Aug. 7, 1934. R. F. DIRKES 1,969,692

TELEGRAPH PRINTING SYSTEM

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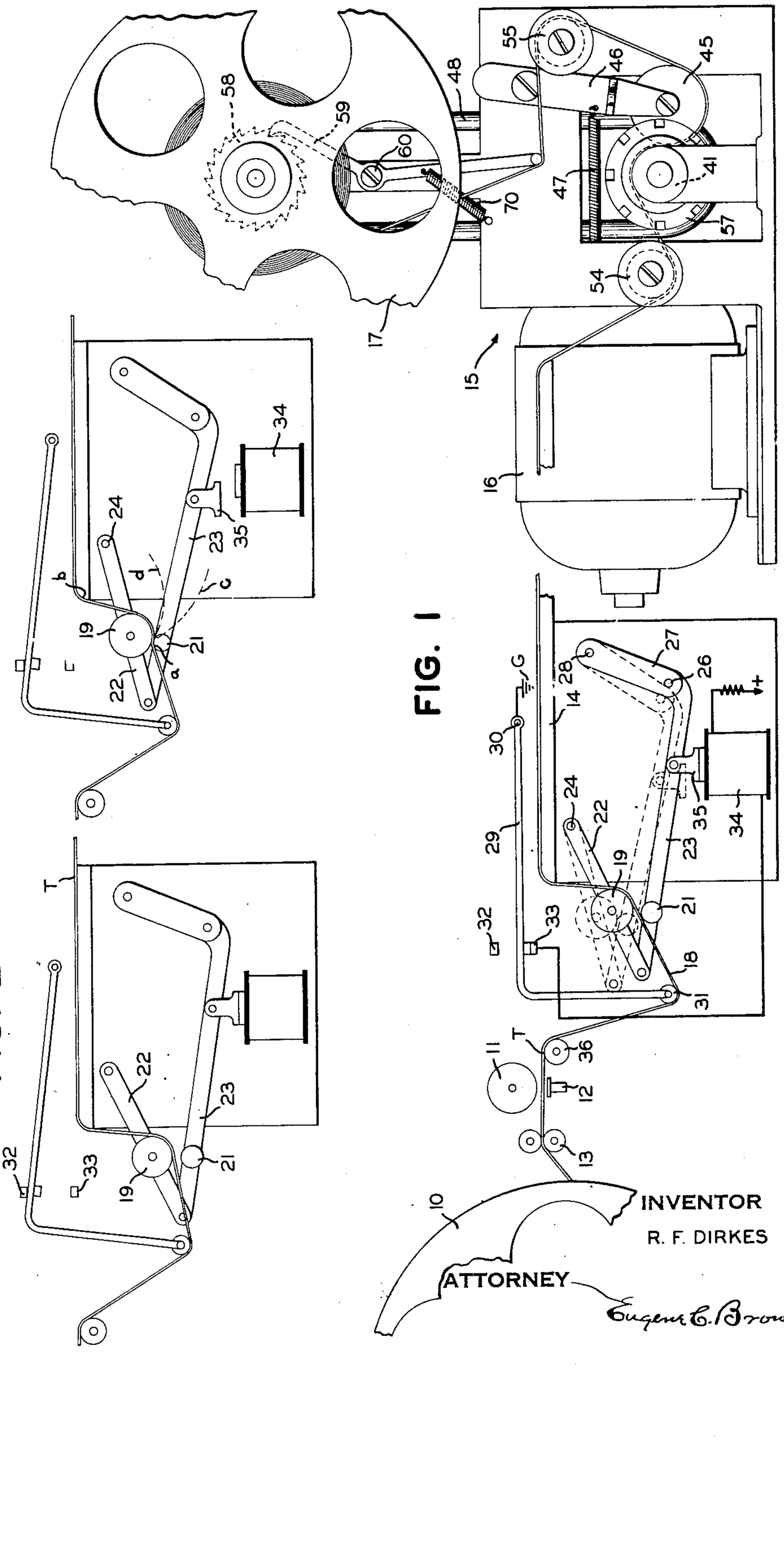

