out by positive automatic mechanism which is initially actuated by a manual movement of one control member, this one movement of this one control member as described and claimed in our parent application being effective to cause the automatic control mechanism sequentially to operate all of thirty-odd operable parts of the apparatus thereby threading the film and placing the machine in full operation. Attention is directed to our co-pending application filed concurrently herewith, Serial Number 10,559 likewise a division of our parent patent. In said co-pending divisional application we describe and claim the operative interconnection means for guiding a film or other strip of material from and to a core placed upon a spindle or from or to such core and pressing means for holding such a film in operative relation to a feeding member which is related thereto. We also describe and claim therein the operation of such guiding means either independently or in cooperation with such film pressing means by an operative interconnection with a revoluble spindle whereby the revolution

of said spindle operates said guiding means. In our parent application and in still a third co-pending divisional application, filed concurrently herewith, Serial Number 10,558, we describe and claim the operation and control of such guiding means in combination with that of other operable members of the apparatus, always exclusive of the presser member.

In apparatus such as is described and claimed herein, the user places a full reel of film or other strip material on a delivery spindle, a tunnel-like guiding channel having been created between that spindle and a take-up spindle in accordance with our parent application and our divisional application Serial Number 10,558, and starts mechanism which rotates both the delivery and the take-up spindles in a feeding direction. Guiding mechanism is automatically brought into lightly resilient contact with the outer periphery of the delivery reel so that the leading end of the film upon the revolution of the spindle is picked up by this guiding mechanism and automatically directed through said cleared channel to other similar mechanism associated with the core of the carrier placed upon the taking up spindle and directed thereabout. As the mass of film upon the take-up carrier increases, obviously the guiding mechanism associated therewith must be removed from a position adjacent the core and it is also desirable that the upper portion of the guiding mechanism be removed from contact with the film in order to avoid needless wear and possible scratching. This removal is automatically controlled by a direct operative interconnection between the mechanism which closes the gate and starts the operation of the machine and the initial guiding mechanism. This interconnection includes timing means so that, irrespective of the size of the film carrier, the thickness of the film, or other adventitious conditions, the guiding members are removed from guiding relation at a specific point in the operating cycle. As described in certain forms of our parent application, we may prefer to force the free end of the film through this cleared channel not by contact between the perforations therein and a toothed member, but merely by the rotation of the mass itself. Also it will be obvious that in connection with the initial removal of the film from the outer periphery of the delivery carrier, an elongation of the guiding mechanism in a direction roughly parallel with the film path is necessary. Also, after the leading end of the film has been directed away from the delivery

carrier, it is desirable to remove this forwardly projected guide from further contact with the film. Control mechanism to accomplish these results is provided.

5 The movement of the guiding members away from the film being wound upon the core of the carrier is gradual. It has been proposed that the guiding members be moved quickly away from the film as by the release of a latch. If such guiding members are lightly constructed, as is necessary if the latch is to be released by contact with the film itself, the resulting jar may spring them out of shape. In any event the snapping away of these guides may be objectionable under certain conditions. Such rapid movement also completely removes them from guiding relation with the film although it is possible that under certain conditions further guiding relation may be desirable.

20 In apparatus according to this invention, however, the guides are moved gradually away from the film as the mass builds up and consequently they continue in guiding relation to the film. Their movement away from the mass is sufficiently rapid to prevent interference with the increasing mass. This gradual movement obviously prevents the possibility of jar or shock.

From the foregoing statement and from certain of the statements of our parent application it will be evident that an important object of the present invention is to provide means whereby a film or other strip of material may be automatically threaded in a film or strip handling apparatus.

35 An object of the present invention is to supply improved mechanism for operating guiding members in a film or strip handling apparatus, such mechanism including improved motive means for carrying out the desired operations and improved timing means for determining the intervals between operations and also the speed and duration of the actual operation itself. A related object is to provide improved mechanism for latching guiding means in guiding position, for releasing said latching means, for timing such release in predetermined relation to the actuation of other parts of the apparatus, and for timing the movement of the operating mechanism.

A further object of the present invention is to provide entirely mechanical and positive means, preferably without putting any special strain or tension upon the film, whereby said guiding and pressing means are automatically and positively operated. It has previously been proposed that the pressure of the mass of film as it piles up about the core of the take-up carrier releases a latch and permits a spring to move the guiding members from guiding position and thereby destroys the channel. In the present invention an improved result is obtained by utilizing a positively timed movement of a control mechanism to operate the means which control the guiding members and destroy the channel. In mechanism which depends upon the building up of the mass of the film, the diameter of the core of the particular carrier which happens to be employed, the thickness of the film itself, or the tightness with which it happens to be coiled about the core, or other conditions which vary from day to day, determine the point at which the movement of the guides takes place. Moreover, the actuation of this movement places a certain strain upon the film and requires an actuating element which rubs against the surface of the film. An apparatus constructed according to our invention always moves the guiding member at exactly the

same time in the cycle of operations. In apparatus constructed in which the film itself operates the means which move the guiding member, it has been necessary to make these guiding members extremely light in order that they may readily be moved or actuated by the film. As a consequence, such an apparatus is delicate and easily bent or otherwise brought out of alignment. In an apparatus constructed according to our invention, however, these guiding members may be made as heavy and rigid as desired since their movement away from the film is under power which is applied by a power operated device which is positively timed.

