

April 20, 1937.

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2,077,925

TAPE PULLING MECHANISM

Filed May 11, 1935

3 Sheets-Sheet 1

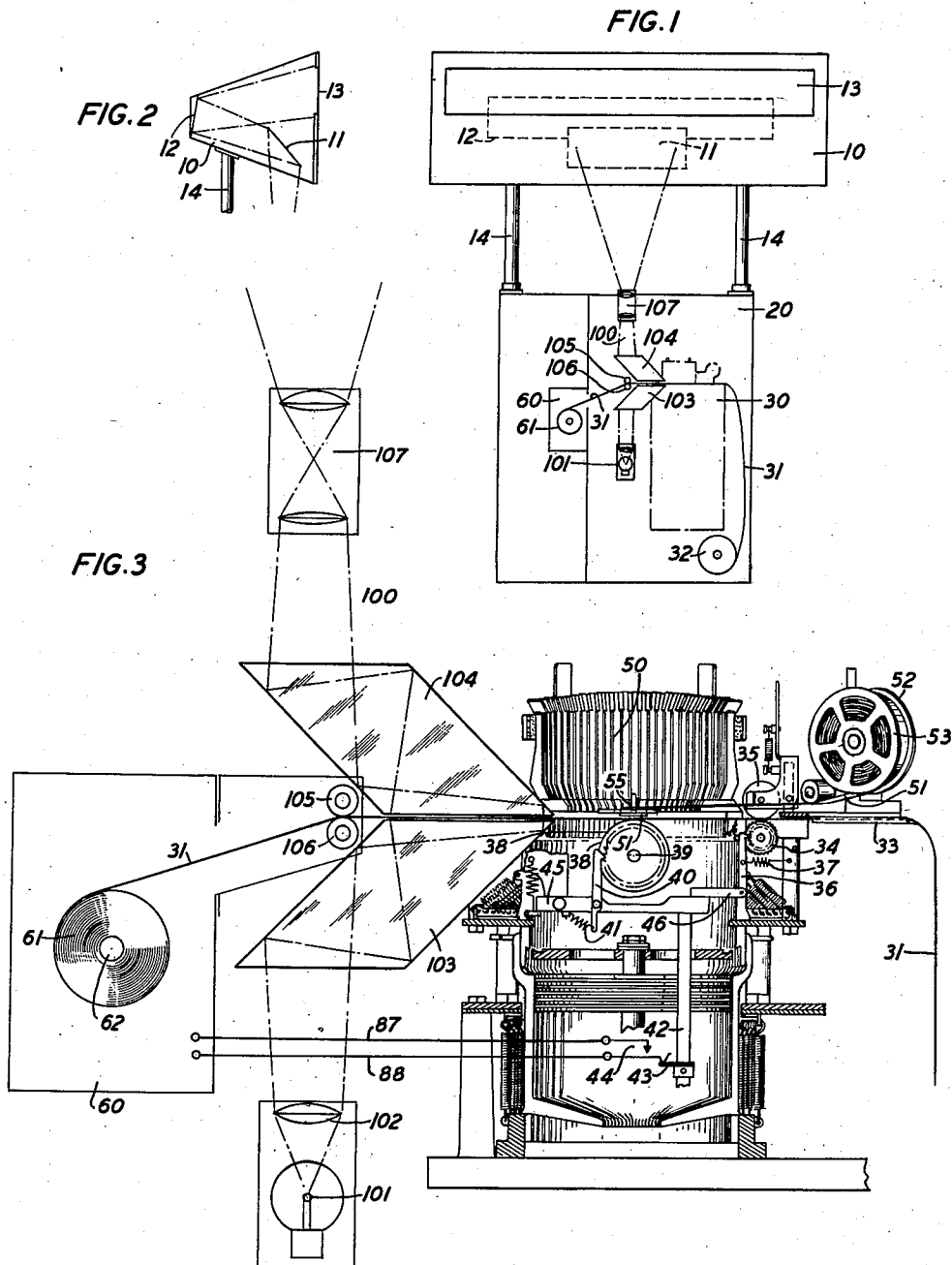


