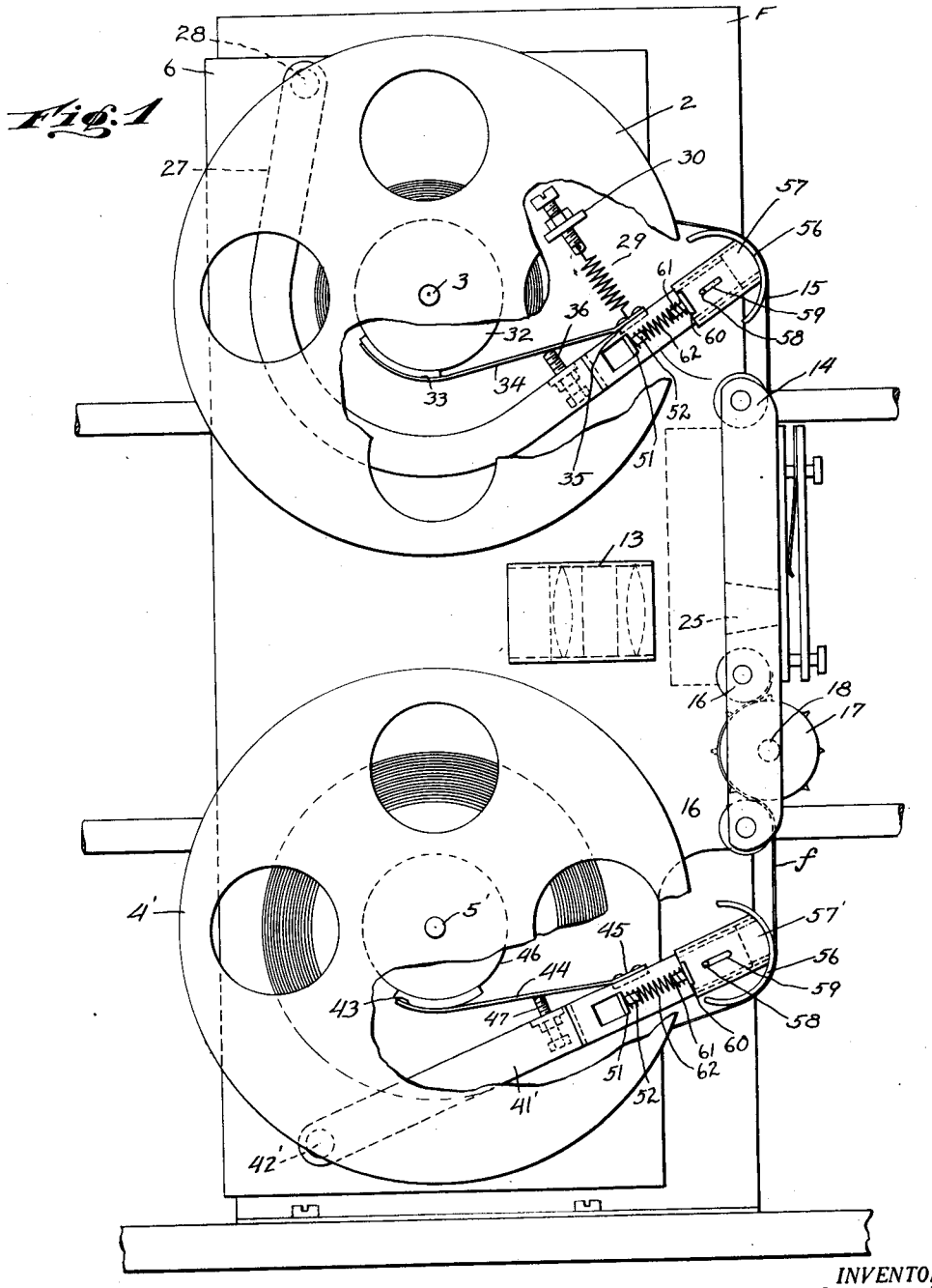
Jan. 16, 1934. F. D. SWEET 1,944,039

APPARATUS FOR FEEDING MATERIAL

Filed Oct. 5, 1931 2 Sheets-Sheet 1

Fig. 1



INVENTOR.
FREDERICK DAVENPORT SWEET

BY Waldo G. Morse

ATTORNEY.