A further object of the present invention is to provide similar guiding means cooperating with the supply spindle whereby the free end of a film positioned thereupon may be directed to the co-operating feeding member. A further object is to control such supply spindle guiding means in the appropriate timed or sequential relation to the operation of the take-up guiding means and to the actuation of all feeding members and the operation of all other guides and the gate. Such supply spindle guiding means include a fixed section surrounding the carrier upon the supply spindle and cooperating with the operable portion of the guiding means whereby the free end of a film upon such carrier, no matter what the position of such free end, will be directed between the operable guiding members and to the feeding members. That operable portion includes a roller placed upon one of the extended guiding members and a shovel-like resilient extension mounted upon the other or of the longitudinally extended guiding member and movable toward and away from the entire mass of film which picks up the free end of the film as the spindle revolves and directs it forwardly into the channel.

An object of the present invention is to actuate each of the above mentioned elements and all of the elements of the apparatus described herein in that timed sequential or otherwise related manner which will result in the completely automatic actuation and operation of the apparatus.

We prefer to illustrate our invention as applied to a film handling apparatus of the type disclosed and claimed in Patent Number 1,894,963, dated January 24, 1933, to Barton Allen Proctor, and co-pending with our parent application, although it will be readily understood that our invention may be applied to other types of apparatus and subjected to control other than that of the sequential and unitary type disclosed in said patent. Also, as stated in our parent application, the control mechanism hereof may be electrically operated, as taught in Patent Number 1,943,303, to Warren Dunham Foster, dated January 16, 1934, or photo-electrically operated, as stated in Patent Number 1,944,024, to said Foster and Earle L. Parmelee, likewise dated January 16, 1934, said patents having been co-pending with our parent application.

While we describe our invention as applied to a film handling apparatus in which loops are provided, it will be understood that its features may be utilized equally well in connection with the tension control system of feeding as disclosed and claimed in Patent Number 1,944,022 to Clarkson Ulysses Bundick and Barton Allen Proctor, said patent having been co-pending with our parent application, and that many features thereof may be applied to apparatus in which the film is moved continuously as for sound recordation or reproduction or in conjunction with optical rectification of the image.

Other objects, advantages and characteristics of the present invention are apparent in the following description, the attached drawings, and the subjoined claims. Although we are showing one preferred embodiment of our invention, it will be readily understood that we are not limited to this particular construction as changes can readily be made without departing from the spirit of our invention or the scope of our broader claims.

In the drawings:

Figure 1 is a right side elevation of the machine, certain parts being omitted for clarity;

Figure 1a is a view taken on the line 1a—1a of Figure 1; and Figure 1b is a plan view of the same;

Figure 2 is a partial side elevation broken away in part, to show actuating parts in film threading position, certain parts being omitted for clarity;

Figure 3 is a partial bottom plan view looking upwardly showing actuating levers in the "intermediate" position SO;

Figure 4 is a side view, broken away in part, of mechanism interconnecting the manual actuating member with the control mechanism of the apparatus.

Figure 5 shows means for driving the take-up spindle.

Figure 6 is a view of an alternative preferred construction in which springs are placed within the take-up guides.

For simplicity, the same reference characters are used herein as in our parent application.

In carrying out the present invention, there may be provided an apparatus comprising a supporting base B having mounted thereon a lamp and resistance containing housing not shown and a supporting frame F upon which are mounted the operating parts of the film feeding and controlling mechanism per se.

Preferably carried by the frame F and projecting from one side thereof in predetermined spaced relation are carrier receiving spindles 2 and 3, the spindle 2 being adapted for the holding of a reel of film during the feeding movement thereof and adapted to effect rewinding of the film at the conclusion of the feeding movement, while the spindle 3 is adapted to be driven during the feeding movement for coiling the film as required.

The spindle 3, which will hereafter be referred to as the take-up spindle, is journaled for rotation in the frame F. A spindle 2, which will hereafter be designated as the delivery or supply spindle, is mounted similarly to the take-up spindle 3. As described in our parent application, it may be driven in a projecting direction for a short initial period in order to propel the free end of a film from a carrier placed thereon to the take-up spindle.

As shown in Figure 5 of the drawings, the take-up spindle 3 may be driven through a slip clutch including disks 9, 10 and 13, as is more fully described in our parent patent, by a shaft 18 which through a worm wheel 19 and a worm 20 is operated by a shaft 21 which is revolved by a motor M. To transmit the power of the driving shaft 18 to the driven spindle 3, a clutch comprising cooperatively toothed serrated members 15 and 26 may be employed. The member 26 may have a slot 25 formed between the collar 24 and the serrated member 26 which may be operated by clutch fingers for control by the manually movable control button 139 hereinafter described, all as explained in detail in our parent patent.

Interposed between the delivery spindle 2 and the take-up spindle 3 are feeding members which

advance a film in a projecting or exposing direction and also gate, guides, and presser members which alternatively create a clear threading path free from interruption from teeth of the feeding members and a projecting or exposing path in which the film is held in operative relation to various feeding members. Since guiding members which are interposed between the delivery spindle and an adjacent feeding member co-operating therewith and between the take-up spindle and an adjacent feeding member co-operating therewith form a part of these path defining elements and are claimed herein in certain combinations, it is necessary briefly to describe all of the path defining elements and feeding members, although it is to be understood that claims to them in various combinations are included in our parent application.

We prefer so to construct the gate that the film may be initially positioned in respect thereto either by the operation of a feeding member which propels the free end of the film between the sections of the gate or by a single lateral manual movement of the film relatively to the gate. We prefer also to make use of the construction shown in the said constructively co-pending Proctor patent by reason of which it is possible at any time to stop the operation of the apparatus, open the gate, move the guiding elements associated therewith to inoperative position, and manually remove the film from the gate by a movement at right angles to its path of travel therethrough. In other words, we may employ end-wise threading, or side-wise threading, or removal, or both.