FIG. 1

FIG. 2

FIG.3

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FIG. 4

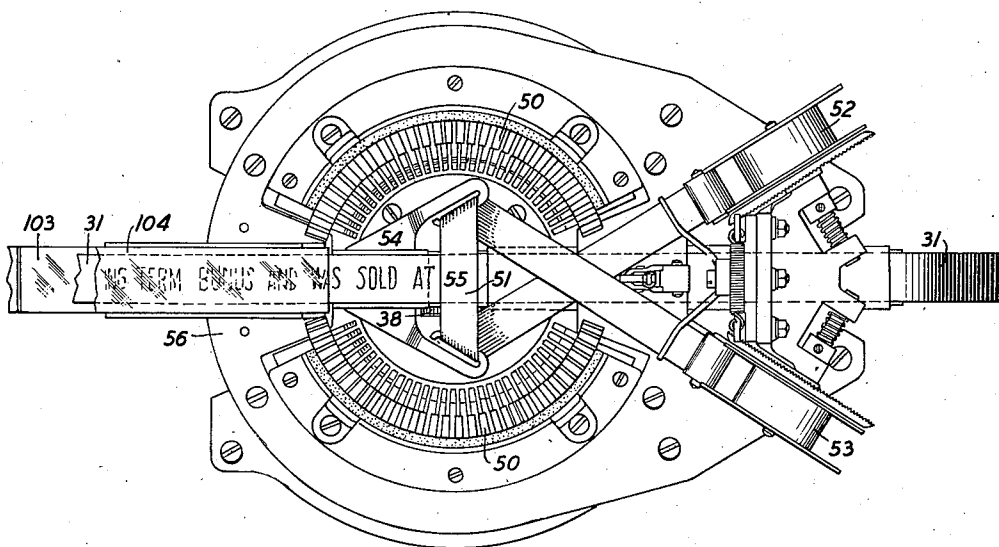
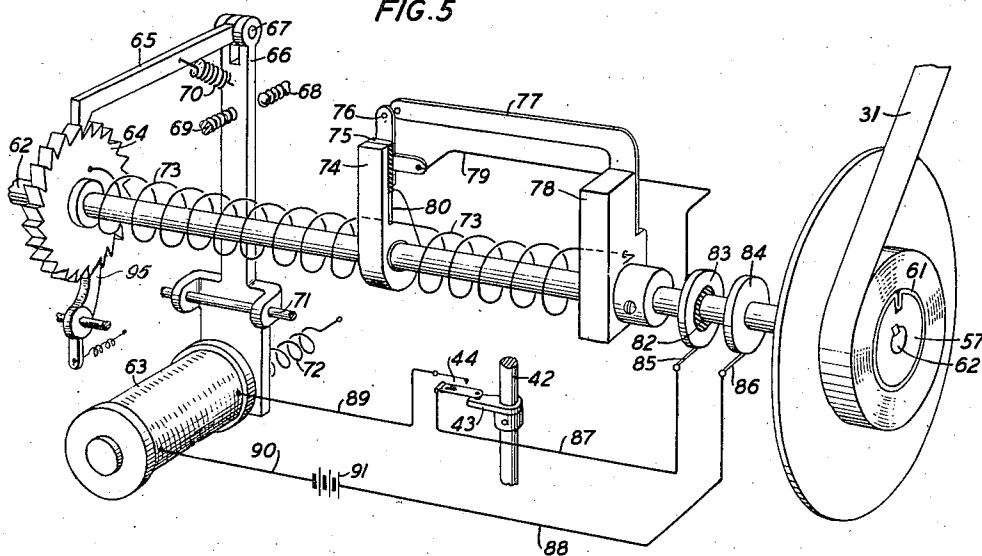