Jan. 16, 1934. F. D. SWEET 1,944,039

APPARATUS FOR FEEDING MATERIAL

Filed Oct. 5, 1931 2 Sheets-Sheet 2

Fig. 2

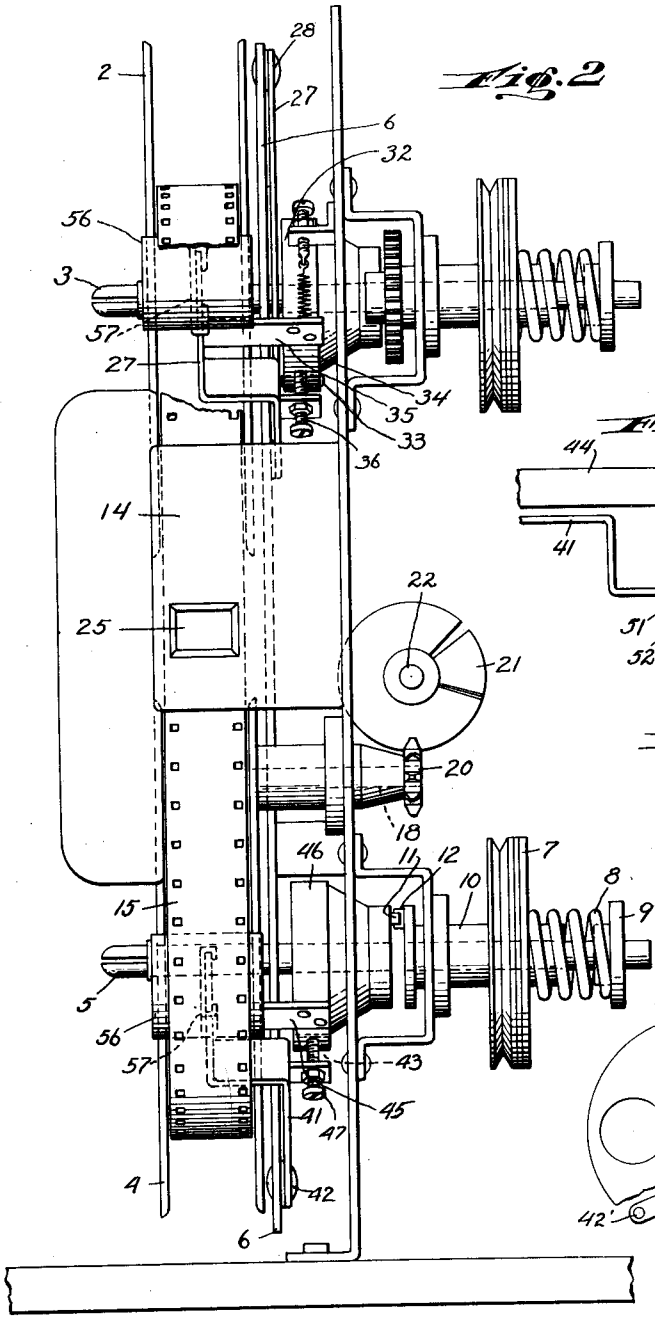


Fig. 3

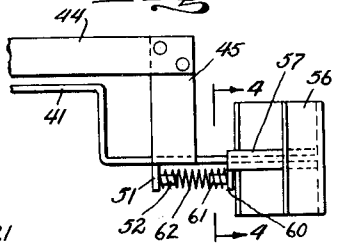


Fig. 4

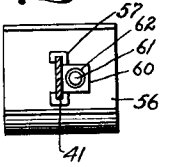
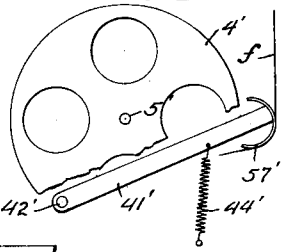


Fig. 5



INVENTOR.
FREDERICK DAVENPORT SWEET.
BY Waldo G. Morse.
ATTORNEY.

Patented Jan. 16, 1934 1,944,039

UNITED STATES PATENT OFFICE

1,944,039

APPARATUS FOR FEEDING MATERIAL

Frederick Davenport Sweet, New York, N. Y., assignor, by mesne assignments, to Kinatome Patents Corporation, a corporation of New York

Application October 5, 1931. Serial No. 567,110

20 Claims. (Cl. 88—17)

The present invention relates broadly to improved apparatus for feeding material, particularly to apparatus especially adapted for the feeding of film bearing thereupon pictorial or sound images or for exposure to such images, although the utility of the invention is not limited in this respect.

In certain of its aspects this invention is an improvement over that described and claimed in the co-pending application of Clarkson Ulysses Bundick and Barton Allen Proctor, filed July 18, 1925, Serial Number 44,432. The Bundick and Proctor system of feeding material, as described and claimed in the above mentioned application, provides method and apparatus whereby a strip of material may be fed from one supporting member to another and an intermediate portion maintained motionless for regularly recurring periods. In this system of feeding both the delivery and the taking-up carriers are driven continuously but at rates of speed which vary in accordance with the intermittency of movement of the intermediate section of the material which is being worked upon, all of the material being maintained under a condition of substantially uniform tension. Under this system of feeding, the intermittently operable feeding member disposed between the masses of material serves both to draw material directly from the source of supply and, working through the material, to operate an auxiliary feeding and tensioning device disposed therebetween. The driven taking-up member serves both to move the film away from this intermediate intermittently operating member and to operate an auxiliary feeding and tensioning device disposed therebetween.