Mounted on the frame F we may place a gate section 42 preferably secured in any desired manner as by screws 43 against movement relatively to the frame. This section is preferably formed with an aperture 44 through which light may be projected as well understood in the art, and with a film guiding depression extending lengthwise of the section and intersecting the aperture 44 for the travel of the film, such depression preferably being of great depth relatively to the thickness of the film. Cooperating with the section 42 is a relatively movable section 46 secured to one end of the gate opening rod 48 slidable through a suitable opening in the gate section 42 and a suitable bearing 49 on the frame F. The usual spring pressed pressure plate is mounted on the movable gate section. By reason of this construction, it will be apparent that when the rod 48 is moved to the left as viewed in Figure 1 or 2, it will be effective for moving the section 46 away from the section 42 thus relieving the pressure between the sections and permitting the removal of one film or the insertion of another film, such insertion being accomplished either by propulsion or by a manual lateral movement, while movement in the opposite direction will bring the sections into cooperative relation.

For effecting the desired intermittent feeding motion of a film in position in the gate, there may be provided a feeding sprocket 50 having film engaging teeth 51 adapted to engage perforations substantially peripherally positioned in the film f. This sprocket is mounted on a shaft 53 extending transversely through the frame F and intermittently driven through the mechanism described in the said Proctor patent or in our parent application or in any desired or conventional way.

Cooperating with the aperture 44 and preferably placed between it and the holder for the objective lens o is a conventional shutter not

shown which may be driven in any desired or conventional way such as that shown in our parent patent. It will be readily understood that our invention is equally applicable to projection or photography by the method known as optical rectification or it may be applied to apparatus in which sound is recorded upon or reproduced from a film. In such cases appropriate and conventional modifications of the shutter and other devices associated therewith would be made, since the film moves continuously.

Cooperating with the sprocket 50 and normally occupying the position illustrated in Figure 1 of the drawings, is a stripping and guiding and protecting shield 71 mounted loosely upon the sprocket shaft 53. Secured to the inner side of the shield 71 is a pinion 73 with which meshes an arcuate rack 74 having a pivotal mounting 75 and operated simultaneously with the operation of the gate rod 48 by means of a pin 77 projecting outwardly from the gate opening rod and engaging a slot 78 in the extension 79 of the arcuate rack. With the construction just described, movement of the gate opening rod to the left as viewed in Figure 1 or 2 for the purpose of opening the relatively separable gate sections, will effect rotation of the rack in a counter-clockwise direction as viewed in this figure, thereby rotating the shield in a clockwise direction. This rotational movement of the shield will be effective for engaging the film *f* and stripping the same from the sprocket preparatory to the removal of the film from the apparatus. During the application by lateral or endwise movement of a new film or during rewinding, it will remain in this position, preferably covering all of the teeth of the sprocket which are exposed during the feeding of the film. Thus the threading operation of the film is greatly expedited, and the film completely protected from all teeth during such changing operation or during rewinding.

Conventionally positioned above and below the gate we place continuous sprockets 89 and 90. The former, hereafter called the supply or delivery sprocket, draws film from the supply or delivery spindle, and the latter, hereafter called the take-up sprocket, takes the film away from the intermittent sprocket 50 and moves it toward the take-up reel. As described in our parent application these three sprockets may be driven by a motor and controlled by a system of articulated clutches, or any desired or conventional driving or controlling mechanism may be employed.

We provide stripping and protective shields 115 and 116 cooperating with the continuously driven sprockets 89 and 90, and similar in operation to the shield 71 which cooperates with the feeding sprocket 50. The shield 115, mounted upon the sprocket shaft 91, is operated by a pinion 116' which meshes with a toothed bar 117 supported as in a bearing 118 and at its opposite end engaging with a pinion which is mounted for movement with the pinion 73. Similarly, the shield 116 is mounted upon the sprocket shaft 100 and is operated by the pinion 120 which meshes with a toothed bar 121, supported as in a bearing 122, and at its opposite end engaging with the pinion 73 which is mounted for movement with the pinion 73.

The operation of such shields will be obvious from Figure 2. As the rod 48 is moved, it will be effective for operating the shield 71, and, with it, the shields 115 and 116. Thus the movement of

the rod 48 to the left as viewed in Figure 1 will be effective to move all shields from the inoperative positions to the protective position, in timed relation to the opening of the gate, thus removing the film from the teeth of the sprockets and completely shielding it therefrom. That is to say, such movement will move the shielding members from the position in which they are shown in Figure 1 to those in which they are shown in Figure 2.

Film guides and film retaining members cooperating with the gate and with the feeding mechanism are provided.

A film retaining element, preferably consisting of three rollers or idlers 123, relieved as is common in the motion picture art, is mounted for movement with the plate 125 which is attached to and pivoted upon the stud 126 extending through the frame F and attached to the downwardly extending arm 125', such retaining element being held in cooperative relation with the delivery sprocket 89 by the tension of the spring 127a.

An upper loop guiding element, preferably consisting of a curved plate 127, is pivotally mounted upon the pin 128, extending from the main frame adjacent the upper portion of the gate, and attached to an arm 129 to which is connected a link 130, such link being attached by a pin to an elongated slot in an arm 130' attached to a gate control rod 152.

A similar retaining element, preferably consisting of three rollers or idlers 131, relieved as is common in the motion picture art, is mounted for movement with a plate 132', which plate is attached to and pivoted upon the stud 133 extending from the front of the frame F.

A lower loop guiding element, preferably consisting of a curved plate 134, is pivotally mounted upon a pin 135, extending from the main frame adjacent the lower portion of the gate. Attached to such plate 134 is an arm 136 which by means of a pin extending therefrom into an elongated slot 136' of the link 137 is attached to and moves with the movable gate section 46.

To actuate the film retaining element positioned adjacent the lower portion of the gate in timed relation with the film retaining element positioned adjacent the upper portion of the gate, the plates 125 and 132' are joined by a link 138.