FIG. 5



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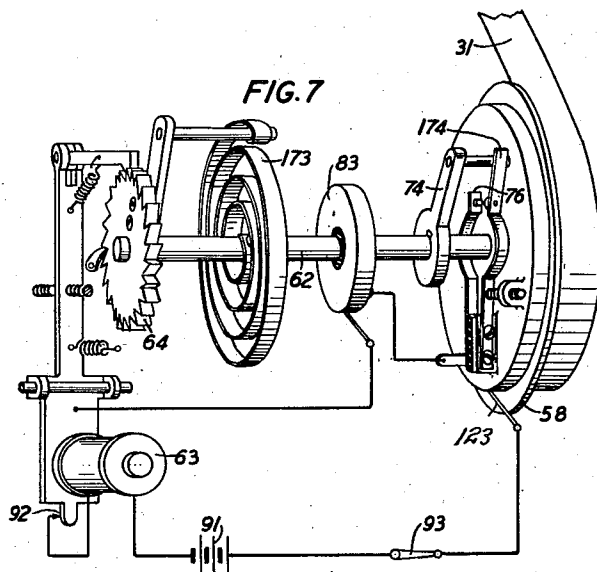
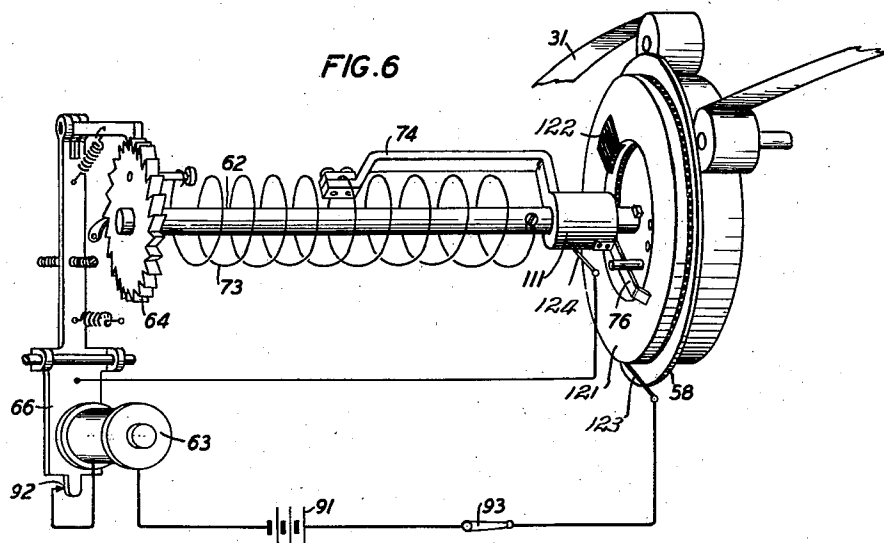
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TAPE PULLING MECHANISM

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3 Sheets-Sheet 3



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TAPE PULLING MECHANISM

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Application May 11, 1935, Serial No. 20,980

3 Claims. (Cl. 178-42)

This invention relates to tape pulling mechanisms and more particularly to mechanisms for pulling the record strip of tape delivered by a telegraph printer for display by an optical projecting system.

It is an object of the invention to provide a tape pulling mechanism for cooperation with a telegraph printer in which clutches and friction drives are avoided and the tape is pulled by a positive connection between the pulling drum and the driving motor.

Another object is to provide a mechanism of this type which is electrically driven and is controlled principally by the tension in the tape.

A further object is to provide a tape pulling mechanism that will not require changes in the telegraph printer which thus may remain of standard design.

A tape pulling mechanism in accordance with this invention is capable of being used with a page printer but is particularly adapted for use with a tape printer, such as the well-known news tickers.

News tickers are frequently operated in combination with an optical projecting system through which the printed tape is fed so that the record will be exposed to light and an image transmitted by a lens system and mirrors to a display screen. In such an arrangement it is essential that the tape emanating from the printer be taut while passing through the field of exposure in the projector.

In accordance with the invention the tape pulling mechanism receives the tape from the projector on a pulling drum; an electric motor, which may be a stepping magnet with a ratchet wheel, drives the drum positively through the medium of a spring member such as a helical or spiral spring. The circuit for the stepping magnet may be controlled by contacts in the ticker, these contacts closing the circuit during each printing operation so that the tape will be pulled taut each time the feeding mechanism in the printer delivers a piece of tape; the pull on the tape is not sufficient to overcome the retaining force asserted on the tape by the feeding mechanism in the printer.

The motor or magnet circuit is, furthermore, controlled by a pair of contacts which open when a predetermined maximum tension is set up by the puller in the tape. The take-up mechanism should be adjusted to have a tendency to take up more tape than is fed out by the printer; thus while the printer is feeding tape the tape puller will have a tendency to pull a greater amount

of tape, but being unable to do so the pulling drum will fall behind the driving motor and a tension will be set up in the intervening motor spring which consequently becomes distorted. This distortion is taken advantage of in accordance with the invention to open the last mentioned pair of contacts so that the motor or stepping device may be stopped until the pulling drum again catches up with the motor.