FIG. 3

FIG. 2

FIG. 1

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FIG. 4

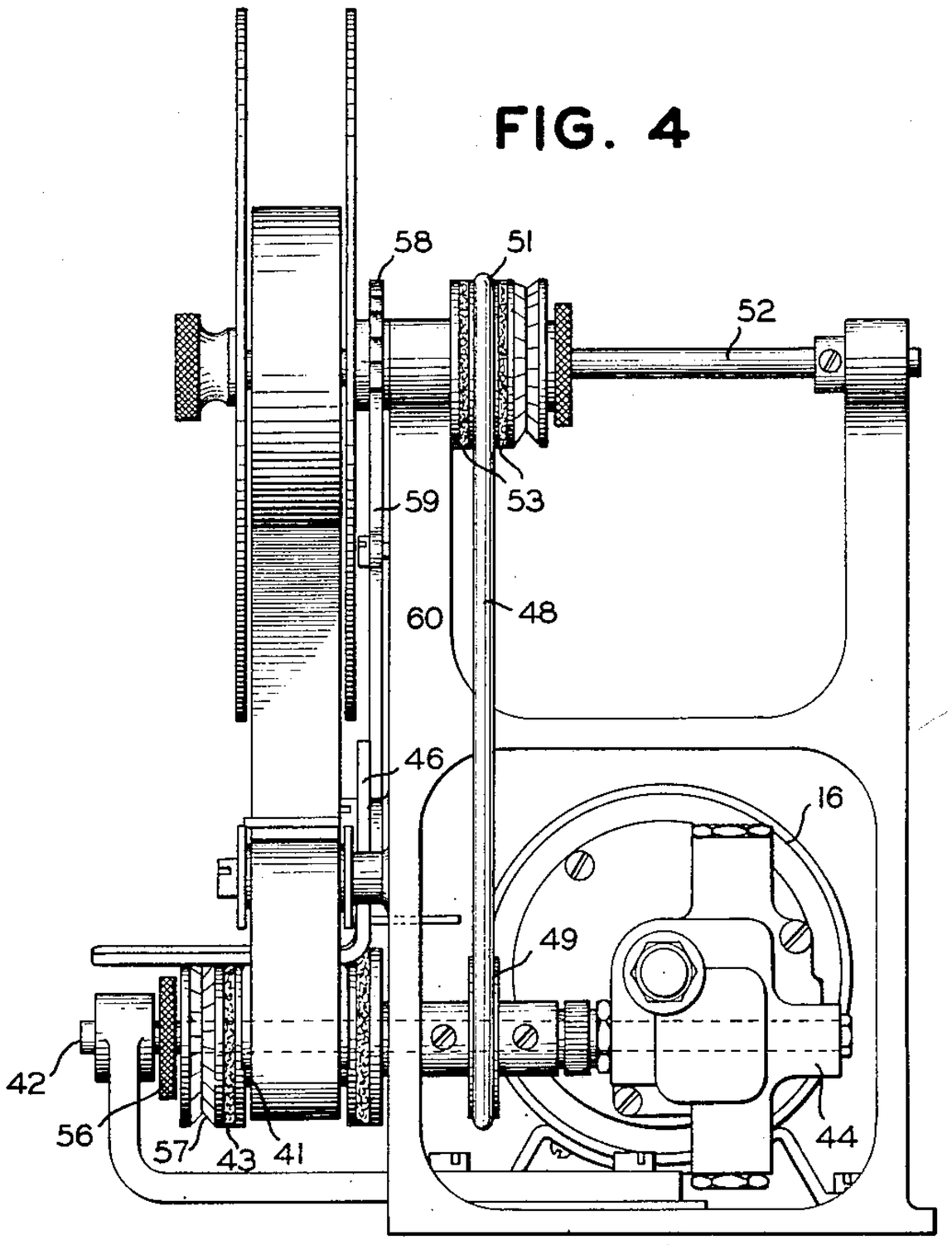
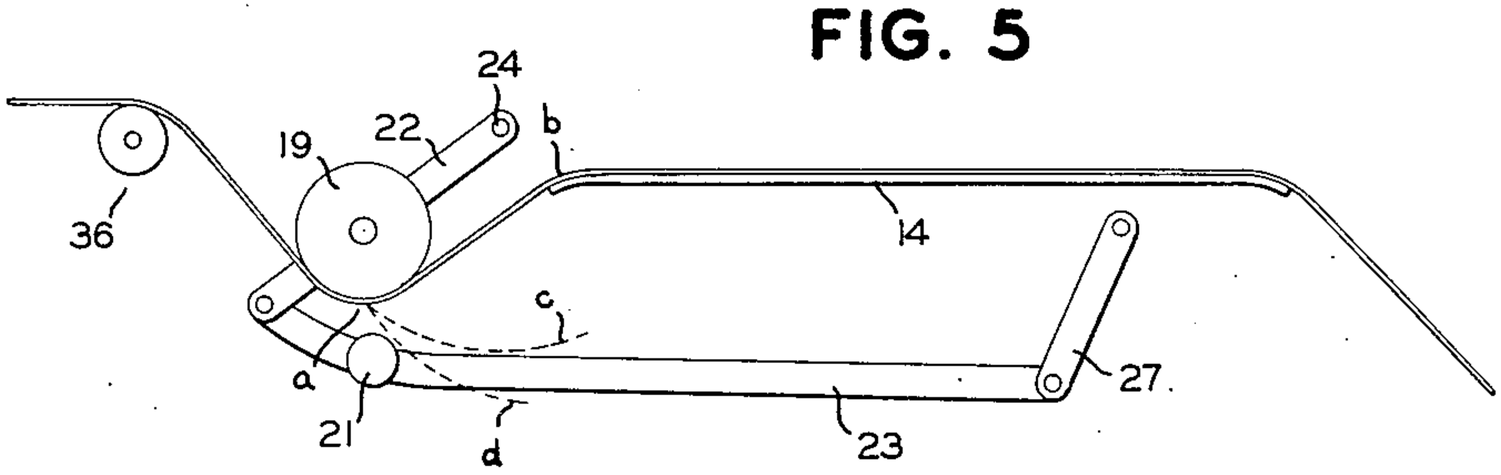