By reason of such construction, it will be evident that when the plates 125 and 132' are moved upwardly, as viewed in Figure 1, by means later described, the film retaining rollers 123 and 131 will likewise be moved upwardly away from the sprockets 89 and 90. By means later described, the loop guiding plates 127 and 134 will likewise be moved downwardly, thus completing the track or path for the film from the supply sprocket through the gate to the take-up sprockets, such movements of such elements being effective to facilitate the positioning of a new film or the edge-wise removal of one already displayed. Similarly, the downward movement of the plates 125 and 132' will be effective to bring the guiding elements 123 and 131 into cooperative relation with the sprockets 89 and 90 respectively, thus positioning the film thereupon and retaining it in cooperation therewith. By means later described the guiding plates 127 and 134 will be simultaneously moved upwardly and away from the film track, thus permitting the unimpeded production of the loops of slack film, in the manner described in our parent application.

For controlling the operation of the apparatus

in the manner desired, there is preferably provided a single control member in the form of a knob or button 139 projecting through a substantially U shaped slot 140 in the supporting base B, as is best shown in Figures 3 and 4. This slot is so shaped as to provide operating stations designated respectively S1, S0, S3 and S4. The button 139 is adapted to be moved at will so that the control mechanism will occupy any one of these stations. With the control at the station S1, the respective parts of the apparatus are in such position as to insure the normal projection of pictures as usual motion pictures. With the control button at the intermediate position, station S0 mechanical timing of the actuation of the control and guiding mechanisms becomes automatically operative as described in our parent application. With the button in position at station S3, the respective parts of the apparatus are in such position as to permit the positioning of a film therein or the removal of a film which has just been fed therethrough. It will be understood that the movement of the button from station S0 to station S3 automatically produces the required change in the operating position of the parts.

The construction and operation of this control mechanism is illustrated and claimed in our parent application and only so much thereof as is necessary for an understanding of the present invention will be repeated herein.

The control mechanism actuated by the control button 139 is shown in Figures 3 and 4. The control button 139 is attached to the control mechanism in such manner that the connection therebetween is automatically destroyed or re-established in accordance with the operating requirements of the apparatus. Such button may be mounted upon a pin 142 having a head 143 against one side of which bears one end of a compression spring 144. The opposite end of this spring bears against a flange 145 extending inwardly from the control button 139. By reason of this construction, it will be apparent that the button may be moved vertically on the pin 142 but that the spring 144 will normally be effective for urging the button downwardly. At its lower end, the button 139 has a collar 146 of a diameter substantially to conform to the contour of the slot 140 as enlarged at each of the respective operating stations except station S0, whereby with the button in its lower position accidental movement from one of these stations is prevented. The lower end of the pin 142 is attached to a sleeve 147 which is slidably mounted upon a lever 148. Such lever 148 is mounted upon a lever 149. Headed pins 150, attached to the lever 149, extend through slots adjacent each end of the lever 148. The lever 149 is mounted for rotation in conjunction with a gate control rod 152 journaled in the main frame F. By reason of this construction, the lever 149 is restricted in movement to rotation only. The combined sliding and rotating lever 148 is effectively mounted on the rotating lever 149 for rotational movement simultaneously therewith and sliding movement independently thereof. Projecting downwardly from the lever 148 is a pin 154 with which a hook 155 pivoted upon a pin 156 attached to the sleeve 147 is adapted to cooperate.

Pivoted upon a pin 157 substantially in line with the portion of the slot 140 extending from station S3 to station S0 is a block 158, normally urged downwardly by a spring 159, such movement being limited by a pin 160 with which the

left hand projection of the block is adapted to contact. Urging the sleeve 147 downwardly as viewed in Figure 3, there is provided a spring 165 mounted upon a rod 166 which may be supported in any desired manner by such sleeve and by the lever 148.

By reason of the above construction, it will be evident that when the combined rotating and sliding lever structure is rotated to the left as viewed in Figure 3 from the position S3 slightly beyond the position S0, the left projecting nose of the hook 155 will engage with the block 158 and will thereby be forced to the right, thus destroying the relationship between the control button 139 and the actuating lever 148 and permitting the power-operated portion of the control mechanism to complete the actuation of the apparatus wholly independently of the user.

At a point intermediate its length, the combined rotating and sliding lever 148 is furnished with a transversely extending recess 169 adapted to cooperate with a pin 170 projecting from a lever 171, pivoted upon a pin 172, the longer or left hand end of such lever, as viewed in Figure 3, being urged downwardly by a relatively powerful spring 173.

In order definitely to time the travel of the control mechanism from station S0 to station S1 and hence to time the actuation of the mechanism which removes the guides from guiding position, as is later described, a dash pot is provided. Suitably connected to the arm 171, is a piston rod 231, a piston 232 working in a cylinder 233 which is pivotally attached to the base B. An adjustable port 234 is provided, whereby the escape of the air may be regulated at will. Usual escape openings 235 are provided in the opposite head of the cylinder.

As will be understood by reference to Figure 3 of the drawings, the movement of the sliding lever 148 from station S1 to station S0 will be effective to swing the irregularly shaped lever 171 upon the pivot 172, thereby placing the spring 173 under tension. Movement of the combined sliding and rotating lever structure to the right as viewed in Figure 3 will be effective to maintain this spring under tension. It will also be understood that movement of the sliding lever 148 downwardly as viewed in Figure 3 will be powered by the spring 173 always against the influence of the piston 232 of the dash pot. Such movement will be entirely automatic since the operative connection between the manually operable button 139 and the control mechanism is broken as at station S0.