Such an arrangement is particularly desirable when the pulling drum is used as a storing reel, in which case the effective diameter of the pulling drum, of course, varies with the amount of tape stored thereon. On account of this the pulling drum will tend to pull the tape at a much greater rate when the reel is full than when it is empty; since the stepping magnet operates at constant speed and must operate fast enough to keep the tape taut when the reel is empty, it is essential that the magnet circuit be interrupted when the reel is partly or completely filled every time the tension in the tape increases beyond a desired maximum.

The contact control in response to tape tension may be accomplished in various ways, the main principle being that the control contacts be held in engagement by means of a spring acting with a tension on the contacts which is in proportion to the maximum allowable tension in the tape, and that this spring be included in the driving circuit between the motor and the drum so that it will be subject to increased tension and will open the contacts when the tension in the tape becomes too high. The contact operating spring may be distorted longitudinally or angularly and it may be a separate spring or may form an intermediate or an end portion of the main power spring; it may be a helical or a spiral spring or it may be a flat spring distorted by bending or by twisting, or combinations of these.

The device may, of course, be operated in conjunction with mechanism for preventing jerky movement of the tape.

These and other features, capabilities and advantages of the invention will appear from the following description of certain specific embodiments of the invention which are illustrated in the accompanying drawings, in which:

Fig. 1 is a diagrammatical view of a projecting system and tape pulling means constructed according to the invention;

Fig. 2 is a side view of the upper portion of Fig. 1;

Fig. 3 is an enlarged view showing more in

detail a printing mechanism and an optical system with which the tape pulling mechanism may be operated;

Fig. 4 is a horizontal elevation of the printing mechanism shown in Fig. 3;

Figs. 5, 6 and 7 are perspective diagrammatical views of tape pulling mechanisms, comprising the main features of the invention.

It is to be understood that various changes and modifications may be made in the details of construction shown in the drawings without departing from the spirit of the invention as set forth in the appended claims.

In general, the projecting system comprises a compartment 20 containing a recording device 30, such as a tape printer or news ticker, together with a tape pulling mechanism 60 and an optical system 100 for observing the recorded message and projecting it upward into a second compartment 10 which is placed directly above the lower compartment at a fixed distance therefrom, so that the recorded message can be reproduced on a vertical screen where it may be viewed from the front by an assembly of people.

The recording device 30 may be any standard tape printer or news ticker, with a supply roll of standard printing tape. For a disclosure of a device suitable for the purposes of the invention, reference should be had to United States Patent 1,989,710, issued to A. H. Reiber et al. on February 5, 1935. Only such details of the recording device will be illustrated and described herein as are necessary for an understanding of the invention and its operation.

Referring to the drawings, the printer 30, the projecting mechanism and the tape pulling mechanism 60 are contained in a general structure, preferably of wood, having a lower compartment 20 and an upper compartment 10. The lower compartment 20 contains the tape pulling means 60, the prismatic mirrors 103 and 104, the tape illuminating means 101, the objective or lens system 107, etc. The upper compartment 10 is open at the bottom and contains the inclined mirrors 11 and 12 and the translucent screen 13. Compartment 10 is supported above compartment 20 by means of the posts 14 or in any other suitable manner whereby the two compartments are combined into a structural unit which may be supported on a table or on the floor.

The printer 30 illustrated in the drawings is of a type particularly suited for the optical system in that it permits the projecting system to observe and project the printed message as nearly as possible to the last character printed.

The printer 30 carries a supply roll 32 of standard transparent paper strip 31 which is led over a tape guiding bar 33 between the tape feed wheel 34 and the feed pressure wheel 35, and thence underneath the color ribbon 51 and over the platen 38 at the point of printing 55. The platen 38 is journaled in bearings 39. The tape 31 is positively fed along by the feed wheel 34 every time the main ball plunger 42 is operated in response to a signal. Immediately upon reception by the printer magnet of each signal combination the main ball plunger 42 is operated and causes main ball 45 to operate lever arm 46 thereby causing pawl 36, which is controlled by spring 37, to engage and rotate the tape feed wheel 34. Operation of main ball 45 causes pawl 40, which is controlled by spring 41, to engage and rotate the platen 38. Opera-

tion of main ball 45 also causes one of the type bars 50 or a special stunt to be operated, depending upon the signal. Operation of main ball plunger 42 operates lever arm 43 which is suitably attached to main ball plunger 42 and which closes the contacts of springs 44 once for each operation thereby establishing a circuit to the tape pulling mechanism 60.