An object of the present invention is to provide improvements upon this system of feeding and in the construction and arrangement of auxiliary feeding and tensioning devices. Another object is the provision of improved auxiliary feeding devices and improved tensioning devices for use with material handling apparatus.

In the accompanying drawings there is shown, for purposes of illustration only, one preferred embodiment of the present invention, it being understood that the drawings do not define the limits of the invention, as changes in the construction and operation disclosed therein may be made without departing from the spirit of the invention or the scope of the broader claims.

In the drawings:

Figure 1 is a side elevational view, partly broken away, and largely diagrammatic, illustrating one embodiment of the present invention.

Figure 2 is a front view of the construction illustrated in Figure 1.

Figure 3 is a top plan view in detail of a preferred construction of the telescoping film engaging auxiliary member.

Figure 4 is a view taken on the lines 4—4 of Figure 3.

Figure 5 is a view, largely diagrammatic, of an alternative construction of the taking-up mechanism, no auxiliary braking means being provided.

In carrying out the present invention in connection, for example, with the feeding of film, there may be provided an apparatus including a feeding or delivery reel 2 mounted for rotation upon the spindle 3 and a take-up reel 4 mounted for rotation upon the spindle 5. Each of these spindles is shown as mounted upon auxiliary plate 6 which is mounted upon a frame F for bodily movement relatively thereto in accordance with the teaching of the co-pending application of Herbert George Ponting and George William Ford, Serial Number 542,898, filed in the United States Patent Office March 11, 1922. Movement is imparted in any desired manner to the take-up spindle 5, preferably through a pulley 7, which through a spring 8, regulated by a nut 9, yieldingly drives the rotating member 10 upon which the pulley is loosely mounted. The bodily movement of the plate 6 brings a motion-receiving member 11, rotatable with the spindle 5, into operative contact with a motion-transmitting member 12, rotatable with the member 10. Power may be applied to the delivery spindle 3 for the purpose of rewinding the film thereupon, but since this arrangement is not included within the scope of the present invention and since any one of a number of known means, including that described in the above mentioned application of Ponting and Ford, may be employed as desired, it is not described. Also, any desired means may be employed for driving the take-up spindle.

Located at a suitable point intermediate the reels is any usual arrangement of lenses 13 in line with a gate 14 through which a material 15, herein illustrated as comprising a perforated film, may be fed. The gate is conveniently provided with guiding and presser wheels 16 over which the film passes. Preferably the gate is of sectional construction, one section carrying the wheels 16 and a portion of the gate and being mounted upon the movable plate 6. The other section of the gate and an intermittently rotating film feeding sprocket 17 against which

the rollers 16 hold the film in operative relation may be mounted upon the fixed main frame F. The sprocket 17 in accordance with common practice may be secured to a shaft 18 which terminates in a star wheel 20 which cooperates with a cam 21, driven by a power shaft 22 and intermittently rotating the sprocket 17, as is well understood in the art. If desired, a Geneva movement or any other satisfactory intermittently effective driving mechanism may be employed. As the feeding member 17 intermittently rotates, it intermittently feeds successive sections of the film past an aperture 25 formed in the gate 14 whereby the portions of the film are successively exposed or projected.

Cooperating with the feeding or delivery reel 2 is a tensioning and auxiliary feeding mechanism, preferably comprising a supporting arm 27 with a pivoted mounting 28 upon the auxiliary plate 6. This supporting arm 27 is normally urged upwardly as shown in the drawings in a counter clockwise direction by a spring 29 cooperating at one end with means 30 for adjustably varying the operation of the spring.

The present invention is described and illustrated as including a braking mechanism supplemental to the tensioning and auxiliary feeding means, but such supplemental means, while desirable under many conditions, is not necessary to the satisfactory operation of the device. Mounted upon the delivery spindle 3 for rotation therewith is a brake drum 32. It will be seen that the supporting arm 27 surrounds a substantial part of this brake drum being pivoted at a point above it as shown in the drawings. Carried by the supporting arm 27 is a brake shoe 33 mounted preferably upon a flat spring 34 which extends from a right angled extension 35 of the supporting arm 27. The pressure of the brake shoe 33 against the drum 32 is adjustable in part by a stop 36 in combination with the adjustment 30.