Movement of the control mechanism between station S0 and station S3 will be effective for opening and closing the gate, for moving the film rollers and guides 123, 127, 131 and 134 and their associated parts to and from film threading position, and for moving the stripping shields 71, 115, and 116 to and from protective and removing relation to the sprockets 50, 89 and 90 so as to facilitate the threading of a new film into position or to permit the rewinding of a film and alternatively to place the film in driven relation with the elements which feed it.

Adjacent its upper portion there is secured to the gate control rod 152 an arm 252' to which is attached a link 253' attached to the arm 125' previously described. Movement of the control button from station S0 to station S3 will be effective for rotating the gate control rod in a counter clockwise direction as viewed in Figure 3 and moving the link 253' to the left as

viewed in Figure 2 moving the pin 127b over the center of the slot 127c in the upper right angled extension 127d of the spring 127a attached to the main frame F, and quickly raising the film retaining or idler rollers 123 and 131 to relatively distant relation to the sprockets 89 and 90 respectively.

Such rotation of the gate control rod 152 will also be effective to move the arm 254' attached thereto to the left as viewed in Figure 1, thus through the medium of the pin 255' attached to the gate control rod 48 moving such rod to the left as so viewed, thus separating the gate sections, and actuating the stripping shields. The accelerated motion provided by the spring 127a is effective for preventing interference between the idlers and the stripping shields. Such rotation of the rod 152 will also be effective, through the arm 130'' attached thereto, the pin working in the elongated slot therein, and the link 130 to move the upper loop idler to guiding position adjacent the supply sprocket 89. The lower loop guide 134 cooperating with the take-up sprocket 90 is directly operated by the movable section 46 of the gate.

Rotation of the rod 152 in the opposite direction following the movement of the combined rotating and sliding structure from station S0 to station S3 will perform the opposite functions, and place the apparatus in condition for the removal or rewinding of the film and the reception of a fresh film.

Mechanism adapted automatically to position the film in correct relation to the take-up spindle and to guide the film as it is propelled from the supply spindle toward the take-up spindle is controlled by the above described mechanism. It may be constructed as follows:

A gear 434 is fixed to a shaft 433, which is supported by the main frame F. To this shaft is attached an arm 445 which carries the guiding element 446 which terminates in a curved plate 447. Meshing with the gear 434 is a gear 435 which is fixed to a shaft 436, which is supported by the main frame F. To this shaft is attached an arm 437 which carries a guiding plate 440 which terminates in a curved plate 441. As is conventional in the art, light leaf springs 441 and 471' may be mounted upon the inner surface of the guides 447 or 441 to force the film close to the hub as it is initially propelled therearound, or dependence can be placed upon the natural curl of the film and the power which propels it. The guiding member 448, fixed to the frame F, cooperates with the guide 440.

Similar guiding members for a carrier 450 placed upon the spindle 2 are provided. As is clearly shown in Figure 1, these guiding members are operated by a link 451 extending from the previously described arm 432 to an arm 452 affixed to a gear 453 which meshes with a gear 455, connection between the link 451 and the arm 452 being accomplished by a pin working in a relatively elongated slot. As is clearly shown in Figure 1a, such gears are suitably mounted upon a bracket 456 which extends from the main frame F. Attached to the gear 455 is an upper guide 458 terminating to the right in a guide roller 449. Attached to the gear 453 is a main lower guide 459. Carried upon such guide member 459, is a shoe or "shovel" 460, mounted upon small supporting members 461 and 462, such supporting members working through slots in the member 459. Between the supporting members 461 and 462 is a compression spring 463 coiled

about a rod 464. Substantially horizontal movement of the shoe 460 is obtained by a connection between such shoe and the link 451, such connection comprising an arm 465 attached to guide shoe 460, a pin extending from such arm and working in a relatively long slot in an upper right angled extension 466 of a pivotally mounted link 467, a lower right angled extension 468 of such link being attached to a link 451 by a pin working in a relatively long slot. It will thus be evident that the movement of the arm 432 will be effective to bring together or apart the guides 458 and 459, and to move the shoe 460 toward or away from the spindle 2.

Embracing the periphery of the supply reel 450 there may be provided a guide 470 whereby the film upon the revolution of the reel 450 is prevented from leaving the reel except through the opening between the guiding elements 458 and 460.

In order to form a completely enclosed channel or track for the film, all guiding elements and the film retaining elements—including members 123, 127, 131, 134, 440, 446, 448, 458, 459 and 460—are preferably provided with both outer and inner sides or flanges which form contact with each other or with the appropriate portion of the apparatus, when such members are in the operative or guiding position, to form such enclosed channel. For clarity, such sides or flanges are omitted from the drawings, their construction being obvious. Guide 470 may be provided with such an outer flange. Side positioning and retaining fingers, as described in our parent application, may also be employed.

To operate the above described mechanism associated with the two spindles, an arm 501 is pinned to the gear 435 and by means of a pin 502 working in a slot 503 of an arm 504 is connected to an arm 506, supported by a bracket 505, which is attached to a plate 507 attached to the head of a plunger arm 508 of a dash pot 509 conveniently positioned under the base B. This plunger arm is carried in a bearing 510. Within a cylinder 511 of this dash pot and about the plunger arm is positioned a relatively heavy compression spring 512 one end of which bears against a head 513 of the plunger and the other end of which bears against an inward end of a wall 514 of the cylinder. The escape of the air from the dash pot is regulated by an adjustable vent 515, and usual exhaust openings 516 are provided. A latch 517 is attached to the plate 507 by a pin 518 and urged upwardly by a spring 519 against a pin 520. The forward end of the latch terminates in a head 521.

To operate the mechanism above described as controlling the movement of the guides away from the spindles with which they are associated, an angular plate 523 is attached to the combined sliding and rotating lever 148.