FIG. 5



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1,969,692

TELEGRAPH PRINTING SYSTEM

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15 Claims. (Cl. 178—42)

This invention relates to telegraph printing and projecting systems in which information printed upon a tape is projected upon a screen for observation. More particularly the invention relates to means for controlling the feeding of the tape through the field of the projector so that the projected images will advance across the screen with an even movement whereby they may be easily discerned.

This application is a continuation in part of application Serial No. 554,574, filed August 1, 1931, and entitled "Tape control for projectors."

In my prior Patent No. 1,684,309, granted September 11, 1928, and entitled "Method of and means for feeding tape and projecting data therefrom" I have shown a tape pulling mechanism in which the tape is drawn through the field of the projector by a motor started into operation whenever predetermined slack occurs in the tape between the printer and the projector, and which is stopped to arrest the movement of the tape whenever the surplus tape has been substantially eliminated. The motor circuit in the aforesaid patent is opened and closed by a contact controlled by an auto-stop arm resting in a loop of the tape which is allowed to accumulate between the printer and the projector. Due to the inertia of the motor armature, the starting and stopping of the motor is gradual and consequently a gradual acceleration and deceleration of the tape occurs upon each movement thereof whereby the usual jerky movement incident to starting and stopping the tape is eliminated. Since the momentum of the armature continues the same in rotation for a slight period after the motor circuit is interrupted, sufficient to draw a few additional characters into the field of the projector, the auto-control contacts are opened a substantial distance by the additional reduction of the loop so that as additional tape is subsequently supplied by the printer, the motor circuit is not immediately completed but is delayed until a substantial loop has again accumulated equivalent to a corresponding number of characters. Consequently there is always a certain dwell between the stopping of the tape and the starting thereof, whereby several characters will be advanced into the field of the projector upon each movement of the tape, thus eliminating the usual step-by-step movement of the characters across the screen should the printer be operated at a slow rate.

One of the objects of the present invention is to provide a tape pulling mechanism in which substantially these same results can be obtained without the necessity of continuously stopping and starting the motor.

Another object is to provide a tape arresting mechanism which is simple in construction and dependable in operation.

A still further object is to provide such a tape arresting device in which the force applied thereby to the tape is proportional to the tension exerted on the tape by the pulling device, whereby slippage of the tape through the arresting device and consequent application of the pulling force to the tape emerging from the printer, is prevented.

Other objects and advantages of the invention will appear from the following description.

In accordance with my invention the tape is drawn through the field of the projector by a constantly running motor acting through a slip clutch, the tape being arrested by a gripping or snubbing action on the tape whenever the loop between the ticker and projector decreases to a predetermined minimum.