Cooperating with the take-up reel 4 is a second auxiliary tension and feeding mechanism comprising a supporting arm 41, having a pivoted mounting 42 in the plate 6, and carrying a brake shoe 43 mounted upon a flat spring 44 which is attached to a right angled extension 45 of the supporting arm 41 and cooperating with a brake drum 46, which is mounted for rotation with the spindle 5. An adjustable stop 47 cooperates with the shoe 43.

The pivotally mounted supporting arms 27 and 41 are shown with telescoping film-engaging ends, as illustrated in detail in Figures 3 and 4. The following description is specifically applied to the take-up arm 41, but it will be understood that the device as applied to the delivery arm 27 is similar.

As will readily be seen from Figures 1 and 3, a portion of the supporting arm 41 is bent at right angles thereto to form a lug 51 in which is inserted a pin 52. A curved film-engaging plate or pad 56 is mounted upon or formed with a sleeve 57, which extends therefrom at a right angle thereto and is slipped over the outer end of the supporting arm 41 and held in predetermined relation thereto by a pin 58 extending from such arm and cooperating with an opening 59 formed in the sleeve 57. The lower or left hand extremity 60 of this sleeve, as shown in the Figures 1 and 3, is turned therefrom at substantially right angles to the body portion. A pin 61 is affixed thereto in line with the previously mentioned pin 52 for the purpose of retaining a compression spring 62 in operative position, such spring being effective to urge the plate 56 toward the film. It will be understood that in practice this telescoping member and the supporting arm will each be pressed with one piece of metal.

It will be readily seen that the above described construction forms a simple telescoping film-engaging member movable along the longitudinal axis of the supporting arm 41 and hence in a direction substantially at right angles to the line of bodily movement of the supporting member.

As clearly shown in Figure 5, an auxiliary feeding and tensioning device without any braking connection with the take-up carrier may be provided. An arm 41' pivoted at 42' with a telescoping film-engaging member 56' under the influence of a tension spring 44' may be employed. In such a construction, the take-up carrier 4' is subjected to no braking influence whatever.

The operation of the device is as follows:

As power is applied to the sprocket 17, the sprocket revolves and the film is pulled from the delivery carrier 2. The arm 27 is depressed and energy is stored in the spring 29. While the sprocket 17 is at rest, the spring 29 acts on the arm 27 to cause it to pull an amount of film from the carrier 2. Upon the next rotation of the sprocket 17 the portion of the film necessary to compensate for the displacement caused thereby is the length of film previously pulled from the carrier 2 and the length thereof which at that moment is pulled directly from the delivery carrier. The resiliently mounted film-engaging member 56 serves to cushion this direct movement of film from the source of supply. This combination of a resilient feeding member 27 and a second resilient cushioning member 56 has been found to be of very great advantage over a single resilient member in controlling the rate of rotation of the idling delivery carrier 2 and "ironing out" its movement in relation to the intermittent member. The delivery member rotates continuously, but its speed of rotation varies in step with the movement of the intermittent sprocket 17. The film is maintained under substantially constant tension.

In addition to the operation above described, the braking shoe 33 and its associated parts if desired may also be used, to perform a braking function. The arm 27 is normally swung in such direction as to bring the shoe 33 in contact with the drum 32 by means of the spring 29. Due to the action of this spring, the brake shoe 33 tends to prevent too free rotation of the delivery spindle and thereby prevents the tension on the film becoming less than that required for proper feeding. In the event of a tendency toward too great tension, however, the tension on the film causes the supporting arm 27 to move in opposition to the action of the spring 29 thereby relieving the braking action of the shoe 33 to a corresponding extent and re-establishing the predetermined tension upon the film. Such braking action is particularly useful in case of an unusual condition of film feeding, such as, for example, binding of the delivery spindle due to improper lubrication, a piece of grit, sudden acceleration or deceleration of the intermittent sprocket 17, or any of the countless small emergencies which arise in film feeding.

As previously pointed out, this braking operation is not required for the normal feeding and tensioning operation of the device. If desired, the braking mechanism may be entirely eliminat-

ed. In that case it is often found desirable to arrange the magnitude of the springs 29 and 62 so that the magnitude of the spring 62 is materially less than that of the spring 29. In such event under many conditions of feeding the operation of telescoping arm 56 satisfactorily performs the feeding and tensioning function while the bodily movement of the arm 27, urged by the spring 29, is satisfactory for taking care of any unusual movement due to emergency conditions.

It is obviously of great importance that the cadence or step between the auxiliary device and the intermittent member be not interrupted. The provision of a telescoping resilient film-engaging member, mounted for bodily movement upon a resilient arm, is useful in this respect. Owing to different conditions of feeding, the movement of the supporting arm may be irregular, but that of the telescoping pad continues regular irrespective of the position or movement of the arm. In maintaining this desirable cadence, the movement of the film-engaging pad in right angled relation to the path of the film between the pad and the intermittent feeding member gives improved results, particularly when use is made of film masses of relatively great weight.