The tape 31 is then passed between prismatic mirrors 103 and 104 and between the tape guide rollers 105 and 106 to the tape reel 61 which is attached to shaft 62 of the tape pulling mechanism 60. This mechanism 60, in a manner yet to be explained, functions to keep the tape 31 taut between the feed wheel 34 and the tape guide rollers 105 and 106 in order to insure accurate focus and proper illumination of all parts of the typewritten message lying between the prismatic mirrors 103 and 104.

The optical system comprises an illuminating means 101 of any suitable kind, a prismatic mirror 103 to deflect the light through the tape 31 and a prismatic mirror 104 to deflect the image on the part of the tape 31 which is between the prismatic mirrors 103 and 104, upward through the objective or lens system 107 and through the top covering of compartment 20. The image is received in the upper compartment by mirror 11, which is placed at an angle with the axis of the lens system 107 so that the image is inverted and thrown greatly enlarged onto mirror 12 which again inverts the image and throws it onto the translucent screen 13. The light from lamp 101 is intensified by lens 102 which may be designed in well-known manner to blur the image of the lamp filament on the tape 31 so that the record will appear evenly illuminated on the screen 13.

The color ribbon 51, during the operation of the printer 30, is fed from ribbon spool 52 through one arm of the color ribbon guide 54 across the tape 31 at the point of printing 55 thence through the other arm of the color ribbon guide 54 to the second ribbon spool 53.

One embodiment of the tape pulling mechanism is particularly illustrated in Fig. 5; the device is shown in a diagrammatic manner to bring out its main features and principles of operation, the details of construction being unimportant for an understanding of the invention. The device comprises a shaft 62 which carries a mounting 57 for a tape reel 61 adapted for easy detachment from the mounting as well as for simple detachment of the printer tape 31 in any desirable manner well known in the art. At the other end of the shaft 62 is a ratchet wheel 64 free to rotate about the shaft and connected to the shaft through a long helical spring 73, one end of which is attached to the ratchet wheel and the other end to a block 78 fastened to the shaft. The ratchet wheel is driven through a stepping pawl 65 attached at 67 to an armature 66 pivoted at 71, the armature in turn being operated by electromagnet 63 and the return spring 72. The pawl 65 is kept in engagement with the ratchet by means of spring 70 and the travel of the pawl may be limited in any desirable manner as by front and back stops 68 and 69 for the armature 66. A spring pressed ratchet 95 prevents the ratchet wheel 64 from rotating backwards.

A pair of control contacts 76 and 77 are arranged for preventing the tape puller from exerting an excessive pull on the tape 31. The

circuit from these contacts extends over conductor 79, slip ring 83 insulated by bushing 82 from shaft 62, brush 85, conductor 87, contacts 44 on the printer, conductor 89, winding of electromagnet 63, conductor 90, battery 91, conductor 88, brush 86, uninsulated slip ring 84, shaft 62, block 78 and contact 77. The contact 76 is carried by a floating arm 74 and is insulated therefrom by insulation 75. The arm 74 is attached to spring 73 in any desirable manner as by passing a portion of the spring 73 into a slot 80 in the arm 74.

For an understanding of the operation of this device it must be pointed out that the movement of the tape 31 is controlled by the feed roller 34 in the printer, which pushes the tape out of the printer through proper guides; by means of the spring-pressed roller 35 the tape is not only positively moved by the feed roller 34 but it is also held with considerable force by the feed roller 34 against movement by an external force. However, the arrangement is such that the shape of the hook on stepping pawl 36 and the tension of spring 37 for the stepping pawl obviates all danger of the tape breaking when the tape is pulled out of the printer by hand. The movement of the platen 38 simultaneously with the feed movement serves to aid in the feeding of the tape past the point of printing.