The tape snubber comprises a pair of gripping members normally spaced apart, when a predetermined accumulation or loop of tape occurs. The gripping members are movable in the same direction, as the loop decreases, but at different speeds, the following gripping member moving at a slightly higher rate than the forward member, whereby they are brought into contact very gradually. Preferably, the gripping members are mounted upon a pair of angularly disposed pivoted links or toggle arms pivoted together at their intersection, with the tape passing therebetween, whereby one of the arms is engaged by the tape so as to be elevated as the loop diminishes in size, carrying with it the other arm in such manner as to gradually close the angle between the arms and thereby ultimately bring the gripping members together.

Due to the fact that both gripping members are moving in the same direction but at slightly different speeds, they are brought together slowly and thereby exert a gradually increasing pressure on the tape. The initial pressure serves to reduce the speed of travel of the tape without actually stopping it. Obviously when the speed of the tape is reduced to the average speed at which it is ejected from the printer, a condition of equilibrium or balance is obtained. If the printer increases in speed, the loop enlarges, allowing the arms to fall apart slowly decreasing the pressure on the tape and permitting it to be drawn through the projector at a higher rate.

However, if the printer decreases in speed sufficiently, or its operation is interrupted entirely, the gripping members will finally be brought into close contact so as to arrest the movement of the tape altogether. The rate at which the gripping members are brought together can be readily varied by changing the length and proportion of the arms and the position of the gripping members thereon.

After the tape has come to rest, it is held stationary until a predetermined and appreciable amount of tape has again accumulated between the ticker and projector. Consequently, after movement of the tape again starts, it will continue for a considerable period, thereby eliminating the constant starting and stopping of the tape, which otherwise occurs when the ticker is ejecting tape at a slower rate than that at which the tape puller is capable of taking it up.

In one modification this dwell in the operation of the tape puller is obtained by arranging the gripping members so that as they come into firm engagement to stop the tape, they are definitely locked in contact by the tension of the pulling device irrespective of the amount of slack or size of the loop accumulated on the printer side thereof. After a predetermined loop has formed which may correspond to several characters, the gripping members may be positively released by a magnet or other device suitably disposed to act upon one of the toggle arms. In another arrangement the gripping members may be disposed so that they do not lock in gripping relation, the energy and momentum of the movable elements and the static friction of the tape relative to the gripping members being utilized to obtain a lag in the restarting of the tape.

In order that the invention may be more fully understood reference will be had to the accompanying drawings, in which:

Figure 1 is a front elevation of a tape pulling and control arrangement showing the tape gripping members disengaged;

Figure 2 is a similar view showing the mechanism in an intermediate position.

Figure 3 is a similar view showing the tape gripping members engaged to arrest the movement of the tape;

Figure 4 is a side elevation of the tape pulling mechanism; and

Figure 5 is a somewhat diagrammatic view of a modified form of tape controlling mechanism.

Referring first to Figure 1, the tape T which is contained upon a reel 10 is fed through a ticker or other printing telegraph apparatus represented conventionally by the type wheel 11, platen 12 and feed rollers 13. The feed rollers serve to step the tape forward intermittently as the printing occurs thereon. Obviously, any type of tape printer may be employed operated either by a uniform code, such as the Baudot code, or by step-by-step signals. The tape is drawn over a support 14 extending across the field of a projector, not shown, by means of a tape puller indicated generally at 15, driven by an electric motor 16 through a slip clutch which will be subsequently described. The tape is rewound upon a reel 17.

The tape puller is geared to operate at a maximum speed slightly greater than the maximum output of the printer and in order that the movement of the tape across the field of the projector will be smooth, a loop 18 of tape is allowed to form between the printer and the guide 14. The movement of the tape across the guide is controlled by the size of the loop 18 by means of a pair of tape snubbing or gripping members 19 and 21 between which the tape passes. The roller or abutment 19 and cooperating stud 21 are mounted upon individual links or toggle arms 22 and 23 respectively, the former being pivoted at 24 to the frame of the projector, and the latter being pivoted at 26 to the end of a link 27 in turn pivoted at 28 to the frame of the projector. An auto-control arm 29 is pivoted at 30 above the projector and has its depending end 31 resting in the loop 18. The arm is grounded at G and plays between two electrical contacts 32 and 33, the former being insulated and forming an upper stop for the control arm, and the latter being connected in circuit with a restoring magnet 34 and forming a lower stop for the control arm.