The operation of the supporting arm 41, the yielding and telescoping film pad associated therewith, the take-up carrier 4, and the sprocket 17 is analogous to that of the elements between the sprocket 17 and the delivery carrier 2. As the sprocket 17 revolves, a portion of the film equal to one frame is moved forwardly. The spindle 5, yieldingly but continuously driven, pulls the film away from the sprocket and tends to coil it upon the take-up carrier 4. The two resilient members, as before described, serve the double function of keeping the section of film between the sprocket 17 and the carrier 4 under continuous motion and tension and of cushioning it whereby the pull of the spindle 5 upon the film is prevented from being communicated to the perforations in engagement with the teeth of the sprocket 17 and hence injuring such perforations and the film.

In addition to the auxiliary feeding operation above described, a braking function may also be performed.

The take-up brake 43 is normally so positioned as to exert little braking action upon the drum 46. In the event, however, of a tendency of undue strain on the film between the feeding sprocket 17 and the reel 4, the film will be effective to swing the supporting arm 41 in such direction about its pivotal mounting 42 as to bring the brake shoe 43 into more effective braking engagement with the drum 8. Due to the fact that the spindle 5 is driven through a frictional drive 8, such braking action will be effective for decreasing the driving force on the spindle 5 and consequently will relieve the tension on the film and produce the desired operating conditions between the intermittent sprocket and the take-up reel.

The usefulness of this braking mechanism has been stated above, but applicant has been able successfully to feed material without the use of braking means in addition to the primary tension controlling means, but under many conditions he prefers to use both means.

It will thus be seen that the operation of the conventional intermittent feeding member, in cooperation with the improved auxiliary feeding and tensioning devices described herein, serves to feed a film or other material from an idling delivery carrier to a frictionally driven take-up carrier, each of such carriers being continuously driven but at rates of speed which vary in step with movement of the intermittent member, the entire operative length of the material being maintained under substantially constant tension. This system of feeding does away with the conventional continuous sprockets with their associated loops of slack film. Under this system, the feeding apparatus is less expensive, wear upon the material is much reduced, breakage rendered very much less frequent, threading and other manipulation made easier, and, in the case of motion picture film, greater exactitude of registration at the aperture secured.

In the manner described required tension on the film to insure proper feeding is automatically secured by the mere threading of the film into position, and is automatically maintained by the operation of the tensioning, auxiliary feeding or braking mechanisms.

Many of the advantages of the present invention have been stated above and will be obvious from a reading of the previous portion of this specification and the subjoined claims. Other advantages arise from the provision of improved apparatus whereby a film or other material may be fed from an idling mass to a driven take-up mass by means of an intermittent feeding member placed therebetween and auxiliary feeding and tensioning means operated by the film itself.

Still further advantages arise from the provision of means in an auxiliary tensioning and feeding device whereby a more even and steady flow of the material may be secured and with reduced wear thereupon and reduced liability of damage.

The foregoing description illustrates my device as applied in connection with an intermittent feeding member. It will be readily understood by those skilled in the art, however, that my invention may be applied to a film or other strip in cooperation with a continuously driven feeding member for the purpose of making the flow of material more uniform and compensating for minor irregularities of movement of the feeding member. This use of my invention is particularly applicable to that operation which is often spoken of in the art as "ripple killing", particularly in connection with sound motion pictures.

I claim:

1. In a film handling apparatus, an idling delivery carrier, a power-driven take-up carrier, an intermittently driven toothed feeding-member positioned therebetween for drawing film from said delivery carrier and moving it toward said take-up carrier, and mechanisms for compensating for the difference in character of movement of said carriers and said feeding member; said compensating mechanism associated with said delivery carrier including a movable supporting member, a spring urging said supporting member toward the film, a member engaging the film between said delivery carrier and said feeding member, means for mounting said film-engaging member upon said supporting member for bodily movement in respect thereto, a spring urging said film-engaging member toward the film, said springs being of different magnitudes whereby each feeding impulse of said feeding member as it draws film directly from said delivery carrier is cushioned by one of said springs and also stores power in said spring so that said spring is effective to move the film directly from said carrier during each period of idleness of said