Referring now to the tape puller, it will be assumed that the tape 31 has been attached to the reel 61 which in turn has been placed on the mounting 57. For proper operation of the device it will usually be necessary to tighten the tape 31 between the printer and the puller. This may be done in different ways as by advancing the ratchet wheel 64 by hand or by manually closing and opening the stepping circuit for magnet 63 until sufficient tension is set up in the spring 73 to hold the tape 21 taut. As the tension in spring 73 increases its various turns will be shifted with respect to each other, and when a certain tension has been set up in the spring the portion of the spring which is in engagement with arm 74 will be turned with respect to the end of spring 73 which is fastened in block 78, with the result that the contacts 76 and 77 are separated. The arrangement is such that the portion of spring 73 which is placed between block 78 and arm 74 will always have a certain tension which corresponds to the maximum pull to which the tape 31 may be subjected; it is, therefore, apparent that it is when this tension is slightly increased by the stepping device that the contacts 76 and 77 will be opened to immediately interrupt the stepping operations. The spring 77 is designed to be of sufficient strength to hold the right hand portion of spring 73 under tension by engagement with the contact 76 even when the left end of spring 73 attached to ratchet wheel 64 is completely released.

Thus assuming that the device has been set up and ready for operation the contacts 76 and 77 may either be closed or opened; it will be assumed that these contacts are left closed. When a printing operation takes place in the printer 30, the rod 42 will be operated to oscillate once in the vertical direction, thereby closing contacts 44 and operating magnet 63 once. The consequent stepping of the ratchet wheel 64 increases the tension in the left portion of spring 73; at the same time the tape 31 is fed out from the printer and causes a degree of release in the left end of spring 73. As the printing operations are repeated the stepping wheel 64 will

tend to increase the tension in spring 73 and the feeding of tape 31 will tend to decrease the tension in the spring. When the reel is newly started the decrease in tension of the spring is much greater for each printer operation than when the reel is nearly filled with tape. It is, therefore, necessary that the stepping magnet increase the tension in spring 73 during each step sufficiently to slightly more than offset the maximum relaxation caused by each step of feeding of tape 31 when the reel is nearly empty. This may, of course, be accomplished in various ways as by providing the proper number of teeth on ratchet wheel 64, or by causing the pawl 65 to travel over a plurality of teeth in each operation, or by providing proper gearing between the ratchet 64 and the attachment for spring 73. Thus, under all conditions the ratchet wheel will gradually increase the tension in the left hand end of spring 73 until it is slightly greater than the normal tension in the right hand end of spring 73, at which time the contacts 76 and 77 will be opened and prevent further stepping of the magnet 63 until further feeding of the tape 31 again relaxes the tension in the left hand end of spring 73 sufficiently to again bring contacts 76 and 77 into engagement; the stepping magnet will then again be permitted to follow the printer operations and to gradually wind the spring 73 until the contacts 76 and 77 again become opened.

It will thus be seen that the tension in the tape 31 can never exceed a tension which is predetermined by means of the tension set up in the right hand end of spring 73 between block 78 and armature 74. It is also apparent that the tape puller will not be active during stunt operations of the printer when no tape is being fed.

It is evident that the portion of spring 73 which lies between the blocks 78 and 74 may be a spring separate from the left hand end of spring 73, and that in that case it may be attached between any of the parts attached to the shaft 62 by means of block 78 and the parts carried by arm 74 and that it may be of any shape so long as it tends to force the contacts 76 and 77 against each other.

In the general projecting system described above the insertion of the prisms 103 and 104 into the printer would probably require a slight modification of certain parts mounted on the shelf 56. It should, however, be understood that this modification of the standard printer is for the sake of adapting the printer for the optical system and is not required for the proper operation of the tape pulling device 16. Contacts such as contacts 44 are usually present in standard printers. In the majority of cases it will therefore not be necessary to subject the printing device to any change at all for operation with the tape pulling device. It is, furthermore, possible to eliminate the control of the tape puller by the printer contacts 44, as illustrated in the embodiments shown in Figs. 6 and 7.

Referring particularly to Fig. 6, a tape pulling device is shown in diagrammatical form which may be arranged for pulling a tape without storing the tape or may be provided with a storing reel. The device is very similar to the one shown in Fig. 5 but differs in certain respects as will appear from the following description.