By reason of such construction, it will be evident that when the combined rotating and sliding lever structure is moved from station S0 to station S3 the angular plate 523 will be brought into operative relation with the hook 521 of the latch 517. As such combined sliding and rotating lever structure is moved from station S3 to station S0, the spring within the dash pot will be placed under tension and the spindle guiding members will be moved into operative position. As is clearly shown in Figure 3, the nose piece of the latch 155 and the pawl 158 are so constructed that the relation between the control button 139 carried by the pin 142 and the control mech-

anism is not destroyed until the user has moved the button downwardly to a distance approximately equal to the diameter of the pin 142 thus preventing interference by the spring 512 with the action of the actuating spring 173. As the sliding lever 149 is moved downwardly under the influence of the spring 173, the operative connection between the angular plate 523 and the latch 517 will be destroyed, the plate moving from the position shown in dotted line in Figure 3 to that shown in full line, thereby permitting the spring 512 to operate the plunger 508 gradually to move the spindle guiding elements to inoperative position.

Under many conditions, it is preferable to provide a relatively small vent 515 whereby the dash pot permits only a slow movement toward inoperative position of the spindle guiding elements this movement taking place substantially in direct relation to the building up of the mass of film upon the take-up reel and the change in the angular position between the film and the supply spindle. This relatively slow removal of the spindle guides is an added safeguard, since the guides are retained in guiding relation until all possibility of slippage between the film and the take-up spindle has been passed.

To illustrate the actuation of the device to project motion pictures, it will be assumed that the user places a film carrier upon the spindle 2 and moves the control button from station S3 to station S0.

Such movement also rotates the gate control rod 152 thereby retracting the stripping shields 71, 115, and 116, moving the shoe 85 and the guiding rollers 123 and 131 toward the sprockets 50, 89 and 90, moving the guides 127 and 134 away from the sprockets 89 and 90, partially closing the gate and moving the guiding elements 458 and 460 toward each other, thus forming a completely enclosed path or tunnel for the film, and similarly moving the guides 441 and 447 toward each other. The guide shoe 460 will be pressed against the film upon the supply reel 450, the light spring 463 bringing it into contact with the film irrespective of minor variations in diameter of the mass upon the reel and protecting the outer convolutions of the film from injury from the shoe. Thereafter, automatically as described in our parent application or in any desired manner, the supply spindle, the supply sprocket, and the intermittent sprocket may be actuated. Such actuation of the supply spindle will be effective to revolve the supply carrier in a feeding direction. Escape of the end of the film, except through the passage way framed by the guiding members 458 and 460 and 459 is prevented by the guiding ring 470, and the guiding shoe 460 is effective for picking up the free end of the film and guiding it into the passage way. What slight scratching effect, if any, is produced by the shoe is immaterial since the leader or forward end of the film is ordinarily not image bearing. Continued revolution of the supply carrier forces this free end of the film past the several sprockets, which are shielded according to the form of our invention herein shown for purposes of illustration, and on to the take-up spindle. The upper loop guide 127 will be withdrawn from guiding position, in the manner later described. The shields may then be retracted and the two necessary loops of unsupported slack film may be created, one adjacent the supply sprocket and one adjacent the take-up sprocket, all as described in our parent

patent, and all sprockets be placed in operation. Rotation of the rod 152 is first effective to move the arm 130'' whereby through the link 130 the upper loop guide 127 is moved to inoperative position and the final gate closing movement begins. The continued rotation of rod 152 is effective to complete the closing of the gate and to retract the lower loop guide 134 through the operation of the slotted link 137.

As the film is fed forwardly by the simultaneous operation of all of the feeding sprockets it is forced through the passage way formed by the guiding elements 446 and 440 and around the hub 442 of the take-up carrier 443 upon the take-up spindle 3, the film being guided about the revolving hub by the circular guiding plates 441 and 447. The continued powered operation of the driving spindle 3 and the carrier 443 thereupon will be effective to wrap the film about the hub 442 thus firmly attaching the end of the film thereto. The downward movement of the lever 148, definitely timed by the dash pot associated therewith, will be effective for moving the latch 523 from holding relation with the hook 521, thereby making the spring 512, definitely timed by the dash pot 509, effective gradually to separate the take-up spindle guides 441 and 447 and to separate the delivery spindle guides 458 and 459 and to withdraw the film contacting "shovel" 460 from contact with the mass of film upon the supply reel. It will thus be seen that the various guiding elements are moved to inoperative position without placing the slightest strain upon the film, and that they are so moved in definitely timed relation to the beginning of the operation of the take-up spindle, which in turn is actuated in a definitely timed relation to the actuating of the other feeding member and the closing of the gate.

With the control button 139 returned to station S3, it will be understood that the gate is completely open, the spring 173 reset, the guides 127 and 134 relatively close to the film path, the film retaining rollers 123 and 131 completely withdrawn from the sprockets 89 and 90 respectively, and the guides associated with the supply and take-up spindles in open position. When he wishes again to use the apparatus, the user thereupon places the reel 450 upon the spindle 2. It is not necessary that the end of the film be placed in any particular relation to the guiding elements. The user thereupon moves the control button 139 from station S3 to station S0 and the automatic threading operations, as previously described, are repeated.

Many of the advantages of our invention are evident from the foregoing portion of this specification. Among other advantages is the provision of definite independent timing means for the removal of the spindle guides, such timing means being operated in direct relation to the building up of the mass of the film upon the take-up reel, and actuated in definite timed relation to the actuation of the other guiding members, feeding members, and the gate. Other advantages include the provision of improved guiding and operating mechanism positively controlled and embodying various operable members sequentially operated for the automatic threading of an apparatus for the handling of film or other strip material.