feeding member, said spring and said feeding member operating in step or rhythm, and whereby said other mentioned spring is effective to yield under abnormal conditions of feeding for the purpose of protecting the film against damage, without interupting such rhythm of said feeding member and said other mentioned spring; and said compensating mechanism associated with said take-up carrier including a movable supporting member, a spring urging said supporting member toward the film, a member engaging the film between said feeding-member and said take-up carrier, means for mounting said film-engaging member upon said supporting member for bodily movement with respect thereto, and a spring urging said film-engaging member toward the film, said springs being of different magnitudes whereby the direct pull of said power-driven take-up carrier upon the film in engagement with said toothed intermittent feeding-member during the period of idleness of said intermittent feeding-member is cushioned by one of said springs and power stored in said spring so that said spring is effective to move the film away from said intermittent feeding member during the period of operation of said intermittent member, said spring and said feeding member operating in step or rhythm, and whereby said other mentioned spring is effective to yield under abnormal conditions of feeding, for the purpose of protecting the film against damage, without interrupting such rhythm of said feeding-member and said other mentioned spring.

2. In a film handling apparatus, an idling delivery carrier, an intermittently driven toothed feeding member for drawing film directly from said delivery carrier, and mechanism for compensating for the difference in character of movement of said delivery carrier and said intermittent feeding member, said compensating mechanism including a movable supporting member, a spring urging said supporting member toward the film, a member engaging the film between said delivery carrier and said intermittent feeding member, means for mounting said film engaging member upon said supporting member for bodily movement with respect thereto, a spring urging said film engaging member toward the film, said springs being of different magnitudes whereby each feeding impulse of said feeding member as it draws film directly from said delivery carrier is cushioned by one of said springs and also stores power in said spring so that said spring is effective to move the film directly from said carrier during each period of idleness of said feeding member, said spring and said feeding member operating in step or rhythm, and whereby said other mentioned spring is effective to yield under abnormal conditions of feeding for the purpose of protecting the film against damage, without interrupting such rhythm of said feeding member and such other mentioned spring.

3. In a film handling apparatus, a power driven take-up carrier, an intermittently driven toothed feeding member for moving film toward said take-up carrier, and mechanism for compensating for the difference in character of movement of said take-up carrier and said intermittent feeding member, said compensating mechanism including a movable supporting member, a spring urging said supporting member toward the film, a member engaging the film between said take-up carrier and intermittent feeding member, means for mounting said film engaging member upon said supporting member for bodily movement with respect thereto, a spring urging said film engaging member toward the film, said springs being of different magnitudes whereby the direct pull of said power driven take-up carrier upon the film in engagement with said toothed intermittent feeding member during the period of idleness of said intermittent feeding member is cushioned by one of said springs and power stored in said spring so that said spring is effective to move the film away from said intermittent feeding member during each period of operation of said feeding member, said spring and said feeding member operating in step or rhythm, and whereby said other mentioned spring is effective to yield under abnormal conditions of feeding, for the purpose of protecting the film against damage, without interrupting such rhythm of said feeding member and such other mentioned spring.

4. A film handling apparatus which comprises a carrier, a member engaging the film supported by said carrier for feeding it in relation thereto, and means for subjecting the film during such feeding operation to a plurality of resilient forces of different characteristics, said means including a resiliently mounted arm engaging the film between said delivery carrier and said feeding member for controlling the tension of the film between said carrier and said feeding member, said arm being characterized by a telescoping film engaging end yieldingly movable relatively to the film.

5. A film handling apparatus which comprises a carrier, a member engaging the film supported by said carrier for feeding it in relation thereto, and means for subjecting the film during the feeding operation to a plurality of resilient forces of different characteristics, said means comprising a movably mounted arm engaging the film between said carrier and said feeding member, a first spring for moving said arm toward the film, a telescoping film engaging end mounted for movement upon said arm toward and away from the film, a second spring for moving said film engaging end toward the film, said first and second springs being of different magnitudes, whereby each feeding impulse of said feeding member as it draws film directly from said carrier is cushioned by one of said springs and also stores power in said spring so that said spring is effective to move the film from said carrier during each period of idleness of said feeding member, said spring and said feeding member operating in step or rhythm, and whereby said other mentioned spring is effective to yield under abnormal conditions of feeding for the purpose of protecting the film against damage without interrupting such rhythm of said feeding member and said other mentioned spring.

6. A material handling apparatus which comprises a carrier, a feeding member engaging the material supported by said carrier for feeding it in relation thereto, and means for controlling the tension of that portion of the material between said carrier and said feeding member, said tension controlling means comprising a pivoted lever, a spring for moving said lever in a direction generally parallel to that of the movement of the material by said feeding member, a film engaging member mounted upon one end of said lever for bodily movement thereupon in a direction substantially parallel to the longitudinal axis thereof and substantially at right angles to such

general direction of movement of the film, and a spring for moving said film engaging member toward the film and into engagement therewith.