In the condition of the mechanism shown in Figure 1, there is a surplus of tape in the loop 18 so that the gripping members 19 and 21 are spaced apart, permitting the tape to be drawn freely around the roller 19 and over the support 14 of the projector, by the motor 16.

If the tape is supplied from the ticker at approximately the same speed as it is drawn across the field of the projector by the tape puller 15, the loop 18 will remain substantially constant and a steady movement of the tape will result. If the ticker operates slightly slower than the tape puller, which is the normal condition, the loop of tape will gradually decrease raising the auto-control arm until it engages the upper contact or stop 32, as shown in Figure 2. Thereafter as the supply of tape between the printer and projector further decreases, the roller 19 is raised by the tape, carrying with it the pivoted arm 22 which in turn pulls upwardly upon the lower toggle arm 23 drawing the stud 21 upwardly towards the roller 19. Due to the pivotal relation of the levers, the upward movement thereof slowly closes the angle between the levers 22 and 23, thereby decreasing the distance between gripping members 19 and 21. However, since the arm 19 is also moving upwardly, the gripping members come together very slowly and exert a gradually increasing pressure on the tape which first retards the movement of the tape across the support 14 and if the upward movement continues, arrests its movement altogether. If the printer is operating only slighter slower than the normal or maximum rate of operation of the tape puller, the retarding effect on the tape as the gripping members approach each other may be sufficient to establish a stable condition, whereby the tape is taken up at the same average rate that it is ejected by the printer. However, if the printer is operated at a still slower rate or temporarily ceases operation entirely, the members 19 and 21 are brought firmly together, as shown in Figure 3, to completely stop the movement of the tape. The stopping of the tape is not sudden, however, but gradually decreases as the pressure between the gripping members increases. Obviously, by varying the position of the members 19 and 21 on the arms 22 and 23 or by varying the length and pivotal relation of the arms, the rate at which this pressure on the tape increases may be controlled to obtain a desired rate of deceleration of the tape.

The arrangement of the levers 22 and 23 as shown in Figures 1, 2 and 3, is such that after

the gripping members have moved into firm contact, they will not be released by the accumulation of slack to the left thereof but serve to continuously hold the tape against movement until released by some external means. This locking action of the gripping members is obtained by locating the pivot point of the lever 22 below and to the right of the line joining the point of contact "*a*" of the gripping members with the point "*b*" of engagement of the tape with the support 14. With this relation established, the roller 19 cannot drop to a lower position along the arm "*c*" drawn around the pivot point 24 without increasing the length of the tape between the points "*a*" and "*b*", since the point "*a*" of the tape can move only along the arc "*d*" described around the point "*b*". Consequently, the tension applied to the tape by the tape puller definitely holds the members locked in their upward position.

In order to release the members 19 and 21, the magnet 34 has been provided under the control of the auto-control arm 29. When the loop 18 increases to a sufficient size to permit the control arm 29 to engage the lower contact 33, a circuit is completed for the magnet 34, which acting upon the armature 35, carried by the lever 23, pulls the lever downwardly and moves the members 19 and 21 apart. By delaying the movement of the tape until an appreciable quantity of tape has accumulated, frequent starting and stopping or jerky movement of the tape is eliminated.

The tape pulling mechanism includes a roller 41 loosely mounted upon a shaft 42 and driven thereby through friction clutch 43. The shaft 42 is driven through suitable reduction gearing contained within a housing 44 by the electric motor 16. A roller 45 mounted upon a pivoted arm 46 presses the tape against the feed roller 41 by means of a spiral spring 47. The take-up reel 17 is operated from the shaft 42 by means of a belt 48 extending around a pulley 49 fixed to the shaft 42 and a second pulley 51 loosely mounted upon the shaft 52 of the reel 17. The shaft 52 is driven from the pulley 51 through a friction clutch 53. The tape passes from the guide 14, under an idler roller 54, thence between the rollers 41 and 44 and over a second idler roller 55 to the reel 17. The tension of the friction clutch 43 may be adjusted by the nut 56, acting on the spider springs 57 so as to cause the tape to be drawn readily across the guide 14, when the gripping members 19 and 21 are disengaged from the tape but to slip freely when the member 21 is held in contact with the tape.