The power spring 73 is connected between ratchet wheel 64 and shaft 62 for positive driving of the disc 58 which may be adapted either for a pulling drum or for reception of a storing reel. The disc 58 carries a contact ring 121 which has

an insulated insert 122 and is insulated from the disc 58. A brush 123 serves to connect the battery 91 to the ring 121. The arm 74 is mounted as by a sleeve 111 to rotate freely on the shaft 62. It carries a contact member 76 adapted to engage the contact ring 121. A brush 124 serves to continue the battery circuit from brush 123, ring 121 over contact member 76 and hub 111. The arm 74 is clamped at its outer end to a point on the spring 73 for rotation of the sleeve 111 in accordance with the distortion of the spring 73.

In this case the operating circuit for the stepping magnet 63 is made self-interrupting by means of the contact 92 which will open up every time the armature 66 is attracted.

In this arrangement there is not set up a constant tension in the right hand portion of the spring 73 as in the arrangement shown in Fig. 5. When the device is idle and the tape has just been placed about the pulling drum the position of the different parts may be as shown in the drawings with spring 73 fully relaxed and the insert 122 a predetermined angle removed from the arm 76. Upon closing of switch 93 the stepping circuit for the magnet will be completed as follows: From battery 91, over switch 93, feed contact 123, ring 121, contact arm 76, hub 111, feed brush 124, armature 66, contact 92 and winding of magnet 63 to the other side of battery 91. The magnet will commence a series of stepping operations whereby the spring 73 becomes wound and the arm 74 with its associated contact member 76 will be rotated. The drum will remain stationary, being held back by the feeding roller in the printer.

When the arm 76 reaches the insulated segment 122 the stepping circuit is opened and the operation stops. In this manner the tape will be under a predetermined tension which, of course, should be insufficient to pull it out of the printer.

When now the printer commences to print and feed tape the pulling drum and disc 58 will begin to rotate, again bringing the ring 121 into contact with the now stationary contact member 76. The stepping circuit is again closed and will remain closed until the arm 76 catches up with the insulated segment 122 at which time the tape 31 will be under the maximum permissible tension and the stepping operation ceases. These two functions will continuously alternate as long as the printer operates.

It is, of course, possible to govern the speed of the stepping operations in a desirable manner so that when the device is used as a tape puller without a storing reel the stepping operation may be practically continuous with very few interruptions by the segment 122. The governing device may be a governor on the shaft 62 or any well-known damping means attached to the armature 66.

The device shown on Fig. 7 has a self-interrupting circuit shown in Fig. 6, but may if desired have a circuit such as that shown in Fig. 5 controlled by contacts 44 in the printer. The power from the ratchet wheel 64 is supplied through one spring section 173 which may be a flat spiral spring attached to the shaft 62; the other portion of the driving spring is in the form of a flat spring 174 mounted directly on the disc 58 which in this case is loosely mounted on the shaft 62.

The tension from spring 173 is supplied through shaft 62 to the arm 74 which thereby is brought into engagement with the spring 174. The contact spring 76 is in this case mounted on an insulating support on the disc 58 and is connected

through insulated slip ring 83 to the stepping circuit.

When the device has been prepared for operation the contacts 76 and 174 will ordinarily be in engagement. Upon closing of the switch 93 the stepping circuit is completed as follows: From battery 91, over switch 93, brush 123, spring 174, contact 76, slip ring 83, self-interrupting contact 92, magnet 63 and back to battery. The device will begin stepping thereby increasing the tension in spring 173, rotating shaft 62 and bringing the arm 74 into engagement with the spring 174. When the tension in spring 173 becomes great enough to overcome the tension with which spring 174 rests against contact 76 the stepping circuit will be opened. When now the printer begins to print and feed the tape 31 the flexing of spring 174 due to the pressure of arm 74 will force the disc 58 to rotate under the released tension from the tape 31. As soon as the contact is again made between contact 76 and spring 174 the stepping circuit will be closed and the arm 74 will again begin to flex the spring 174 for continued operation of the disc 58 until the spring disengages the contact 76.

What is claimed is:

1. A strip pulling mechanism for a strip fed from a telegraph printer or the like comprising a pulling drum for the strip, a motor electrically controlled over a circuit, a driving spring system between said motor and said drum, contact means included in said circuit, and contact operating means for closing and opening said circuit by said contact means when the tension in said spring system decreases and increases, respectively, said spring system including a spring for maintaining a tension in said tape under all operating conditions.