7. A material handling apparatus which comprises a carrier, an intermittent feeding member engaging the material supported by said carrier for feeding it in relation thereto, and means for controlling the tension of that portion of the material between said carrier and said feeding member, said tension controlling means comprising a pivoted lever, a spring for moving said lever in a direction generally parallel to that of the movement of the material by said feeding member, a film engaging member mounted upon one end of said lever for bodily movement thereupon in a direction substantially parallel to the longitudinal axis thereof and substantially at right angles to such general direction of movement of the film, and a spring for moving said film engaging member toward the film and into engagement therewith, said springs being of different magnitudes, whereby each feeding impulse of said feeding member as it draws film directly from said carrier is cushioned by one of said springs and also stores power in said spring so that said spring is effective to move the film from said carrier during each period of idleness of said feeding member, said spring and said feeding member operating in step or rhythm, and whereby said other mentioned spring is effective to yield under abnormal conditions of feeding for the purpose of protecting the film against damage with interrupting such rhythm of said feeding member and said other mentioned spring.

8. A film handling apparatus which comprises a carrier, a member engaging the film supported by said carrier for feeding it in relation thereto, and tension-controlling means, said means comprising a movable supporting member disposed between said carrier and said feeding-member, a spring for moving said supporting member toward the film, a film engaging element mounted upon said supporting member for bodily movement in respect thereto, and a spring for urging said element toward the film, said carrier, said feeding member, and said film engaging element being so disposed in relation to each other that they form an arcuate path for the film and said film engaging element being positioned between such arc and the chord thereof.

9. Apparatus according to claim 8, said springs being of substantially different magnitudes.

10. In a material handling apparatus, a delivery carrier, an intermittently operating feeding member engaging the material supported by said carrier for drawing it therefrom, and auxiliary feeding means adapted both to cushion the effect of said intermittent feeding member upon the material during the periods of operation thereof and to draw material from said delivery carrier during the periods of rest of said intermittent feeding member, said auxiliary feeding means comprising a member engaging the material between said feeding member and said carrier, means movable relatively to the apparatus for mounting said engaging member upon said apparatus, resilient means for urging said engaging member toward the film and into engagement therewith, and a spring for moving said mounting means in opposition to the traction of the film, said mounting means being so disposed in relation to the material that following the movement of the film by said feeding member said engaging member is moved both in a direction substantially parallel to the direction of movement of the film and also in a direction substantially normal thereto.

11. A material handling apparatus which comprises a delivery carrier, a powered feeding member engaging the material supported by said carrier for drawing it therefrom, and auxiliary feeding means, said auxiliary feeding means comprising a pivoted lever disposed between said delivery carrier and said feeding member, a spring for moving said lever in a direction generally opposite to that of the movement of the material by said feeding member, said spring being so mounted and so attached to said lever that it moves said lever upon its pivot, a film engaging member mounted upon one end of said lever for bodily movement thereupon in a direction substantially parallel to the longitudinal axis thereof, and a spring for urging said film engaging member into engagement with the film.

12. A material handling apparatus which comprises a delivery carrier, an intermittent feeding member engaging the material supported by said carrier for drawing it therefrom, and auxiliary feeding means, said auxiliary feeding means comprising a pivoted lever disposed between said delivery carrier and said feeding member, a spring for moving said lever in a direction generally opposite to that of the movement of the material by said feeding member, said spring being so mounted and so attached to said lever that it moves said lever upon its pivot, a film engaging member mounted upon one end of said lever for bodily movement thereupon in a direction substantially parallel to the longitudinal axis thereof, and a spring for urging said film engaging member into engagement with the film, whereby each feeding impulse of said feeding member as it draws film directly from said carrier is cushioned by one of said springs and also stores power in said spring so that said spring is effective to move the film from said carrier during each period of idleness of said feeding member, said spring and said feeding member operating in step or rhythm, and whereby said other mentioned spring is effective to yield under abnormal conditions of feeding for the purpose of protecting the film against damage without interrupting such rhythm of said feeding member and said other mentioned spring.

13. A material handling apparatus which comprises a take-up carrier, a powered feeding member engaging the material supported by said carrier for moving its theretoward, and auxiliary feeding means, said auxiliary feeding means comprising a pivoted lever disposed between said take-up carrier and said feeding member, a spring for moving said lever in a direction generally the same as that of the movement of the material by said feeding member, said spring being so mounted and so attached to said lever that it moves said lever upon its pivot, a film engaging member mounted upon one end of said lever for bodily movement thereupon in a direction substantially parallel to the longitudinal axis thereof, and a spring for urging said film engaging member into engagement with the film.