The friction clutch 53 controlling the reel 17 has a variable load thereon, increasing as the diameter of the tape on the reel increases. Consequently, if the clutch is adjusted to carry the maximum load imposed by a full reel, it may exert too strong a pull on the tape when the reel is empty, resulting in the dragging of the tape through the gripping members 19 and 21. To avoid this difficulty I provide a control mechanism for the reel 17 comprising a detent wheel 58, fixed to the shaft 52 to rotate with the reel and a detent lever 59 pivoted at 60, and having one free end engaging the detent wheel and the other free end extending across the path of the tape between the roller 55 and the reel 17. The detent lever is held out of contact with the wheel 58 by a light spring 70. However, when the tape between the roller 55 and the reel becomes taut, the detent is forced into engagement with the detent wheel locking the reel against further movement.

It will be evident that the locking of the gripping members 19 and 21 will not occur if the pivot point of the lever 22 is located above and to the left of the line joining the points "*a*" and "*b*". With such an arrangement the magnet 34 and control arm 29 may be omitted, the tape passing directly from the roller 36 to the roller 19 and thence over the support 14.

Such an arrangement is shown in Figure 5. It will be noted here that the lever 22 is pivoted above the tape. Consequently as the lever 22 drops following engagement of the members 19 and 21, the point "*a*" of the tape describes the arc "*d*" around the point "*b*" and the point "*a*" of the roller describes the arc "*c*" around the pivot point 24. The tape, therefore, does not restrict the downward movement of the lever 22 whenever slack tape occurs between the rollers 36 and 19. The release of the tape does not occur immediately, however, upon ejection of additional tape from the printer but only after an amount of tape has been ejected which may be equivalent to a number of characters. The cause of this dwell in the movement of the tape will be understood by the description of a cycle of operation. With the members 19 and 21 separated and the tape moving freely at a uniform rate over the roller 19 and guide 14, there is only a small amount of friction between these elements and the tape for the tape puller to overcome. Consequently, the tension on the clutch 43 may be readily adjusted to a low value by the thumb screw 56 only slightly greater than that required to overcome such friction. As the gripping members come together, they must apply sufficient braking action to the tape to overcome not only the direct pull of the clutch but the momentum of the tape and the driven elements of the clutch. Consequently, the stud 21 is pressed quite tightly against the rubber surface of the roller 19 before the tape is brought to rest. After the movement of the tape has been arrested, a considerable greater force is required to start the movement of the tape than that normally necessary to maintain it in movement, since the inertia of the tape and driven clutch elements must be overcome as well as the static friction of the tape with the roller 19 and support 14, the static friction being considerably greater than the moving friction. Consequently, only a small force need be exerted by the stud 21 to maintain the tape stationary and since the members 19 and 21 move apart only slowly as additional tape is ejected from the printer, an accumulation of tape will be formed before the stud releases its grip upon the tape sufficiently to enable the tape puller to start the movement of the tape. The foregoing action results in acceleration of the tape following a dwell, the period of which is dependent primarily upon the rate of recession of the gripping members, the inertia of the driven parts, the stretch of the tape and the static friction between the tape and the rollers 19 and support 14.

Obviously, various modifications and changes may be made in the details of construction shown herein without departing from the spirit or essential attributes of the invention, and therefore I do not desire to be limited to the precise details shown except as required by the limitations in the appended claims.

What I claim is:

1. In combination, a source of tape, a support,

a tape puller, tape arresting means comprising a pair of links, a tape gripping device carried by each of said links, the links being interconnected so that as one is moved, the tape gripping devices are brought together, said tape passing between the gripping devices and being arranged to move one of said links, as the tape between the source and support becomes taut to move the gripping devices into contact with the tape to arrest the movement thereof.

2. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, friction means disposed between said recorder and support said friction means comprising spaced elements between which the tape passes, said elements both being movable in the same direction but at different rates into contact with the tape to retard the movement of the tape and means operated by slack takeup between the recorder and support for so moving said friction means.

3. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, friction means comprising spaced elements between which the tape passes, said elements being movable in the same direction but at different rates to bring the same into contact with the tape to retard its movement and an arm adapted to bear gravitationally on the tape approaching the support whereby slack takeup caused by stoppage of the recorder will raise the arm, said elements both being operated in one direction or the other by said arm, when the latter rises and falls, into and out of contact with the tape.

4. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, a tape engaging member movable into contact with the tape to retard its movement, a lever by which said member is carried and a second lever movable by variations in the slack of the tape approaching the support, said second lever being directly connected to the first lever to move said tape engaging member into and out of contact with the tape as the slack decreases and increases.

5. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, a pair of toggle arms, tape engaging means carried by each of said arms and movable into contact with the tape to arrest its movement over the support and means controlled by variations in the slack in the tape approaching the support for varying the angle of the toggle arms to move said tape engaging member into and out of engagement with the tape.

6. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, a pair of toggle arms, tape engaging means carried by each of said arms and movable into contact with the tape to arrest its movement over the support and means connected to one of said toggle arms adapted to vary the angle of the toggle arms in accordance with variations in the slack of the tape approaching the support for moving said tape engaging members into and out of engagement with the tape.

7. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, a pair of tape engaging members disposed between the recorder and support movable into contact with the tape to retard its movement, a lever by which each of said members is carried one of said levers being adapted to rest upon the tape approaching the support whereby slack takeup caused by stoppage of the recorder will raise said lever and operative connections between said levers whereby said other lever is operated thereby to move the tape engaging member into and out of contact with the tape.

8. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, a lever movable by slack takeup caused by stoppage of the tape approaching the support, an abutment carried by said lever over which said tape passes and a tape engaging member movable by said lever toward said abutment to arrest the movement of the tape.

9. In combination a recording device adapted to eject tape therefrom, a support, means for drawing tape across said support with a continuous movement, a member adapted to bear gravitationally on the tape approaching the support, a lever, a tape engaging member carried thereby and movable against the tape to retard its motion, a second lever directly connected to the first lever for operating the same and operative connections between said member and said second lever whereby movement imparted to said member by slack takeup and accumulation of the tape will be transmitted to said tape engaging member.

10. In combination, a recording device adapted to eject tape therefrom, a support, means for feeding said tape across said support with a continuous movement, movable tape engaging members movable at different rates of speed between which the tape passes and toggle members responsive to variations in the length of tape between the recorder and support, for moving said tape engaging members together to engage the tape, or apart to disengage the tape.

11. In combination, a recording device adapted to eject tape therefrom, a support, means for feeding said tape across said support with a continuous movement, a plurality of pivoted levers, tape engaging means carried by each of said levers between which the tape is adapted to pass and means controlled by the available supply of tape for moving said levers together and apart to force said tape engaging means into and out of engagement with the tape.

12. In combination, an intermittently operating ticker adapted to discharge marked tape, a support, a continuously operating mechanism for drawing the tape over said support, a tape tensioning apparatus comprising a pivoted lever adapted gravitationally to bear on the tape approaching the support whereby slack takeup caused by stoppage of the ticker will raise the same, a roller and an abutment between which the tape passes on entering the projecting device and means operated by said lever when the latter rises and falls for moving both the roller and abutment, said elements by their combined movement respectively forcing together and separating said roller and abutment.

13. In combination, an intermittently operating ticker adapted to discharge marked tape, a support, a continuously operating mechanism

for drawing the tape across said support, a tape tensioning apparatus comprising a roller and an abutment between which the tape passes and means operated by slack takeup and accumulation, caused by stopping and operating the ticker, respectively, for respectively forcing together and separating said roller and abutment, said means including a pair of toggle members operatively associated with said tape said roller and abutment being mounted on said toggle members.

14. In combination, an intermittently operating ticker adapted to discharge marked tape, a support, a continuously operating mechanism for drawing the tape across said support, a movable abutment over which the tape passes in entering said projecting device; a tape-tensioning apparatus comprising a lever adapted gravitationally to bear on the tape approaching the support, whereby slack take-up caused by stoppage of the ticker will raise said lever, a roller adjustably positioned over said abutment, and means positively operated by said lever when the latter rises for moving said roller against said abutment to clamp the tape.

15. In combination, an intermittently operating ticker adapted to discharge marked tape, a support, and a continuously operating pulling mechanism for drawing the tape across said support; a tape-tensioning apparatus comprising a pivoted lever adapted gravitationally to bear on the tape approaching the support, whereby slack take-up caused by stoppage of the ticker will raise said lever, a roller and an abutment between which the tape passes, means operated by said lever when the latter rises and falls for respectively forcing together and separating said roller and abutment, said pulling mechanism including a reel on which the tape is received, actuating means, and a slip clutch connecting said reel with said actuating means whereby the reel will remain stationary when the tape is locked against movement by said roller and abutment.

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