We claim:

1. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of a carrier placed upon said spindle,

said guiding means including at least one film contacting member which is movable in relation to said core, a dash-pot including a cylinder and a plunger operating therein, an operating connection between said plunger and said movable member whereby the movement of said plunger moves said member against the operation of said dash-pot, a spring for moving said plunger, means for placing said spring under tension, a latch for releasing said plunger, a movable actuating member for releasing said latch, and powered means for moving said movable actuating member.

2. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of a carrier placed upon said spindle, said guiding means including at least one film contacting member which is movable in relation to said core, a dash-pot including a cylinder and a plunger operating therein, an operating connection between the shaft of said plunger and said movable member whereby the movement of said plunger in one direction moves said film contacting member against the holding influence of said dash-pot, a spring coiled about the shaft of said plunger within the cylinder of said dash-pot for moving said plunger, means for moving said plunger in a direction opposite that previously stated for placing said spring under tension, and a latch for holding said plunger after said spring has been placed under tension.

3. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of a carrier placed upon said spindle, said guiding means including at least one member which is movable in relation to said core, and powered mechanism for moving said movable member in relation to said core, said moving mechanism including a timing device for determining the speed of movement of said member, a manual actuating member operatively interconnectable with said moving mechanism for starting the operation of said moving mechanism, and means for destroying the operative connection between said manual actuating member and said moving mechanism so that said moving mechanism can operate under the influence of said timing device unimpeded by manual interruption.

4. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of a carrier placed upon said spindle, said guiding means including at least one member which is movable in relation to said core, and mechanism for moving said movable member in relation to said core, said moving mechanism including a manual actuating member operatively interconnectable with said moving mechanism for starting the operation of said moving mechanism, powered driving means, and means for destroying the operative connection between said manual actuating member and said moving mechanism so that said powered mechanism can operate unimpeded by manual interruption.

5. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of the carrier when placed upon said spindle, said guiding means including at least one movable film contacting member, a spring for moving said movable film contacting member, an operating element operatively connected with said spring for movement therewith, and control

mechanism, said control mechanism including an actuating member movable between a first position wherein it engages said operating element and a second position spaced from said first position and so disposed in relation thereto that its movement from said first to said second position in engagement with said operating element moves said operating element and places said spring under tension, and to a third position out of operative connection with said operating element thereby releasing said spring and permitting said spring to operate as said operating element is moved thereby from said second to said first position, and means for moving said actuating member between said positions.

6. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of the carrier when placed upon said spindle, said guiding means including at least one movable film contacting member, a spring for moving said movable film contacting member, an operating element operatively connected with said spring for movement therewith, and control mechanism, said control mechanism including an actuating member movable between a first position wherein it engages said operating element and a second position spaced from said first position and so disposed in relation thereto that its movement from said first to said second position in engagement with said operating element moves said operating element and places said spring under tension, and to a third position out of operative connection with said operating element thereby releasing said spring and permitting said spring to operate as said operating element is moved thereby from said second to said first position, powered means for moving said actuating member between said second and third positions, and means for timing the operation of said powered means.

7. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of said carrier when placed upon said spindle, said guiding means including at least one movable film contacting member, a spring for moving said movable film contacting member, an operating element operatively connected with said spring for movement therewith, and control mechanism, said control mechanism including an actuating member movable between a first position wherein it engages said operating element and a second position spaced from said first position and so disposed in relation thereto that its movement from said first to said second position in engagement with said operating element moves said operating element and places said spring under tension, and to a third position out of operative connection with said operating element thereby releasing said spring and permitting said spring to operate as said operating element is moved thereby from said second to said first position, powered means for moving said actuating member between said second and third positions, a manually operable actuating element, a connection between said manual element and said powered means for starting the operation of said powered means by the movement of said manual element, and means for destroying said connection so that said powered means can be operated independently of said manual element.

8. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation

to the core of said carrier when placed upon said spindle, said guiding means including at least one movable film contacting member, a spring for moving said movable film contacting member, and control mechanism, said control mechanism including an operating member which is mounted for movement in a plurality of directions, a connective element mounted for movement with said spring for placing said spring under tension when force is applied thereto, said operating member being so disposed in relation to said connective element that when said operating member is moved in one direction it comes into operative contact with said connective element and when it is moved in another direction it moves said connective element thereby compressing said spring and when it is moved in another direction it is removed from operative contact with said connective element thereby releasing said spring, and means for moving said operating member.

9. In a film handling apparatus, a spindle adapted for the removable mounting of a carrier thereupon, means for guiding a film in relation to the core of said carrier when placed upon said spindle, said guiding means including at least one movable film contacting member, a spring for moving said movable film contacting member, and control mechanism, said control mechanism including a first control member mounted for rotational movement, a second member mounted upon said first control member for rotational movement therewith and longitudinal movement independently thereof, means for rotating said first and second control members, means for longitudinally moving said second control member, a connective element mounted for movement with said spring for placing said spring under tension when force is applied thereto, and an operating element mounted upon said second or longitudinally movable control member, said operating element being so disposed in relation to said connective element that when said first and second control members are rotated in one direction said operating element comes into operative contact with said connective element and when said first and second control members are rotated in the opposite direction said spring is placed under tension and when said second control member is moved longitudinally said operating element and said connective element are removed from operative relation one with the other thereby releasing said spring so that it can move said film contacting member.

10. In a film handling apparatus, a film supporting member, a member for feeding a film in relation to said film supporting member, guiding means for establishing a path for the film between said film supporting member and said film feeding member, said guiding means including at least one movable film contacting member, means for moving said movable film contacting member in relation to said path, and means determining the speed of said moving means whereby the speed of movement of said film contacting member in relation to said path is predeterminedly governed.