14. In a material handling apparatus, a delivery carrier, an intermittently operating feeding member engaging the material supported by said carrier for drawing it therefrom, and auxiliary feeding means adapted both to cushion the effect of said intermittent feeding member upon the material during the periods of operation thereof and to draw material from said delivery carrier during the periods of rest of said inter-

mittent feeding member, said auxiliary feeding means comprising an element engaging the material between said feeding member and said carrier and tending to displace the material from a straight line between said carrier and said member, a mounting for said film-engaging element movably disposed upon said apparatus, a first spring effective upon said mounting for urging said film engaging element toward the film in a direction substantially parallel to the direction of travel of the film between said film engaging element and said feeding member, a second spring effective upon said mounting for urging said engaging member toward the material in a direction substantially at right angles to such first mentioned direction, said mounting being so disposed relative to the material that the movement of said material-engaging element in one of such directions is effective to carry out such cushioning operation and the movement thereof in the other of such directions is effective to carry out such auxiliary feeding operation.

15. In a material handling apparatus, a take-up carrier, a toothed intermittently operating feeding member engaging the material supported by said carrier for feeding it theretoward, and auxiliary feeding means adapted both to cushion the effect of said driven carrier upon the material during the periods of operation thereof and to draw material from said intermittent member during the periods of rest thereof, said auxiliary feeding means comprising an element engaging the material between said carrier and said feeding member, a mounting for said film-engaging element movably disposed upon said apparatus, a first spring effective upon said mounting for urging said film-engaging element toward the film in a direction substantially parallel to the direction of travel of the film between said film-engaging element and said feeding member, a second spring effective upon said mounting for urging said engaging member toward the material in a direction substantially at right angles to such first mentioned direction, said mounting being so disposed relative to the material that the movement of said material-engaging element in one of such directions is effective to carry out such cushioning operation and the movement thereof in the other of such directions is effective to carry out such auxiliary feeding operation.

16. A film handling apparatus which comprises two film supporting members between which a film is fed and film tensioning means disposed between said supporting members, said film tensioning means comprising a movable lever, a fulcrum upon which said lever is movably mounted, a film engaging member, said supporting members and said film engaging member being so positioned that they form an arcuate path for the film, said film engaging member being positioned between such arc and its chord, means for mounting said film engaging member upon said lever for bodily movement in relation thereto as well as for bodily movement therewith, said mounting means including elements which guide the movement of said film engaging member relatively to said lever, and means for moving said lever upon said fulcrum and thereby bodily moving said film engaging member.

17. A film handling apparatus which comprises two film supporting members between which a film is fed and film tensioning means effective between said supporting members, said film tensioning means comprising a pivoted lever, a fulcrum upon which said lever is movable, a spring for moving said lever upon said fulcrum in opposition to the traction of the film, a sleeve upon said member movable along the longitudinal axis thereof, a film-engaging element mounted upon said sleeve, and a spring for urging said sleeve toward the film and said element into engagement therewith.

18. A film handling apparatus which comprises a spindle adapted for the removable mounting of a film carrier thereupon, a brake drum revoluble with said spindle, a toothed member for feeding a film supported upon said carrier, a supporting member movably mounted adjacent said carrier, an element engaging the film between said carrier and said toothed member, means for mounting said film engaging element upon said supporting member for bodily movement along the longitudinal axis thereof, a spring for urging said element toward the film and into engagement therewith, a brake shoe mounted upon said supporting member for cooperation with said brake drum upon said spindle, and a spring for urging said supporting member toward said drum.

19. A film handling apparatus which comprises a spindle adapted for the removable mounting of a film carrier thereupon, a brake drum upon said spindle, a toothed member for feeding a film supported upon said carrier, a pivoted member disposed adjacent said carrier, a sleeve mounted upon said member for movement along the longitudinal axis thereof, an element supported by said sleeve and engaging the film between said carrier and said toothed member, a spring for urging said sleeve toward the film and said element into engagement therewith, a brake shoe, and a flat spring one end of which is fixed to said pivoted member and to the other end of which said shoe is attached.

20. A film handling apparatus which comprises a spindle adapted for the removable mounting of a film carrier thereupon, a brake drum upon said spindle, a toothed member for feeding a film supported upon said carrier, a pivoted member disposed adjacent said carrier, a fulcrum upon which said pivoted member is movable, a sleeve mounted upon said pivoted member for movement along the longitudinal axis thereof, an element supported by said sleeve and engaging the film between said carrier and said toothed member, a spring for urging said sleeve toward the film and said element into engagement therewith, a brake shoe, a flat spring one end of which is fixed to said pivoted member and to the other end of which said brake shoe is attached, and means for mounting said flat spring upon said pivoted member in relation to said brake drum for utilizing the resilience of said spring both to cushion the operation of said brake and also directly to move said pivoted member in opposition to the traction of the film.

FREDERICK DAVENPORT SWEET.