2. A strip pulling mechanism for the printing strip fed out from a telegraph printer comprising a pulling drum for the strip, a motor electrically controlled over a circuit, contact means included in said circuit for starting and stopping said motor, contact operating means for closing said contact means with a pressure, a driving spring for transmitting power from said motor to said drum, said contact operating means being mounted to rotate with said spring and to open said contacts when the transmitted torque increases sufficiently to overcome said pressure.

3. A strip pulling mechanism for pulling without appreciable slack a strip fed from a strip feeding mechanism, such as a telegraph printer, at a varying rate determined by said feed mechanism comprising a rotating drum for exerting a pull on said strip, an electric motor having an operating circuit, spring means for transmitting driving power from said motor to said drum, contact means affixed for revolution with a point on said spring means, contact making means affixed for revolution with another point on said spring means for opening and closing said circuit at said contact means as the tension in said spring means varies, at least one of said points being located intermediate the ends of said spring.

4. In a tape pulling mechanism for winding tape from a news ticker projector or the like, an electric motor having a current supply circuit, an axle, a pulling reel for the tape mounted on said axle to be rotated therewith, a power spring section about said axle and having one end mounted for positive rotation by said motor, a contact operating member mounted to rotate about said axle and connected for positive rotation with the other end of said spring section, a

second contact operating member mounted for positive rotation with said axle, a flexible member for holding said contact operating members in engagement when there is a slack in the tape, and contact means for opening said current supply circuit by the separation of said contact operating members when the tape is taut.

5 5. A tape winding mechanism for pulling tape from a tape feeding device and having a tape storing reel, an electric driving motor connected to a current supply through a pair of contacts, characterized in this that a flexible member is connected between said motor and said reel for rotation of said reel with said motor and that
10 15 said pair of contacts are mounted to be separated by the distortion of portion only of said flexible member due to increased tension in the tape.

6. A tape pulling mechanism for continuously pulling a tape taut against a back tension applied
20 to the tape by a tape feed mechanism such as included in a telegraph printer for intermittent feeding of the tape which comprises a pulling drum adapted to pull the tape under tension, a motor connected for driving of said drum, a first
25 contact member, a second contact member, a circuit controlled by said contact members for starting and stopping said motor, a coil spring connected to said motor to drive said drum, said first contact member being attached for rotation
30 with one end of said spring, and said second contact member being attached for rotation with an intermediate point on said spring to keep said circuit closed under tension from said spring when the pull on said tape is normal and to open said
35 circuit under tension from said spring when the pull on said tape is greater than normal.

7. In combination, a telegraph tape printer having means for feeding the tape and for opposing pulling of the tape by external means and
40 having contacts which are temporarily closed once by each printing operation, and a tape pull-

ing mechanism for constantly pulling the tape taut during normal operations, said mechanism comprising a pulling drum for the tape, a driving member and a driven member in engagement for rotating said reel when a slack in the tape
5 occurs, a power spring section for rotating said driving member with one end, a stepping magnet with ratchet wheel for winding the other end of said spring section, a current supply circuit for said magnet controlled by said contacts for step-
10 ping of said ratchet wheel for each printer operation, other contacts for controlling said supply circuit and operable by said members to open when said members disengage due to tension in the tape, and another power spring section for
15 holding said members in engagement with a pressure.

8. In combination, a telegraph printer having means for feeding the tape and for opposing pulling
20 of the tape by external means and having contacts closed and opened once for each printer operation and a tape pulling mechanism for constantly pulling the tape taut during normal operations, said pulling mechanism comprising a
25 winding-up reel for the tape, a power spring having one end attached to said reel for driving thereof instantly the tape is fed by said printer, a stepping magnet with ratchet wheel for winding of said spring, circuit connections between
30 said contacts and said magnet for stepping of said ratchet wheel once for each tape feed operation when the reel is nearly empty, other contacts included in said connections and attached for operation by said power spring in accordance
35 with the tension in a section only thereof to cut out steppings of said ratchet as the reel becomes filled with tape, said power spring exerting a continuous pull on said reel irrespective of the positions of any of said contacts.

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