11. In a film handling apparatus, a film supporting member, a member for feeding a film in relation to said film supporting member, guiding means for establishing a path for this film between said film supporting member and said film feeding member, said guiding means including at least one movable film contacting member, means for moving said movable film contacting member in relation to said path, and

control mechanism for said moving means, said control mechanism including powered means for carrying out the operation of said moving means, manual means connected to said powered means for starting the operation of said powered means, and means for breaking the connection between said manual means and said powered means so that said powered means may operate uninterrupted by said manual means.

12. In a film handling apparatus, a film supporting spindle, means for establishing a path for guiding a film in relation thereto, said guiding means including at least one movable film contacting member, and mechanism for moving said film contacting member in relation to said path, said moving mechanism including powered means for moving said film contact-member in one direction relatively to said path, a handle, connections between said handle and said movable film contacting member for moving said film contacting member in one direction relatively to said path by a predetermined movement of said handle, and connections between said handle and said powered means for actuating said powered means by another movement of said handle.

13. In a film handling apparatus, a film supporting spindle, means for establishing a path for guiding a film in relation thereto, said guiding means including at least one movable film contacting member, a spring for moving said film contacting member away from said path, a latch, a handle, connections between said handle and said spring for moving said member toward said path and placing said spring under tension under the holding influence of said latch by one movement of said handle, and connections between said latch and said spring for releasing said latch by another movement of said handle.

14. In a film handling apparatus, a film supporting spindle, means for establishing a path for guiding a film in relation thereto, said guiding means including at least one movable film contacting member, a spring for moving said film contacting member away from said path, a latch, a handle, connections between said handle and said spring for moving said member toward said path and placing said spring under tension under the holding influence of said latch by one movement of said handle, connections between said latch and said spring for releasing said latch by another movement of said handle, said last previously mentioned connections including means establishing a predetermined period between said movement of said handle and the release of the latch.

15. In a film handling apparatus, a film supporting spindle, means for establishing a path for guiding a film in relation thereto, said guiding means including at least one movable film contacting member, and mechanism for moving said film contacting member in relation to said path, said moving mechanism including powered means for moving said film contacting member in one direction relatively to said path, timing means for retarding and governing the operation of said powered means, and means for moving said film contacting member in the other direction without interference from said governing and retarding means.

16. In a film handling apparatus, a supply spindle, a take-up spindle, each of said spindles being revoluble and adapted for the removable mounting of a carrier thereupon, guiding means cooperating with the cores of each of the carriers mounted upon said spindles for establishing a

path which directs a film in relation to said core, each of said guiding means including a film contacting member movable in relation to said path, and means operatively interconnecting said film 5 contacting members for concomitantly moving each of said film contacting members.

17. In a film handling apparatus, a spindle, complementary members for guiding a film relatively to said spindle, means for moving one of 10 said members in relation to the other thereof, and means operatively interconnecting said complementary members and necessarily effective to determine the speed at which such movement is carried out.

18. In a film handling apparatus, a film winding core, means for guiding a film to said core, means for moving said guiding means away from the film positioned upon said core, and timing mechanism governing the operation of said moving means for assuring the operation thereof at 20 a relatively slow speed.

19. In a film handling apparatus, a live spindle, complementary members forming a channel extending to and about the core of a carrier positioned upon said spindle for guiding the free end 25 of a propelled film to and about such core, and operating mechanism for said members for moving said members away from each other and from said core at a rate proportional to the building up of the mass of film upon said core.

20. In a film handling apparatus, a spindle, a film winding core adapted to be mounted upon said spindle, a guiding member disposed adjacent one side of the initial path for the film which extends to said core, a member pivotally mounted 35 adjacent said member and so arranged that it may be disposed in a position extending from said first mentioned guiding member to said core for the purpose of defining one side of such initial path and directing the film therealong, means for revolving said spindle whereby the mass of the film is built up thereupon and the angular relation of the film to said core gradually changed, means for moving said pivoted member away 40 from such position and such path, and timing means governing said moving means for changing the angular relation of said member to said core an amount substantially equal to the change in angular relation of the film to said core.

21. In a film handling apparatus, a film supporting spindle, means for establishing a path for guiding a film in relation thereto, said guiding

means including at least one movable film contacting member, a first spring for moving said member, a latch for holding said first spring under tension, a first means for releasing said latch, a second spring for operating said releasing means, a second latch for said second spring, a second means for releasing said second spring, and unitary control mechanism operatively interconnecting both of said spring and both of said releasing means and alternately operative first 10 for concomitantly placing both springs under tension and thereafter for operating said second releasing means thereby actuating said second spring for operating said first releasing means whereby said first spring moves said film contacting member. 15

22. In a film handling apparatus, a film supporting spindle, means for establishing a path for guiding a film in relation thereto, said guiding means including at least one movable film contacting member, a first spring for moving said film contacting member, means for placing said first spring under tension, a first latch for holding said first spring under tension, a second spring for operating said first latch, a second 25 latch for said second spring, means for placing said first and second springs under tension under the holding influence of said latches, and means for releasing said second latch whereby said second spring moves said film contacting member. 30

23. In a film handling apparatus, a film supporting spindle, means for establishing a path for guiding a film in relation thereto, said guiding means including at least one movable film contacting member, a first spring for moving said film contacting member, means for placing said first spring under tension, a first latch for holding said first spring under tension, a first means for operating said first latch to release said first spring, a second spring for operating said first latch, a second latch for said second spring, a second means for operating said second latch to release said second spring, means for placing said first and second springs under tension under the holding influence of said latches, means for operating said second releasing means whereby said second spring operates said first releasing means, and means establishing a predetermined time interval between the operation of said first and second releasing means. 40 45 50

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